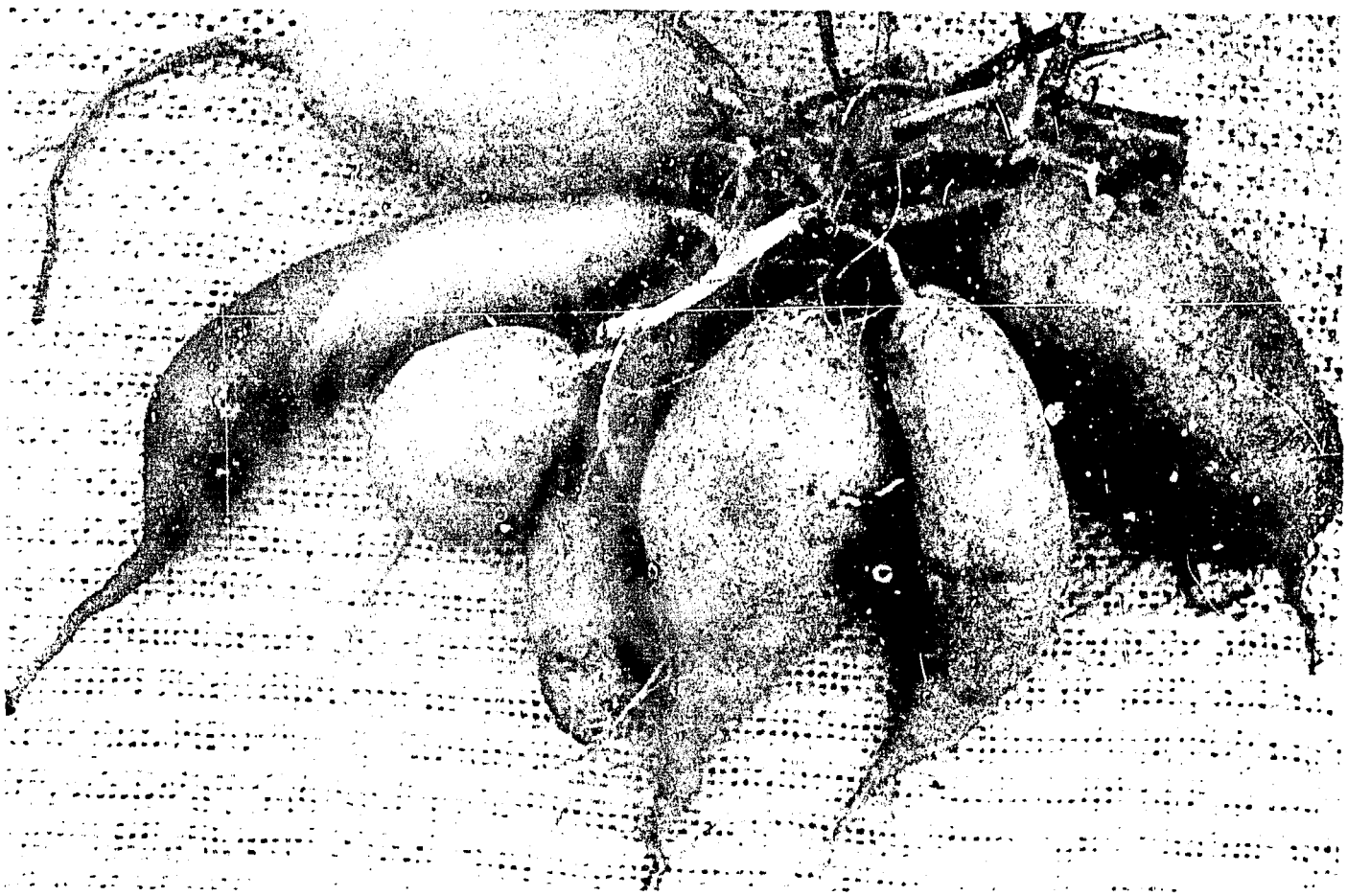
Information Series No. 6

Sweet Potato

Ipomoea batatas (L)

Abstracts of Selected Research and Development Literature, 1949 - 1979

G.O. Ibekwe



Library and Documentation Centre
International Institute of Tropical Agriculture
PMB 5320, Oyo Road, Ibadan, Nigeria

October 1979

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FOREWORD

One of the objectives of the Library and Documentation Center of IITA is to disseminate information on priority areas of IITA's research programs to appropriate scientific communities around the world. This is achieved through compilation and distribution of abstracts, bibliographies and newsletters as well as provision of photocopies of papers on request.

To date, abstracts and bibliographies have been compiled on the following subjects: Yams (*Dioscorea* spp.); Cowpeas (*Vigna unguiculata*); Winged Beans (*Psophocarpus tetragonolobus*); Bambarra Groundnut (*Voandzeia subterranea*); Plantains (*Musa paradisiaca*); Mealybugs (*Pseudococcidae*); Cassava Bacterial Blight (caused by *Xanthomonas manihotis*); and Farming Systems in Africa (published and sold by G. K. Hall, Boston, Massachusetts). The International Grain Legume Information Center, has published a quarterly newsletter, Tropical Grain Legume Bulletin, since July 1975.

The sweet potato (*Ipomoea batatas*) is a major world crop; world production in 1977 was over 136 million metric tons from 14 million hectares (FAO Production Yearbook, 1977). Many of the producing areas lie in the tropics where it is an important food crop. It is thus understandable that IITA has accorded sweet potatoes a high priority in its research programs.

On the occasion of IITA's First Annual Research Conference, the Library and Documentation Center is pleased to present these abstracts of key publications on sweet potatoes. We hope that the information contained in this publication will be a definite help to research scientists and others engaged in sweet potato improvement.

Stephen M. Lawani
Head, Library and Documentation Services

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INTRODUCTION

The purpose of this volume of abstracts on Sweet potato (*Ipomoea batatas* (L.) Lam) is to provide a compact package of documented information on various aspects of sweet potato production considered pertinent to research on, and development of the crop. It is addressed primarily to scientists, agriculturists, policy makers, extension workers, farmers, storage and processing experts, and nutritionists. It is hoped that they will find it useful in planning further research on the sweet potato and in promoting the development of profitable production of it.

It is arranged in the following sections: Distribution (geographical), Research priorities and programs, Genetics, Breeding, Production physiology, Culture; Pests, diseases and their control; Curing, chilling and storage; Food processing, Chemical composition and nutritive values. Some of the sections have been sub-divided where necessary. Thus, Breeding has been sub-divided into: (i) breeding for disease and insect pest resistance, (ii) breeding for other desirable characters, and (iii) seed piece multiplication. Similarly, Culture has been split into ten sub-sections namely: (i) general agronomy and economics of production, (ii) agronomic experiments, (iii) propagation methods, (iv) land preparation, spacing, mulching; and staking, (v) fertilizers, plant nutrition and effect of

soil types, (vi) effect of growth regulators and other chemicals, (vii) irrigation effects, (viii) seasonality, (ix) herbicidal weed control, and (x) mechanization and harvesting. In the same vein, section G,Pests, diseases and their control, has been rationally sub-divided into: (i) sweet potato weevil, (ii) other insect pests, (iii) nematode pests, (iv) fungal and bacterial diseases, and (v) virus diseases. Section I, Food processing, is arranged under: (i) general, (ii) cooking and steaming, (iii) baking, (iv) canning, (v) flaking. Likewise, section J, Chemical composition and nutritive values, is arranged thus: (i) proteins and amino acids, (ii) vitamins and minerals, (iii) carbohydrates, (iv) human nutrition, (v) sweet potato leaf as vegetable, (vi) animal nutrition. To facilitate the use of the volume, detailed author and subject indexes have been provided.

As the title indicates, all the pre-1949 references have been excluded from this volume in view of their age. Moreover, many publications that fall within its time scope were dropped bacause they fell outside its subject scope. These include mostly literature on anatomy, morphology and histology, mere descriptions of species and varieties unless such varieties were also being recommended for adoption on the grounds of special agronomic or culinary qualities. Simple reports of pest and disease incidence have been similarly excluded. Literature in Japanese without at least an English summary have been excluded too. On the other hand, literature on the use of

other *Ipomoea* species in breeding to improve *Ipomoea batatas* (L.) Lam.) have been included.

Approximately seventy-five per cent of the papers abstracted in the volume are available in this library, and requests for photo-copies of limited number of pages will be satisfied. The general exception to this provision is the literature in Japanese with only English summaries as indicated at the end of such entries.

The major bibliographic sources consulted while compiling the abstract include the following:

Selected List of Publications Received in the Library. Ibadan, IITA.

Bibliography of Agriculture.

Biological Abstracts.

Chemical Abstracts.

Dissertation Abstracts.

Field Crop Abstracts.

Food Science and Technology Abstracts.

Helminthological Abstracts.

Horticultural Abstracts.

Nutrition Abstracts and Reviews.

Plant Breeding Abstracts.

Review of Applied Entomology.

Tropical Abstracts (Continued in 1975 as Abstracts on Tropical Agriculture).

The abstracter/compiler is grateful to the following people: Mr. S. M. Lawani for useful advice and encouragement, Mr. Emma Agbodike for assistance in indexing, Dr. S. K. Hahn for providing copies of the literature in Japanese, Messrs A. Akinola and S. Suarau for typing the text, Mr. R. K. Teniola and Miss A. Adeleke for carding some entries, and Mr. S. B. Akande for cheking the indexes.

A. GEOGRAPHICAL DISTRIBUTION

1. ALEXANDER, M.N. 1969.
Some factors affecting the demand for starchy roots and tubers in Trinidad. In: E.A. Tai, W.B. Charles, P.H. Haynes et al. Proceedings of the International Symposium on Tropical Roots Crops... St. Augustine, Trinidad, 2-8 April 1967. Vol. 2 pp. V 45-56.

Premises are outlined for individual demand curves and the demand for starchy food is predicted on a given taste and preference pattern of consumers. Tastes and preferences may have as important an influence on the demand for starchy roots as prices and incomes. A consumer preference survey conducted in 1967 indicated a preference for Irish potatoes, followed by sweet potatoes over other starchy roots.

2. ALDRICH, D.T.A. 1963.
The sweet potato crop in Uganda. East African Agricultural and Forestry Journal, 29(1): 42-49.

The significance of sweet potatoes in Uganda's agriculture is assessed and traditional methods of cultivation are described in detail. Yields are known to vary greatly and an attempt has been made to assess the relative importance of the various factors which could account for the poor yields that are so often obtained. The evidence suggests that the main causes of low yields are the use of inferior varieties, and infection with virus diseases. Cultivation methods are in general satisfactory, but wider spacing than in usual could be adopted with advantage when planting material is in short supply. Results from the use of fertilizers have been disappointing, but the response to organic manures has been more promising.

3. CHENG, C. and L. Li. 1970.
Sweet potato production in Taiwan. In: Plucknett, D.L. ed. Proceedings of the 2nd International Symposium on Tropical Root and Tuber Crops. Aug. 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Hawaii, the University. Vol. II. pp. 5-7.

Sweet potato ranks second to rice amongst the food crops in Taiwan where it is used commonly for feed (63%), food (30%) and

other purposes. Though capable of being grown throughout the year and all over the entire country, 73% is grown in autumn (Sept. - Oct.) mainly along the western coast of south Taiwan. The paper further discusses the factors contributing to the steady yield increase such as the varietal improvement program and the implementation of improved cultural practices. It ends with recommendations for future development of the crop in Taiwan.

4. DOKU, E.V. 1969.
Root crops in Ghana. In: E.A. Tai, W.B. Charles, P.H. Haynes et al eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 2-8 April 1967. Vol. 1, pp. III-39-65.

The status of sweet potatoes in Ghana Agriculture is discussed. Some nineteen foreign varieties were introduced in the 1930's.

5. GARRETT, L.N. 1974.
The impact of *Ipomea batatas* on New Guinea Highland agriculture and an investigation of its origin. Philippine Geographical Journal, 18(1-2): 7-20.

The paper examines the concept of plant diffusion with respect to the sweet potato (*Ipomea batatas*), which though an externally introduced plant, has profound impact on the socio-economic infrastructure of the New Guinea Highland agricultural system with ramifications felt in such diverse areas as population densities and trade relations. The origins of the plant are considered too.

The population of the Highland depends almost totally on sweet potato to a degree comparable to the absolute dependence on rice in southern China. The regions that intensively cultivate the crop have higher population densities.

6. GETAHUM, A. 1973.
Root and tuber crops grown and used in Ethiopia. In: 3rd International Symposium on Tropical Root Crops. Ibadan, IITA. Vol. I, 26p. (Mimeo).

Sweet potato ranks fifth amongst the root and tuber crops grown and used in Ethiopia. The author discusses the geography of these crops, according to their ecological zones in Ethiopia, their place in the Ethiopian diet and in the country's agriculture. Short notes are given on each of the major root and tuber crops of Ethiopia, including the sweet potato.

7. HERNANDEZ, T.P. 1970.
National sweet potato cooperator group: progress reports 1970 from state experiment stations and United States Department of Agriculture. Louisiana, the State University, 112p.

The reports presented include those of 17 stations working on sweet potato. Regional test summary tables for "advanced" trials and "observational" trials are included too, as well as committee reports on baking, canning, sprouting, disease, field test procedure, genetics and mechanization.

8. HORNELL, J. 1946.
How did the sweet potato reach Oceania? Journal of the Linnean Society London Botany, 53: 41-62.

The various possibilities of the method of entry of the crop into the region are considered. It is concluded that the crop was introduced into Polynesia following an instance of effective contact between Polynesia and and South America in the pre-Columbian period. The writer felt that the diffusion of sweet potato into Polynesia originated in a involuntary drift voyage from Peru. Spanish authorities encouraged its cultivation in Guam from the 16th to the 19th century so as to supply food to passing ships on voyages between Acapulco and Manila. Consequently its Mexican name camote (Camotl) was adopted into local languages.

9. HUBBELL, J.N., Jr. 1977.
Establishment of Asian Vegetable Research and Development Center (AVRDC) Outreach Program of Vegetable Research and Production in the Philippines. Hortscience, 12(4): 391.

From its world germplasm collection, AVRDC is developing for tropical conditions improved lines of six crops -- *Brassica pekinensis, Glycine max, Ipomoea batatas, Lycopersicon esculentum, Solanum tuberosum* and *Vigna radiata*. In the Philippines plant breeders have traditionally had limited access to germplasm of these crops. An outreach program was established May 1975 by AVRDC and the Philippine Government with 2-year support from the Asian Development Bank. Infrastructure was developed with national agricultural research agencies for country-wide distribution and testing of breeding lines and accessions from AVRDC germplasm collection. Selected scientists were trained at AVRDC to work in continuing the program. Trials conducted during the 2-year establishment period demonstrated improved yields.

10. JONES, A. 1970.
The sweet potato-today and tomorrow. In: Plucknett, D.L., ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops, August 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol. 1. pp. 3-6.

The status of the sweet potato today is discussed in relation to a generalized scheme of crop development. Some statistics and historical trends are presented as a means of pointing out problem areas and of suggesting solutions. Certain anticipated changes in market demands are discussed and ways to meet such changing demands analyzed. Because of rapidly expanding knowledge in all aspects of the industry from variety development to socio-economic factors, the outlook for the sweet potato is optimistic. (Author's abstract).

11. LAMBETH, V.N. ed. 1962. (?)
Twenty years of cooperative sweet potato research 1939-1959. (N.P.) U.S.A, National Sweet Potato Collaborators. 64p.

It is remarked that the development of cooperated program on sweet potato research was an outgrowth of the increased interest in, and the recognized need for research following the introduction of potentially useful genetic material, development of techniques to promote flowering and hybridization, and anticipated greater utilization of sweet potatoes for fresh markets and in processed products. Thirty varieties have been bred and released with the leading ones possessing much higher provitamin A content than the older standard varieties. Some of the new varieties are resistant to as many as three diseases, and yield much higher than the older commercial varieties. Much progress was also made in storing, handling, marketing, and mechanization of the crop.

12. LEON, J. 1976.
Origin, evolution and early dispersal of root and tuber crops. In: Cock, J.R. Maclatyre and M. Graham eds. Proceedings of the 4th Symposium of the Society for Tropical Root Crops, held at CIAT, Cali, Colombia 1-7 Aug. 1976. Ottawa, IDRC, 1977. pp. 20-36.

Tropical root and tuber crops have been domesticated in Southeast Asia, West-central Africa, and tropical Latin America. They dispersed slowly between Southeast Asia and Africa. After the 17th century a very active interchange occurred especially with the American crops. Since then, there has been a continuous replacement of crop species, especially in Africa. The sweet potato, of American origin, was found in Oceania when the

Europeans arrived but no satisfactory explanation of how it got to Polynesia, has ever been given. A hexaploid population of *Ipomea* from Mexico has been considered as an ancestor species or a weedy variety of sweet potato. (Author's summary modified)

13. LESLIE, K.A. 1969.
The significance of root crops in the tropics. In: E.A. Tai, W.B. Charles, P.H. Haynes, et al, eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 1967. Vol. 2. pp. VI - 13.

The paper deals with the significance of root crops which over the years have been basic in the diets of millions of tropical peoples. It reviews the relative importance of tropical root crops and in terms of food-supply, resource allocation, national product and in trade, both domestic and international. The analysis is set against the background of tropical food deficiency. Sweet potato is one of the root crops covered.

14. MACDONALD, A.S. 1963.
Sweet potatoes, with particular reference to the tropics. Field Crops Abstracts, 16(4): 219-225.

The author briefly reviews the history of sweet potato, then discusses its botany, chemical composition, its status as a food crop, planting, soils and manuring, harvesting and yield. Also discussed are varieties, utilisation, breeding, diseases and pests.

15. MACDONALD, A.S. 1969.
Some aspects of the sweet potato and its agronomy in Uganda. In: E.A. Tai, W.B. Charles, H.P. Haynes. et al. eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 2-8 April 1967. Vol. I-III 112-123.

The paper presents a review of the existing knowledge pertaining to the growing of sweet potato in Uganda, covering the importance of the crop in Uganda, varieties, its place in crop rotation systems, method of planting and spacing it, cultural operations, manures and fertilizers, harvesting. Pests and diseases, farm scale costings.

16. MATHIA, G.A. 1975.
An economic evaluation of consumer characteristics affecting sweet potato consumption. Journal of the American Society for Horticultural Science, 100(5): 529-531.

The purpose of this report was to relate several economic and social characteristics of sweet potato consumers to level of fresh sweet potato consumption. National cross-sectional data were used to identify consumption patterns using the least squares regression procedure. Relationships were estimated for white and non-white households.

The relationships for white households indicated that price of sweet potatoes, family income, number of meals eaten- at-home, family size, and expenditures for white potatoes were important determinants of weekly sweet potato consumption. Regional, urbanization and seasonal differences were also apparent for white households. Education, age, and employment status were not critical in determining consumption patterns.

The relationship for the non-white households was similar structurally to the white household relationship but the sample size was not sufficiently large to yield statistically significant coefficients for some of the variables found important in the white household. Nevertheless, price, age and number of households did exhibit statistically significant coefficient. Seasonal and urbanization differences were noted.

Sweet potato merchants should find the relationships useful in market segmentation. Sales efforts should take into account at least regional, seasonal, and urbanization differences.

17. O'BRIEN, P.J. 1972.
The sweet potato: Its origin and dispersal. American Anthropologist, 74(3): 342-365.

The sweet potato originated in northwestern South America, arising possibly as a hybrid cross or through karyotypic alterations from an unknown plant of the genus *Ipomoea*. This domestication is associated with the development of Tropical Forest agricultural villages by ca. 2500 B.C. The Spanish introduced it to Europe and spread it to China and Japan and Malaysia and the Moluccas region. The Portuguese carried it to India, Indonesia, and Africa. The plant has a pre-Magellan introduction into Polynesia by possibly A.D. 1 in the Samoa area and is dispersed from there to the rest of the Pacific. The plant was transferred either by birds carrying the seed or, more likely,

through an accidental casting of a vessel carrying it upon an island of the Samoa region. The word kumara, alleged by many shows direct contact between Polynesians and Quechuan-speaking Indians, apparently reconstructs to Proto-Polynesian and was introduced into the Quechua dictionaries to reflect the educated Spaniard's knowledge of sweet potato terms. (Author's summary).

18. PANTASTICO, E.B. 1979.
Prospects and problems for sweet potato production in the Philippines. Hortscience, 14(2): 125.

Sweet potatoes can be grown in almost all parts of the Philippines. It can be grown throughout the year from sea level to an elevation of 1,500 meters. The Philippines having a warm climate is faced with the problems of pests, typhoons, drought making productivity of sweet potatoes very low. The national average production is about four tons/ha. The crop is considered the crop of the poor and being eaten during times of calamities. Despite all these problems, sweet potatoes may be the crop of the future since it was shown that it can yield as much as 30 tons/ha in the experiment station. Research strategy for its development is to popularize its use through processing for food and feeds. Likewise, extension activities will be stepped-up particularly in the area of varietal introduction, cultural requirements, processing, utilization and socio-economics.

19. STEINBAUER, C.E. and L.J. KUSHMAN
Sweet potato culture and diseases. Washington, D.C., Agricultural Research Service, USDA, 74p. (Agriculture Handbook No. 388).

This booklet is presented in two parts. Part 1 on culture treats the importance, uses and botany, varieties, growth requirements, response to fertilisers, types and sources of planting materials, and producing plants of sweet potatoes. Other aspects of the culture covered are field planting, weed control and cultivation, water requirements and irrigation, harvesting, curing and storage, as well as preparation of tubers for fresh marketing.

The second part treating diseases covers disease agents, field diseases and their control, nematodes and their control, storage diseases and their control.

20. WARID, W.A., B.W. DAHMANI, and M.M. KUSHAD. 1977.
Sweet potato clones adapted for Libyan Agriculture. In: Cock, J., R. MacIntyre and M. Graham eds. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops held in CIAT, Cali, Colombia. 1-7 August 1976. Ottawa, IDRC pp. 62-65.

Five experiments were conducted from 1971 to 1973 on the adaptability of some introduced clones of sweet potato. An average yield of marketable enlarged roots of 7.4-21.2 t/ha was produced by clone American from USA, 24.3-26.6 t/ha by clone Kahera hybrid and 14.5-29.6 t/ha by clone Mabrooka. The last two clones were introduced from Egypt.

The most variable clone in weight of vine, number of roots or yield was Mabrooka, and the least variable was Kahera hybrid. Within a given clone, the yield showed the highest degree of variability. A nonsignificant correlation existed between vine weight and number of roots. A positive correlation was found between vine weight and yield in two clones, and between number of roots and yield in all clones. (Author's summary).

B. RESEARCH PRIORITIES AND PROGRAMS

21. COLLINS, W.W., D.G. HOGGARD, and S. ARRENDEL. 1977.
Sweet potato breeding and genetics; a summary report. North Carolina State University. Dept. of Hort. Science. Horticultural Science Series No. 42. ii, 27p.

This is the report of a new project whose long term and most important objective is to develop and release new cultivars with superior horticultural characteristics. The results of 64 selections which were tested at several locations during the 1977 growing season are presented here. The report covers seed nurseries, preliminary seedling selection, advanced selections, variety yield test, national collaborator group trials, screening tests for disease resistance, on farm tests and foundation seed.

22. GOODING, H.J. 1964.
Some aspects of the methods and results of sweet potato selection. Empire Journal of Experimental Agriculture, 32(128): 279-289.

Studies of sweet potatoes collected in the West Indies indicated that there were at least eighty-eight distinct cultivars. Data on their yield and tuber characteristics revealed that the majority were rather poor, probably mainly due to virus infection. Selection of seedlings was begun, aimed at obtaining yields of at least 8 tons/acre combined with good storage and cooking qualities. The results of seven trials show the increase in yield effected by selection, six seedlings producing a total yield of at least 8 tons/acre, in two trials.

23. HARMON, S.A., L.H. HARRELL, T. HERNANDEZ and D.T. POPE. 1970.
Progress in the breeding and development of new varieties (of sweet potato). In: Thirty years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series Bulletin No. 159: 8-17.

The progress so far made in breeding as well as the objectives pursued are reviewed. Varietal improvement has been of tremendous value to the industry. Genetic studies have been undertaken to determine modes of inheritance of specific characters, to study the incompatibility and sterility of varieties and seedlings. Progress in this area has been slow because of the hexaploid nature of the sweet potato, the numerous, quantitatively inherited characters involved and the large plant populations required.

24. HERNANDEZ, T.P., T. HERNANDEZ, R.J. CONSTANTINE and R.S. KAKAR. 1969.
Improved techniques in breeding and inheritance of some of the characters in the sweet potato, *Ipomoea batatas (L.)*. In: E.A. Tai, W.B. Charles, P.H. Haynes et al eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine Trinidad, 2-8 April, 1967. Vol. 1 pp. 1-31-40.

The objectives of sweet potato breeding program in Louisiana are outlined. The genetic characters studied were skin and flesh colour; dry matter content, culinary qualities and resistance to *Fusarium wilt*. These behave as quantitative genetic characters. White flesh colour is incompletely dominant. Transgressive inheritance is indicated in some crosses. The breeding technique is described.

25. JONES, A. 1965.
A proposed breeding procedure for sweet potato. Crop Science, 5(2): 191-192.

A proposed breeding procedure is outlined to make use of both intra- and inter- chromosomal recombination, allow the maximum likelihood for expression of epistasis, and protect against attempt to fix and transmit epistatic effects. It would also provide an orderly improvement in parental types each year, entail no hand crossing and require no detailed records. The disadvantage of the procedure, and other considerations are given.

26. MACDONALD, A.S. 1969.
Some aspects of sweet potato breeding at the Kabanyolo University Farm (Kampala). In: E.A. Tai, W.B. Charles, P.H. Haynes, et al, eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad, 2-8 April, 1967. Vol. 1 pp. I-131-140.

A reasonably prolific sweet potato seed production was observed in 1961, but the rate or importance of deterioration has not been determined. The situation is complicated by the peasant farmer assigning existing variety names to new varieties, which may conceal a greater deterioration rate than is apparent.

The breeding potential of the Bugarda seed is good. A failure to screen the varieties for virus resistance at an early stage of the breeding program dictated discarding the Kabanyolo sweet potato seedling selection due to their susceptibility to virus diseases. A fresh breeding program benefitting from the Kabanyolo experience would screen the existing cultivated varieties, individual seedlings and seedling "mother" groups which contain a range of virus resistance that can be exploited, quite apart from other improvements.

27. MAGOON, M.L. and R. KRISHNAN. 1973.
Sweet potato breeding in India - problems and prospects. Third International Symposium on Tropical Root Crops, IITA, Ibadan, 2-9 Dec. 1973. Vol. 2. 9p. (Mimeo).

Sweet potato green vines are used as cattle feed while the tubers are used extensively as subsidiary food, livestock feed, and raw material for starch and other industries.

The studies reported here are indicative of the advantages in employing pachytene analysis to outstanding problems on the phylogeny of *Ipomoea* species and the data thus gained can provide

invaluable information for the formulation of breeding programmes aimed at exploitation of genetic variability at interspecific level. The tetraploid *I. biloba* could effectively serve as bridging species between the hexaploid sweet potato and the large number of diploid species of the genus.

In India, despite the antiquity of sweet potato cultivation comprehensive efforts on its breeding are relatively of recent origin. But the significant recent successes in the amelioration programme and accumulation of useful data as a result of basic studies may rejuvenate interest in the future prospects of its cultivation and genetic improvement.

28. MOLINYAWE, C.D. 1969.
Status of root crops research in the Philippines. In: E.A. Tai, W.B. Charles, P.H. Haynes, et al, eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad. 2-8 April, 1967. Vol. 1. pp. III-69-83.

Sweet potato is reported to be the most important root crop in the area, and may yet become one of the most important industrial crops there. Research on the crop has covered variety tests, propagation, intercropping and topping and fertilization.

29. MONTALDO, A. 1967.
Bibliografia de raices y tuberculos tropicales. Maracay, Facultad de Agronomia, Universad Central de Venezuela. 595p. (Revista de la Facultad de Agronomia de U.C.V. Alcance No. 13). Supplements 1-3, 1968, 1969 and 1971.

Yam, cassava and sweet potato are the 3 most important root and tuber food crops of the tropics. The section of the bibliography on sweet potato covers its origin, history and geography; botany; climate, soils and fertilizers; agronomy, genetics and breeding; diseases; pests; storage; analysis and composition; utilization, and economic aspects.

30. MONTELARO, J., W.J. MARTIN and E.J. KANTACK. 1966.
Sweet potatoes in Louisiana. Louisiana, Cooperative Extension Service, L.S.U. 43p. illus.

This booklet outlines the imperatives in sweet potato production then discusses the recommended varieties, seed selection, production plants, bedding seed stock, selection and treatment of mother potatoes; soil and chemical weed control. Also discussed are harvesting, packaging, storing and curing. Other aspects covered are diseases of the crop, with emphasis on the

seven most costly ones, together with control methods for them and insect pests and their control.

31. MOSCOSO, C.G. 1969.
Sweet potato research in Puerto Rico. In: E.A. Tai, W.B. Charles, H.P. Haynes et al, eds. Proceedings of the international Symposium on Tropical Root Crops ... St. Augustine, Trinidad. 2-8 April, 1967. Vol. 1. pp. III-127-130.

Sweet potato is a relatively important food crop in Puerto Rico that once supplied raw material to two canneries processing it. The research there included the introduction of high yielding yellow type sweet potatoes with desirable qualities. Hundreds of other varieties were introduced from U.S.A. The desired qualities include yield, palatability, high carotene content, resistance to poor soil and drought conditions, keeping qualities for canning purposes. Several tests to determine the best planting time indicated that for Puerto Rican condition it is September to December.

In the course of these experiments new planting techniques for sweet potatoes in the tropics were developed and are described here. Research on diseases and pests of the crop and their control was also conducted.

32. PODE, D.T. 1970.
Recent progress and current needs of the sweet potato industry in the United States. In: Plucknett, D.L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops August 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol. 1, pp. 3-6.

An attempt is made to point out a few of the major research in sweet potato production, breeding, harvesting, curing and storing packaging and marketing, and uses that have been valuable to the industry. Areas where greater research emphasis is needed are discussed also. (Author's abstract).

33. RHEENEN, VAN H.A. 1963.
Breeding research in sweet potato, *Ipomoea batatas* Poir. Euphytica, 12(3): 245-352.

As the sweet potato, *Ipomoea batatas* Poir, is propagated vegetatively its selection is comparatively simple. Choice of parents and selection procedures were carried out on the basis of yield capacity, resistance or tolerance to a fungus and virus disease, resistance to Cylas formicarius F. and the shape and size of

tubers. Because insufficient data were available the protein content played no important role in the choice of parents. In the selection procedures, also this character could not yet be taken into account because the laboratory equipment was insufficient. This might have changed in the future.

In the selection fields the new clones were planted by the side of a well-known test-clone, in such a way, that every new clone had a test on either side. At every selection cycle 25% of the new clones was kept for further research while the rest was rejected. On two generations the visible disease symptoms of new clones increased considerably while their production capacity decreased. For various characters a clear relation could be demonstrated between the phenotype of the parents and their offspring.

34: RUINARD, J. 1969.
Notes on sweet potato research in West New Guinea (West Irian). In: E.A. Tai, W.B. Charles, H.P. Haynes. et al, eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad. 2-8 April 1967. Vol. 1, pp. III-88-108.

Sweet potato is by far the most important crop here, accounting for almost one hundred percent of the human food intake, leading to unbalanced diet deficiencies, particularly to widespread protein malnutrition. Therefore research work described here was undertaken between 1959 and 1963 with the objective of introducing sweet potato clones with a higher protein content than the traditional types to counter-balance the protein deficiency. The research work covered chemical analysis of the tubers of popular lowland and highland clones with interpretation of the resultant data, effect of storage of tubers on their protein content, carotene content of tubers, analysis of young leaves and tubers of the same plant to compare protein distribution in them.

As part of a comprehensive breeding programme, methods to stimulate the flowering of various clones and to improve the germination of sweet potato seed were studied. Selection work in new clones developed from seed was started.

The preliminary and inconclusive results of a rotation trial, that was planned to extend over many years, are presented.

35. SILVESTRE, P. 1969.
Research on root crops by IRAT in Africa and Madagascar. In: E.A. Tai, W.B. Charles, H.P. Haynes et al, eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad. 2-8 April, 1967. Vol. 1, pp. III-84-87.

IRAT has done limited work on sweet potatoes in Malagasy Republic.

36. VILLAREAL, R.L. 1975.
The philosophy in the tomato and sweet potato breeding programs of the Asian Vegetable Research and Development Center. Crop Science Society of the Philippines - 6th Scientific Meeting (Proceedings).

The uses of single seed descent (SSD) and intergenotypic competition avoidance (ICA) in the tomato and sweet potato breeding programs, respectively, of the Asian Vegetable Research and Development Center are presented. The breeding of varieties for intensive cropping systems, for tolerance to low levels of nitrogen and for widely varied soil pH conditions are also presented. The implications of the above philosophies on plant improvement in tropical Asian countries are discussed. (Author's summary).

36(a) WILSON, L.G. and W.W. COLLINS. 1978.
Sweet potatoes as a title XII project proposal. Hortscience, 13(3): 268.

The U.S. Foreign Assistance Act of 1961 was amended in 1975 by adding at the end thereof the following new title: TITLE XII-FAMINE PREVENTION AND FREEDOM FROM HUNGER". This international expansion of the U.S. Land Grant concept is a challenge from our government to prove that we can teach the people of the world to feed themselves (as we have so effectively taught Americans to feed themselves). Productive results abroad and maximum benefits at home should be accomplished if international activities become completely integrated into ongoing research, teaching and extension functions, through collaboration with counterpart professionals and institutions. The sweet potato is a promient commodity aground which to build a Title XII project through the coordination of the National Sweet Potato Collaborators Group. Several areas of interest and expertise identified include Breeding and Genetics for sweet potato improvement and germplasm exchange, pest management, Cultural Practices, Mechanisation and Alternate Uses. The International Institute of Tropical Agriculture (IITA) in Nigeria and the Asian Vegetable Research and

Development Center (AVRDC) in Taiwan have identified themselves as potential collaborators. A working group should be established to keep the "Collaborators" abreast of Title XII developments and convene as a committee at our Annual Meeting to prepare necessary inputs.

37. YEN, D.E. 1970.
Sweet potato. In: Frankel, O.H. and E. Bennett eds. Genetic resources in plants; their exploration and conservation. London, I.B.P. (I.P.B. Handbook No. 11), pp. 341-350.

The chapter discusses the status of sweet potato as a food crop in tropical and sub-tropical regions, traces its origin, proposes a field phase of genetic exploration in four regions of the world. It then discusses the experimental phase, the significance of exploration in sweet potato improvement and the preservation of germplasm.

C. GENETICS

38. AUSTIN, D.F. 1975.
Typification of the new world sub-division of *Ipomoea L.* (Convolvulaceae). Taxon, 24(1): 107-110.

The various sub-divisions of the genus *Ipomoea* have been created largely without regard for rules of nomenclature and priority. This complex genus has been divided into an unusually large number of species groups which have been given formal names at several levels. The groups are assimilated and discussed. (Author's abstract).

39. BURNHAM, M. 1967.
Ovule number as a factor in low seed set of certain sweet potato clones. Proceedings of the American Society for Horticultural Science, 90: 313-315.

Observations on number of ovules found in the ovaries of 30 sweet potato clones showed that most of the clones were quite regular in containing 4 ovules per ovary. Five clones, L3-5, L9-143, 'Goldrush', L8-67, and L2-116 were highly irregular with 68%, 64%, 63%, 35%, and 20%, respectively, of their ovaries containing less than the normal 4 ovules. The reported female sterility of the 'Goldrush' variety and the reduced seed set of

the 4 other clones are considered to be due to this reduction in ovule number in association with other factors contributing to the general low seed set in sweet potatoes.

40. CHARLES, W.B., D.G. HOSKIN and P.J. CAVE. 1973.
Overcoming cross- and self-incompatibility in *Ipomoea batatas (L.)* Lam. and *Ipomoea trichocarpa* Elliot. In: 3rd International Symposium on Tropical Root Crops, Ibadan, IITA. Vol. 1, 17p.

Cross- and self-incompatibilities in sweet potato cultivars are serious problems in breeding especially since many of the desirable parents of good genotypes are in the same incompatible group. Several methods have been used to overcome the fertilization barrier. This study investigated the nature of the barrier to self-fertilization in *I. trichocarpa* and in *I. batatas* cultivars of West Indian sweet potato with attempts to overcome it. Eight cultivars of *I. batatas (L.)* Lam., and two strains of a wild species *I. trichocarpa* were used in 7 experiments. The results showed that pollen retention and germination response on the stigma differed between self- and cross-pollinations in *I. trichocarpa*. Pollen failed to germinate on stigmas when self pollinated; the mean number of grains retained on the stigma was considerably less than those found in the cross-compatible pollinations. Two penetration in the styles of compatible pollinations was central and completed within two hours. Pollen *in vivo* germination was visible in the five cultivars of *I. batatas* irrespective of whether the stigma lobes were removed or retained. These and other results are discussed.

41. CHOI, H.O., K.Y. PARK, S.K. JONG and R.C. SEONG. 1977.
New sweet potato variety "Hong-Mi". The Research Reports of the Office of Rural Development, Korea, Suweon, 19(C): 4p.

"Hong-Mi", a newly bred, high yielding variety has been developed from the cross between Hwang-Mi (+) and Norin #25 ( ) during the period of 10 years from 1967 to 1976.

It gave relatively higher tuber yield and starch yield but decreased the extractable starch content as compared with the standard variety, Hwang-Mi, in case of late planting, and it was observed that the storing ability of the tubers was superior to that of the standard variety.

42. FUJISE, K. 1965.
Spontaneous mutation and its use in sweet potato. Gamma Field Symposia, 4: 43-53.

It is remarked that sweet potatoes often produce bud mutations

in tuber and stem. The author then discusses the following aspects of the topic: mutable characters, varietal difference in frequency of spontaneous mutation, relationship of mutation to the surface colour of tuber, mutation of vine, histological observations of the mutants, and varieties derived from mutation.

43. HAMMETT, H.L., T.P. HERNANDEZ and J.C. MILLER. 1966. Inheritance of fiber content in the sweet potato *(Ipomoea batatas (L.)* Lam.). Proceedings of the American Society for Horticultural Science, 88: 486-490.

Variations in fiber content in fleshy roots of sweet potato seedlings occurred within each individual progeny means were similar. Two sets of genes appeared to be involved-one for the presence of fiber and another controlling fiber size. The data indicate that a few genes with simple dominance controlled fiber size while total fiber content was controlled by serveral genes, geometric in effect and linked with the genes for fiber size. Breeding for low fiber content is feasible and a maximum for new sweet potato varieties is proposed.

44. HERNANDEZ, T.P., T.P. HERNANDEZ, R.J. CONSTANTIN and J.C. MILLER 1965. Inheritance of and method of rating flesh color in *Ipomoea batatas*. Proceedings of the American Society for Horticultural Science, 87: 387-390.

The frequency distribution of the total pigment content of segregating sweet potato seedlings from progenies of crosses between parents containing varying amounts of total pigments (mostly beta-carotene) is presented. White flesh color was incompletely dominant over orange. Orange flesh is due to carotenoid pigments, especially beta-carotene. Total carotenoid pigments appeared to be controlled by several genes, possibly 6 that are additive. Crosses between parents medium to high in total carotenoids produced seedlings having a mean total pigment content of 12.8 to 15.8 mg/100 g fresh weight. Transgressive segregation was indicated in crosses between certain parents.

The L and aL values of root samples tested on the Gardner Color Difference Meter were correlated with total carotenoid content of the same roots. A highly significant negative correlation was found between total carotenoids and L values, (R =- .89), and highly significant positive correlation (.91) between total carotenoids and aL values. Both the aL values and visual ratings of color were found to be reliable estimates of total carotenoids.

45. HERNANDEZ, T.P., T. HERNANDEZ and J.C. MILLER. 1964.
Frequency of somatic mutations in several sweet potato varieties. Proceedings of the American Society for Horticultural Science, 85: 430-433.

Sweet potato varieties were found to have a fairly high frequency of mutations in the skin and flesh color of the roots. Centennial, Unit 1 Porto Rico and Earlyport produced significantly more spontaneous color mutations than Goldrush. Centennial had a significantly larger number of flesh sectorial mutations than Unit 1 Porto Rico. Heartogold, a light skin variety, did not produce any mutations in the skin.

Irradiation of Heartogold, Goldrush and Unit 1 Porto Rico resulted in a larger number of flesh color mutations in the roots of Heartogold and Unit 1 Porto Rico than Goldrush. Most of the flesh color mutations in the roots were from orange to white. This study indicates that in any variety the same loci may mutate frequently and this weakness is inherent for a variety.

The varieties varied in plant production following different rates of irradiation. Goldrush produced few plants at 20 Kr and none at higher dosages. Porto Rico sprouted well at 20 Kr and Heartogold produced plants at high irradiation dosages of 30 and 40 Kr.

46. HERNANDEZ, T.P. and J.C. MILLER. 1962.
Self- and cross-incompatibilities in the sweet potato. Proceedings of the American Society for Horticultural Science, 81: 428-433.

Of 18 sweet potato breeding parents that were selfed, only 3 were self-compatible. The seedlings grown from these selfed parents, especially those of L3-80, were of low vigor.

The presence of self- and cross-incompatibility has made it difficult to produce seeds by crosses between certain parents having desirable characteristics.

Incompatibility in the sweet potato is thought to be determined by genes that form a multiple allelomorphic series. Indications are that a fertility factor is present.

47. HERNANDEZ, T.P. and J.C. MILLER. 1964.
Further studies on incompatibility in the sweet potato. Proceedings of the American Society for Horticultural Sciences, 85: 426-429.

Thirty sweet potato seedlings and varieties were classified into 6 groups (5 incompatible and 1 self-compatible). Only 1 allele for each group is suggested and the genes designated by the letter S form an allelomorphic series S_1, S_2, S_3, S_4, S_5 and S_6 representing groups I, II, III, IV, V, and VI, respectively. Group VI consists of the self-compatible parents having the Sf factor. Half of the breeding parents in this study belong to group II, and generally speaking, they are those with the best horticultural characteristics.

48. JONG, S.K. 1974.
General and specific combining ability in a diallel cross among six sweet potato *(Ipomoea batatas* Lam.) clones. Korean Journal of Breeding, 6(2): 116-122. (Also in IITA, Ibadan, 1974. 16p. Mimeo).

Among 6 sweet potato *(Ipomoea batatas* Lam.) clones studied TIS 2129 exhibited high general combining ability variance component and low specific combining ability variance component for tuberous root weight, average size of tuberous root, dry matter percentage, dry weight of tuberous root and top weight and clone TIS 2172 had high general combining ability variance component for the number of tuberous root and dry matter percentage.

It is suggested that the additive genetic variance is more important than non-additive genetic variance in determining tuberous root weight, average size of tuberous root, dry matter percentage, dry weight of tuberous root and top weight. But for the number of tuberous root per plant the main of genetic variance is of the non-additive type.

49. JONG, S. 1974.
Study of the sequential characteristics of sweet potato populations. Ibadan, IITA. 14p. (Mimeo).

Transformation of sequential quantitative characters and log transformation were used for the analysis of the data obtained from the six sweet potato *(Ipomoea batatas (L.)* Lam.) populations which were introduced from different parts of the world. These populations showed very different tendencies in the relations among the yield and yield components which suggest genetic diversity. It is suggested that the oscillatory model might be adapted to the practice of sweet potato breeding and, thus, the emphasis should be directed to promoting the recombinations of unfavourably linked genes, to increasing the flow of environmental resources throughout the period of need by the components and to raising the genetic ceiling by selection.

It is also suggested that both transformation methods be used for the more precise estimation of heritabilities of sweet potato quantitative characters. By log transformation, high heritability (0.8261) was obtained in the number of tubers per plant which showed very low heritability (0.2237) and more agreeable results derived among data.

50. JONES, A. 1953.
Theoretical segregation ratios of qualitatively inherited characters for hexaploid sweet potato *(Ipomoea batatas L.)*. Agricultural Research Service, USDA. Technical Bulletin No. 1368: 1-43.

This bulletin brings together pertinent information needed for qualitative genetic studies of hexaploids, in particular the sweet potato, and provides tables of theoretical segregation ratios that may make the breeder's task of interpreting genetic data much less laborious. The tables presented are intented as a starting point only as many factors have not been included, notably: multiple class ratios; consideration of lethals; dosage effects beyond one-factor hypotheses; and many test-cross possibilities. (Author's abstract).

51. JONES, A. 1965.
Cytological observations and fertility measurements of sweet potato *(Impomoea batatas (L.)* Lam.*)*. Proceedings of the American Society for Horticultural Science, 86: 527-537.

Cytological observations of 40 clones proved meiotic activity of sweet potatoes to be highly regular. Bivalent pairing is the rule and involves an average of 87.6 of the 90 chromosomes. Multivalents, although low in frequency considering that the plant is hexaploid, were observed. Secondary association was present in all metaphase 1 cells involving a maximum of 24 II, so at least 2 of the 3 genomes of the sweet potato are closely related. Tetrad formation in pollen mother cells was regular, and a high percentage of sound pollen diameter averaged 110u.

Seed set was generally low, ranging from zero to 30.7% pod set and 1.0 to 1.9 seed per pod. Pod set and seed per pod were correlated, but no association with cytological or fertility measures was detected. Therefore, the low seed set general to sweet potatoes must be due to causes other than meiotic abnormality, such as disease, genetically controlled incompatibility or sterility, or physiological disharmony in developing seed. (Author's abstract).

52. JONES, A. 1966.
Morphological variability in early generations of a randomly intermating population of sweet potatoes *(Ipomoea batatas (L.)* Lam.), Athens, (Ga.), University of Georgia College of Agriculture Experiment Stations. Technical Bulletin, N.S. 56: 30p.

Nineteen sweet potato parents selected only for early blooming were reciprocally intercrossed in a modified diallel to generate a population suitable for quantitative genetic studies. In subsequent generations random intercrossing was effected by insects. Although no conscious selection was imposed on the population, selection for flowering was unavoidable. Morphological variability and phenotypic correlation of 32 and 39 characters were studied in Cycles 1 and 3. Very wide variability was recorded for all characters studied. Distributional shifts from cycle 1 and 3 were noted predominantly in flowering and in those characters most subject to selection in the history of the originating plants. Most correlations could be explained on physiological bases, but the following appear to be due to genetic linkage: high carotene and low root-flesh oxidation (.599**), leaf-vein and root-skin purplin (.311**), leaf-vein purpling and flowering (-.148**), and root-skin purpling and flowering (-.179**). The ranges, distributions and correlations obtained indicate that the population is suitable for quantitative genetic study with little bias expected from previous selection of parental stocks or from the unavoidable selection for flowering imposed by the breeding procedure. Results are expected to have general application to sweet potato investigations.

53. JONES, A. 1967.
Should Nishiyama's K123 *(Ipomoea trifida)* be designated *I. batatas*? Economic Botany, 21(2): 163-166.

Observations of K123 (very graciously supplied to the author by Dr. Nishiyama) lead me to the inescapable conclusion that it should be considered an extreme segregate of the sweet potato rather than a different species as previously postulated. This paper presents information relative to that conclusion. Consideration of morphological similarities of K123 and twining pubescent sweet potatoes, of fertility relationships of K123 and sweet potatoes, and of the cytological information from progeny of their crosses leaves little doubt that K123 is a contemporary of *I. batatas* and not a representative of some progenitor species. (Author's abstract).

54. JONES, A. 1968.
Chromosome numbers in *Ipomoea* and related genera. Journal of of Heredity, 59(2): 99-102.

The chromosome numbers of 42 *Convolvulaceae* species are reported of which 25 agreed with one or more previous reports, 2 differed from previous reports, and 15 are reported for the first time. The two counts differing with previous reports had 2n=60. Among the species not previously reported, two were found to have 2n=20, and two were found to have 2n=18. The remaining 11 species reported for the first time had 2n=30. (Author's abstract).

55. JONES, A. 1972.
Sweet potato population changes during six random crossing generations. Journal of the American Society for Horticultural Science, 97(1): 102-107.

Twenty-four traits in generations 2 to 7 of a randomly intercrossing sweet potato [*(Ipomoea batatas (L.)* Lam.] population were studied. Mean changes detected were: increased flowering, reduced leaf whorl purpling, increased vine length. Changes in the *Fusarium wilt* index were not significant but distributional changes were important; fewer plants with high levels of resistance occurred in the later generation. Reduction in vine diam. and in root wt. were considered independent of each other. There was no indication that the natural selection for increased flowering was responsible for either vine diam. or root wt. reductions. (Author's abstract).

56. JONES, A. and M.T. DEONIER. 1965.
Interspecific crosses among *Ipomoea lacunosa, I. ramoni, I. trichocarpa,* and *I. triloba*. Botanical Gazette, 126(3): 226-232.

Chromosome-pairing at metaphase I in pollen mother cells of interspecific hybrids among *Ipomoea lacunosa L., I. ramoni,* Choisy, *I. trichocarpa* Ell., and *I. triloba L.* was as good as that of the parental species, indicating a common genome for all four species. It is proposed that this genome be labeled "A". Some *I. trichocarpa* plants were observed to be perennial. On the basis of this observation and of other characters which are similar in the four species studied and in the sweet potato *I. batatas* [L.] Lam.) it is suspected that genome A is one of the three genomes represented in the sweet potato. (Author's abstracts,.

57. JONES, A., P.D. DUKES and F.P. CUTHBERT, Jr. 1975. W-13 and W-178 sweet potato germplasm. Hortscience, 10(5): 533.

Two breeding lines of sweet potato [*Ipomoea batatas (L.)* Lam.] were released in 1975. They possess unusual combinations of disease and insect resistances with other useful characteristics. Both lines originated from mass selection for multiple disease and soil insect resistance in a sweet potato population incorporating a wide gene base. Both lines flower and set seed without any special treatment; traits of particular value in breeding.

58. JONES, A., and M. KOBAYASHI. 1968. Derived polyploids of section *Batatas* genus *Ipomoea*. Proceedings of the American Society for Horticultural Science, 93: 497-501.

By backcrossing derived tetraploids of *Ipomoea* (genome A) to diploids (2n=30) and treating the progeny with colchicine, we synthesized a hexaploid. The hexaploid obtained was highly sterile, but based on a wide range of fertility observed in derived tetraploids, it is postulated that fertile hexaploids may be forthcoming. Feasibility of an alternate procedure for obtaining hexaploids by doubling the derived tetraploids and backcrossing seems likely because of the production of an octoploid (2n=120). The procedures show promise for phylogenetic studies of sweet potato. A schedule for root-tip chromosome counts is presented. (Author's abstract).

58a. KOKUBU, T. 1973. Thremmatological studies on the relationship between the structure of tuberous root and its starch accumulating function in sweet potato varieties. Thesis... Bulletin of the Faculty of Agriculture, Kagoshima University, 23: 114-126. (English summary).

With the aim of obtaining a general view of the relationship between the structure and the starch accumulating function of tuberous roots of sweet potato in order to breed high-starch yielding variety, the structural characteristics of tuberous roots of sweet potato and their variations among varieties were investigated with special reference to the starch content and its thickness. The structural characteristics were analyzed genetically from early stage to harvest time. Stress was laid on the differentiation of vascular bundles and proliferation of storage parenchyma cells. (Author's summary modified).

59. LOVE, J.E., P. HERNANDEZ and M. MAHMOOD. 1978.
Performance of 'Centennial' sweet potato mutants. Hortscience, 13(5): 578-579.

Yield, quality, and respiration studies were conducted with 23 mutations of the 'Centennial' sweet potato *(Ipomoea batatas (L.)* Lam). None of the mutant selections produced significantly higher yields than the original cultivar. Total carotenoid pigments of mutant clones ranged between 1 and 14 mg per 100 g of fresh tissue, with 10 mutants not different from the original cultivar and 13 with less pigments. Dry matter content varied from 26 to 34% in the fleshy roots with 4 selections significantly higher than the 'Centennial' roots. Dark skin color (rose or purple) was accompanied by orange flesh color in all samples tested. There was a large variation in respiration rates of storage roots between mutant clones and 'Centennial' roots.

59a. MACDONALD, A.S. 1965.
Variation in open pollinated sweet potato seedlings in Buganda, East Africa. East African Agricultural and Forestry Journal, 31: 183-188.

During the past three years variation has been observed amongst 883 sweet potato seedlings grown at Kabanyolo University Farm, Buganda. Considerable variation has been observed in several of the sweet potatoes' characteristics, and it is apparent that genetically, sweet potato seedlings could be a source of exploitable variation. The characteristics of eighteen selected seedlings are given in Table III, although further testing is required before any conclusions can be drawn about these plants.

60. MARREWIJK, G.A.M. 1973.
The sterility-incompatibility complex in sweet potato *(Ipomoea batatas (L.)* Lam.). Third International Symposium on Tropical Root Crops, IITA, Ibadan. 2-9 Dec. 1973. Vol. 2. 29p. (Mimeo).

The data collected confirms that poor seed-set in the sweet potato result from a complex of incompatibility and sterility mechanisms, in which sterility plays a dominant part. Pollen sterility appears of no importance except in some particular clones. Thus it was found that anthers of cv. Jersey Orange did not burst and on mechanical opening shed very little pollen. Cvs. Goldrush and Puteri Selatan showed low percentages of pollen germination and tube growth in compatible matings.

To explain low capsule and seed-set Martin and Cabanillas (1966) proposed the action of two growth barriers one of which inhibits the pollen tubes to pass the border between stigma and style, the second operating in the ovary. No inhibition mechanism would be active in the style. The results of our investigations, however, suggest that, at least in some cultivars, an additional growth barrier is operating in the upper region of the style. Whether this impedes or retards tube growth cannot be simply settled but the formation of swollen tips on the pollen tubes makes the first assumption the most probable.

61. MARTIN, F.W. 1965.
Incompatibility in the sweet potato. A review. Economic Botany, 19: 406-415.

The important characteristics of the incompatibility of the sweet potato, insofar as they are known, are summarized in Table 4. It can be said with assurance that the incompatibility is of the homomorphic type as concluded by Van Schreven (27). The failure of pollen germination on the stigma after incompatible matings, the presence of unilateral incompatibilities, and the compatibility reactions among parents and offspring suggest that a sporophytic system is in operation. But the fundamental question of sporophytic versus gametophytic control cannot be resolved until more data are available.

62. MARTIN, F.W. 1968.
Self incompatibility system in *Ipomoea*. Journal of Heredity, 59(5): 263-267.

Cross-pollinations among plants of *Ipomoea setifera* revealed the presence of at least 10 self-incompatibility groups of intra-incompatible plants. Several groups were unilaterally incompatible in crosses with other groups. Genetic analysis of one set of related families permitted an interpretation of genetic control based on a one-locus, sporophytically controlled incompatibility system of the type found in the Compositae and the Cruciferae. When an attempt was made to apply this interpretation to the data available from sweet potato, an adequate explanation could only be found assuming that the incompatibility locus had been duplicated and that the two loci were epistatically inter-related.

63. MARTIN, F.W. 1969.
The sterility-incompatibility complex of the sweet potato. In: E.A. Tai, W.B. Charles, P.H. Haynes et al, eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad. 2-8 April, 1967. Vol. 1, pp. I-3-15.

The paper discusses sexual reproduction particularly in plants and self-incompatibility and sterility in plants with intermediate behaviours of partial sterility or partial incompatibility. It then describes the genetic characteristics of the sweet potato as well as breeding techniques applicable to it. Then come some fertility measurements of the sweet potato, and the system of classification suitable for that fertility pattern. The sterility features of the sweet potato are given together with some characteristics of its self-incompatibility. It is concluded that the sweet potato has proved to be an excellent example of an imperfect species, a species in which evolution has not yet straightened out the reproductive processes and in which sex is thus only a second-best method of reproduction.

64. MARTIN, F.W. 1970.
A clustering technique applied to sweet potato incompatibility classification. Horticience, 5(6): 485-486.

Sweet potato cultivars both as males and as females were classified into groups of related individuals on the basis of an index of similarity (correlation coefficients based on pollen tubes per stigma data). By gradually lowering the criterion of similarity the majority of the varieties were classified into one large group. At no stage of the process were inter-compatible, intra-incompatible groups found. A few cultivars, either as male or female, did not fit into the large group and were also not clearly related to each other. Thus this technique, as well as previous techniques, demonstrates the difficulty of incompatibility classification in sweet potato, and the resultant lack of predictability of crossing ability. (Author's abstract).

65. MARTIN, F.W. 1970.
Sterility in some species related to the sweet potato. Euphytica, 19: 459-464.

The kinds and sites of sterility and inviability were noted in induced tetraploids of three *Ipomoea* species, and of hybrids of *Ipomoea lacunosa* with *I. trichocarpa*. Tetraploids were somewhat less fertile than diploids, but seeds were normal appearing and usually viable. Hybrids were much less fertile. Hybrid

sterility occurred as pollen abortion, pollen germination failure, and in failure of pollen tube growth. Small and underdeveloped seeds failed to germinate. The sterility of hybrids (but not of tetraploids) is thus very similar to that of the hexaploid sweet potato. Sterility suggests developmental inbalance, which is probably due to genic and perhaps minor chromosomal differences among the parent species of the sweet potato. Hybrid sterility of the sweet potato may have been fixed by polyploidy, and thus may be impossible to eliminate. (Author's abstract).

66. MARTIN, F.W. and E. CABANILLAS. 1960.
Post-pollen-germination barriers to seed set in sweet potato. Euphytica, 15: 404-411.

Three sweet-potato crossing combinations selected for good pollen germination were characterized by a moderate to high amount of failure of tubes to pass from stigma to style. The number of tubes penetrating the style was about 6 times the number of seeds produced. Ovules of compatibly pollinated flowers were divided into two classes, by size. Larger (probably fertilized) ovules matured into seeds, whereas smaller (probably unfertilized ovules) dried into scales. Besides the incompatibility barrier in sweet potato, which inhibits pollen-germination, a physiological or mechanical barrier between stigma and style is hypothesized. Pollen tube growth is not appreciably inhibited within the style. A third barrier between stylar penetration and mature seed development is postulated but not identified. However, the mechanism does not appear to be due to embryo abortion. Seed abortion leads to small, weak and inviable seeds, and thus represents a further reproductive loss. (Author's abstract).

66a. MARTIN, F.W. and E. CABANILLAS. 1968.
Classification of sweet potato varieties for compatibility and sterility. Proceedings of the American Society for Horticultural Science, 93: 502-511.

Twenty-nine varieties or stocks of the sweet potato were inter-pollinated in a large number of combinations. The number of pollen tubes growing in the stigma 8 h after pollination were counted. These data were used to compare crossing combinations, and varieties as males and females by analysis of variance. In addition, phenotypic classifications of varieties into incompatibility groups were made by comparing crossabilities, and by use of inter-varietal correlations. These classifications were compared to previous classifications made on the basis of seed-set data. Significant differences in number of pollen tubes

per stigma were found among crossing combinations and among varieties as males and as females. Varieties fertile as males also tended to be fertile as females. Correlation coefficients among varieties of pollen tubes per stigma, based on crosses in common, were distributed by a one-mode, but not normal curve. Incompatibility groups established by different systems showed few similarities. No single system could be used to classify all varieties in inter-compatible, intra-incompatible groups. Thus, the sterility of the sweet potato masks and confounds the analysis of the incompatibility system. The latter might be functioning only as a relic in this particular species.

67. MARTIN, F.W. and A. JONES. 1971.
Flowering and fertility changes in six generations of open pollinated sweet potatoes. Journal of the American Society for Horticultural Science, 96(4): 493-495.

The fertility of 6 successive generations of open pollinated sweet potatoes was studied in each of 4 months. Breeding by open pollination increased the percentages of plants in flower, the number of flowers per plant, and total seed production. Both capsule and seed numbers per flower were higher in the first and last generations than in intervening generations. Self-compatibility, when determined by numbers of pollen tubes per stigma, was not affected by the breeding procedure. Mean numbers of pollen tubes per flower following cross pollination were higher in the later generations. Month to month effects were important in the case of all measurements. Flowering was most profuse in the middle of the season; seed set was highest early in the season; and pollen germination after selfing or crossing was highest at the beginning and end of the season.

68. MARTIN, F.W., A. JONES, and R.M. RUBERTE. 1974.
A wild *Ipomoea* species closely related to the sweet potato. Economic Botany, 28: 287-292.

The important characteristics of the foliage and roots of the new *Ipomoea* accessions are given in Table 1, in comparison to the characteristics of the sweet potato, of *I. leucantha* and of *I. littoralis*. All accessions differ from the sweet potato in that none bear tuberous roots, and none contain carotenoids in the cortex or storage parenchyma of the root. On the other hand, all resemble the sweet potato in the fact that they are perennials in nature and characteristically root at the nodes. Climbing versus trailing habit appears to be variable in each entity. Because the sweet potato itself is so variable, leaf sizes, shapes, and pubescence have little significance. Taken as a group, the foliar characteristics of the new accessions

can be said to indicate close relationships of all entities to the sweet potato. On the other hand, the entities differ considerably in floral and fertility characteristics (Table 11). The flowers that most resemble those of the sweet potato are those of the new *Ipomoea* accession.

69. MARTIN, F.W. and S. ORTIZ. 1966.
Germination of sweet potato pollen in relation to incompatibility and sterility. Proceedings of the American Society for Horticultural Science, 88: 491-497.

Using a fluorescent technique, the stigmas and styles of cross-pollinated sweet potatoes were classified for pollen germination behavior. In compatible crosses, large numbers of grains germinated. In partially incompatible crosses, only occasional germinated grains were seen. In incompatible crosses, germination failed entirely. Germinability of pollen was correlated with capsule and seed set, but seed set was reduced even in the most fertile crosses. Pollen of sweet potato and related species failed to germinate on a wide variety of liquid and agar media, but produced fine strands of living cytoplasm unprotected by a pollen-tube wall. An exception was *Merremia umbellata* which occasionally produced true pollen tubes. Structure and staining of pollen tubes in style and stigma were compared to those of cytoplasmic strands resulting from pseudo-germination. The significance of these findings is discussed with respect to incompatibility and sterility in the sweet potato.

70. NISHIYAMA, I., T. MIYAZAKI and S. SAKAMOTO. 1975.
Evolutionary autoploidy in the sweet potato *(Ipomoea batatas (L.)* Lam.) and its progenitors. Euphytica, 24: 197-208.

The role of polyploidy in the evolution of the sweet potato *I. batatas* (2n=6x =90), became more clear in 1971 when wild species with 30, 60 and 90 chromosomes were discovered. These species, *I. leucantha* (2x), *I. littoralis* (4x) and *I. trifida* (6x), are the progenitors of the sweet potato (6x), in an autopolyploid series with doubling of the *I. leucantha* B genome.

In the present study the hypothesis of the origin of the sweet potato was confirmed by comparative studies on some plant characters, sexual compatibility, and the behavior of artificial hexaploids produced from *I. leucantha*(2x) and *I. littoralis* (4x).

Since induced hexaploid *I. leucantha* exhibits weak growth, a few multivalents are formed at meiosis in the sweet potato, and there are differences in morphological and physiological characteris-

tics between the artificial hexaploids and *I. batatas*, raw autoploidy seems unlikely, but a balanced or diploidised autoploidy could have been achieved by genic and chromosomal changes in the course of evolution. However, there is still sufficient homology so that meiotic pairing occurs usually between regular partners but also between homoeologous chromosomes in a certain situation. (Author's summary).

71. SAKAMOTO, S. 1973.
Relationship between the origin and the cross-incompatibility of sweet potato varieties. Japanese Journal of Tropical Agriculture, 17(2): 71-74.

This experiment was carried out aiming at exploring the relationship between the origin and the cross-incompatibility of sweet potato varieties. Nine hundred and fifty five varieties, out of which 199 were Japanese local varieties, 542 were Japanese improved varieties and 214 were introduced varieties, were classified into 12 groups (from A to L) from the view point of cross-incompatibility for every origin of varieties. 2. Japanese local varieties belong to either of group A, B or C except only one variety. Introduced varieties include every group, although about half of them belongs to group B. Varieties which belong to each group other than A, B and C were those introduced from limited countries. Japanese improved varieties include most of 12 groups, and the varieties which belong to the groups othern than A, B and C occurred only when foreign varieties were used as the parent for crossing.

3. It was observed whether the grouping of varieties based on cross-incompatibility agree or not among countries. It was difficult, however, to see the agreement in most cases because test varieties for the classification differ with countries. Therefore, it seems necessary to investigate internationally the relationship, among countries as to the grouping of varieties through usage of common test varieties for classification and exchange of information in order to succeed in introducing and breeding of new varieties. (Text in Japanese) (Author's summary modified).

72. SUGE, H. 1979.
Gibberellin relationships in a dwarf mutant of sweet potato. Japanese Journal of Genetics, 54(1): 35-42.

Gibberellin (GA) relationships were examined in a spontaneous dwarf mutant and its original normal variety of sweet potato. The dwarf strain had shorter internodes than the normal strain although its leaf petiole remained unchanged. Grafting of dwarf

scion, and normal stock did not induce normal growth of the dwarf stock and did not alter the normal growth. The amount and kind of endogenous GAs did not seem to differ between the normal and dwarf strains. Applied GA_3 markedly stimulated the growth of normal strain but did not stimulate the growth of dwarf strain markedly. Application of CCC, an inhibitor of GA biosynthesis, greatly reduced the amount of GAs and the growth of leaf petioles and stems in both strains. It was suggested that dwarf strain had a partial block to the utilization of GAs in the stem but not in the leaf petiole. (Author's summary).

73. TING, Y.C. and A.E. KEHR. 1953.
Meiotic studies in the sweet potato (*Ipomoea batatas* Lam.). Journal of Heredity, 44: 207-211.

Meiosis in the sweet potato, *Ipomoea batatas*, has been studied for the first time and revealed that in this plant, the gametic number is x equals 45, confirming the hypothesis that the plant is a hexaploid. Meiotic divisions in the two varieties L 240 and L 9-32 have been observed. In the variety L 240, no abnormalities were observed, but in L 9-32 laggards were found at both metaphase I and metaphase II. These cytologic observations are discussed in the light of field experience.

73(a) WEDDERBURN, M.M. 1967.
A study of hybridization involving the sweet potato and related species. Euphytica, 16: 69-75.

Overwhelming evidence points to an American origin for the sweet potato *Ipomoea batatas* (L.) Lam. Attempts have been made to identify related diploid species from Mexico, and to use these in hybridisation experiments with *I. batatas*. The sweet potato is a poor seed setter but abundant bloom occurs in Jamaica very late in the year. Attempts at hybridisation between *I. batatas* (2n = 90) and *I. trichocarpa* (Elliot) 2n = 30 or *I. gracilis* 2n = 30 has been tolerably successful. A very high degree of self-incompatibility was demonstrated in all three species investigated but successful crosses were made using different plants of *I. trichocarpa*. An investigation of pollen viability showed that in all cases pollen could germinate but pollen tube growth was abnormal in incompatible pollinations. *I. trichocarpa* hybridised readily with *I. batatas* when the former was used as female parent. Embryo development in such a cross proceeded slowly, and stopped before cotyledon formation. No viable seeds were obtained. A comparison of embryo development in hybrid and normal seeds brought to light anormalies in development and structure of endosperm and maternal tissue in the hybrid. (Author's summary).

74. WANG, H. 1964.
A study on the self- and cross-incompatibilities in the sweet potato in Taiwan (Formosa). Proceedings of the American Society for Horticultural Science, 84: 424-429.

The object of these studies, which were conducted at the Chiayi Agricultural Experiment Station of the Taiwan Agricultural Research Institute in Formosa from 1959 through 1962, was to classify various sweet potato parents as to compatibility. In general, most of the sweet potato varieties and seedlings are self incompatible and/or sterile. However, a few varieties and seedlings were self-compatible giving a capsule set of 30% or more. There were at least 5 cross-incompatible groups found in this study. A few varieties and seedlings were found to be self-compatible and cross-compatible therefore suggesting the presence of a fertility factor "S_f". Several irregular phenomena found in sterile-intraclass groups or in fertile-interclass groups were probably due to physiological cytological and environmental factors some of which will be presented in a later publication. (Author's abstract).

75. WANG, H. 1964.
A study on the self- and cross-incompatibility and the factors affecting seed setting in the sweet potato. Journal of the Agricultural Association of China, 48: 1-12.

In general, most of the sweet potato varieties and seedlings are self-incompatible and/or sterile. However, a few varieties and seedlings were self-compatible giving a high percent capsule set of 30% or more. There were at least 5 cross-incompatible groups found in this study among 76 varieties. A few varieties and seedlings were found to be self-compatible and cross-compatible, therefore, suggesting the presence of a fertility factor "S_f". In addition to the varietal incompatibility, seed setting are still influenced by some other factors, such as environmental factors, particularly the temperature, and a number of sterile pollen as well as the chromosomal irregularities usually happened during meiosis in the pollen mother cell. The favourable season for crossing the sweet potato at Chiayi is from the beginning of November to the middle of December. The average temperature is about from 20° to 25°C. Out of the range, the flowering, seed setting as well as the number of seeds in each capsule are prohibited by either the higher or the lower temperature. Meanwhile, the flower buds, even the smaller ones of several varieties were found seriously damaged when the temperature is below 12°C. The percentage of capsule set of the varieties, such as Hawaiian, Sixty Day, Hochwan Big Vine, etc., is very low when they were used as male parents. The results

may be due to the chromosomal irregularities, such as laggards and univalent chromosome etc. that occurred during meiosis in metaphase of pollen mother cell. The abnormal chromosomal behavior may also be related to the increasing number of sterile pollen of those varieties. (Text in Chinese). (Author's summary).

76. WANG, H. 1968.
A study of fruit and seed setting ability and female sterility in the sweet potato *(Ipomoea batatas (L.)* Lam.). Botanical Bulletin of Academia Sinica, 9(2): 139-153.

The purpose of this study is to investigate the fruit set and seed forming ability of following compatible matings in L9-39 LO-240 and the female sterility of the Goldrush variety. The results are presented in seven tables. Self pollination studies indicated that L9-39 was highly self fertile with more than 80% fruit set and an average of 2.11 seeds per fruit while LO-240 was self-sterile. Under conditions of cross-pollination, the percentage fruit set of L9-39 was twice that of LO-240.

77. WANG, H. 1969.
A study on the first generation of self-pollinated clones of the sweet potato. Taiwan Agriculture Quarterly, 5(1):

There were about one third of the S_1 clones still not flowering easily. This non-flowering character, however, is still an obstacle to either cross or self-pollinations. There have been the higher percentage of sterile pollens occurred among the one half of the flowering S_1 clones observed. This could be one of the reasons for decreasing the percentage of self-fertility among S_1 clones. None of the pollen germinated on its own stigma gave the concrete evidence to explain why the most S_1 clones were self-sterile. The most S_1 clones were found to be not restricted by genetical cross-incompatibility factors.

When an attempt was made to determine the incompatibility group(s) of S_1 clones by using each S_1 clone by using each S_1 clone as female and crossed it to member of its respective incompatibility group considering the decrease or loss of self-fertility and a general tendency of the decrease in the tuber yields and the percentage of chips among S_1 clones as revealed by the results of segregating progenies in this experiment, the development of a good S_1 clone for producing high yielding hybrid appears difficult. However, few exceptionally high yielding S_1 clones observed in the experiment indicated that breeding

good sweet potato variety through the utilization of S_1 clone is not entirely impossible.

77(a) WARMKE, H.E. and H.J. CRUZADO. 1949.
Observations on flowering and fertility in some varieties of Jersey and Moist-flesh sweet potatoes. Proceedings of the American Society for Horticultural Science, 54: 391-398.

Three Jersey sweet potato varieties have flowered in field plots during the past season at Mayaguez, Puerto Rico. Only Big Stem Jersey, Vineland Bush, and Red Jersey have failed to flower, and plants of these varieties were perhaps too young to be expected to flower. During the months of October through March some 2000 crosses were made, the majority between Jersey and moist-flesh varieties. From these crosses, 337 hybrid seeds were produced, 116 being from crosses between Jersey and moist-flesh varieties. The Jersey varieties, as a whole, set 11.21 seeds per 100 crosses when used as the female parent and 7.26 seeds per 100 crosses when used as the male parent. The moist-fleshed varieties, as a group, set 15.46 seeds per 100 crosses when used as female and 29.99 seeds per 100 crosses when used as male. It was found that the percent of seed set at the beginning and end of the season was low as compared with the middle of the season. During the first 15 days of February (midseason) 41.28 seeds were harvested from each 100 crosses.

78. WEDDERBURN, M.M. 1967.
A study of hybridization involving the sweet potato and related species. Euphytica, 16: 69-75.

Overwhelming evidence points to an American origin for the sweet potato *Ipomoea batatas (L.)* Lam. Attempts have been made to identify related diploid species from Mexico, and to use these in hybridisation experiments with *I. batatas*. The sweet potato is a poor seed setter but abindant bloom occurs in Jamaica very late in the year. Attempts at hybridisation between *I. batatas* (2n = 90) and *I. trichocarpa* (ELLIOTT) 2n = 30 or *I. gracilis* 2n = 30 has been tolerably successful. A very high degree of self-incompatibility was demonstrated in all three species investigated but successfull crosses were made using different plants of *I. trichocarpa*. An investigation of pollen viability showed that in all cases pollen could germinate but pollen tube growth was abnormal in incompatible pollinations *I. trichocarpa* hybridised readily with *I. batatas* when the former was used as female parent. Embryo development in such a cross proceeded slowly, and stopped before cotyledon formation. No viable seeds were obtained. A comparison of embryo development in hybrid and normal seeds brought to light anomalies in development and structure of endosperm and maternal tissue in the hybrid. (Author's abstract).

79. WILLIAMS, D.B. and F.W. COPE. 1969.
Notes on self incompatibility in the genus *Ipomoea L.* In: E.A. Tai, W.B. Charles, P.H. Haynes et al ed. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad, 2-8 April 1967. Vol. 1: 1-17-30.

The study reported here was directed towards obtaining a better understanding of incompatibility in the sweet potato by examining: (I) the relationship between heterostyly and fertility (II) cross-compatibility relations among cultivars and (III) a preliminary survey of the characteristics of the incompatibility reaction in two wild species of *Ipomoea*. The outcome of interspecific crosses among the three species was also examined. The results indicate heterostylic variation and fertility in the sweet potato as well as intra-incompatible and inter-compatible groups. The results also reveal relations in intra- and inter-specific crosses and their progenies. These results are discussed in detail.

80. WILSON, L.A. 1973.
Components of tuber yield in sweet potato *(Ipomoea batatas L.* Lam. Third International Symposium on Tropical Root Crops. IITA, Ibadan, 2-9 Dec. 1973. Vol. 3. 9p. (Mimeo).

The paper examines the interrelationships between crop yield in six sweet potato cultivars of different foliage and tuber characteristics. Effects of tuber shape on the volume component of tuber weight and some anatomical considerations of tuber meristems, relevant to the cell number component of tuber volume are outlined. Possible implications of tuber shape and tuber meristems in the integrated considerations of tuber crop yield are discussed.

80(a) WU, H.H.F., T.T. YU, and LIOU, T.C. 1974.
Physiological and biochemical comparisons of sweet potato varieties sensitive (Tai-Lung 57) and insensitive (Red-Tuber-Tail) to chilling temperatures. Royal Society of New Zealand Bulletin, 12: 483-486.

After experiencing an air temperature of 10°C for a week, sweet potato Tai-Lung 57 displayed visual symptoms of leaf injury, followed by cessation of growth. Red-tuber-tail grew more slowly, but did not display visual symptoms of chilling injury. Reciprocal grafting did not change the response of the shoots of either variety to exposure to low temperatures. These results suggest that the chill-shock treatment, photosynthetic rate determination on attached leaves, and the assay

for starch synthetase can form useful selection procedures in screening for chill tolerance in sweet potato. (Author's abstract).

D. BREEDING

D. 1. Breeding for Disease and Insect Pest Resistance

81. COLLINS, W.W. 1977.
Diallel analysis of sweet potatoes for resistance to *Fusarium* wilt. Journal of the American Society for Horticultural Science, 102(2): 109-111.

Eight clones of sweet potato *Ipomoea batatas* L. were evaluated for resistance to the soil-borne pathogen *Fusarium oxysporum* (Schlecht) f. sp. *batatas* (Wr.) Snydor & Hanson and their reactions varied from extremely susceptible to extremely resistant. The 8 clones were used as parents in a modified diallel crossing design which generated 24 families each consisting of 10 full-sib clones. These 240 clones were evaluated for *Fusarium* wilt resistance in a randomized complete block design. They showed a gradation of resistance similar to the parents which is consistent with the theory of a quantitative mode of inheritance for this character. Diallel analysis of the 24 families revealed significant general and specific combining ability effects. Additive variance accounted for 87% of the total genetic variance while dominance variance accounted for only 13%. Broad-sense and narrow-sense heritabilities estimated for individuals and full-sib families from the diallel analysis were consistently greater than 70%. Narrow-sense heritability of using the parent-offspring regression method was 50%. Results indicate that gains in *Fusarium* wilt resistance should be rapid and substantial in sweet potatoes. (Author's abstract).

82. CORDNER, H.B., F.B. STRUBBLE, and L.S. MORRISON. 1951.
Breeding sweet potatoes for resistance to the root-knot nematode. Plant Disease Reporter (Suppl.), 227: 92-93.

At a relatively early date, root-knot injury to sweet potatoes was observed and varietal differences reported (5, 4). In these studies, the varietal differences described were based on injury to plants in infested plant beds and plant and root injury in

crops grown in infested field plots. In a more recent report (3), varietal resistance to root knot was based on the prevalence of egg masses on roots of plants grown for a short period of time in infested soil in greenhouse benches. In this report, it was indicated that the Jersey varieties were the most consistently resistant, the Porto Rico variety and its mutant strains were of intermediate resistance, while the Nancy Hall and Red Bermuda were highly susceptible to root-knot. Breeding line and Plant Introduction sweet potatoes were also tested and each assigned to one of the three resistance classes. (Authors' abstract).

83. CUTHBERT, JR., F.P. and DAVIS, JR., B.W. 1970.
Resistance in sweet potatoes to damage by soil insects. Journal of Economic Entomology, 63: 360-363.

Sweet potato varieties and breeding lines varied widely in susceptibility to root damage by soil insects in the field. Sources of resistance to most major pests of sweet potato roots were found. Some commercial lines proved to have useful levels of resistance to some insects, but lines selected specifically for resistance were generally most resistant. Resistance to some of the insects appeared to be controlled by common factors.

84. CUTHBERT, JR., F.P. and DAVIS, JR., B.W. 1971.
Factors associated with insect resistance in sweet potatoes. Journal of Economic Entomology, 64(3): 713-717.

An unidentified factor in the root periderm of some sweet potatoes was an effective deterrent to injury by wireworms (*Conoderus* spp.), by *Diabrotica* spp., and by larvae of *Systena elongata* (F.). The presence of larval antibiotic or non-preference factors in the inner portion of some roots was demonstrated, but these were not clearly related to resistance. The amount of injury by these insects as well as by the sweet-potato flea beetle *Chaetocnema confinis* Crotch, and by a grub, *Plectris aliena* Chapin, was influenced only slightly, if at all, by the time and depth of root enlargement, by the sugar, carotene, and dry matter content, by latex flow, or by the flesh pH.

85. CUTHBERT, JR., F.P. and A. JONES. 1972.
Resistance in sweet potatoes to coleoptera increased by recurrent selection. Journal of Economic Entomology, 65: 1655-1658.

Four cycles of recurrent selection in a random crossing population of sweet potato, *Ipomoea batatas* (L) Lam., increased incidence of resistance to root damage by the grub of plectris

aliena chapin and the incidence and levels of resistance to larvae of the southern potato wire-worm conoderus falli lane; the banded cucumber bettle, Diabrotica balteata Leconte; the spotted cucumber bettle, D. undecimpunctata howardi Barber; the elongate flea beetle, systena elongata (F); and S. frontalis (F). No appreciable improvement in resistance to the sweet potato flea beetle, chaetocnema confinis crotch, was deteched, but resistance to this insect was relatively high in the original population.

86. CUTHBERT, JR., F.P. and A. JONES. 1978.
Insect resistance as an adjunct or alternative to insecticides for control of sweet potato soil insects. Journal of the American Society for Horticultural Science, 103(4): 443-445.

Insect resistance in sweet potatoes (*Ipomoea batatas* (L.) Lam.) was more effective than fonofos, O-ethyl-S-phenylethylphosphonodithioate, in reducing insect injury to the roots. The most recent resistant line tested did not sustain economic injury from relatively high insect infestations even without the protection of an insecticide. Fonofos at 2.24 and 4.48 kg/ha did not prevent economic injury to the susceptible 'Goldrush'.

87. DEAN, J.L. and F.B. STRUBBLE. 1953.
Resistance and susceptibility to root-knot nematodes in tomato and sweet potato. Phytopathology, 43(5): 290.

Plants were inoculated with the root-knot nematode *(Meloidogyne incognita)* by a method which makes it possible to determine the time of entry of the nematodes within the limits of whatever period is chosen for inoculation. Root systems were stained and examined microscopically at various time intervals after inoculation. Root systems of resistant tomatoes, *Lycopersicon peruvianum* and *L. peruvianum* hybrid, were invaded by fewer larvae, usually half or less, than those of susceptible Marglobe tomatoes. Nematodes entering resistant roots produced extensive necrosis of host tissue within 48 hrs. Two weeks after inoculation most of the invading larvae had died and disappeared. No larvae in resistant roots ever developed as far as the second molt. No differences related to resistance and susceptibility were noted between sweet potato varieties with respect to the number of larvae entering the roots. Nematodes entering resistant sweet potato roots (Orlis, Oklahoma 46, Oklahoma 29) produced necrosis of host tissue several days after inoculation. Necrosis was not observed in susceptible Allgold roots. A few nematodes in all lines of resistant sweet potatoes developed to egg-laying maturity but most larvae died and disappeared before reaching that state. (Author's summary).

88. DUKES, P.D., A. JONES and J.M. SCHALK. 1979.
Evaluating sweet potato for reaction to sclerotial blight caused by *Sclerotium rolfsii*. Hortscience, 14(2): 123. 1979.

Over 300 entries of sweet potato were evaluated in the plant bed for reaction to sclerotial blight (SB). These entries included 45 named varieties, 56 plant introductions (PI), all 13 of the 1978 regional entries (RE) of the National Sweet Potato Collaborator Group and many breeding lines. SB was evaluated on a scale of 1 to 5; with 1 and 2 indicating the least susceptible (LS), 3 indicating intermediate susceptibility (IS), and 4 and 5 indicating high susceptibility (HS). Only 2% of the named varieties tested and 4% of the PI's were IS, while the remainder were rated LS. In the USDA breeding (W) lines, 16% were found to be HS, 17% IS and 67% LS; whereas breeding lines from other sources were 7% HS, 2% IS and 91% LS. The RE's were rated 15% HS, 10% IS and 75% LS. We conclude, therefore, the diversity of reaction in sweet potatoes to SB is large and that less susceptible lines can be selected. (Author's summary).

89. GENTILE, A.G., K.A. KIMBLE and G.C. HANNA. 1962.
Reactions of sweet potato breeding lines to *Meloidogyne* spp. when inoculated by an improved method. Phytopathology, 52: 1225-1226.

In California, root-knot nematodes (*Meloidogyne* spp.) frequently reduce sweet potato yields and damage the appearance of storage roots. The use of healthy rootstocks, combined with soil fumigation, is effective in reducing the initial nematode population density below a level that causes economic loss, but is expensive. Hence, breeding acceptable resistant varieties is a more economical and desirable method of control. None of the varieties presently grown in California is resistant.

90. GIAMALVA, M.J., W.J. MARTIN and T.P. HERNANDEZ. 1980.
Reaction of eight sweet potato selections to five species of root-knot nematodes. Phytopathology, 50(8): 575.

Sweet potato varieties Porto Rico, Goldrush, Acadian, Heartogold, Allgold, and Nemagold, and Louisiana seedlings 1-80 and 3-77 were grown in replicated greenhouse experiments in steam-sterilized soil artificially infested with *Meloidogyne arenaria, M. hapla, M. incorgnita, M. incognita acrita,* and *M. javanica.* Ten weeks after planting, roots of each plant were rated for galling and necrosis. The roots were weighed and the number of larvae in the soil was determined. All nematode species caused galling

and root necrosis and developed to maturity on certain selections. However, selections differed greatly in their reaction to given nematode species. *M. incognita* caused galling (trace) and developed mature females in Heartogold only. On Nemagold, trace galling and development of mature females was induced by all species except *M. arenaria*. *M. arenaria* caused slight to moderate root necrosis on all varieties. *M. incognita* and *M. incognita acrita* caused the most severe galling on all selections.

There was no correlation between galling and root necrosis. There was a significant positive correlation between root-knot gall index and number of larvae. There was no significant difference in root weights between species on any variety, and no correlation between root weights and other indexing methods. (Author's abstract).

91. GIAMALVA, M.J., W.J. MARTIN, and T.P. HERNANDEZ. 1963. Sweet potato varietal reaction to species and races of root-knot nematodes. Phytopathology, 53: 1187-1189.

Two of eight sweet potato varieties were highly resistant to a population of each of these nematodes - *Meloidogyne incognita*, *M. incognita acrita*, *M. hapla*, *M. javanica*, and *M. arenaria*. Some varieties were resistant to some root-knot species and susceptible to others. Only 1 of 15 isolates of *M. incognita acrita* did not develop to maturity on var. Heartogold. *M. arenaria* was the only species that did not develop mature females on any variety. *M. javanica* developed abundant mature females on var. Allgold, a new host record for this species. Two types of resistance to root-knot nematodes in sweet potato are suggested. (Author's abstract).

92. HARMON, S.A. 1976. Breeding and testing sweet potatoes for nematode resistance. Hortscience, 11(3): 228.

In 1970, increased emphasis was placed upon breeding for nematode resistance in the sweet potato. Clones known to have resistance were used to a greater degree in crossing and a program for screening all promising seedlings was initiated. The screening was done in field plots in which a high population of *Meloidogyne incognita* was maintained. From 1970 through 1975 over 500 varieties and seedlings were checked. A few resistant seedlings were found from many crosses and parent clones, some of which were highly susceptible. However, only about 1 percent have had the high degree of resistance wanted. Germplasm from Polynesia, Japan, South and Central

America, Africa and Australia as well as a wide selection from North America has gone into the program. Breeding lines developed in Oklahoma by Howard Cordner has provided a good source of resistance.

93. HERNANDEZ, T.P., T.P. HERNANDEZ, R.J. CONSTANTIN and W.J. MARTIN 1975.
"Jasper", a soil rot resistant sweet potato variety. Hortscience, 10(2): 6.

Jasper, a disease-resistant sweet potato variety, produces fleshy roots with bright copper skin color, well shaped, tapering to both ends. Jasper produces a large percentage of marketable roots with almost twice the carotene content of Unit I.P.R. and similar to Goldrush. The vines are trailing, medium in thickness and 4 to 5 feet long. This variety was tested for 3 years in soil infested with soil rot and in non-infested soil Jasper produced an average of 425.2 bushels of marketable roots per acre, compared with 85.9 bushels for Centennial. Yield were approximately the same in non-infested soil. Jasper does not store as well as Centennial and should be marketed early. It ranked slightly better than Centennial in quality evaluations. Jasper is resistant to soil rot, and also has good resistance to internal cork, stem rot or *Fusarium* wilt, and moderate resistance in root-knot nematodes.

94. HILDEBRAND, E.M. 1956.
Rapid inoculation techniques for mechanical transmission of sweet potato internal cork virus. Plant Disease Reporter, 40(6): 527-530.

This report describes three rapid inoculations procedures for sweet potato internal cork virus, employing respectively root, leaf, and petiole tissue as sources of inoculum. The method is an adaptation of Yarwoods quick virus inoculation method of rubbing freshly cut virus-infected tissue onto carborundum-dusted leaf surface sprayed with potassium-phosphate buffer solution.

95. JATALA, P. and C. RUSSEL. 1972.
Nature of sweet potato resistance to *Meloidogyne incognita* and the effects of temperature on parasitism. Journal of Nematology, 4: 1-7.

Penetration, rate of development, and total population of *Meloidogyne incognita* in roots of susceptible "Allgold" and resistant 'Nemagold' sweet potatoes increased with temperature 24-32 C. Rate of larval penetration in 'Allgold' was significantly higher than in 'Nemagold' after 48 hrs of root exposure

24, 28, and 32 C. At 24, 28, and 32 C (16 hrs) day and 20 C (8 hrs) night temperature the life cycle of *M. incognita* required 42, 32 and 28 days in 'Allgold', and 44, 33, and 31 days in 'Nemagold'; mature females in the first generation were 40, 40, 40, and 10, 22, 20 respectively. The correlation between the length of time roots were allowed to grow in the soil prior to inoculation and number of larvae recovered from the roots after inoculation was positive for 'Allgold' and negative for 'Nemagold'. Therefore, a root exudate repellent to *M. incognita* larvae is proposed as a hypothetical basis for resistance to *M. incognita* in sweet potatoes. Key words: *Ipomoea batatas*, root observation box.

96. JONES, A. 1969.
Quantitative inheritance of *Fusarium* wilt resistance in sweet potatoes. Journal of the American Society for Horticultural Science, 94: 207-208.

We obtained estimates of genetic components of variance for resistance to *Fusarium* wilt in sweet potato, through study of 40 randomly chosen plants of an intermating population and their respective open-pollinated offspring. The additive component accounted for virtually all of the genetic variance. Predicted advance from mass selection of the best 10% of the parents was 10.5% of the mean. The actual advance obtained in offspring of the selected plants was 13.9%. Heritability was estimated as .86. (Author's abstract).

97. JONES, A. and F.P. CUTHBERT, JR.
Associated effects of mass selection for soil-insect resistance in sweet potato. Journal of the American Society for Horticultural Science, 98(5): 480-482.

Character association in a sweet potato [*Ipomoea batatas* (L.) Lam.] population after 4 cycles of selection for resistance to soil insects and in a control population with no selection were studied by use of contingency tables of pairs of traits. Possible common factors were indicated for resistance to the sweet potato flea beetle and the wireworm-*Diabrotica-Systena* (WDS) complex. Selection changed the means and distributions of 6 of 13 unselected root and vine traits. None of these changes were directly associated with insect resistances, but that in root cracking was caused by the grading techniques. Two traits appeared genetically associated (cortex thickness and leaf-whorl color), and 2 appeared to be expressions of the same character change (flesh-color changes were also expressed as skin-color changes). The selected population had shorter internodes than the unselected. These changes in unselected

traits were probably due to drift caused by small population sizes in the selected generations. No barriers to development of insect-resistant cultivars were detected.

98. JONES, A., F.P. CUTHBERT, JR., J.M. SCHALK. et al. 1978. Field screening for sweet potato weevil resistance: A progress report. Hortscience, 13(3): 268.

Exploratory tests to determine the feasibility of breeding for sweet potato weevil (*Cylas formicarius elegantulus* Sum.)) resistance in sweet potatoes (*Ipomoea batatas* (L.) Lam.) have been conducted at Yoakum, Texas, an area of natural weevil infestation, in each of the past 4 years. About 75 lines have been rated each year for crown and root infestations which appear to be uncorrelated. During the first 3 years natural infestations were erratic and too light for firm conclusions. Attempts to artificially infest the tests were made in 1977. Although higher infestations and more extensive root damage were obtained, results were still inconclusive. Additional tests with artificial infestation are planned for 1978.

99. JONES, A., P.D. DUKES and F.P. CUTHBERT. 1976. Mass selection in sweet potato: breeding for resistance to insects and diseases and for horticultural characteristics. Journal of the American Society for Horticultural Science, 101(6): 701-704.

Advances attained by the sixth generation of mass selection in sweet potato (*Ipomoea batatas* (L.) Lam.) were assessed. The objective was to combine multiple resistances to pathogens, nematodes and insects with other desirable production and market qualities. Although progress from 6 single-year cycles of selection was encouraging, a change to 2-year cycles was indicated. Generation 6 contained high frequencies of flowering and seed set, attractive root shape, orange flesh, thin cortex, root specific gravities of about 1.02, acceptable yield, and resistance to *Fusarium* wilt (*Fusarium oxysporum* f. sp. *batatas* (Wr.) Snyd. and Hans.), the southern root-knot nematode (*Meloidogyne incognita* (Kofoid and White) Chitwood) and the following soil insects: the southern potato wireworm (*Conoderus falli* Lane), the banded cucumber (*Diabrotica balteata* LeConte), the spotted cucumber beetle (*D. undecimpuncta howardi* Barber), the elongate flea beetle (*Systena elongata* (F.)), a white grub (*Plectris aliena* Chapin), and the sweet-potato flea beetle (*Chaetocnema confinis* Crotch). (Author's summary).

100. KUKAWA, K. and SAKAI (n.d.)
Breeding method for resistance of sweet potato to nematode. Report of Kyushoo Agricultural Experiment Station, 14(3): 397. (n.d.). (Text in Japanese; author's in English summary).

Studies were conducted to establish the breeding method for resistance to the root-knot nematode (*Meloidogyne incognita*) the root-lesion nematode (*Pratylenchus coffeae*) in sweet potato. The results indicate that it would be possible to breed resistant varieties on the assumption that the resistance to the root-knot nematode depends largely on additive effects of genes; that there is positive genotypic correlation between the yield of tubers and resistance, and no genotypic correlation between the dry matter percentage and resistance. In clonal selection for resistance nematode, resistance varied between individuals of seedlings, and high heritabilities of the character. So it will be efficient to select the high resistant individuals at seedling stage. As for root-lesion, the results show that resistance root-lesion nematode depends largely on additive effects of genes as in the case of resistance to the root-knot nematode. Positive genotypic correlation is as for the root-knot nematode. Thus varieties can be bred with resistance to both nematodes.

101. MARTIN, W.J. 1954.
Varietal reaction to *Ceratostomella fimbriata* in sweet potato. Phytopathology, 44(7): 383-384.

Tests were conducted under the conditions of inoculum and climate prevailing in Louisiana those varieties and seedlings which were reported as highly resistant to *Ceratostomella fimbriata*. The results indicate that the reaction of a sweet potato variety or seedling to the black rot fungus depends upon the specific parasitic race of the fungus to which it is exposed, as well as upon the temperature conditions under which the disease develops. Seedling B-6097 showed good tolerance to black rot under the conditions of these experiments.

102. MARTIN, W.J. 1956.
Varietal reaction to white rust in sweet potatoes. Plant Disease Reporter, 40(3): 233-234.

White rust disease of sweet potato (caused by *Albugo ipomoea-panduranae* (Schw.) Swing.) is favoured by exceptionally wet weather. Usually considered a minor disease, it can cause severe defoliation under such weather. Results of observations made on seedlings in 2 field experiments in 1955 showed highly significant varietal differences in reaction to white rust.

103. MARTIN, W.J. 1966.
Sweet potato varietal reaction to reniform nematode. Plant Disease Reporter, 50: 500-502.

The variety Goldrush was the least suitable of 24 sweet potato selections tested for increase of populations of the reniform nematode, *Rotylenchulus reniformis*. Goldrush is very susceptible to root-knot nematode, *Meloidogyne incognita* group; four of the selections studied are resistant to root-knot nematode. Apnematode differ from those controlling resistance in sweet potatoes to root-knot nematode. (Author's abstract).

104. MARTIN, W.J., W. BIRCHFIELD and T.P. HERNANDEZ. 1966.
Sweet potato varietal reaction to the reniform nematode. Plant Disease Reporter, 50(7): 500-502.

The variety Goldrush was the least suitable of 24 sweet potato selections tested for increase of populations of the reniform nematode, *Rotylenchulus reniformis* Goldrush is very susceptible to root-knot nematode, *Meloidogyne incognita* group; four of the selections studied are resistant to root-knot nematode. Apparently, factors controlling suitability of sweet potatoes as hosts for the reniform nematode differ from those controlling resistance in sweet potatoes to root-knot nematode.

105. MARTIN, W.J., T.P. HERNANDEZ and T.P. HERNANDEZ. 1975.
Development and disease reaction of Jasper, a new soil rot-resistant sweet potato variety from Louisiana. Plant Disease Reporter, 59(5): 388-391.

Jasper, a new sweet potato variety released by the Louisiana Agricultural Experiment Station in 1974, is the first sweet-potato variety with appreciable resistance to soil rot caused by *Streptomyces ipomoea*. The results of systemic screening for resistance to soil rot in Louisiana since 1963, leading to the release of Jasper, are summarized. Jasper is also resistant to the virus diseases internal cork and russet crack, to stem rot caused by *Fusarium oxysporum* f. *batatas*, and to the root knot caused by some races of *Meloidogyne incognita*. Jasper is susceptible to other important sweet potato diseases including black rot caused by *Ceratocystis fimbriata*, scurf caused by *Monilochaetes infuscans*, and foot rot caused by *Plenodomus destruens*. This variety is very susceptible to Java black rot caused by *Diplodia tubericola*, to charcoal rot caused by *Macrophomina phaseolina*, and to diseases caused by *Sclerotium rolfsii*. (Author's abstract).

106. OGAWA, K., T. TAKEMATA, S. TAKEUCHI. et al. 1979. Varietal resistance, dissemination, and control of *Fusarium* wilt of sweet potato. Journal of the Central Agricultural Experiment Station, 30: 97-120.

One hundred and nineteen cultivars and lines of sweet potato (*Ipomoea batatas* L.) to *Fusarium* wilt caused by *Fusarium oxysporum* Schl. f. sp. *batatas* (Wr.) Synd. et. Hans., were examined for their susceptibility by dipping the cut sprouts into the bud cell suspension of the pathogen just before planting. Reaction of the cultivars varied continuously from highly resistant to highly susceptible. They were divided into following five categories of resistance according to the percentage of the died plants.

When some of these cultivars were planted in the artificially infested soil, either highly or slightly susceptible cultivars were diseased. From the result of our experiment, it is assumed that only highly susceptible cultivars alone are injured seriously by the disease when they are grown in the naturally infesed field. It is considered that the former method (cut-sprout dipping) is available for selection of highly resistant cultivars or lines and the latter method (planting on artificially infested soil) is suitable for selection of field-resistant ones.

The tuberous roots yielded from the infested field carried the pathogen in their vessels even though they seemed symptomless in appearance. And the pathogen existed more frequently in the neck part of the roots than in the part near to the root tip. The sprouts developed from such infested roots were diseased very frequently when they were planted in the non-infested soil. The sprouts cut at the further part from the seed-roots were less diseased than the ones cut in the nearer part of those. The order of the sprouts developed from the infested roots showed no correlation with the frequency of the disease, if they were taken from the same distant part of the seed-roots. The pathogen was transmitted also to the healthy sprouts cut with a scissors. Recently *Fusarium* wilt in sweet potato has been rapidly disseminated. One major cause can be ascribed to the distribution of a new highly susceptible cultivars "Benikomachi", especially to that of the infested seed-sprouts developed from the infested roots.

It is considered that the disease can be controlled by the use of non-infested seed-roots yielded from the healthy plants and by the choice of high quality sprouts. It is also effective to dip the sprouts into the 500 times suspension of benomyl for 30

minutes before planting, and to inject 3 ml of chloropicrin into a 30 cm square of the infested field covered with plastic film.

107. SHIBUYA, M. 1954.
Studies on the varietal resistance of the root-knot nematode injury. Plant Breeding Abstracts, 24: 248.

Studies were conducted to establish the breeding method for resistance to the root-knot nematode (*Meloidogyne incognita*) and the root-lesion nematode (*Pratylenchus coffeae*) in sweet potato. In the studies, resistance was treated as a quantitative character, and effects of selection of parental lines, F_1 seedlings and the second year lines after seedling were investigated from a standpoint of statistical genetics.

The results for resistance to the root-knot nematode are as follows: (1) We may be able to breed resistant varieties on the assumption that the resistance to the root-knot nematode depend largely on additive effects of genes. Therefore it is effective to select the parents and cross combinations with high resistance for the breeding of resistant varieties of sweet potato to the nematode. (2) There is positive genotypic correlation between the yield of tubers and resistance, and no genotypic correlation between the dry matter percentage and resistance. In the selection of parental lines, therefore, it seems hardly probable that selections for root-knot nematode resistance bring about the decreases of yield and dry matter percentage. (3) In the clonal selection for resistance to the nematode, it has been observed that there were large variation of resistance between individuals of seedlings, and high heritabilities of the character. So it will be efficient to select the high resistant individuals at seedling stage. (4) It is a very promising method to select the high resistant seedlings in sowing bed. (5) The selection of high resistant clones is effective at the second year after seedling, and in this case the satisfactory sample size is between 5 and 10 plants per line. (6) No genotypic correlation was recognized between the yield of tubers and resistance, nor between the dry matter percentage and resistance of clonal strains, as in the case of F_1 seedlings. It seems, therefore, that clonal selections for root-knot nematode hardly bring about the decreases of yield and dry matter percentage of the population.

(2) There are positive genotypic correlation between the dry matter percentage and resistance, and no genotypic correlation between the dry matter percentage and resistance, as in the case of the root-knot nematode. Hence, it is considered similarly

that selections for root-lesion nematode in parental lines hardly bring about the decreases of yield and dry matter percentage in the successive generation. (3) As the resistance to root-knot nematode and root-lesion nematode seemed almost independent of each other in these experiments, we can breed up the varieties with resistance to both nematodes. (4) By the method used in these experiments, it is efficient to select the high resistant individuals at seedling stage. It is considered that the effect of selection is established up to the second year's selection of clones after seedling. (Author's abstract).

D. 2. Breeding for other Desirable Characters

108. FUJISE, K. 1970.
Sweet potato and its breeding efficacy in Japan. In: Plucknett, D.L. ed. Proceedings of the 2nd International Symposium on Tropical Root and Tuber Crops, Aug. 23-30, 1970. Honolulu, Hawaii. Hawaii the University. Vol. 1: pp. 10-23.

The author gives the acreage production, and consumption levels of sweet potato in Japan illustrated with graphs. Then the breeding experiments of the crop are described indicating that about 100,000 seeds were produced yearly. The purpose of the breeding experiment, was to establish varieties possessing qualities of high yield, good characteristics food, and high starch content for the glucose industry using sweet potato starch, adaptability for much or less manuring, early digging, tolerance to black rot disease and root-knot nematode, cold tolerance, drought tolerance, and late planting.

It is demonstrated with the use of graph and data that progress in breeding tests has greatly contributed to increasing the tuber yield and starch content the two most important factors in sweet potato as raw material for the starch industry. Success in breeding has also led to better control of black rot and root-knot nematode a serious set-back to the crop.

108a. HAYNES, P.H. 1974.
Tropical root crops: a modern perspective. SPAN, 17(3): 116-118.

The status of the main tropical root crops is examined: These include manioc, yam, edible aroids and sweet potato (*Ipomoea batatas* (L.) Lam.). General attitudes to them are considered as well as their prospects with respect to plant breeding and selection, processing, and protein enrichment.

Sweet potato is noted to be the main edible member of the Convolvulaceae family, with a highly variable morphology producing foliage and tubers in a range of shapes and colours. Cross breeding and subsequent selection have yielded many improved types. The favourable agro-ecology for it is mentioned as well as the uses made of the crop.

109. JONES, A. 1969.
Quantitative inheritance of ten vine traits in sweet potatoes. Journal of the American Society for Horticultural Science, 94(4): 408-411.

Heritability (%) estimates of 10 vine characters were obtained from a parent-offspring study of 40 sweet potato lines as follows: leaf vein purpling, 95; number of buds per cyme, 50; leaf whorl purpling, 74; vine purpling, 53; vine diameter, 111; vine length, 60; internode length, 61; leaf length, 99; plant pubescence, 82; and leaf type, 59. The additive component of variance was more important than the non-additive for all traits. In all cases the realized changes due to selection agreed with the predictions very well. (Author's abstract).

110. JONES, A. 1970.
Phenotypic, genotypic, and environmental correlations in sweet potatoes. Journal of the American Society for Horticultural Science, 95(3): 326-330.

Estimates of phenotypic, genotypic and environmental correlations of 21 sweet potato traits indicated no serious impediments to selection for improved horticultural types through mass selection techniques. Some secondary traits were genetically correlated with traits of primary economic importance, a factor which suggests that their use in selection indices may be profitable in sweet potato improvement programs. (Author's abstract).

111. JONES, A. 1971.
The use of correlated responses in sweet potato selection. Journal of the American Society for Horticultural Science, 96(4): 538-541.

The applicability of the method of correlated responses to selection of sweet potatoes in a breeding program is illustrated by use of previously determined correlations between 21 traits. Examples of the kinds of changes that might be expected due to correlated responses are pointed out. It is further demonstrated that knowledge of such responses can assist plant breeders in making prudent selections and in the design of improved breeding procedures. Agreement of predicted and realized correlated responses indicates that this technique is suited to use with the sweet potato. Through mass selection procedures, cultivars with most any combination of traits desired should be possible. (Author's abstract).

112. JONES, A. 1972.
Mass selection for low oxidation in sweet potato. Journal of the American Society of Horticultural Science, 97(6): 714-718.

Mass selection for low oxidation of root flesh was initiated in the fourth generation of an open-pollinated sweet-potato [*Ipomoea batatas* (L.) Lam.] population. Two selection schemes were followed which provided different selection pressures by varying effective population sizes. In one (population A), selected plants were randomly intercrossed by insects each cycle. In the other (population D), approximately 10% of the randomly intercrossing population were selected each cycle and their true seed used to plant the next generation. After 2 cycles of selection in A and 3 in D, they were compared to appropriate generations of the base population. Results were in agreement with selection theory and closely parallel those obtained with other crops. More rapid advance was made with A, which requires 2 seasons per cycle for any trait not measured in the seedling stage. Good advance was made with D, which allows 1 cycle per season. Study of 21 other traits indicated more changes in unselected traits in A than in D, thus favoring the method of D in early generations of mass selection in sweet potato. The rapid increase of low oxidizing plants in this study suggests that selection for low oxidizing cvs. may reduce associated processing problems.

113. JONES, A. 1977.
Heritabilities of seven sweet potato root traits. Journal of the American Society for Horticultural Science, 102(4): 440-442.

Forty-five plants of sweet potato (*Ipomoea batatas* (L.) Lam.) taken randomly from the second cycle of a mass-selection population, and 25 open-pollinated progeny from each were used to estimate heritabilities (h^2) of 7 root traits: root weight, 0.25 + 0.13; intercellular space (IS), 0.70 + 0.14; percent of dry matter (DM), 0.65 + 0.12; sprouting, 0.39 + 0.14; flesh oxidation, 0.24 + 0.13; flesh color, 0.53 + 0.14; and cortex thickness, 0.25 + 0.13. IS was distributed normally with mean and mode of about 7%. DM had a bimodal distribution with mean 28.8 and modes of 27 and 31%. At least 2 genetic systems were apparently involved in experession of DM; one was associated with orange flesh and the other, with white flesh. This is the first report of the h^2 for IS, DM, and sprouting. (Author's abstract).

114. JONES, A. and P.D. DUKES. 1976.
Some seed, seedling, and maternal characters as estimates of commercial performance in sweet potato breeding. Journal of the American Society for Horticultural Science, 101(4): 385-388.

Thirty random seedlings from each of 50 random parents of a sweet potato (*Ipomoea batatas* (L.) Lam.) mass selected population were evaluated in the greenhouse and their subsequent field performances were recorded. Simulated selection sequences were also studied. A sequence with mass selection first on maternal hill weight, high seed set, and high seed weight followed by a 50% culling level within families on the basis of low greenhouse seedling vigor resulted in average progeny field yields 45% above that of no selection. The results showed seed weight to be a potentially useful selection criterion for root yield. Individual seedling root weight in the greenhouse was not a good predictor of field yield. (Author's abstract).

115. JONES, A., P.D. DUKES and J.M. SCHALK. 1979.
Heritability estimates and sweet potato breeding. Hortscience, 14(2): 123.

During the past decade quantitative genetic studies of sweet potato (*Ipomoea batatas* (L.) Lam.) have provided about 165 heritability (h^2) estimates for various measurements of yield, root quality, vine and pest (*Fusarium* wilt, root-knot nematodes, and soil insects) resistance traits. Some of these h^2 estimates involve the same trait under different environments or in materials of different genetic origins. A summary of these h^2 estimates is presented and generalizations regarding their use and applicability in sweet potato breeding is discussed and reviewed.

116. JONES, A., M.G. HAMILTON and P.D. DUKES. 1978.
Heritability estimates for fiber content, root weight, shape, cracking, and sprouting in sweet potato. Journal of the American Society for Horticultural Science, 103(3): 374-376.

A parent-offspring test of 21 sweet potatoes (*Ipomoea batatas* (L.) Lam.) and 25 open-pollinated offspring from each provided heritability estimates ($h^2 \pm SE$) for root fiber (0.47 ± 0.04), weight (0.41 ± 0.04), shape (0.50 ± 0.05), cracking (0.37 ± 0.04), and sprouting (0.37 ± 0.02). These characters were sufficiently independent to allow selection of one, or of any combination simultaneously, without adverse effects on the others.

117. JONES, A., C.E. STEINBAUER, and D.T. POPE. 1969.
Quantitative inheritance of ten root traits in sweet potatoes. Journal of the American Society for Horticultural Science, 94(3): 271-275.

A parent-offspring study of 40 sweet potato lines grown in 6 environments provided heritability (%) estimates for 10 root characters as follow: weight, 41; number of edible roots, 32; veining, 30; growth cracks, 51; flesh oxidation, 64; shape, 62; flesh color, 66; cortex thickness, 45; skin color, 81; and skin purpling, 74. In most cases the realized changes due to selection fit the predictions very well. The additive component of genetic variance was relatively more important than the non-additive for all traits except veining and number of edible roots. The study illustrates the usefulness of quantitative genetic approaches to sweet potato breeding. (Author's abstract).

118. KOBAYASHI, M. and T. MIYAZAKI. 1977.
Sweet potato breeding using wild related species. In: Cock, J., R. MacIntyre and M. Graham. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops held in CIAT, Cali, Colombia. 1-7 August 1976, Ottawa, IDRC, pp. 53-57.

A sweet potato variety and various breeding materials that include germplasm of wild *Ipomoea* suggest that the wild species have much to offer sweet potato breeders. The wild relatives that can be crossed with cultivated sweet potato include diploids, triploids, tetraploids and hexaploids. All of them resemble the sweet potato in two respects. They have similar floral morphologies and incompatibility systems. These characters may be useful in future searches for wild plants.

Our experience in the practical use of hold species in sweet potato breeding, a flower induction technique, self and cross-compatibility test, and species hybridization with sweet potato suggests that useful genes can be expected from wild species. Some principles necessary for an effective gene introduction system have been identified.

118(a) LAM, S.L., A.E. THOMPSON and J.P. McCOLLUM. 1959. Induction of flowering in the sweet potato. Proceedings of the American Society of Horticultural Science, 73: 453-462.

The purpose of this investigation was to develop a technique of inducing the sweet potato to flower at any time of the year. Such a method would be of considerable value in the improvement of the sweet potato by plant breeding.

The technique has been described. Floral induction was obtained when sweet potato scions were grafted on eight out of nine related species from three genera of Convolvulaceae (morning glory). At high temperatures (86 - 105F), a short photoperiod is essential for flowering of the morning glory. Therefore, exposure of the donor to a short photoperiod is essential to obtain floral induction in the sweet potato at high temperatures.

Wide differences among different species were observed with respect to effectiveness of inducing the sweet potato to flower. Some species were very effective during the summer but of no value in the fall and winter and even produced an inhibitory effect on the growth of the sweet potato scion.

119. LI, LIANG. 1975. Studies on the inheritance of quantitative characters in a randomly intermating population of sweet potatoes (*Ipomcea batatas* (L.) Lam.). Journal of Agricultural Research of China, (Formerly) Journal of Taiwan Agricultural Research, 24(3/4):

Sixty-plans selected at random from each of the fourth and sixth generations of a randomly intermating sweet potato populations and their respective open-pollinated progeny provided the materials for use in quantitative genetic study.

In all four characters, the genetic components (σ^2) accounted for a large portion of the phenotypic variance. The values of genetic component was 78 to 82%. The interaction variance component of parents by locations and error variance component

were relatively small.

The additive component of genetic variance was relatively more important than the non-additive for root wt., average wt., per root and number of roots. For the stem and leaves wt., the main component of genetic variance is of the non-additive type. Root wt., average wt. per root and number of roots showed comparatively high heritabilities, 44.5%, 50% and 43.5%, respectively. Stem and leaves wt. showed the lowest heritability, 10.04%. With a selection intensity of 10%, the predicted and observed genetic advance as percent of the mean were fit well. In the root weight, about 82% of the phenotypic variance is accounted for by the genotypic variance component (Table 5) and about 54% of genotypic variance was due to the additive component (Table 8). Thus this study indicates that mass selection procedures can be used to advantage in sweet potato breeding. (Author's abstract).

120. MASSEY, JR., P.H., J.F. EHEART, R.W., YOUNG, et al. 1957. The effect of variety on the yield and vitamin content of sweet potatoes. Proceedings of the American Society for Horticultural Science, 69: 431-435.

The pertinent results of the experiments conducted for three years involving the effect of variety on the yield, vitamin content, and dry matter content of sweet potatoes may be summarized as follows:

Yield of U.S. No. 1 grade roots was significantly higher for B-5941 than for the other seven entries included in the experiment. The Earlyport, Heartogold, Georgia Bunch, and Allgold varieties all yielded more marketable roots than were yielded by Unit 1 Porto Rico. Variety was found to exert a considerable influence on the yield of sweet potatoes.

Ascorbic acid content was highest in the B-5999 selection and lowest in the Earlyport, Georgia Bunch, and Unit 1 Porto Rico varieties. Carotene content of Allgold, Goldrush, and B-5999 was more than three times as high as that of Porto Rico. Selection B-5941 contained twice as much pro-vitamin A as Unit 1 Porto Rico. These results reflect the progress that has been made in sweet potato breeding in recent years.

Moisture content of the Goldrush variety was higher than that of the other entries. Unit 1 Porto Rico was again found to be the lowest ranking variety.

Under the conditions of these experiments, practically all the new varieties and seedlings tested proved to be superior in yielding ability and vitamin content to the standard variety, Unit 1 Porto Rico. Consequently, it is concluded that the better new sweet potato varieties should replace the Unit 1 Porto Rico, which is the variety most commonly grown in the South.

121. POOLE, C.F. and J.S. TANAKA. 1962.
Transmission of yield variation in irradiated sweet potato clones. Proceedings of the American Society for Horticultural Science, 80: 488-496.

An 81-unit 9 x 9 lattice square field plot design, replicated 4 times at 3 locations, permitted statistically significant variance analysis for yield only at the one location, Mid-Pacific Farm, which had least ground slope and most uniformity of soil.

The 81 units comprised 6 groupings of sister subclones which, when studied as 6 varieties at 1% probability levels, indicated that two groups, NS-2 and S-1, outyielded, and one group, NS-1 underyielded a field run source group, Check. NS-2, S-1, and NS-1 were irradiated with Cobalt-60 isotope, whereas Check and two other groupings, C and A, all 3 of which were statistically undifferentiated, were subjected only to natural irradiation.

Despite excessive locations and locations x clones variance ratio, there proved to be significantly positive correlation coefficients for rank order when the significant Mid-Pacific data were compared with the other two squares.

Twelve of the subclones from the 81-unit lattice, when planted as 3 12 x 12 latin squares, confirmed the impracticability of combining 3 squares from widely divergent locations, but disclosed that 4 subclones from artificial irradiation ranked consistently high and low at all 3 locations.

Six varieties from the 81-unit lattice were prepared for a 6 x 6 latin square, with much increased plot size, by massing an equal number of roots from the 3 highest yielding, and 3 lowest yielding subclones of each of 3 groupings, as: NS-2+, NS-2-, S-1+, S-1-, Check+ and Check-. At 1% probability NS-2+ and S-1+ outyielded NS-2- and S-1- and NS-2+ outyielded all others except S-1+. At 5% probability both NS-2+ and S-1+ outyielded the remaining 4 entries.

122. SADIK, S. 1976.
Screening sweet potatoes for low CO_2 compensation point. Ibadan, IITA. (Mimeo). 7p.

Sweet potato lines from four populations obtained from Japan, Puerto Rico, and the United States were screened for low CO_2 compensation concentration. Results indicate that some of the tested plants from each of the four populations appear to have low CO_2 compensation point.

[Un grand nombre de lingnees de patate douce choisies parmi 4 populations venues du Japon Puerto Rico et des Etats-Unis ont ete etudiees en vue d'y trouver des concentrations de compensation en CO_2 basses. Les resultats obtenus indiquent qu'un certain nombre de plantes parmi les 4 populations paraissent avoir des points de compensation bas en CO_2]. (Author's summaries).

123. SAKAMOTO, S. 1970.
Utilization of related species on breeding of sweet potato in Japan. Japanese Agricultural Research Quarterly (JARQ), 5(4): 1-4.

The main objects of sweet potato breeding in Japan are stated. As a result of the use of related species of sweet potato as parental materials of breeding, the section *Batatas* genus *Ipomoea* was recognized as profitable for breeding of sweet potatoes. Over 100 species were screened during the studies, the results of which are presented here.

124. SAKAMOTO, S. 1976.
Breeding of a new sweet potato variety, Minamiyutaka, by the use of wild relatives. Japanese Agricultural Research Quarterly (JARQ), 10(4): 183-186.

The paper treats the objectives and procedures of breeding of sweet potato, describes the characteristics of the variety, Minamiyutaka; the future of breeding by using wild relatives. Elaborate data are included to illustrate the points.

125. SUGE, H. 1977.
Promotion of flowering in sweet-potato by gibberellin A_3 and A_7. Japanese Journal of Breeding, 27(3): 251-256.

Effect of exogenously applied gibberellin A_3 (GA_3) and A_7 (GA_7) on the flowering of Kanto No. 48, a dwarf strain of sweet potato, was tested. GA_3 and GA_7 were found to stimulate the flowering

of the cuttings evidently. Cuttings with 15-20 cm long were made using terminal tips of the stem from field grown plants and planted in 1/10,000 are pots or containers (28 x 24 x 11 cm). Under those experimental conditions, untreated control plants flowered finally although the plants grown in the field remained strictly vegetative. GA_7 was much more effective than GA_3 to stimulate the stem growth and first flowering, whereas, total number of flowers was evidently increased by GA_3 application. However, neither control plants nor GA applied plants induced flowering under strictly non-inductive long photoperiod. (Author's summary).

126. THIBODEAUX, S.D., T.P. HERNANDEZ and T. HERNANDEZ. 1973. Breeding techniques, combining ability of parents, heritabilities, insect resistance and other factors affecting sweet potato breeding. Third International Symposium on Tropical Root Crops, IITA, Ibadan. 2-9 Dec. 1973. Vol. 3: 12p. (Mimeo)

The paper briefly records the achievements of the sweet potato breeding program at Louisiana State University. Then it reports the study undertaken to assess the possibility of obtaining seed populations of sweet potato, parental crosses with low levels of compatibility provided resources existed to make a large number of control crosses. The polycross system using highly mobile insects afford the chance for obtaining seed populations, but there is no guarantee as to the precision and source of male gametes except for a nursery with highly selected germplasm of known compatibilities.

127. WHATLEY, B.T. and B.R. PHILLS. 1977. "Carver" sweet potato. Hortscience, 12(3): 266.

The 'Carver' sweet potato (*Ipomoea batatas* Lam.) has been released by Tuskegee Institute to fill a need for a cultivar possessing high resistance to *Fusarium* wilt, *Fusarium oxysporum* f. sp. *batatas*, and intermediate resistance to the southern root-knot nematode, *Meloidogyne incognita* 'Carver' is a dual purpose cultivar, suited for both fresh and processing market (Fig. 1), and it is well adapted to Alabama growing conditions. (Author's abstract).

128. WHATLEY, B.T. and B.R. PHILLS. 1977. "Rojo blanco" sweet potato. Hortscience, 12(3): 265.

'Rojo Blanco', a new cultivar of sweet potato (*Ipomoea batatas* Lam.), has been released by Tuskegee Institute for the Latin trade in New York, Chicago, and Denver marketing areas, as well as Latin American countries. 'Rojo Blanco' should be considered

a substitute for the 'Boniato' or 'Cuban' sweet potato, which is rough, veiny, produces less than 5% U.S. no. 1 roots and does not store well. 'Rojo Blanco' is intermediate in resistance to *Fusarium* wilt, (*Fusarium oxysporum* f. sp. *batatas*), which is comparable with that of 'Centennial' and therefore, should be satisfactory for most growing conditions. It is susceptible to the southern root-knot nematode, (*Meloidogyne incognita*), (Table 1). (Author's abstract).

D. 3. Seed Piece Multiplication

129. ALLEN, B.M. and B.R. PHILLS. 1979.
Evaluation of sweet potato cultivars and advanced breeding lines for desirable plant production with special emphasis on seedpiece propagation. Hortscience, 14(2): 124.

Varietal differences were found to exist among cultivars with respect to plant production and seedpiece potential. White flesh cultivars produced a significantly higher number of plants than did orange flesh cultivars. The sectioning of roots broke proximal dominance, and resulted in the production of an equal number of plants from each section.

The middle section had a higher percent mortality, tended to enlarge less, and was the least persistent. There were no significant differences among root sections with respect to location of storage root development. However, a higher percentage of daughter roots developed indirectly to the mother root for all cultivars. NC-317 and MD-304 produced the fewest number of plants from seedpieces, yet had the highest marketable and total yield.

130. BOUWKAMP, J.C. and L.E. SCOTT. 1972.
Production of sweet potatoes from root pieces. Hortscience, 7(3): 271-272.

Yields and size distribution of sweet potato (*Ipomoea batatas* Lam.) propagated from root pieces were similar to those grown from sprouts when comparable stands were obtained.

131. CORDNER, H.B., H. THOMSON and M.S. JAYYOUSSI. 1966.
Proximal dominance and plant production in bedded roots of the sweet potato, *Impomoea batatas* Lam. Proceedings of the American Society for Horticultural Science, 88: 472-476.

Sweet potato plant production was obtained from bedded roots of 333 clones originated as seedlings. The values ranged from 0 to 100+ plants per pound of roots (mean 29). This reproduction potential presumably relates to proximal dominance which is affected by genetic factors and by changes occurring with age from time of harvest. A change in growth substance balance, perhaps a decline in inhibitor (s) during an extended storage period, resulted in a decline in proximal dominance and an increase in initiation and growth of shoots or plants.

132. DE KRAKER, J.P. and G.G. BOLHUIS. 1969.
Propagation of sweet potato with different kinds of cuttings. In: E.A. Tai, W.B. Charles, H.P. Haynes, et al, eds. Proceedings of the International Symposium on Tropical Root Crops... Augustine, Trinidad. 2-8 April 1967. Vol. 1: pp. III-131-135.

The paper reports studies made to determine whether there was any difference in growth between top-cuttings and base cuttings and between cuttings of different length, as well as to determine the possibility of growing plants from short-cuttings when quick multiplication is wanted. The results showed that:
1. With both cultivars tested the growth rate of the top and base cuttings of 30 cm is better than those of 20 cm.

2. Whenever quick multiplication is desired, top cuttings shorter than 30 cm may be used; even top cuttings of 5 cm length show a fair in the cases studied, short base-cuttings of the quick growing cultivar can still be used; but similar cuttings of a slow-growing cultivar gave disappointing results.

133. ELLIOT, R.F. 1969.
Growth of excised meristem-tips of kumara, *Ipomoea batatas* (Linn.) Poir in axenic culture. New Zealand Journal of Botany, 7: 158-166.

Some factors affecting the growth of excised kumara, *Ipomoea batatas* (Linn.) Poir, meristem-tips into plantlets, were studied. Root initiation and subsequent development into plantlets were influenced by the length of the shoot apex excised, the clone of kumara used and the addition of plant growth regulators to the culture medium. Shoot apices longer than 1.6 mm rooted better than shorter spices. 1-naphtylacetic acid (1 mg/l) added to a high salt nutrient medium during early stages of culture,

stimulated root initiation in two out of three clones of Kumara tested and accelerated development in all three clones. Gibberellic acid (10 mg/l) stimulated root initiation in all three clones, but development was slower than with 1-naphthylacetic acid. (Author's abstract).

134. FOLQUER, F., L.R. RONCEDO, E.R. ROSSI, et al. 1970.
Winter nurseries for production of early sweet potatoes. In: Plucknett, D.L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops, August 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol. 1: pp. 27-31.

An investigation was carried out in 1969, based on several years experiments, to determine cutting and sprout yields of sweet potato (*Ipomoea batatas* (L.) Lam.). The Tucumana Lisa Variety was used in this trial and results were considered efficient.

Beds including seed-potato and seed-cuttings protected by transluscent polythylene frames and spread over straw were used to avoid frost damage. These protections proved effective for -2.5°C frost of that year. Cutting and sprout were hight for the 1st harvest (9-1-69) inframe-protected plots. For the 2nd and 3rd harvests (10-24-69 and 12-29-69), however, greatest yields were found in straw protected plots.

The lower yields were always found on the south ridge of each plot due to the cold light breeze running south-north in the region.

Straw-protected plots showed significant higher seed cutting stand. It was inferred that 10 seed-cuttings in a metre of ridge was the most favourable stand.

Weight and leaf area of Tucumana Lisa cuttings were superior to sprouts as propagating material. For the prevailing conditions of Tucumana, he spread over-straw method is most economical and proved to be sufficient frost protection (Author's summary).

135. FOLQUER, F. 1974.
Varietal efficiency in the spring production of sweet potato seeds. [Eficiencia varietal en la produccion primaveral de semillas de batata (*Ipomoea batatas* (L.) Lam.]. Revista Agronomica Del Noroeste Argentino, 11(3-4): 193-223.

Varietal efficiency in the spring production of sweet potato seeds. An investigation was carried out in 1973 spring about

the efficiency on blooming and seed setting on four sweet potato varieties grafted over *Ipomoea fistulosa* root stock. The level of the varietal efficiency was determined throughout: (1) Percentage of flowers that set capsuls; (2) Average number of days until the ripening of the capsuls; (3) Number of ripened capsuls during the spring period; (4) Varietal precocity; (5) Percentage of capsuls from one to four seeds; (6) Average number of capsuls and seeds per day and plant in every subperiod; (7) Correlation and interaction with the climatic elements (temperature, relative humidity, cloudiness, and photoperiod). The best seed yield was in the subperiod December 31, 1973, to January 7, 1974, corresponding to a "critical period of flowering", December 1 to 13, 1973. The climatic conditions during this "critical period" are described and discussed. (Author's abstract modified).

136. GRANBERRY, D.M., R.A. CONOVER, and B.T. WHATLEY. 1977. Storage root production of sweet potato seedlings and vegetative progeny. Hortscience, 12(1): 62-63.

Seedlings of sweet potato [*Ipomoea batatas* (L.)], which failed to form storage roots, produced good yields of sweet potato roots of acceptable size and grade when propagated asexually by vine cuttings.

137. GRAUES, B. 1976. Production of certified potato and sweet potato seed. The Vegetable Growers News (Virgina), 30(8): 123.

The author discusses the implications of seed certification. In U.S.A a basic stock of certified sweet potato seed, free of disease and true to variety, is maintained by state or federal agencies. The lack of sufficient land, funds, and trained staff in these agencies limit the availability of such stocks in substantial amount. The process and problems of sweet potato seed certification is discussed.

138. GRAVES, B. 1978. Field beds for sweet potato sprout production. The Vegetable Growers News (Virginia), 32(8): 124. [Also in 29(5): 3 and 4].

It is remarked that the use of field beds instead of cold frames or heated beds offers sweet potato growers an opportunity to reduce the cost of producing sprouts as well as its labour requirements, which represent a significant portion of total production costs. Then the following aspects are discussed: field selection and soil preparation, spreading seed, planting

depth and seed covering, film or mulch laying, weed control, late sprouts, seed requirements, irrigation, and time to bed.

139. HAMMETT, H.L. 1979.
Some factors affecting sprout production in sweet potatoes. Hortscience, 14(3): 428.

Centennial and clone LO-323 were evaluated to determine the effect of cultivar, seed piece size, preheating and method of sprout harvest on yield to sweet potato transplants. Uniform roots 2-4 cm and 7-9 cm in diameter were exposed to 0, 2, and 4 weeks at 23°C and 80% R.H., bedded and sprouts harvested by pulling or cutting. Pre-heating increased sprout earliness regardless of cv. seed size or method of harvest. Seed piece size affected both number and size of transplants but not earliness. First harvest was later when sprouts were cut compared to pulled, but subsequent harvests were earlier and total plant production was greater regardless of cv, preheating treatment or seed size.

140. HERNANDEZ, T.P., J.C. MILLER and J.F. FOUNTENOT. 1950.
Studies of plant production of sweet potatoes including the effects of chemical treatments. Proceedings of the American Society for Horticultural Science, 55: 423-426.

Studies were made to determine the varietal and seedling differences in plant production of 15 industrial type varieties and seedlings. The effects of several chemical treatments on the plant production of Unit 1 Porto Rico were studied.

The results with the 15 industrial type varieties and seedlings shows that L-203 and L-231 were the two highest yielding lots. Seedling L-203 sprouted late and for the first two pullings it produced significantly less plants than either Pelican Processor or Whitestar; however, for the four pullings the total number of plants it produced was significantly greater at the 1% level than the number produced by either Pelican Processor or Whitestar.

In the first two and first four pullings roots treated with 10 ppm of 2,4-D produced significantly larger numbers of plants per root and per 50-pound bushel than the controls. All of the other chemical treatments, except the Semesan Bel and 2.6 ppm of 2,4-D, gave increases over the controls in the numbers of plants produced per root and per bushel in four pullings although these differences lacked statistical significance. All of the 2,4-D treatments except 2.6 ppm gave significantly larger numbers of plants in the four pullings than did Semesan Bel.

141. HERNANDEX, T.P. and S.D. THIBODEAUX. 1976.
Treatments causing sweet potato plant (Slip) production increments-decrements. Hortscience, 11(3): 228.

Selected materials were tested (72-75) for efficacy in sweet potato plant production. Treatments showing no benefit (no. of years in (()) are: 1. Botran 75W dip (3) 2. Botran 75W-10% Energizer (1) 3. 10% Energizer sol. dip (1) 4. 10% Energizer sol. sprayed on roots prior to covering with soil (1) 5. 10% Energizer sol. sprayed on soil surface at sprout emergence (1) 6.50% Energizer sprayed on roots prior to covering with soil (3) 7. 50% Energizer sprayed on soil surface at sprout emergence (3) 8. Mertect dip (1) 9. Botran-Mertect dip (2) 10. Soil Ac-T-Vator (1). Significant plant (slip) increases occured with addition of 50-100-50 fertilizer drilled at bedding and with cut roots at each pulling. A coconut milk dip diluted 1:100 produced twice as many plants (29% heavier) as the next highest treatment in the first pulling. An apical meristem extract (from slip shoots) diluted 1:400 H_2O inhibited sprouting for 60 days.

142. HOZYO, Y. and C.Y. PARK. 1971.
Plant production in grafting plants between wild type and improved variety in *Ipomoea*. Bulletin of the National Institute of Agricultural Sciences (Japan), Series D., No. 22: 145-164.

The purpose of this study is to make clear the interrelationship between top function and tuberous root growth, photosynthesis and tuberous root growth, and plant production and tuberous root growth. The total dry weight per plant also the dry weights of each, (leaf blade, leaf petiole stem, tuberous root and fiberous root) were determined. The materials harvested for dry matter weight determination were used for measuring N, P, K, total soluble sugar and starch content. Photosynthetic activity was measured on the fifth leaf blade in developing leaves. The chlorophyll content was determined on leaf blades. Consequently a close relationship was found between photosynthetic activity and tuberous root growth.

143. KUSHMAN, L.J., W.O. DRINKWATER and B. GRAVES. 1970.
Plant production (in sweet potatoes). In: Thirty years of cooperative sweet potato research 1939-1969. Southern Cooperative Series, Bulletin No. 159: 18-24.

Commercial plantings of sweet potatoes are made with young plants obtained from the fleshy roots stored over winter and then placed in field beds, cold frames, or hotbeds in soil, sand, or sawdust where, at temperatures from about 70°F to 85°F., the

fleshy roots send up sprouts that produce leaves above the soil and rootlets in the soil. Bed cuttings and field cuttings are used primarily to avoid soil-inhabiting diseases such as scurf and black rot, and thus produce disease free crop. Thus the use of cuttings is a requirement for producing "certified" seed roots.

144. LITZ, R.E. and R.A. CONOVER. 1978.
In vitro propagation of sweet potato. Hortscience, 13(6): 659-600.

In vitro propagation of 2 selections of white-fleshed sweet potato (*Ipomoea batatas* (L.) Lam.) was obtained on modified Murashige and Skoog media using lateral buds and shoot apices as primary explants. Cultivars differed in response to exogenous levels of growth substances and in rate of proliferation. Optimum shoot regeneration from 'White Star' explants was induced by 1 mg/liter benzyladenine (BA) and from Plant Introduction (PI) 315343 by 1 mg/liter kinetin with 1 mg/liter indoleacetic acid (IAA).

145. MARTIN, F.W. 1975.
The storage of germplasm of tropical roots and tubers in the vegetative form. In: O.H. Frankel and J.G. Hawkes. eds. Crop Genetic Resources for Today and Tomorrow. (International Biological Programme Vol. 2). pp. 369-377.

Sweet potato and other tropical roots and tubers are staple foods and important sources of calories in many parts of the tropics. Some few attempts have been made to gather and evaluate the germplasm of these crops. A pressing need is felt collect, evaluate and utilize a full range of their germplasm . New methods of long-term germplasm storage of vegetative organs of these perennials are urgently needed so as to reduce the high cost of annually cultivating them as well as eliminate the attendant danger of disease infection and many other hazards.

With respect to the storage potential of the propagating material of sweet potato, a post harvest curing period is highly desirable. In the curing chamber the roots are exposed to temperatures of about 31°C and humidities between 80 and 90 percent for about five days. After curing the tuberous roots are cooled rapidly at about 14°C. The optimum humidity for long-term storage is high, about 85-90%. The regulatory effects of certain chemicals in increasing sprout production suggest also the possibility of modifying storage life and subsequent sprouting. The crop cannot be stored in the soil

for long periods in view of its susceptibility to insect and disease attack. On the other hand, the lack of seasonal dormancy, the ability of cutting to germinate rapidly, and their facility for growth in small areas indicates the possibility of maintaining large collections of sweet potatoes in a state of immaturity in which cuttings would be grown in small containers and re-propagated periodically from small cuttings. Such a system might permit the preservation of a collection of 1000 varieties in a space of 50 x 60 cm^2.

146. MILER, J.C., T.P. HERNANDEZ., T. HERNANDEZ. et al 1959. Sweet potato foundation seed program for Louisiana. Agricultural Experiment Station, Louisiana State University and Agricultural and Mechanical College. Circular No. 58.

The necessity of good seed of sweet potatoes is stressed. The history of foundation seed production is Louisiana is given followed by steps in the production of foundation seed. Then a brief description of some of the leading Louisiana varieties now grown as foundation seed is given. They are Unit 1 Porto Rico, Goldrush, Acadian, Heartogold, and Pelican Processor.

147. MORSE, R. and B. GRAVES. 1978. Research on sweet potato seedpiece propagation. The Vegetable Growers News (Virginia), 33(2): 1-2.

It is remarked that by planting sweet potato seedpieces instead of transplants, the high cost of production and transplanting of sweet potato sprouts representing 20 to 35% of total costs and of labour of sweet potato production could be considerably reduced. Some of the preliminary results of studies conducted to resolve one of the most serious problems hindering the commercial production of sweet potatoes from seedpieces, the delayed and irregular sprouting of the root pieces, are presented here.

148. MORSE, R. and B. GRAVES. 1979. Presprouting sweet potato seedpieces. The Vegetable Growers News, 33(9):

Soil moisture stress severely limited the sprouting of seedpieces in 1977. Presprouting uncut seed significantly improved both early and total germination of seedpieces. This same treatment increased germination of pieces cut from all sections of the seed root, including center seedpieces which are inherently more difficult to serminate; thereby enhancing the uniformity of sprout emergence.

The authors wish acknowledge financial assistance from the Virginia sweet potato commission who provided a grant-in-aid in partial support of this project.

149. NORMAN, C.W. and T.M. LITTLE. 1966.
Effects of heating and cutting roots on sweet potato sprout production. Proceedings of the American Society for Horticultural Science, 88: 477-480.

Heating Velvet variety sweet potato roots at 109°-111°F for 26 hours prior to planting resulted in production of significantly more slips than from unheated roots, regardless of cutting treatment. Sweet potato roots cut radially produced significantly more slips than uncut roots. The effect of heating was greater than the effect of cutting. Effects of heating and cutting were independent of each other. Roots both heated and cut produced the most slips.

150. PHILLS, B.R. and B.M. ALLEN. 1979.
Evaluation of selected sweet potato cultivars for seedpiece propagation. Hortscience, 14(2): 124.

Five sweet potato cultivars were evaluated for potential use in seedpiece propagation. Of these cultivars, NC-317 and MD-304 were superior in total marketable and total yield. 'Carver', a newly released cultivar from Tuskegee Institute, offered some promise for future use. It produced no jumbos, and had the fewest number of culls. It ranked third in both total marketable and total yield.

151. TAKATORI, F.H., D.C. PURNELL and J.I. STILLMAN. 1961.
Influence of seedpiece size and cutting on the production of sweet potato shoots. Proceedings of the American Society for Horticultural Science, 77: 473-478.

Sweet potato roots, 8, 6 and 4 inches long were cut transversely into halves, thirds, and fourths and bedded to measure sprout production in cold frames, bean straw, and hot water heated propagating beds.

In general the largest roots produced the most shoots.

Cut roots produced more shoots than intact roots, irrespective of size, but the cutting treatments were most effective in the larger roots. Some increase in shoot production was obtained by cutting the seed roots more than once. The greatest increase in shoot production due to cutting occurred in tests where the shoots were harvested the least number of times.

Shoots from cut seed pieces weighed less than shoots from whole roots and were reduced progressively as the size of the seed piece decreased.

152. WHATLEY, B.T., S.O. THOMPSON and M. MAYES. 1968.
The effects of dimethyl sulfoxide and 3-indolebutyric acid on plant production of three varieties of sweet potatoes. Proceedings of the American Society for Horticultural Science, 92: 513-525.

Three varieties of *Ipomoea batatas* were treated with 4 levels of dimethyl sulfoxide (DMSO), 2 levels of 3-indolebutyric acid (IBA), and 3 soaking intervals. DMSO treatments accelerated the growth of and increased the number of sprouts of all 3 varieties. IBA had no effect except in combination with 12% DMSO. The best duration of soaking in DMSO depended upon the variety. None of the factors had any effect on mean weight of individual plants.

153. WHATLEY, B.T. 1968.
The effects of root sectioning and chemicals on sweet potato plant production. Hortscience, 3(2): 93. (Also in Journal of the American Society for Horticultural Science, 94: 179-180).

Roots of the 'Centennial' Variety of *Ipomoea batatas* were sectioned and treated with Captan, DMSO, Semesan Bel and combinations of these chemicals using 5 soaking intervals. A 5 x 4 x 5 factorial arrangement of treatments in a randomized block design with 3 replications was used. A significant difference was found between chemicals and number of plants and mean weight of plants produced. Combinations of chemicals were better in both cases than chemicals used independently. DMSO yield significantly more plants than Captan or Semesan Bel, however the 3 single chemicals gave plants of equal average weight. Number and weight of plants obtained from DMSO x Captan and DMSO x Semesan Bel were not significantly different. Whole roots produced a greater number and a higher average weight of plants than individual sections. The middle section gave significantly more plants than the end. Soaking time had no effect upon number of plants or average weight of plants.

E. PRODUCTION PHYSIOLOGY

154. AHMED, E. M. and L. E. SCOTT. 1958.
Pectic constituents of the fleshy roots of the sweet potato. Proceedings of the American Society for Horticultural Science, 71: 376-387.

Determination of pectic constituents in eight varieties of sweet potatoes, and the characterization of the extracted pectic fractions at harvest, during storage, and after baking and processing showed the following:

1. Pectic constituents of the different varieties, expressed as anhydrogalacturonic acid, ranged from 3 to 5 per cent of the fresh weight at time of harvest.
2. The total anhydrogalacturonic acid content decreased during the storage period in the order of about 40 per cent. The decrease was confined largely to the acid-soluble fraction.
3. Relatively low degrees of esterification of the pectic fractions were found, ranging from less than 10 per cent for the acid-soluble fraction to about 30 per cent for the water-soluble fraction. The esterification values decreased rapidly toward the end of the storage period.
4. The intrinsic viscosity values for the water-soluble and oxalate-soluble fractions decreased markedly after curing and continued to decrease at a lesser rate during the storage period.
5. Baking and processing resulted in a reduction in the total anhydrogalacturonic acid content, particularly in the acid-soluble fraction. There also occurred a reduction in degree of esterification and in the intrinsic viscosity values of the extracted polygalacturonides. The nature and extent of the pectic changes effected by baking or processing were similar to those occurring during the storage of the fresh roots.

155. AUSTIN, M. E. and L. H. AUNG. 1972.
Dry matter distribution patterns of sweet potato *Ipomoea batatas* during development. HortScience, 7(3): 350-351.

Growth measurements were made of *Ipomoea batatas* cultivars during field development. The attainment of maximum vegetative top growth preceded storage root development. Also, a high degree of correlation was observed between the development of the top and the storage root weights. Dry matter distribution in the leaves, stems and roots were found to change linearly with sampling time. However, final dry matter accumulated varied with cultivars, spacing, location and season. Julian showed a greater efficiency in dry matter accumulation in the storage roots than Centennial or Nemagold, and the RGR of the roots was correlated with the change in NAR. From the observations made, we concluded that the rate of assimilates movement appears to be more important for sweet potato storage root development than increase in leaf areas.

156. AUSTIN, M. E. and L. H. AUNG. 1973.
Patterns of dry matter distribution during development of sweet potato *Ipomoea batatas*. Journal of Horticultural Science, 48: 11-17.

Dry matter distribution in 3 *Ipomoea batatas* cultivars was observed in 2 plant populations, 2 locations and 2 seasons. Increases in dry matter were linear with sampling time regardless of spacing, but the final amount produced under 2 populations and 2 locations differed. The cv. Julian was more efficient in accumulating dry matter in its storage roots than cvs. Centennial and Nemagold, and in Julian the relative growth rate of the roots was correlated with the net assimilation rate. The rate at which assimilates move appears to be more important for storage root development than increases in leaf area. (Authors abstract)

157. AUSTIN, M. E., L. H. AUNG, and B. GRAVES. 1970. Some observations on the growth and development of sweet potato *Ipomoea batatas*. Journal of Horticultural Science, 45: 257-264.

Four *Ipomoea batatas* cultivars were observed to develop measurable storage roots at the 6- to 8- leaf stage approximately 3 weeks from planting. The increase in sweet potato storage root weight followed a linear growth pattern with time. It was seen that the attainment of the highest vegetative growth weight preceded the largest storage root weight increase by several weeks, and this time interval was dependent upon the cultivar and the condition of growth. A high degree of correlation existed in each year between the development of the tops and the storage root weight. (Authors' abstract).

158. AUSTIN, M. E., L. H. AUNG, and B. GRAVES. 1970. The use of carbohydrate contents as an index of sweet potato maturity. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops. August 23-30, 1970, Honolulu, Hawaii and Kapaa, Kauai, Hawaii, vol.I, pp42-44.

A study on carbohydrate changes during storage root development as an index of maturity of sweet potatoes *Ipomoea batatas*(?)sucrose and alcohol insoluble solids of 4 cultivars showed that these carbohydrate components varied with cultivar and the developmental stage of the plants. These variable responses suggested that the contents of carbohydrate may not be a reliable index for determining sweet potato "maturity". The results of this study and those of earlier workders were discussed. (Authors' abstract).

159. BODNIUK, A. G., G. V. USTIMENKO and A. M. SINUYKHIN. 1971. Effect of potassium on physiological processes during tuber formation in *Ipomoea batatas*. Izv Akad Nauk Sssr Ser Biol., (1): 114-121.

Differentiation of the root system of the *Batatas* is accompanied by changes in the metabolism of the plants:

the metabolites become redistributed, synthesis of physiologically active substances undergoes changes etc. In the course of root differentiation the character and intensity of respiration become altered. Monoiodacetic acid and sodium fluorate inhibit respiration markedly stronger in the meristematic root zone than in the differentiation zone. Deficit of potassium is felt most clearly in the meristem zone while its effect is considerably feebler in the extention zone. Arsenite hydroxylamin and malonate also influence to a higher degree respiration intensity in the meristematic zone than in the zone of cell extention. On the contrary, diethyldithiocarbamat, 8-hydroxychinoline and phenylthiourea inhibit respiration intensity more in the zone of cell extension than in the meristematic one. Lack of potassium in the presence of these inhibitors only slightly influences respiration intensity. Deficit of potassium causes an accumulation of monosugars and a reduction of general nitrogen, disugars and starch contents. Potassium enhances an increase of growth of overground parts of the plant and formation of tubers in *Batatas*. Potassium increases the coefficient of tissue polarization and enhances a vitality increase of *Batatas* tubers. (Authors' summary).

160. BUESCHER, R. W. 1977.
Hardcore in sweet potato roots as influenced by cultivar, curing, and ethylene. HortScience, 12(4): 326-327.

Hardcore in sweet potato roots *Ipomoea batatas* (L.) Lam. is induced by chilling and subsequent exposure to nonchilling temperatures prior to cooking. The defect is detected only after cooking and could adversely affect consumer acceptance and utilization. Of seven cultivars tested, 'Red Jewel' and 'Jewel' were the least susceptible to hardcore, while 'Georgia Jet' and 'Jasper' were the most susceptible. Cured roots were more susceptible than those freshly harvested in all cultivars except 'Centennial'. Exposure to ethylene during the post-chilling induction period did not reduce the incidence of hardcore but significantly reduced its severity.

161. DEGRAS, L. M. 1969.
Growth and storage in tropical root crops. In E. A. Tai, W. B. Charles, P. H. Haynes et. al. eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad, 2-8 April 1967. Vol.1. III - 18-26.

The paper reports observations undertaken on the morphological and physiological determinants of yield as related to leaf and root storing processes. The following aspects are examined in detail: yield and dry matter storage in sweet potatoes, structure of the leaf canopy and yielding ability in sweet potatoes. The data are presented graphically and interpreted with implications for breeding objectives and practice.

162. EL-KATTAN, A. A. and F. C. STARK. 1954.
Tissue activity and structural differences in the storage roots of Maryland Golden and Jersey Orange sweet potatoes as related to cracking. Proceedings of the American Society for Horticultural Science, 60: 378-388.

The results of histological examination of normal and of cracked roots of Maryland Golden and Jersey Orange sweet potatoes indicate that:

1. Cracking is a rupture of the inactive outer tissues of the storage root possibly due to internal pressure from the expanding vascular cylinder. Meristematic activity occurs around cracked surfaces to form new healing tissues. These cracks may be completely healed under favorable environmental conditions providing there is sufficient time before harvesting for healing to take place.
2. Jersey Orange has smaller xylem vessels surrounded by more active parenchyma, a wider combial ring, more compact parenchyma, and more secondary cambium units as compared with the roots of Maryland Golden.
3. Moisture may be the most limiting factor retarding activities of the outer tissues under field conditions. Tissues of Jersy Orange storage roots are more active than Maryland Golden, especially under dry conditions where the latter is completely inactive. Differences in tissue activity are due to the formation of more secondary cambium units by Jersey Orange.
4. Practical aspects of tissue activity tests are discussed.

163. FUJISE, K. and Y. TSUNO. 1962.
Studies on the dry matter production of sweet potato. I. Photosynthesis in the sweet potato with special reference to measuring of intact leaves under natural conditions. Proceedings of the Crop Science Society of Japan, 31(2): 145-150.

Photosynthesis is the most important factor in dry matter production. Therefore, as the first step to acquire fundamental knowledge about the photosynthesis of sweet potato, several experiments were undertaken with individual leaf. Apparent photosynthetic rates of intact leaves were measured under natural conditions by the use of the apparatus shown in Fig. 1. As experiment materials, some varieties of sweet potato were grown in field and in Wagner's pots under different applications of fertilizer. The following results were obtained:

Light saturation values measured on a horizontal surface with an intact leaf and a detached leaf were about 30 k lux. Light saturation values of the population were, however, higher than that of individual leaf owing to the lowering of light intensity caused by mutual shading of leaves in the population. The relation between the photosynthetic rate of leaves and nitrogen, phosphorus and potassium concentrations on dry weight basis in them was investigated with intact leaves of Norin No.1 which include various ages except young leaves below 15 leaf position, under different manurial conditions. It was observed that potassium exerted a much larger effect on photosynthetic rates than nitrogen. (Text in Japanese)(Authors' abstract).

164. FUJISE, K. and Y. TSUNO. 1969.
Effect of potassium on the dry matter production of sweet potato. In E. A. Tai, W. B. Charles, P. H. Haynes et. al eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad, 2-8 April 1976. Vol.I, II; pp.20-33.

This paper reports the influence of potassium on dry matter production of sweet potato which determines tuber yield.

The results show that heavy application of potassium promoted especially the growth of tubers; it also has high positive correlation to the photosynthetic rate. Further results reveal that the rate of movement of photosynthates from leave (source) to acceptory tissues (sink) is essential in controlling photosynthetic activity. It is suggested that potassium be continuously and deeply applied in the soil so as to maintain a vigorous tuber growth till a late growth stage.

165. GREIG, J. K. and F. W. SMITH. 1961.
Sweet potato growth, cation accumulation and carotene content as affected by cation level in the growth medium.
Proceedings of the American Society for Horticultural Science, 77: 463-472.

The effects of cation additions, by synthetic resins, to Sarpy fine sandy loam soil on vegetative growth, fleshy root growth, cation accumulations and carotene content of fleshy roots were determined.
In the first experiment, addition of Ca and Mg did not affect weight of plant material, but additions of Na and K caused a reduction in weight and ultimate death of plants. Ca and Mg treatments stimulated fleshy root formation. Fleshy roots did not form with the K, Na or mixed treatments. Cation accumulation in the vegetative portion of the plant generally increased with increased concentration of the cation in the growth medium. Sodium at the rates used was most detrimental to plant growth. This detrimental effect was probably due mainly to its quick dissociation from the exchange resin as compared with the rather slow dissociation of divalent cations. Increased uptake of Na resulted in decreased uptake of Ca, K and Mg. A nutrient deficiency of these cations probably existed. Sweetpotato plants accumulated Na very readily when it was available in the growth medium.
In the second experiment, addition of Na to the growth media reduced both weight and carotene content of fleshy roots, but induced greatest vegetative development. The greatest K concentration added to the soil material significantly increased carotene content of fleshy roots.

This indicated that even though K did not increase the vegetative growth, additional K improved the value of the sweetpotato nutritionally by inducing greater carotene accumulation in the root. Accumulation of cations by fleshy roots generally was in proportion to quantity of cations added to soil. Maximum safe cation concentrations of Ca, K and Na were established. These cation concentrations were: Ca in excess of an amount equivalent to the original exchange capacity of the soil, K in excess of 0.4 times the original exchange capacity of the soil and Na in excess of 0.1 times the original exchange capacity of the soil.

166. HAHN, S. K. 1977.
A quantitative approach to source potentials and sink capacities among reciprocal grafts of sweet potato varieties. Crop Science, 17: 559-562.

Economic yield of sweet potato, *Ipomoea batatas* L., may be limited by either photosynthetic source potential or tuberous root sink capacity. The relationships between source and sink were investigated quantitatively with special reference to the yield of dry tuberous root yield through the use of reciproval grafts of a set of varieties in all possible combinations. Responses of the sink to the source and of the source to the sink were examined. The varieties with large sink capacities showed greater responses of sinks to source than the varieties with poor sink capacities. The varieties with the greater source potential showed the greatest response of source to sink. Source-sink relationships as determinants of yield in the sweet potato are discussed. (Author's abstract).

167. HAHN, S. K. 1977.
Sweet potato. In P. T. Alvin and T. T. Kozlowski, eds. Eco-physiology of Tropical Crops... New York, Academic Press, pp.237-248.

The paper briefly traces the origin and spread of the sweet potato, then treats the effect of environment on dry matter production with respect to mineral nutrients, radiation, temperature, and moisture. It further treats source-sink relations, photosynthetic efficiency and drought tolerance of the crop, and finally genotype and environmental interaction. Data are included to illustrate the points. (Authors' summary modified).

168. HATTEN, P. N. and J. O. GARNER, Jr., 1979.
Storage root development of six sweetpotato *Ipomoea batatas* genotypes. Hortscience, 14(3): p.406.

Six sweetpotato genotypes were evaluated over the growing season for storage root initiation and development. Storage root number per plant observed four weeks after transplanting is related to the size distribution of storage roots at the final harvest. Genotype M3-702 which had the largest number of storage roots four weeks after transplanting was the only genotype that did not produce jumbo-size roots. However, leaf area had a strong influence on the rate of storage root development and the final size distribution during the latter part of the growing season. Genotype LO-323 had the largest leaf area, highest total bulking rate and the highest yield.

169. HAYNES, P. H., J. A. SPENCE and C. I. WALTER. 1969.
The use of physiological studies in the agronomy of root crops. In E. A. Tai, W. B. Charles, and P. H. Haynes et al. eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad, 2-8 April 1967. Vol.I, pp.III - 1-15.

In this paper a value of the growth analysis is emphasized though recognition is also given to the fact that knowledge of the morphology of the plant may influence agronomic practice. In addtion to the approach of growth analysis, the necessity to seek an understanding of biochemical processes within the plant is indicated. The limitations of the traditional approach to agronomic practice where treatment differences are assessed after a given period of time is illustrated by the conflicting reports on the response of sweet potatoes to nitrogen fertilizer. The value of a knowledge of the growth and development of the crop in understanding the effect of nitrogen fertilizer when applied at differential rates becomes evident in studies like that of Walter (1966) which has helped to clarify the nitrogen response (or lack of response) in the sweet potato. Using evidence from the work on sweet potatoes, the hypothesis is put that optimum yield is related to a given leaf area curve. The effectiveness of a given leaf area is related to its display and so optimum leaf area curves must be related to specific systems of culture.

Plant breeders should bear in mind the several circumstances of agronomic practice when breeding new cultivars. If in this way material is produced with highly contrasting leaf areas (low or high) their yields may be maximised in both types by the varying practices which are possible at the different levels of production.

170. HOZYO, H. 1970.
Growth and development of tuberous root in sweet potato. In Plucknett, D. L. ed. Proceedings of the 2nd International Symposium on Tropical Root and Tuber Crops, August 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Hawaii, the University. Vol.I, pp.22-23.

The paper examines the interrelationships between the top function and tuberous root growth, photosynthesis and tuberous root growth, tuberous root growth and cell division activity, starch accumulation in the tuberous root, and tuberous root morphogenesis.

171. HOZYO, Y. 1973.
The callus formation on tissue explant derived from tuberous roots of sweet potato plants, *Ipomoea batatas* Poiret. The Bulletin of the National Institute of Agricultural Sciences, Japan, 24: 1-33.

This study was conducted to clarify the following points concerning sweet potato plants *Ipomoea batatas* Poiret: The relationship between callus formation on the tuberous root explant and content of culture medium, the effect of top and root on the callus growth in the grafting plants, and cytokinin content of the tuberous root. Four cultivars were used: Okinawa No.100, Koganesengan, Norin No.1, Konasengan, and Tamautaka. The callus growth of Koganesengan was superior to that of Okinawa No.100 on the standard medium. The callus growth of Norin No.1, Konasengan, and Tamautaka indicated similar tendencies to that of of Okinawa No.100. The stimulative effect of 2,4-D on the callus growth was considerably higher in the callus formation of Koganesengan. The promotive effect of kinetin on the callus growth was found in the callus formation of Okinawa No.100, but in Koganesengan its effect was not observed. Callus formation on the tuberous root explant of grafting plant indicated the inherent tendency in the stock variety. The high cytokinin contents in the tuberous root were regarded in both stages of the beginning and the maximum of the tuberous root thickening. (Author's abstract).

172. HOZYO, Y. 1977.
The influences of source and sink on plant production of *Ipomoea* grafts. Japan Agricultural Research Quarterly (JARQ) 11(2): 76-83.

To analyze whether the larger tuberous root of cultivar is a result or a cause of the greater photosynthetic ability of cultivar, the dry matter production and translocation were studied using reciprocal grafts. In the process of plant production, the feed-back function between source and sink is considered to be interrelated, but depending on different kinds of source and sink or different kinds of crops one of them may be more influential than others in determining plant production. In case of *Ipomoea* plants, it was proved that the sink determines plant production, based on the fact that the influence of stock on plant production is apparently predominant. (Author's abstract).

173. HOZYO, Y. and S. KATO. 1976.
The interrelationship between source and sink of the grafts of wild type and improved variety of *Ipomoea*. Proceedings of the Crop Science Society of Japan, 45(1): 117-123.

This investigation was conducted to make clear the interrelationship between the source (photosynthate donor, top part of sweet potato plant) and the sink (main photosynthate acceptor, tuberous root) from the side of tuberous growth. For the purpose of study of interrelationship between source and sink of photosynthates, twelve kinds of sample grafts were cultured. From the results observed, it may be considered that the interrelationship between source and sink is close in case of grafts of *Ipomoea*, and that the sink function is active. It can also be considered that the sink action has effects on the parts of the source. (Authors' abstract).

174. HOZYO, Y. and S. KATO. 1976.
Thickening growth inhibition and re-thickening growth of tuberous roots of sweet potato plants *Ipomoea batatas* Poiret. Proceedings of the Crop Science Society of Japan, 45(1): 131-138.

The morphological and physiological features of tuberous roots in the process of thickening growth inhibition and re-thickening growth were tested by means of the light exposure treatment for growing tuberous roots.

Viewed from the results of exposure of tuberous roots to the light as well as of the re-thickening growth of tuberous roots due to the stop of the treatment, it may be suggested that the starch storage function of tuberous roots is apt to adapt itself to the environmental conditions. (Authors' summary).

175. HOZYO, Y., T. MURATA and T. YOSHIDA. 1971.
The development of tuberous roots in grafting sweet potato plants *Ipomoea batatas* Lam. The Bulletin of the National Institute of Agricultural Sciences, Series D No.22: 165-189.

This investigation was conducted to make clear the inter-relationship between the photosynthetic system (photosynthates donor) and the sink system (photosynthates acceptor), also the individual function of each system from the site of inherent property. Nineteen grafting combinations were made among five improved varieties. Five improved varieties were provided as convenient materials for the experiment. The total dry weight per plant, and the organ dry weight (leaf blade, leaf petiole, stem, tuberous root and fibrous root)were determined. The materials used for the determination of the dry weight were used for the measuring of N,P,K, total sugar and starch content. The results may suggest that the grafting method was to be a good technique for the test of the top and the root functions.

176. HRISHI, N. and S. G. NAIR. 1973.
Length of petiole as an index for yield in sweet potato. In Third International Symposium on Tropical Root Crops. I.I.T.A., Ibadan. Vol.2. 8p. (mimeo).

It is essential to study the characters that are positively and negatively correlated for production and quality breeding programmes. In sweet potato *Ipomoea batatas* some of the yield components are highly correlated, whereas some others are negatively correlated. The present study was undertaken to identify such characters that have got a bearing on the yield potential. Thirty varieties were studied for two seasons for the following characters: number of vines, length of vines, weight of vines, girth of vines, length of petiole, length of stomata, distribution of stomata, number of tubers, weight of tubers, and percentage of rind. Significant varietal variability is observed with reference to stomatal characters though this was considered as a character to distinguish species in this genus. Except

for the presence of positive significant correlation between the length of the petiole and yield, also the other characters did not show any correlation with yield. The data indicated that this character, length of petiole, may be effectively utilized as selection index for yield.

177. KATO, S. and Y. HOZYO. 1972.
Translocation of 14C-photosynthates in grafts between the wild type and improved variety in *Ipomoea* . Proceedings of the Crop Science Society of Japan, 30(4): 496-502.

The purpose of this study is to make clear the effects of sink activities on the translocation of 14C-photosynthates by using the sample grafts. Four reciprocal grafts were obtained by grafting between the stocks and scions of wild type *Ipomoea trifida* (H.B.K.) (Don) T-15) and improved variety *Ipomoea batatas* Poiret var Okinawa No.100). The fifth leaf of the respective grafts was exposed to 14CO2 for 1 hour, and the plants were harvest in the lapse of 24 hours after treatments. From the above mentioned facts, close relationships were observed between the "translocation process of C- photosynthates or the apparent photosynthetic rate of leaf blades and the growth of tuberous roots". In this sense, it may safely be said that the sink activity has effect on the translocation of photosynthates and photosynthetic activity. (Authors' summary).

178. KATO, S. and Y. HOZYO. 1974.
Translocation of 14C-photosynthates in several growth stages of the grafts between improved variety and wild type plants in *Ipomoea*. Bulletin of the National Institute of Agricultural Sciences, Japan, Series D No.25: 31-58.

The purpose of this study is to make clear the effects of source and sink on the translocation of 14C-photosynthates in the grafts of *Ipomoea* at several growth stages. Four reciprocal grafts were obtained by grafting between the stocks and scions of improved variety *I. batatas* Poiret var. Okinawa No.100 and wild type *I. trifida* (H.B.K.) Don. T-15). The fifth leaf of the respective grafts was exposed to 14CO2 gas for thrty minutes in June, July and August in 1972. The plants were harvested in lapse of twenty-four hours after exposure to 14 Co2 gas. It was supposed that the direction and the amount of translocated 14C-photosynthate were affected by the source in the young growth stage. According to the enlargement of tuberous roots, the property of translocation was gradually influenced by the effect of sink. (Authors' summary).

179. KATO, S. and Y. HOZYO. 1978.
The speed and coefficient of 14C-photosynthates translocation in the stem of grafts between improved variety and wild type plant in *Ipomoea*. Bulletin of the National Institute of Agricultural Sciences, Japan, Series D(29): 113-131.

The purpose of this study is to make clear the effects of sink on the translocation process of 14C-photosynthates in stem of grafts in *Ipomoea*. Four reciprocal grafts were obtained by grafting between the stocks and scions of improved variety (*I. batatas* Poiret var. Okinawa No.100) and wild type plant (*I. trifida* (H.B.K.) Don. T-15). The fifth leaf of the respective grafts was exposed to 14Co2 gas for thirty minutes on July twenty-sixth in 1975. The plants were harvested in the lapse of one,six and twenty-four hours after the beginning of the exposure to 14Co2 gas. In case where Okinawa No.100 was used as scions, it was observed that the dry weight of whole plants, top and underground organs were greater than in case where *I. trifida* T-15 was used as scions on July twenty-sixth. When the same type scions were grafted on the stocks, dry weight of whole plant and underground organs of Okinawa No.100 stocks graft were greater than those of *I. trifida* T-15 stocks grafts. (Authors' abstract).

180. KATO, S., H. KOBAYASHI and Y. HOZYO. 1972.
Translocation of 14C-photosynthates in isolated sweet potato leaves, *Ipomoea batatas* (Poiret). Proceedings of the Crop Science Society of Japan, 41(2): 147-154.

Many papers indicate that the translocation is controlled to an appreciable extent by the mutual interaction among systems, i.e. source conducting and sinks than it is presumed that each system is influenced by the other systems through the translocation. But these interactions have been very slightly studied from the quantitative angle. Isolated sweet potato leaves have the advantage that photosynthates are translocated to the principal sinks, i.e. tuberous roots. Using the simplified system described here, the dry matter production and the translocation of 14C-photosynthates have been investigated. The results obtained were summarized as follows:
(1) The leaf area of the isolated leaves increased in the early vegetation period, and did not wither during the period of 10 weeks. In spite of extensive leaf area, its photosynthetic rate continued to be relatively

higher than that of the intact plants during the same period. The starch contents in the leaves did not increase with growing, being higher than those in the intact plants. However, the former seemed not to differ greatly from the latter in contents of N, P and K in leaves.

(2) The formation of tuberous roots was observed even in the isolated sweet potato leaves. From the stand points of varietal characteristics, the isolated plants showed to be similar to the intact ones in enlargement of tuberous roots. No distinct differences were found between the isolated and the intact plants about the starch contents and the dry matter distribution ratios in the tuberous roots.

(3) The amounts of 14C-photosynthates in the leaves, after exposure to 14Co2 for 1 hour, remarkably decreased during the subsequent period of 24 hours, and then decreased slightly during the period from 24 hours to 5 weeks. About 20% of 14C-photosynthates were assumed to move from the leaves to others within 30 minutes after exposure to 14Co2.

(4) The specific activities of 14C-photosynthates in the tuberous roots increased at higher rate than those of the other organs with passage of time up-to 24 hours after the treatment. 14C-photosynthates were primarily translocated towards the tuberous roots in a short time.

(5) The specific activities of 14C-photosynthates in the stems axillary buds were observed to be high throughout the experimental period. The translocation to the stems axillary buds continued for long time under the conditions mentioned here.

(6) More than 50% of 14C-photosynthates disappeared from the plant during the period of 24 hours after exposure to 14Co2 possibly due to respiratory consumption. (Authors' summary).

181. KEHR, A. E., Y. C. TING and J. C. MILLER. 1955. The site of carotinoid and anthocyanin synthesis in sweet potatoes. Proceedings of the American Society for Horticultural Science, 65: 396-398.

The transfer of carotenoids and anthocyanins in the leaves and stems of sweet potatoes through a graft union was studied by reciprocal grafting technique. Neither carotenoids nor anthocyanins as such were transported through the stems of sweet potato plants to the roots. On the contrary, both

carotenoids and anthocyanins were apparently synthesized *in situ*, and there was no evidence found that these pigments, once they were synthesized, were transferred or moved to other parts of the plant. The ability to synthesize carotenoids and anthocyanins seemed to be governed by genetic factors found in the storage organ. Therefore, reciprocal grafts did not exert detectable influence on the synthesis of these pigments. Carotenoids produced in the roots of Goldrush were apparently synthesized in the roots independently from the chlorophyll-containing organs. The anthocyanins present in the root skin layers of the sweet potato, New Zealand 203044-A, likewise appeared to be synthesized independently from the tops of the plants.

182. KNAVEL, D. E. 1971.
The influence of nitrogen and potassium nutrition on vine and root development of the 'Allgold' sweetpotato at early stage of storage root enlargement, Journal of the American Society for Horticultural Science, 96(6): 718-720.

Plants of the 'Allgold' sweetpotato were grown for 60 days with 3 levels of N and K in a peat-perlite medium to determine the influence of these nutrients on plant development early in the stage of root enlargement. Dry vine and fresh root weights were highly correlated, with high N and medium K resulting in the largest vine and root weights. The numbers of roots were influenced more by K than by N, but the size of roots was influenced more by N than by K. The addition of N without K was responsible for long roots, and the addition of K reduced root length at all N levels.

183. KNAVEL, D. E. and A. M. LASHEEN, 1969.
The association of flowering with nutrition in the sweetpotato, *Ipomoea batatas*, L. Journal of the American Society for Horticultural Science, 94(6): 675-677.

Flowering was induced in the sweetpotato cultivar, 'Allgold', by growing plants with a N level of 280 mg/l in a peat moss-perlite medium. Plants grown with other factorial combinations of N and K failed to flower. Analyses of plants from treatment N_2K_0 prior to and after flowering showed these plants to contain the highest percentage of N, the lowest total sugars, and the lowest starch in both tops and roots as compared with plants that failed to flower.

184. KOKUBU, T. and M. HIRAI. 1978.
Variation of esterase isozymes in sweet potato varieties. The Memoirs of the Faculty of Agriculture, Kagoshima University, 14(23).

The variations of esterase isozymes of tuberous root in sweet potato varieties were investigated, by electrophoresis using horizontal agar gel thin layer. The results obtained are as follows:

(1) One band on the cathodic side and twelve bands on the anodic side were observed.
(2) Among those thirteen bands, four bands, 7A, 8A, 9A and 10A, showed strong enzymatic activity and clear separation.
(3) Concerning zymogram patterns comprising these four bands, Japanese old local variety, Chinese variety and Formosan variety groups showed higher similarities within and between them, while Mexican variety and American variety groups showed lower similarities within and between them.
(4) And also, concerning the above mentioned zymogram patterns, it was shown that there were lower similarities between Japanese old local variety, Chinese variety or Formosan variety groups and Mexican variety or American variety groups. (Authors' summary).

185. KOKUBU, T. and K. MAEDA. 1978.
Variation of peroxidase isozymes in sweet potato varieties. The Memoirs of the Faculty of Agriculture, Kagoshima University, 14(23).

The variations of peroxidase isozyme of semi-tuberous root of sweet potato varieties were investigated, by electrophoresis using horizontal agar gel thin layer. The results obtained are as follows:

(1) Six bands on the cathodic side and twenty two on the anodic side were observed.
(2) They were classified into three groups according to their incidences, lower, higher and intermediate incident one respectively.
(3) Some lower and intermediate incident bands showed the lowest occurence - frequency in Mexican or Brazilian variety groups and showed gradual increase in American, Formosan or Chinese variety groups, showing decrease in Japanese old local variety group, again.

(4) The average number per variety of the bands in Mexican variety group showed especially smaller value and its differences between the Mexican variety group and Japanese, Chinese or Formasan variety groups were significantly large, respectively while the differences of the average number among variety group of Japan, China and Formasa were quite small.
(5) Mexican variety group showed lower similarity index value within the variety group as well as between other variety groups. (Authors' summary).

186. KUSHMAN, L. J., D. T. POPE and J. A. WARREN, 1968.
A rapid method of estimating dry-matter content of sweet potatoes. Proceedings of the American Society for Horticultural Science, 92: 814-821.

By vacuum displacement of the air in intercellular spaces with water, a highly significant correlation between dry-matter content and corrected (tissue) specific gravity was obtained for sweetpotato roots. A broad range of genetic material grown in North Carolina during the 1965 season gave the following regression equation: per cent dry matter = 2.19 + 215.4 (corrected specific gravity - 1.0000). The regression represented by this equation was very similar to and appeared almost as an extension of a comparable regression developed for white potatoes. One milliliter of intercellular space produces a buoyancy in water equivalent to the weight of 2.38 g dry matter. Using this information, a method is proposed for estimating per cent dry matter of sweetpotatoes from uncorrected specific gravity when the amount of intercellular space is known or can be estimated.

187. LAM, S. and H. B. CORDNER. 1955.
Flowering hormone in relation to blooming in sweetpotatoes. Science, 121: 140-141.

In experiments aimed at developing a technique for inducing flowering in Jersey varieties and determining the factors that induce flowering in grafted scions of sweetpotatoes, it was discovered that there is no direct relationship between flower bud initiation and the accumulation of carbohydrates in the grafted sweetpotato scion. In the terminal shoot 1/2 to 1 inch in length used as scion, about 6 to 8 nodes are differentiated. The appearance of the first flower bud at the seventh node (or first node

differentiated after grafting) indicates a very rapid flowering response in the sweet potato scion following grafting. The rapid initiation of flowering in the scion, the association of flowers on the scion with the leaves on the stock, the influence of growing fruit on the stock, all point toward the conclusion that a flowering hormone (floringen) originating in the leaves of the morning glory stock is translocated to the meristematic region of the sweet potato scion where it exerts its morphogenetic effect.

188. MAHUNGU, N. 1979.
Relationship between fresh tuberous root yield and its components in sweet potato *Ipomoea batatas* L. Lam. A project submitted to the Department of Agronomy, Faculty of Agriculture, University of Ibadan in partial fulfilment of the requirements for the Degree of Master of Science. Ibadan, the University. 48p.

The objectives of this study were to obtain estimates of phenotypic and genotypic correlations of yield and its components and of their path co-efficients and to estimate genotype X environment interaction effects in relation to the improvement of sweet potato. Data of four quantitative characters (fresh tuberous root yield; fresh tuberous root size; number of tuberous roots and percent dry matter content in tuber) were collected from twenty clones in a test grown under six environments (3 years - 1976, 1977, 1978 - with two seasons each: early and late seasons) in the same location (IITA - Ibadan). It was concluded from the results obtained that since number of tuberous roots was related to tuberous root yield and as it contributed the high positive direct effect on fresh tuberous yield, selection for the fresh tuberous root yield could be based on number of tuberous roots. (Author's abstract modified).

189. MARTIN, F. W. 1968.
Some enzymes of the pollen and stigma of the sweet potato. Øyton Gasper Campos 841, Vicente Lopez, FNGBM, Argentina, 25(2): 97-102.

Protein and enzymes diffusing from intact and homogenized stigmas, anthers, and pollen grains were detected by means of an agar gel technique. The diffusate and the exine of the pollen of the sweet potato are rich in enzymes, but

the diffusate of the stigma and the stigmatic surface are inactive. However, the stigmas of other species used for comparison showed some minor enzymatic activity. The nature and role of the stigmatic fluid remains to be determined, but the possibility of enzyme activation or inhibition must be considered. (Author's abstract).

190. MARTIN, F. W. and L. TELEK. 1971.
The stigmatic secretion of the sweetpotato. American Journal of Botany, 58(4): 317-322.

The stigmatic exudate of sweetpotato, when removed with organic solvents, consisted chiefly of lipid and phenolic compounds. Only traces of sugar were obtained. The esterified lipids were similar in chain length to capric and lauric acids. The two pricipal phenolic compounds have UV absorption peaks, and bathochromic shifts on ionization with NaOH similar to those of esters of caffeic acid. On acid hydrolysis, caffeic acid was obtained from these and from three minor phenolic compounds. From two of the minor phenolic compounds, glucose was released by hydrolysis. The phenolic content of stigmas increased up to 20-24 hr before anthesis, and then gradually decreased. Neither compatible nor incompatible pollination affects the amount or composition of the stigmatic exudate. (Author's abstract).

191. MIKELL, J. J. 1952
The influence of chemical treatments on the growth and flowering of sweet potatoes. Proceedings of the American Society for Horticultural Science, 60: 295-298.

Many experiments have been conducted in the past several years by investigators who are interested in the effect of chemical compounds on the initiation of floral primordia in plants. Therefore, an attempt was made to induce sweet potato plants to flower readily by the use of certain chemical substances. No chemical treatments had any effect on the initiation or retardation of floral primordia formation of sweet potatoes. The plants of varieties which flower easily flowered regardless of the chemical treatment received. Corresponding untreated plants came into flowering about the same time and produced as many flower buds as the plants which were treated with TIBA or alpha-naphthaleneacetic acid.

192. MILLER, J. C. and A. K. GAAFAR. 1958.
A study of the synthesis of carotene in the sweet potato plant and root. Proceedings of the American Society for Horticultural Science, 71: 388-390.

In order to determine where the products of carotene were synthesized, vines of varieties in which carotene was absent in the roots were grafted onto roots of high carotene varieties. It was found that synthesis of carotene actually took place in the root of the potato, and the carotene itself was not translocated from the leaves to the root as such. It would seem that the mechanism for the factor for carotene is either present or absent in the root of the potato. For example, when varieties high in carotene were grafted onto potatoes which had no carotene, no carotene developed regardless of whether a high carotene variety was grafted onto them or not. Our conclusions were that the mechanism for synthesizing carotene must be a genetic character and is either present or absent in the potato root.

193. MURATA, T. 1971.
Enzymic mechanism of starch synthesis in sweet potato roots. Part IV. Sucrose synthetase of sweet potato roots (1) changes in enzyme activity during development and some properties of sucrose synthetase. Journal of the Agricultural Chemical Society of Japan, 45(10): 441-448.

Both sucrose synthesizing and cleaving reactions of the sucrose synthetase were high in young roots and decrease gradually during development of sweet potato roots. The enzyme activity rapidly decreased after the roots were harvested or exposed to the sunlight. Based on these experimental results, physiological role of sucrose synthetase has been discussed in relation to starch synthesis in the plant cells.

194. MURATA, T. 1971.
Regulatory properties of sucrose synthetase in sweet potato roots. Agricultural and Biological Chemistry, 35(2): 297-299.

It was thus surmised that the sucrose cleavage reaction in sweet potato roots may be regulated at the level of sucrose synthetase reaction. In order to examine this hypothetical view, some kinetic properties were studied with sucrose synthetase isolated from sweet potato roots.

197. MUTO, S. and I. URITANI. 1972.
Glucose 6-phosphate dehydrogenase from sweet potato: Effect of various ions and their ionic strength on enzyme activity. Plant and Cell Physiology, 13: 111-118.

Activity of glucose 6-phosphate degydrogenase (D-glucose 6-phosphate: NADP oxidoreductase EC1.1.1.49) preparation from sweet potato root tissue was markedly altered in the presence of various ions. Cations or anions were effective in the following order: Na^+, $K^+ > Tris^+ > NH_4^+ > Mg^{2+} > Ca^{2+}$, or $Cl^- > No_3^-$, $HPO_4^{2-} > SO_4^{2-} > HCO_3^-$. Activity was inhibited at high concentrations of Ca^{2+} and HCO_3^-. In an investigation on the dependence of the activity on PH, two activity peaks were clearly observed at low ionic strength. Ionic strength altered both the Km Vmax for glucose 6-phosphate (G6P). A line weaver-Burk plot for the enzyme, with respect to G6P, showed a bimodal nature at low ionic strength; suggesting negative co-operativity. Deriation from linearity of the plot was less with an increase in the ionic strength. (Authors' summary).

198. NISHIDA, K. et al. 1950/52.
Studies on the stability of carotene in sweet potatoes. Memoirs of the Faculty of Agriculture, Kagoshima University, 1: 62-82.

The sweet potato-tannin was potash fused and the fusion products were paper chromatographically studied. Being identified in the chromatogram, protocathechnic acid was presumed to be a constituent of sweet potato-tannin. For further details, the authors are continuously studying.

199. -

195. MURATA, T. 1971.
Sucrose synthetase of sweet potato roots. Part II. A kinetic study. Agricultural and Biological Chemistry, 35(9): 1441-1448.

The effect of concentration of each substrate in the reaction catalyzed by sucrose synthetase isolated from sweet potato roots was determined. For the sucrose synthesizing reaction, UDP-glucose (ADP-glucose) + fructose → sucrose + UDP (ADP), the substrate saturation curves for UDP-glucose, ADP-glucose and fructose were hyperbolic in shape and the reaction was strongly inhibited by UDP competitively. On the other hand, the substrates for the reversal of sucrose synthetase reaction, sucrose + UDP(ADP) → UDP-glucose (ADP-glucose + fructose, exhibited a sigmoidal shaped saturation curve which was deviated from the Michaelis-Menten equation. The plot of data according to the empirical Hill equation gives n values greater than 1.0 for every substrate examined in the latter case. In view of these experimental data, the major role of sucrose synthetase is postulated in that this enzyme is involved in the breakdown of sucrose in sweet potato root tissues instead of the sucrose synthesizing reaction. The molecular weight of the enzyme was determined to be about 540,000 by the sephadex gel filtration chromatography.

196. MUTO, S. and I. URITANI. 1971.
Effect of NADP+ and glucose 6-phosphate on the sedimentation behaviour of glucose 6-phosphate dehydrogenase from sweet potato. Plant and Cell Physiology, 12: 803-806.

Sedimentation behaviour of sweet potato glucose 6-phosphate dehydrogenase was studied using the sucrose density gradient centrifugation. The relative s value to s20 value of alcohol dehydrogenase was determined to be about 6 in the absence of both NADP+ and glucose 6-phosphate. In the presence of NADP+, the enzyme was sedimented with a relative s value of about 9. The addition of glucose 6-phosphate did not affect the sedimentation behaviour. When glucose 6-phosphate was added to the gradient medium containing NADP+, the enzyme was sedimented with a relative s value of about 6 or 7, depending on the concentration of glucose 6-phosphate. (Author's summary).

200. OBA, K. K. F. and I. URITANI. 1978.
Synthesis of RNA in tissue discs of sweet potato roots after cutting or mercuric chloride treatment. Plant and Cell Physiology, 19(5): 741-747.

Time course analysis of RNA contents of tissue discs after cutting disclosed a remarkable increase in total RNA during the first 12 hr. after cutting and this elevated level remained unchanged for 48hr. The elevated RNA level cutting at 24 hr. of incubation was not changed by subsequent $HgCl_2$ treatment. The incorporation rate of the label from 3H- Uridine into RNA rapidly increased immediately after cutting and reached a maximum at about 9 hr. of incubation, then decreased sharply until 24 hr. and continued to decrease gradually thereafter. The incorporation rate at 24 hr. of incubation was not changed by subsequent $HgCl_2$ treatment. The results of polyacryamide gel electrophoresis indicated that bulk RNA was synthesized most actively at 9 hr. of incubation than the rate of RNA synthesis decreased gradually. (Author's abstract).

201. OBA, K. and I. URITANI. 1979.
Biosynthesis of furano-terpenes by sweet potato cell culture. Plant and Cell Physiology, 20(4): 819-826.

Callus was induced from sweet potato root tissue on an agar medium containing Heller's minerals, vitamins, 2, 4-D, yeast extract and sucrose. Furano-terpenes were scarcely detected in the callus. However, when the callus was transferred to a liquid culture medium and incubated with reciprocal shaking, furano-terpenes were rapidly produced mainly in the culture medium. Furano-terpene production by the cell culture was suppressed by addition of *Ceratocystis fimbriata* spores or $HgCl_2$ to the culture medium. Yeast extract and sucrose in the culture medium were important for furano-terpene production. 3-Hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase activity pattern of furano-terpenes produced by the cell culture was essentially the same as that produced by sweet potato root tissue infected by *C. fimbriata* or treated with $HgCl_2$, but the quantitative proportion of the individual furano-terpenes in the former differed markedly from that in the latter. (Authors' abstract).

202. PATERSON, D. R. 1974.
Stress ethylene production and the respiration rate, internal atmosphere, early growth and yield of *Ipomoea batatas* plants. Journal of the American Society of Horticultural Science, 99(6): 481-483.

The internal atmosphere extracted from the basal 6 inches of sweet potato plants held for one minute at 48°C in tap water was higher in ethylene (C_2H_4) and oxygen (O_2) and lower in carbon dioxide (Co_2) than similar samples from untreated plant material. This increase in endogenous C_2H_4 content of treated sweet potato slips was accompanied by increases in respiration rate, early growth and total root yield at harvest. C_2H_4 content, respiration rate, early growth and yield appeared to be essentially quadratic functions of treatment time at 48°C. Maximum values for the above parameters occurred after treatment for 1 to 2 minutes at 48°C. (Author's abstract).

203. PHILLIPS, T. L., D. W. PORTER and R. W. GRACY. 1975.
Nature of the multiple forms of sweet potato glucose phosphate isomerase. Biochemical Journal: 147(2): 381-384.

The previously reported isoenzymes of sweet-potato glucose 6-phosphate isomerase were resolved by DEAE-cellulose chromatography. The multiple forms exhibited identical electrophoretic properties and electrofocused as a single component with an apparent isoelectric pH of 4.0. Chromatographic studies also suggest that the multiple forms do not represent true isoenzymes. (Authors' abstract).

204. PORTER, W. C. 1979.
Sweet potato growth as affected by photoperiod. HortScience, 14(2): 124.

Four experiments were conducted to study the growth of "Centennial" sweet potatoes under photoperiods of 8 & 14 hrs. The 8 hr treatment was natural daylight with the plants being covered the remainder of the day. The 14 hr treatment was natural daylight plus lighting with incandescent lights to give the required daylength. In all four experiments the number of leaves, vine length, stem fresh and dry weights and leaf fresh and dry weights were greater for the 8 hr photoperiods. Total and average leaf area were also greater. In experiments two, three and four, feeder root fresh weight was greater for the 8 hr treatment. The feeder root dry weights were greater in experiments two and

three for the 14 hr period. In experiments one and three the 14 hr treatment produced a greater yield of storage roots. Storage root dry weight was greater for the 14 hr daylength in the first and third experiments.

205. SCOTT, L. E. 1950.
Potassium uptake by the sweet potato plant. Proceedings of the American Society for Horticultural Science, 56: 248-252.

The percentage of potassium in sweet potato vines decreased during the period of growth of the fleshy roots. The Porto Rico variety showed consistently higher percentages potassium in both vines and roots than did the Maryland Golden variety. Total seasonal uptake of potassium by Porto Rico amounted to 541 pounds K_2O per acre, of which 362 pounds was present in the roots. Total uptake by Maryland Golden was 256 pounds of which 152 pounds was found in the roots. Uptake during the first two months of the season amounted to about five per cent of the total. Vine growth accounted for most of the potassium utilization during the third month, while accumulation of potassium in the growth of the fleshy roots accounted for practically all of the potassium uptake during the last two months of the season.

206. SCOTT, L. E. and A. A. KATTAN. 1957.
Varietal differences in the catechol oxidase content of the sweet potato root. Proceedings of the American Society for Horticultural Science, 69: 436-441.

Wide variation among sweet potato varieties was found in the degree of activity of the catechol oxidase system which is responsible for the development of discoloration of sweet potato roots that may occur during preparation for processing. The degree of oxidase activity was found to be negatively correlated with the intensity of flesh color of the roots. The mode of development and nature of the dark colored compound formed is discussed and a suggestion made that the oxidase activity test be used as an aid in evaluation of seedlings for processing qualities.

207. SEKIOKA, H. 1970.
The effect of temperature on the translocation and accumulation of carbohydrates in sweet potato. In Plucknett, D.L. ed Proceedings of the 2nd International Symposium on Tropical Root and Tuber Crops, Aug. 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Hawaii, the University. Vol.1, pp.37-40.

Using sweet potato plants with high photosynthetic capability, the relationships between the temperature and various phases of carbohydrate translocation such as translocation and distribution of sugar, release of carbohydrate from leaves, their acceptance and storage in roots and their redistribution for growth and storage were studied. The results showed that the accumulation rate of the total carbohydrates was higher at soil temperature 15°C and it decreased with rise in soil temperature. The rate of accumulation in leaves marked the highest value under the air temperature of 25°C. Air temperature seemed to influence translocation more than soil temperature.

208. SPEIGHTS, D. E., E. E. BURNS, D. R. PATERSON, et al. 1967.

Some vascular variations in the sweet potato root influenced by mineral nutrition. Proceedings of the American Society for Horticultural Science, 91: 478-485.

Sweet potato roots were grown in a 3^3N x P x K factorial field experiment then harvested and prepared for histological examination. A statistical and histological technique was devised to determine quantitative vascular differences among roots grown under the various nutritional treatment. Histological examinations were made to determine the number of secondary xylem vessels associated with the continuous cambial zone, the number of anomalous vascular units and the average width of the continuous cambium. Roots which grew in the presence of high levels of N with high rates of K had an increased number of secondary xylem vessels associated with the continuous cambial zone and an increase in width of the continuous cambium compared with roots receiving high rate of N without K. Roots grown with high levels of P with intermediate and high rates of N had an increased number of secondary xylem vessels associated with the continuous cambial zone when compared with the control or with high rates of P without N. The differences were statistically significant at the .05 level.

209. SPENCE, J. A., R. W. SOFFE and E. C. HUMPHRIES. 1972. Rooted leaves for physiological experiments. Planta (Berl.), 104: 352-356.

Rooted leaves provide convenient material for investigating various physiological processes. Details are given for producing rooted leaves of species with tuberous roots, e.g. sweet potato *Ipomoea batatas*.

210. STINO, K. R., A. T. HEGAZY, A. K. GAAFAR et al. 1969.

Studies on the effect of gibberellic acid on growth, flowering and chemical composition of sweet potatoes. Journal of Botany, U.A.R., 12(2): 123-139.

This work was carried out to study the effect of Gibberellic acid on growth, flowering and chemical composition of major components of easy and hard blooming varieties of sweet potatoes. Various treatments were carried out for two successive seasons. Results can be summarised as follows;

(1) Hard blooming varieties were induced to flower using GA: 100 p.p.m. proved to be the best treatment either soaking or spraying.
(2) Average daily number of flowers per plant was higher in case of spraying treatment as compared with soaking.
(3) Blooming was delayed by GA. However, the number of flowers per plant induced was larger than the untreated plants.
(4) Gibberellic acid proved to have a contradictory effect on growth of plants represented by plant heights. It has a promoting effect on the growth of the easy blooming variety.
(5) Dry weights of roots and shoots of hard blooming variety were significantly decreased using GA. In case of easy blooming variety dry weights of shoots were increased significantly using 100 p.p.m. while in case of roots there was a significant decrease in dry weights.
(6) In both easy and hard blooming varieties carbohydrate contents of shoots, were significantly increased, and decreased in the roots by using GA. However, 100 p.p.m. GA treatment increased carbohydrate content of variety Mabrouka roots.
(7) Nitrogen content of shoots of both types of sweet potatoes was insignificantly decreased. The effect of both types was irregular.

(8) Thus it can be concluded that it is possible to use GA to induce hard blooming varieties of sweet potatoes to flower in spite of the fact that this plant is a short day plant. This acid has various effects on the chemical composition of the studied varieties. These variations in carbohydrate and nitrogen contents may be direct or indirect factors of flower induction. (Authors' abstract).

211. TSUNO, Y. and K. FUJISE. 1963.
Studies on the dry matter production of the sweet potato. II. Aspect of dry matter production on the field. Proceedings of the Crop Science Society of Japan, 31(3): 284-288.

The present studies reported in this paper were made in an effort to make clear the basic facts of dry matter production in sweet potato under field conditions. Sweet potato, variety Norin No.1, was grown on a field in 1961 with different fertility levels, planting dates and planting densities. Dry matter in increase was measured at intervals of 3 weeks over all growing course. Maximum rate of dry matter increase per unit field area showed 120 g/m^2 field/week which existed at middle stage of growth. Maximum values of net assimilation rate and leaf area index were 55 g/m^2 leaf area/week and 4.3 m^2/m^2 field, respectively. Optimum leaf area index of sweet potato on 380 g. cal/cm^2/day at middle growing stage, from July 17 to Sept. 18. When leaf area index became an excess, it had an unfavourable effect on the dry matter production due to lack of light intensity in community; moreover, stems weight ratio tend to increase. Increase of this ratio was considered to be a disadvantage for the net assimilation rate owing to rise in the respiration consumption in non-productive parts. (Text in Japanese)(Authors' summary).

212. TSUNO, Y. and K. FUJISE. 1964.
Studies on the dry matter production of sweet potato. III. The relation between the dry matter production and the absorption of mineral nutrients. Proceedings of the Crop Science Society of Japan, 33(4): 295-300.

These experiments were carried out in order to make clear the relation between dry matter production and absorption of the three major elements under various cultural conditions, and to find out the factors which influence the absorption of nutrients in sweet potato plants.

(1) In the course of absorption of the three major elements, it was recognized that the process was greatly influenced by soil temperature during early growing stage. Sweet potato plants could hardly absorb the nutrients and slightly produce the dry matter at about 20°C of the culture solution. But both dry matter production and absorption of nutrients markedly increased with a rise of the solution temperature.

(2) The total dry matter production per unit field area was most remarkably governed by the amount of absorption of potassium among others. There was a close relation between the amount of nutrient absorbed and the increasing weight of leaves in early growing stage, and at the harvesting time there was a high correlation between the leaf area duration and the amount of nitrogen absorbed.

(3) The amount of nitrogen absorbed was increased by late planting compared with early planting. As a result, it caused an increase in leaf area duration in late planting plots. Increment of leaf area duration had also other effects, e.g. total dry matter production was increased in the infertile field, while, in the fertile field, it was decreased by the decline of net assimilation rate owing to excessive increase of the leaf area duration (Table 2). (Text in Japanese) (Authors' abstract).

213. TSUNO, Y. and K. FUJISE. 1964.
Studies on the dry matter production of sweet potato. IV. The relation between the concentation of mineral nutrients in plant and distribution ratio of dry matter produced. Proceedings of the Crop Science Society of Japan, 32(4): 301-306.

The relationship between the concentration of nutrients in plant and distribution of dry matter produced has long been recognized. It was decided, therefore, to investigate further this problem as in the previous work the role of these nutrients was not clearly understood. The distribution ratio of dry matter produced was defined as the ratio of the increase in weight of each part of that of the total dry matter during a unit period. There is a close relationship between the distribution ratio of dry matter to the top and nitrogen concentration in leaves under different potassium levels as shown in figure 2. The distribution ratio of dry matter to the top shows an increase with the

increase of nitrogen concentration in leaves. But in the case of high potassium level, the distribution ratio to the top is considerably less than that of low potassium level even if the nitrogen concentration is exactly the same. consequently, it was considered that potassium was effective for translocation of assimilates from the top to the tuberous roots. Further results of the study are discussed with respect to early and late growing stages. (Text in Japanese)(Authors' abstract modified).

214. TSUNO, Y. and F. KAZUMA. 1964.
Studies on the dry matter production of sweet potato. V. The differences in distribution ratio of dry matter produced among some varieties. Proceedings of the Crop Science Society of Japan, 32(4): 304-310.

(Text in Japanese).

215. TSUNO, Y. and K. FUJISE. 1964.
Studies on the dry matter production of sweet potato. VI. Varietal differences of respiration and respiration: photosynthesis ratio. Proceedings of the Crop Science Society of Japan, 32(4): 309-314.

An investigation was conducted to determine the changes of respiratory rates in each part of sweet potato and the ratio of nocturnal respiration to photosynthesis per day with four varieties grown under pot cultivation.

(1) Leaf blades showed the largest value in the percentage of respiration of each part to total respiration through all the growing stages, i.e. about 50 per cent of total respiration, and there was no varietal difference in the percentage. At the late growing stage, the respiration of tuberous roots could not show large percentage notwithstanding the ratio of dry-weight of tuber to total dry-weight was large. It was caused by the fact that respiratory rate of tuberous roots was below one-tenth.

(2) The percentage of nocturnal respiration to photosynthesis per day was shown in table 2. After 2nd period (July 13), the percentages showed a static tendency in each variety until harvesting time. Okinawa No.100 showed low percentage, about 20. Ibaragi No.1 showed high percentage, about 30. These percentages were obtained under

excellent condition of light receiving under pot cultivation. It is assumed that the ratio of respiration to photosynthesis will increase more under inexpedient condition of light for photosynthesis with mutual shading of leaves. (Text in Japanese)(Authors' summary).

216. TSUNO, Y. and K. FUJISE. 1964.
Studies on the dry matter production of sweet potato. VII. Varietal differences of photosynthetic rate. Proceedings of the Crop Science Society of Japan, 32(4): 315-318.

The same four varieties of sweet potato as reported in the previous paper, were used to investigate some aspects of varietal differences of photosynthesis and factors concerning with photosynthetic rate.

(1) There was a varietal difference of photosynthesis per pot between Norin No.1 and Okinawa No.100. The photosynthesis of Norin No.1 was mainly supported by having broader leaf area than other varieties, and Okinawa No.100, having the smallest leaf area among the four varieties, showed higher photosynthesis per unit leaf area than others. Consequently, both Norin No.1 and Okinawa No.100 showed similar rates in photosynthesis per pot at the first half of their growing stages.

(2) The results obtained in the relation between photosynthetic rate per unit dry leaf weight and the three major nutrient elements in the leaves essentially agreed with those described in the previous paper. It was shown that both potassium and nitrogen closely correlated to photosynthetic rate, and carbohydrates concentration in leaves showed high negative correlation for photosynthetic rate. All positive correlation factors for photosynthetic rate, i.e. nitrogen, potassium and respiratory rate of leaves, had respectively negative correlation for carbohydrates concentration in leaves. (See table 2.)(Text in Japanese)(Authors' summary).

217. TSUNO, Y. and K. FUJISE. 1965.
Studies on the dry matter production of the sweet potato. VIII. The internal factors influence on photosynthetic activity of sweet potato leaf. Proceedings of the Crop Science Society of Japan, 33(3): 230-236.

In the previous paper, it was recognized that intimate correlations, positive or negative, were found among factors

concerning photosynthetic activity, such as potassium per cent, nitrogen per cent, respiratory rate and carbohydrate content in the leaf, but it was not clear which one of these factors showed a true correlation with photosynthetic activity. Therefore, the present study has been an attempt to elucidate the factors showing a true correlation with that. Various experiments shown in table 2 and table 4 were carried out and photosynthetic rate, three major nutrient elements content and carbohydrate content in the leaf were determined. Partial correlation coefficients were calculated between the factors and photosynthetic rate. A high significant partial correlation was found only between carbohydrate content and photosynthetic rate, all the other correlations proving insignificant. In order to evaluate the influence of carbohydrate accumulation on photosynthetic rate, the diurnal changes of both photosynthesis and carbohydrate content in the leaf were observed. The growth of tuber which is the largest acceptor (sink) of the photosynthates in the sweet potato plant at later growth stage, was inhibited by exposing tubers to light. The treated plant was depressed in the photosynthetic rate and increased in starch content of leaves owing, presumably, to the restricted translocation of photosynthates from leaves. Futhermore, in another experiment, there was a parallel relation found between the net assimilation rate and the dry-weight increase of tubers. All the above mentioned results suggest the following hypothesis: since the accumulation of photosynthates in the leaf does not bring any great change in the diurnal course of photosynthesis of sweet potato leaves, it is not accumulation of photosynthates in the leaf but the rate of movement of photosynthates from leaf (source) that is essential in controlling photosynthetic rate from inside. According to this hypothesis, to promote the growth of tuber means to increase the rate of translocation of photosynthates from leaves, and this, in turn, will give an accelerating influence to photosynthetic activity. Thus, the fact that potassium content in the leaf had a very intimate correlation with photosynthetic rate can be explained primarily by the nutritional effect of potassium for promoting the tuber growth. (Text in Japanese)(Authors' abstract).

218. TSUNO, Y. and K. FUJISE. 1965.
Studies on the dry matter production of sweet potato. IX. The effect of potassium on the dry matter production in sweet potato. Proceedings of the Crop Science Society of Japan, 33(3): 235-242.

A lot of experimental results indicate that an abundant application of potassium to the sweet potato leads to an increased tuber yield, though it is less effective to the growth of top. Potassium contained in the leaf of sweet potato is quite effective for maintaining photosynthetic activity, thereby contributing to increase the dry weight of the plant. It is unknown why potassium promotes the growth of sweet potato tubers. Therefore, experiments were carried out by gravel culture or by field culture to acquire the information concerning the relationship between potassium and growth of tubers. The sweet potato plants cultured with various cultural solutions showed an intimate relationship between their tuber weight and K_2O/N ratio in the tuber. A high K_2O/N ratio in the tuber was combined both with a low ratio of water soluble nitrogen to total nitrogen content and with a low total nitrogen concentration in fresh tuber, this in turn, showing an intimate negative correlation with the net assimilation rate (Fig.4). Also, to increase the potassium/nitrogen ratio in dosage of fertilizer gave a favorable influence upon both the increment of tuber weight and net assimilation rate. In the field experiments where much potassium was applied, the effects of potassium were recognized in bigger tuber weight, higher net assimilation rate and increased water content in tubers. Above mentioned results suggest that potassium participates in either the protein metabolism, or the hydration of tuber tissue or both, which are the most fundamental processes included in the growth of tuber in some way. It is, therefore, highly possible that the promotion of tuber growth by potassium may result in the promotion of photosynthetic activity through the accelerated translocation of photosynthates from leaves to tubers.

219. TSUNO, Y. and K. FUJISE. 1968.
Studies on the dry matter production of sweet potato. X. An explanation of the determination of dry matter percentage in tuber with the viewpoint of nutrient conditions and dry matter production. Proceedings of the Crop Science Society of Japan, 37(1): 11-16.

It is particularly desirable that we obtain both the high

tuber yield and the high starch content of tuber in the actual cultivation of sweet potato. Dry matter percentage of tuber (Y) highly relating with the starch content can be calculated as the quotient of the nitrogen concentration of tuber on the fresh weight basis (Z) divided by the nitrogen concentration of tuber on the dry weight basis (X), i.e. $Y = \frac{Z}{X} \times 100$. Although we would substitute the concentration of phosphorous, potassium or other optional nutrient elements for nitrogen content in the above formula, nitrogen concentration was considered to be most suitable because of the intimate relationship (table 1) between the nitrogen concentration of tuber on the fresh weight basis and the K_2O/N ratio in tuber closely relating with the tuber bulking. It would be necessary that the over growth of top is prevented by the adequate absorption of nitrogen and the light-receiving system is favourably kept up and also that the photosynthetic activity of leaves is highly maintained by manuring much potassium to nitrogen, in order to produce the tuber with high yield and high starch content in the actual cultivation of sweet potato. (Authors' summary).

220. TSUNO, Y. and K. FUJISE. 1968.
Studies on the dry matter production of sweet potato. XI. The effect of deep placement of mineral nutrient on the tuber-yield of sweet potato. Proceedings of the Crop Science Society of Japan, 37(2): 273-279.

There is an intimate correlation between the absorption amount of potassium and tuber-yield of sweet potato in a wide range. However, it had been vainly attempted to increase the dosage of potassium application with ordinary procedure to get a very high yield. Then we carried out various experiments on the application method of potassium. In the investigation of root system of the sweet potato, an interesting fact was found out that the roots originating from the stem were located in shallow soil layer near the surface but the roots developed from the tuber were located in deep soil layer. Another fact also recognized was that abundant potassium exists in deep soil layer at high-yield-field of sweet potato. Consequently, mineral nutrients were applied at both layers, shallow and deep, through ploughing before planting. We got a conclusion as follows: it was very effective in order to increase tuber yield to apply the potassium in deep soil layer, 30 cm or 40 cm deep, at fertile soil, and it is desirable to apply together with potassium, nitrogen and phosphorous in arid field.

221. TSUNO, Y. 1970?
Sweet potato; nutrient physiology and cultivation. Berne, International Potash Institute. 73p. illus.

This booklet covers the botanical characteristics of sweet potato, its habitat and cultivation (with subsections on seedling growing, transplanting, fertilization, irrigation, harvesting, curing and storage). Under growth and nutrient absorption, the amount of nutrient absorption and dry matter production as well as concentration of nutrients in the plant body are discussed. Finally, under relationship between nutrients and growth, the effects of N, P, K and compost on the growth and yield of the crop; deficiency of other nutrients, and the effect of fertilizers on the composition of tubers are discussed.

222. TYLER, K. K., D. M. MAY, R. W. SCHEUERMAN and N. C. WELCH. 1975.
Petiole analyses for diagnosing the macronutrient status of sweet potato. HortScience, 10(3): 33.

Leaf petioles and whole leaves were analyzed and compared for use as indicator tissue to assess the macronutrient status of sweet potatoes. Petioles, because of their generally higher concentrations and greater sensitivity to the soil availability of the macronutrients, were better suited for tissue sampling of sweet potatoes. Field fertilizer experiments with three cultivars grown in central and southern California were used to correlate petiole analyses with harvest yields and with available soil levels of macronutrients and to develop useful ranges for diagnostic purposes.

223. WANG, H. and C. T. LIN. 1969.
Determination of carotene content among parental varieties and their offsprings in the sweet potato. Journal of the Agricultural Association of Chine, 65: 1-5.

There are great differences in the carotene among varieties and clones in the sweet potato. None of the varieties or clones with white flesh has been found with any carotene content. The more the carotene content, the deeper the flesh color. The use of the available breeding lines, either variety or clone, with higher levels of carotene as parents may be expected to raise the tendency for the higher carotene content of the sweet potato in breeding. (Authors' abstract).

224. WARMKE, H. E. and H. J. CRUZADO. 1949.
The flowering and seed-setting of sweet potatoes in Puerto Rico. Science, 109(2821): 62-63.

Thirteen of the 16 varieties grown in the field plots at the Federal Experiment Station flowered during the fall and winter in 1947-48. These were grown from sprouts, set in the field in July. Plants were trained up on 6' chicken-wire trellises and were kept thinned by constant pruning. It was not found necessary to girdle the plants. Among the varieties which flowered was one of the difficult-to-flower Jersey types, Orange little stem. The conditions under which it flowered are described here.

225. WILSON, H. P., B. GRAVES and C. P. SAVAGE, Jr. 1974.
Effects of incorporation depth and activated carbon on sweet potato response to vernolate. Journal of the American Society for Horticultural Science, 99(3): 245-246.

Incorporation of S-propyl dipropythiocarbamate (vernolate) to a depth of 5.0 cm in soil resulted in more vigor reduction of sweet potatoes *Ipomoea batata* (L.) Lam. than incorporation to a depth of 10.0 to 12.5 cm. The initial plant response to vernolate by 'Nemagold' was greater than by either 'Julian' or 'Centennial'. Yields of all 3 cultivars were not affected by vernolate at the rate of 2.2 kg/ha, but yields were reduced at rates of 4.5 and 6.7 kg/ha. Activated carbon applied as a suspension in the transplant water protected sweet potatoes from vigor reductions at rates of vernolate up to 6.7 kg/ha. Dipping roots in a suspension of activated carbon prior to transplanting failed to protect sweet potatoes from vernolate injury.

226. WILSON, L. A. 1969.
The use of rooted leaves and grafted plants for the study of carbohydrate metabolism in sweet potato. E. A. Tai et al ed. Proceedings of the International Symposium on Tropical Root Crops, Trinidad 1967, Vol.I. Section II, pp.46-55.

Two systems conveniently called phytomodels, rooted leaves and reciprocal grafts of different sweet potato varieties have been described and their use in the study of carbohydrate mobilization and carbohydrate storage, in the sweet potato discussed. Preliminary experiments on the calibration of the phytomodels against growth changes known to occur

in intact sweet potato plants have been described. The ultimate aim of this work is to find out the factors of primary importance in tuber growth. On this subject, attention is drawn to the fact that tuber cells must first be formed before they can act as a tuber sink. Expansion of these cells once formed is also a prerequisite for the increase in size of the tuber sink with development. Apart from this fundamental objective, grafted sweet potato phytomodels could provide an immediate answer to the plant breeder, with respect to the capacity for tuberization of new varieties. Such a use for these phytomodels is suggested by the increased tuberization of C9/049 and R38/049 reciprocal grafts over C9 and R38 intact plants. The capacity for increasing tuberization in models with C9 and R38 scions could be taken as a measure of the tendency for tuberization of a particular variety. (Author's summary abridged).

227. WILSON, L. A. 1970.
The process of tuberization in sweet potato *Ipomoea batatas* (L.) Lam. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops. August 23-30, 1970, Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol.I, pp.24-26.

Morphological, anatomical, and biochemical evidence is presented for the point of view that normal sweet potato tuberization involves three distinct processes, viz, (1) development of potential tuber bearing roots, (2) tuber initiation, and (3) tuber development to maturity. (Author's summary).

228. WILSON, L. A. and S. B. LOWE. 1973.
The anatomy of the root system in West Indian sweet potato *Ipomoea batatas* (L.) Lam. cultivars. Annales of Botany, 37: 633-643.

The comparative anatomy of different root types including tuberous roots and tubers in the root system of a West Indian sweet potato cultivar cv. 049 is described, and tissue distribution in mature tubers compared with five other local cultivars. Anatomical events leading to tuber initiation and tuber growth to maturity are outlined and the anatomical specialization of the sweet potato tuberous root, particularly in the development of translocatory tissues in the 'tuber stalk' and in adventitious bud genesis, is described. Possible relationships between the anatomy of tuber development and final tuber yield are discussed.

229. WILSON, L. A. and S. B. LOWE. 1973.
Quantitative morphogenesis of root types in the sweet potato *Ipomoea batatas* (L.) Lam. root system during early growth from stem cuttings. Tropical Agriculture, 50(4): 343-345.

The paper reports the studies on the sequential genesis of major root types culminating in tuber production. This is described and compared in six sweet potato cultivars with particular reference to the period associated with early tuber growth, that is up to eight weeks after planting when rapid bulking commenses in many sweet potato cultivars. The authors conclude that the process of tuberization in the cultivars studied occurred in two distinct stages: (a) tuber initiation, and (b) tuber bulking. Early establishment of final tuber number recorded in these cultivars indicated that the adverse influence of rainfall on yield was effected during initiation stage of tuber development which occurred in the period between 2 and 8 weeks in five of the six cultivars studied.

230. WOOD, G. and A. HUANG. 1975.
The detection and quantitative determination of ipomeamarone in damaged sweet potatoes *Ipomoea batatas*. Journal of Agricultural and Food Chemistry, 23(2): 239-241.

A relatively simple procedure is described for the quantitative determination of ipomeamarone in damaged sweet potatoes. This compound is produced along with other toxic furanoterpenoid compounds as a general response of the sweet potato to certain exogenous stimuli. The toxic compounds were extracted from the tissue with ether and separated by column chromatography, using increasing percentages of ethyl acetate in hexane as the eluting solvent mixture. Thin-layer chromatography was used for qualitatively analyzing the separation fractions. Those fractions containing ipomeamarone were analyzed quantitatively by gas-liquid chromatography, using hexadecane as the internal standard. The lower limit of detection of ipomeamarone by this procedure was 2 ng.

231. YOSHIDA, T., Y. HOZYO and T. MURATA. 1970.
Studies on the development of tuberous roots in sweet potato *Ipomoea batatas*, Lam. var. edulis, Mak. Proceedings of the Crop Science Society of Japan, 39(1): 105-110.

Studies were made in order to find out the ecological factors on the deep plowing culture of sweet potato. Deep plowing culture was carried out by plowing 25 cm deep, and compound fertilizer was applied to both shallow and deep layers of soil. Nutrients treatments are as follows (kg/10a): ordinary culture, compound fertilizer (3-10-10) 100; heavy manuring culture, 200; deep plowing culture, 100 (shallow) plus 100 (deep). The ordinary and heavy manuring culture were applied only at shallow layer. For growth analysis, whole plants were taken seven times every three weeks after transplanting and divided into each organ. Leaf area was estimated by the leaf punch method and various ecological indexes were calculated from the values of leaf area and dry weights of the plant. In order to analyze the photosynthetic ability of leaves physiologically, three major elements (N,P,K) and carbohydrate contents were determined.
From the results described, it can be concluded that photosynthetic ability of the deep plowing culture was higher and photosynthates translocated very efficiently into the tuberous roots. (Authors' abstract).

232. MONTELARO, J. and J. C. MILLER. 1951.
A study of some factors affecting seed setting in the sweet potato. Proceedings of the American Society for Horticultural Science, 57: 329-334.

This study was designed to correlate the seed-setting ability of certain lines of sweet potatoes to air temperature and the type of pollination employed where grown under field conditions in the breeding nursery at the Louisiana State Experiment Station. The seed set was studied in the pollination of 13,528 flowers from the five clonal breeding lines of sweet potatoes, Unit I Porto Rico, Code Numbers 21, 131, 201, and 241. All five lines functioned about equally well as pollen parents but there were significant differences in their ability to function as seed parents. Seedlings 201 and 241 when used as female parents showed a high degree of sexual incompatibility both when selfed and crossed, and this incompatibility appeared to be a varietal characteristic which affected seed set with no detectable relationship to the environment.

No highly significant differences were found between the per cent of seed set of open and cross-pollinated flowers. However, all five lines showed some evidence of self-incompatibility. It was suggested that the latter might be genetically controlled. There was an observed decline in seed set during very hot or very cold periods, with the highest seed set during a period when the mean temperature was about 75 degrees F. Temperature, however, did not influence seed set as seriously as did certain non-environmentally controlled physiological disharmonies characteristic of some lines of sweet potatoes.

233.

F. SWEET POTATO CULTURE

F. 1. General Agronomy and Economics of Production

234. COVINGTON, H. M., L. G. WILSON, C. W. AVERRE, et al. (1976?) Growing and marketing quality sweet potatoes. Revised. Raleigh, North Carolina Agricultural Extension Service. 42p. (Extension Publ. AG-09, formerly Circular 353).

It is remarked that growing sweet potatoes is a specialized job, as considerable "know-how" is required to grow, cure, store and market them. The present publication is primarily aimed at new growers and provides recommendations for producing high yields of good quality sweet potatoes. It covers these aspects: varieties, use of good seedstock, growing plants, soils, soil insects and soil borne diseases, fertilization, planting, weed control, foliage pests, harvesting, storage house and container, disinfestation, curing, storage, curing and storage house design, preparation for market, and other market considerations.

235. EDMOND, J. B. and G. R. AMMERMAN. 1971.
Sweet potatoes: production, processing, marketing. Westport (Connecticut), AVI Publishing Co. iv, 334p., illus. (Major Feed and Food Crops in Agriculture and Food Series).

This 14-chapter treatise eleven of which chapters were contributed by J. B. Edmond covers the taxonomy, history, and industrial development of sweet potatoes; morphology and anatomy; physiology, biochemistry and ecology; genetics, breeding behaviour, and development of superior varieties; seedstock selection and plant production; soil, cropping systems, and commercial fertilizers; field production practices and operations; sweet potato pests, (viz destructive fungi, viruses, parasitic nematodes and destructive insects); harvesting, curing and storing; marketing the fresh product; canning, dehydrating and freezing sweet potatoes; and finally, production for industrial use.

236. HAYNES, P. 1970.
Some general and regional problems of sweet potato *Ipomoea batatas* (L.) Lam. growing. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops. August 23-30, 1970, Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol.I. pp.10-13.

Sweet potato problems of general and regional importance are presented for discussion in this paper. The general problems discussed have their origin in two situations: in the use of inappropriate plant types in particular production systems and in the high degree of variability of the sweet potato. The regional problems are related to environmental conditions, the level of technology at which the crop is grown and in some cases the need for new knowledge. The latter problems are discussed under the following heads: The seasonality of sweet potato production; the short storage life of tubers; production costs and the epidemiology of sweet potato pests. (Author's summary).

237. KAY, D. E. (Mrs.) 1973.
Sweet potato, Spanish potato, Louisiana yam. In her Root Crops (No.2). T.P.I. crop and product digest. London, Tropical Products Institute. pp.144-159.

Other common names of sweet potato are Spanish potato and Louisiana yam. Other data given include its botanical name,

family, some 44 other names, form and habitat, cultivation conditions such as temperature, rainfall, soils; planting procedure covering material, method, field spacing and planting rate; pests and diseases; growth period, harvesting; primary product, yield, main use, subsidiary uses, secondary and waste products, special features, processing, production and trade, and major influences.

238. KIMBER, A. J. 1972.
The sweet potato in subsistence agriculture. Papua New Guinea Agricultural Journal, 23(3-4): 80-102.

It is generally accepted that the sweet potato *Ipomoea batatas* (L.) Lam. originated in the Americas and was transported westwards across the Pacific, but there is as yet no firm evidence as to when or how it was introduced into Papua New Guinea. The significance of sweet potato varies according to an ecological partitioning of Papua New Guinea into six natural regions, but taking the country as a whole it is quantitatively the most important crop in subsistence agriculture. A very wide range of morphological variation has been found to exist. Propagation, maintenance of gardens and harvesting are, with some exceptions, similar in all regions, but there are notable differences in mixed cropping practices and methods of land preparation, especially in the broad intermontane valleys of the main Cordillera. Storage practices are not well developed, as there has generally been no necessity for this, and aspects of cooking and eating quality are fairly uniform throughout the country. As a subsistence crop, the sweet potato is relatively free of pests and diseases, though there are some exceptions. Sweet potato plays a major role in maintaining the domestic pig population and because of this it is important in the accumulation of wealth and in the establishment of prestige in subsistence social systems. (Author's summary).

239. RANKIE, L. B. 1973.
Comparative performance: large-scale production vs. small-scale production of yams and sweet potatoes in the Carribean. Third International Symposium on Tropical Root Crops. IITA, Ibadan. 2-9 Dec., 1973. Vol.3, 30p. (Mimeo).

Large-scale and small-scale production of yams and sweet potatoes are compared using three indices: labour utilization, land and labour productivity, and relative profitability.

These indices were constructed from data collected mainly from farms of between one and five acres in four territories of the English-speaking Caribbean - Barbados, St. Vincent, St. Kitts-Nevis and Jamaica. Reasons for variations are given and a few suggestions are offered on how the situation might be improved.
(On compare la production en grand avec la production en petit de l'igname et de la patate, au moyen de trois indices, à savoir: la mise en valeur de la main-d'oeuvre, le rendement des terres et de la main-d'oeuvre, la comparaison des benefices. Ces indices ont été etablis d'après de renseignments recueillis pour la plupart dans des fermes d'une superficie d'entre un demi-hectare et deux hectares, dans quatre territoires des Antilles anglophones: la Barbade, St. Vincent, St. Kitts-Nevis et la Jamaique. On donne les raisons des differences, et quelques suggestions en vue d'une amélioration de la situation.)

240. REES, A. M. M. 1969.
Some economic aspects of root crop production; with particular reference to the economics of producing carbohydrates from roots as compared with other sources in primitive, developing and advanced economics. In E.A. Tai, W. B. Charles, P. H. Haynes et al eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 2-8 April, 1967. pp.18-33.

The paper examines the pattern of world cropping and dietary patterns; it presents then a case study of food consumption in Jamaica. It further discusses crop yields and productivity; labour requirements and labour productivity. It is concluded that root crops as a source of carbohydrates compare favourably with other sources, and that irrespective of the level of development of the economy the root crops appear to have an important role to play in terms of both their food and monetary values. The returns from growing these crops will probably always remain at a satisfactory level. A lot of data is given. Sweet potato features prominently among the three most important tropical root crops discussed.

241. TANAKA, J. S. and T. T. SEKIOKA. 1977.
Sweet potato production in Hawaii. In Cock, J., R. MacIntyre and M. Graham eds. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops held in CIAT, Cali, Colombia. 1-7 August, 1976. Ottawa, IDRC. pp 150-151.

This paper describes the general cultural practices of sweet potato production in Hawaii. Presented are cultivars grown, method of planting, fertilizer application, pest control, harvesting and factors contributing to increased yield.

242. WOOD, I. J. L. 1976.
Sweet potato growing in Queensland. Queensland Agricultural Journal, 102: 553-566.

The paper describes the status of the crop in Queensland, its nutritional qualities, its botany, varieties, growth requirements covering crop rotation and land preparation, and planting material.

243. YEN, D. E. 1969.
The economic aspects of the Pacific sweet potato collection. In E. A. Tai, W. B. Charles, P. H. Haynes et al eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 2-8 April, 1967. Vol.1, 45-52.

The author discusses some features of the collection of 580 varieties of sweet potato and its possible two fold contributions to plant improvement. Then he discusses some economic characters for modern horticulture; economic characters in indigenous cultivations; and the possibilities of utilisation of the collection.

F. 2. Agronomic Experiments

244. BOUDREAUX, J. E. and L. G. JONES. 1978.
Field-plot studies with sweet potato. Journal of the American Society for Horticultural Science, 103(1): 87-89. Also in HortScience, 13(3)(1978): 269.

The coefficient of variation on number of replications

required for significance in field trials with sweet potato *Ipomoea batatas* (L.) Lam. decreased in most cases as the plot length and width increased. Using 12% as an arbitrary level of acceptability for the coefficient of variation, a single-row plot 15 to 20 hills, 30.5 cm apart in length and replicated 9 to 11 times appeared to be sufficient to conduct research on the total weight of sweet potatoes. A double-row plot of the same length would require 5 to 7 replications while a triple-row plot would require 3 to 6 replications to be precise enough for research on the total weight of sweet potatoes. For satisfactory research on the total number of roots, a plot 1 row wide and 20 to 25 hills long with 5 to 9 replications appeared to be adquate. A double-row plot the same length would require 3 to 7 replications, and a triple-row plot would require 2 to 6 replications for satisfactory results. (Authors' abstract).

245. EDMOND, J. B. and J. A. MARTIN. 1946.
The flowering and fruiting of the sweet potato under greenhouse conditions. Proceedings of the American Society for Horticultural Science, 47: 391-399.

Investigations on the breeding and improvement of the sweet potato began at Clemson Agricultural College in 1936. An important phase of the work is the development of new types and varieties by the sexual method of plant breeding. Naturally, the sexual method requires the production of flowers, fruit and seed of the sweet potato plant - a phase of plant behavior that rarely occurs under field conditions in continental United States. From 1936 to the present time methods of greenhouse management have been developed by which a number of varieties, seedlings and introductions have produced flowers and seed more or less satisfactorily. Since certain investigators are interested in producing sweet potato seed in their breeding and improvement programs, a description of the methods used at Clemson may be helpful and is reported herein. (Authors' summary).

246. EKPERE, J. A. 1976.
Improving the technique of field testing the products of agricultural research. Sweet potato *Ipomoea batatas* adaptive trials in Nigeria: a field study. Journal of the Association for the Advancement of Agricultural Science in Africa, 3(1): 34-39.

This study was carried out to substantiate the need for a

second - level adaptive demonstration - that is, to show that the results of the agriculturala experimental station should be duplicated on the farmers' plots under their conditions of production before widespread recommendations are made. It was also thought that economic profitability and consumer preference were pre-conditions to widespread acceptance of a new crop variety. Using sweet potatoes, this study found that where a large enough number of clones of a given crop is available, field adaptive trials provide one of the best procedures for screening for yield, disease resistance, and acceptability. The results suggest that the crop is more ecologically adaptable to the derived savanna area, where higher average yields were recorded. However, Ajia in the forest rain belt recorded the best overall yields for most of the clones compared with the experimental station yields. If cultivated with a package of recommended practices, sweet potatoes could be a profitable crop and could complement other sources of calories for the humid tropics. The data in table 8 indicate that at least five clones with moderate yields are acceptable to the farmers and that requests from farmers for planting materials could be self-generating if a package of production practices becomes available. The policy implications of this study could be far-reaching. It is obvious that at a time when governments are placing greatest emphasis on food production, the concept of adaptive trials and demonstration plots on farmers' plots should be more meaningful than ever before. Adaptive trials have established not only ecological suitability and resistance to diseases and pests but also farmers' acceptance and use of the new crop. (Author's abstract).

247. HAYNES, P. H. and D. W. WHOLEY. 1971.
Variability in commercial sweet potatoes - *Ipomoea batatas* (L.) Lam. in Trinidad. Experimental Agriculture, (7): 27-32.

The variation in number and yield of tubers from three commercial fields of sweet potato was measured over three seasons. Sources of variation were attributed to factors external to the plant, such as soil, management and climatic differences, and to inherent plant factors, including type of planting material. It is suggested that a reduction in variability could lead to increases in productivity, and may also increase the precision of field experimentation. (Authors' summary).

248. JONG, S. 1974.
Genotype X season interactions and heritability in sweet potato *Ipomoea batatas* (L.) Lam. selection experiments. Ibadan, IITA. 10p. (Mimeo).

The data obtained from the sweet potato advanced yield trials conducted over three seasons at IITA, Ibadan were analysed. The author discussed the basic problems in sweet potato selection experiments. Genotype X season interactions were highly significant for tuber yield, average tuber number per plant and average tuber size. Clone X season interactions components of variance were much larger than the clone components of variance for tuber yield and average tuber size. Heritabilities of yield and yield components are relatively high in each season but heritabilities of tuber yield and average tuber size are very low for the combined data of three season with 0.1778 and 0.1562, respectively. Heritability of average tuber number per plant is relatively high with 0.3992 and more consistent than those of tuber yield and tuber size. Genotypic and phenotypic correlations between seasons are very low in all characters. Genotypic and phenotypic correlations between yield and yield components are very high but the genotypic and phenotypic correlations between yield components are very low. From these results it is suggested that selection should be done in more than two seasons or under several environments. And it seems to be more desirable to select high yielding clones based on the average number of tubers per plant than to select on the basis of average size of tuber.

249. JONG, S. K. and K. Y. PARK. 1975.
Variety x environmental interactions in sweet potato *Ipomoea batatas* Lam. tests in Korea. The Research Reports of the Office of Rural Development, Korea, Suweon, 17(C): 125-130. (Also in IITA, Ibadan, 1974. 7p. (Mimeo).

In the study of sweet potato variety x environment interactions in Korea, variety x location x year interaction was

highly significant, while variety x year interaction was non-significant. The most effective way to reduce the standard error of a theoretical variety mean and improve the expected genetic progress was the increasing years, followed by locations and replicates.

250. KLEINSCHMIDT, G. D. 1972.
Response of citrus seedlings, tomato, pepper and sweet potato plants to inoculation with endomycorrhizal fungi. Thesis... London, University Microfilms International. 37p.

In 1970 a fumigated plot of sweet potatoes, cultivar Jersey, inoculated with *E. mosseae* at the time of transplanting yielded more sweet potatoes than the non-inoculated plants.

251. LOWE, S. B. and L. A. WILSON. 1975.
Yield and yield components of six sweet potato *Ipomoea batatas* cultivars. II. Variability and possible sources of variation. Experimental Agriculture, 11(1): 49-58.

Variabilities in total yield, marketable yield and components of yield (tuber numbers and mean tuber weights) were studied in six sweet potato cultivars over two seasons, in crops harvested at two dates. Yield variability was high, particularly in marketable tubers, and was related to either or both components of yield. High-yielding cultivars had lower variabilities and the commercial cultivar 049 the lowest. The contribution of yield components to variability in total yield was evaluated and sources of yield variation were attributed to planting material, tuber development and season. (Authors' abstract).

252.

253. PINCHINAT, A. M. 1974.
Potential yields of sweet potato *Ipomoea batatas* (L.) Lam. in the Turrialba region, Costa Rica. (Rendimiento potencial del camote *Ipomoea batatas* (L.) Lam. en la zona de Turrialba, Costa Rica). Tropical Root and Tuber Crops Newsletter, 7: 10-14.

In the foot hill, rain forest of Costa Rica [illegible] varieties of sweet potatoes were tested in 5 trials at different fall planting dates. Twenty varieties were selected that yielded 30 or more metric tons per hectare, with the highest two yielding 48.2 and 53.6 respectively. Two

varieties, Cuarenteno and Estrella Berlin, will be used in future agronomic trials. They combine high yields with high acceptability as food for humans.

254. POOLE, C. E. 1959.
Improvement in yield of sweet potato clones. Proceedings of the American Society for Horticultural Science, 73: 445-451.

By planting 100 sound and uniformly shaped sweet potato roots widely spaced, and selecting the five highest and five lowest yielding hills after five months, at each of the three different farms, there were obtained from the the first 300 roots one superior and one inferior yielding clone after two successive clonal settings. A second series of clonal selection studies was made after irradiating 50 roots with Cobalt-60 isotope in two moistened cloth bags for 72 hours at a dosage of 2350 r. Half of the roots had begun to sprout before treatment and half were apparently entirely dormant before irradiation treatment. Eight root progenies:-4 from the sprout-treatment and 4 from the dormant-treatment, were included in three 10 x 10 Latin Squares, along with one plus and one minus selection from the natural irradiation trials; the sprout-treated progenies as a group significantly outyielded the dormant group, even though one of the latter was one of the three coordinate leaders. Separate and combined yield data from the three farms showed significant superiority of three plus clones NS-2, S-1, and C over three minus clones 4-A, NS-3, and NS-1. Plus clone C from the natural irradiation experiment was demonstrated to be statistically superior to minus clone A in two series of carefully designed field plots, the second of them being in conjunction with eight artificially irradiated root progenies.

255 PORTEOUS, D. J. 1968.
A study of the influence of certain cultural practices for sweet potatoes on the accumulation of nitrate ions by the storage roots and the degree of detinning of the cans containing the root. A dissertation... London, University Microfilms International, 1968. 146p.

Experiments were conducted on Mississipi terrace and loessial hill soils in 1965-67 to determine the influence of various environmental conditions and certain cultural practices on the nitrate absorption and accumulation by

sweet potato storage roots at harvest time and the effects of the nitrate level on the extent of internal darkening (detinning) of cans containing the roots during storage at room temperature. The nitrate concentration of the individual roots on the same hill varied considerably, regardless of location, size, position on the hill or harvest date. The nitrate level of raw roots decreased steadily and markedly during the first 14 days of storage at room temperature. Appreciable amounts of nitrate were evidently contributed to the soil by a winter cover up (hairy vetch) or Bermuda sod and White Dutch Glover grown in rotation with sweet potatoes. This increase in the nitrate level was reflected in the roots at harvest time and in increased detinning of the cans containing the roots during storage. Soybeans from which the seeds were harvested did not cause a significant increase in nitrate accumulation by successive sweet potatoes. The nitrate content of the roots grown on soil that received 0,30,60 or 90 pounds of fertilizer nitrogen per acre and maintained at dry, moist or wet conditions increased with increasing rates of nitrogen, regardless of the soil moisture level. Roots grown on dry soil accumulated more nitrate accumulation by the roots, and the amount of detinning of the cans. The nitrate concentration of the roots grown on soil that received 0,30,60,90,120, or 150 pounds of fertilizer phosphorous (P_2O_5) per acre varied inconsistently. A positive, highly significant association was found between the total yield and the phosphorous application rate. Large, consistent increases in the nitrate content of the roots occurred as the rate of complete fertilizer was increased. This nitrate level was positively correlated with the extent of detinning of the cans. In another experiment, the application of calcium carbonate to the soil stimulated the accumulation of nitrates by sweet potato roots. Any possible influence of the application of sulfur or fertilizer (30-60-30) alone or in combination on the nitrate concentration of the roots was not evident.

256. SEEMANTHANI, B. 1959.
Four foreign sweet potatoes beat Madras locals. Indian Farming, 9(4): 23-24.

It is reported that four high-yielding sweet potato varieties for Madras state have been isolated from a collection of over 100 at Coimbatore ARI. All of them are introductions from abroad, and have proved superior in every way to the existing locals.

257. SWINGLE, H. D. and C. W. MARR. 1970.
The effect of pre-harvest treatments on air cracking in sweet potatoes. HortScience, 5(4): 317.

The tendency of sweet potatoes to crack when exposed to the air at digging time was studied in NC-212 sweet potato breeding line for two growing seasons. Yields were not significantly influenced by pre-harvest treatments. The percent cracked roots was reduced by certain pre-harvest treatments. Soil moisture appeared to be related to the degree of air cracking.

258. THAMBURAJ, S. and C. R. MUTHUKRISHNAN. 1977.
Studies on the performance of sweet potato clones. Madras Agricultural Journal, 64(6): 402-404.

The authors describe the studies conducted to determine the influence of varietal characteristics, soil and agroclimatic conditions on the yields of popular varieties of sweet potato. The clone I.B.3 was found suitable and superior to others under soil and agroclimatic conditions pre-valent in Bhavanisagar, having recorded the highest yield of 30.34 tons of tuber per hectare.

259. VILLAREAL, R. L., S. K. LIN and S. H. LAI. 1979.
Variations in the yielding ability of sweet potato under drought stress and minimum input conditions. HortScience, 14(1): 31-32.

Evaluation of 381 sweet potato cultivars and 464 breeding lines for root yield under drought stress and minimum input conditions following a rice crop revealed certain genotypes that surpassed the tropical Asian yield average by at least 100%. Such genotypes appeared to possess both drought tolerance and good yielding ability. (Authors' abstract).

F. 3. Propagation Methods

260. DEONIER, M. T. and L. J. KUSHMAN. 1960.
The effect of pre-sprouting and type of bed on the early production of sweet potato plants. Proceedings of the American Society for Horticultural Science, 75: 557-560.

In tests conducted during a 3-year period, comparisons were made of the sprout production of roots of the Porto Rico variety of sweetpotato (a) cured at 85°F with high humidity and stored in the conventional manner, (b) cured as in (a) for a time long enough to force sprouts to a length of about 2 inches,then stored in the usual manner, and (c) cured and stored in the conventional manner, but pre-heated at about 85°F under conditions of high humidity, just prior to bedding, until sprouts reached a length of about 2 inches. Samples of roots from each of these three preparatory treatments were bedded in three types of beds: (1) heated to 75°F, glass-covered; (2) unheated, glass-covered; (3) unheated, open.
The numbers of early plants produced were correlated with length of sprouts at bedding time and with soil temperatures maintained in the beds. When results from the 3 types of beds were considered together, roots sprouted to a length of about 2 inches either by extending the curing period in the fall or by preheating before bedding, produced significantly more plants at 43 days from bedding than did roots bedded when sprouts were just showing; they also produced more total sprouts in 4 pullings. However, roots sprouted in the fall by extending the curing period produced slightly fewer plants when bedded than did roots sprouted by pre-heating for about the same length of time just before bedding. This difference appears to be explained by the killing of some of the fall-produced sprouts during storage by disease organisms. Regardless of the length of sprouts on roots when bedded, more plants were produced earlier and in a given period of time in a sash-covered heated bed than in a sash-covered bed given no heat, and, this, in turn, produced more and earlier plants than were obtained in an open bed. These differences

were directly associated with the differences in time required to attain a favorable sprouting temperature of about 70°F in the 3 types of beds.

261. GRANBERRY, D. M., R. A. CONOVER, and B. T. WHATLEY. 1977. Storage root production of sweet potato seedlings and vegetative progeny. HortScience, 12(1): 62-63. (Also in HortScience, 11(3): 229).

Seedlings of sweet potato *Ipomoea batatas* (L.), which failed to form storage roots, produced good yields of sweet potato roots of acceptable size and grade when propagated asexually by vine cuttings. (Authors' abstract).

262. SHANMUGAVELU, K. G., S. THAMBURAJ, A. SHANMUGAM et al. 1972.

Studies on the effect of time of planting and type of planting materials on the yield of sweet potato *Ipomoea batatas* Lam. South Indian Horticulture, 20(1/4): 55-58.

Investigations were undertaken to study the influence of type of planting material and time of planting on the yield of sweet potato cultivar V.6. Terminal vine cuttings recorded higher yields than and proved superior to the other two types of planting materials, viz., median cuttings and slips from tubers. Planting the crop in the second forthnight of September and the first forthnight of October in that order was found to be conducive to obtain maximum yields. (Authors' abstract).

263. SHIKATA, S. 1976.
Bredding of sweet potato adapted to direct planting and method of planting culture. Japan Agricultural Research Quarterly (JARQ), 10(4): 174-177.

The author enumerates the advantages of direct planting culture as compared to the transplanting culture. Then he describes the characteristics of varieties adaptable to direct planting; the development of a new variety, tagged Naeshirazu, for direct planting; and direct planting culture of the crop. He concludes that for the future development of sweet potato production, it is most important to save labour and increase yield by establishing labour-saving, high-yielding cultural technology.

264. SHIKATA, S., M. KOBAYASHI, M. KUSUHARA et al. 1975. Naeshirazu, the first sweet potato variety for direct planting. Report of Jukoku Agricultural Experiment Station, Japan, A24: 97-108.

Naeshirazu which means "free from vine cutting for propagation" is a new variety of sweet potato *Ipomoea batatas* (L.) Lam. that was released by Chugoku National Agricultural Experiment Station and was registered as Kansho (or sweet potato) Norin 32 by the Ministry of Agriculture and Forestry in 1974. It is the first variety for direct planting and a planting manner is similar to that used in planting Irish potatoes. Naeshirazu is a selection from a cross between Koganesengan and Chugoku 25, and was tested under the code number Fukukei D7-752 or Chugoku 33 afterward. Botanical and agronomic characteristics of Naeshirazu are as follows: stems are purplish green in colour and rather thick. Vines are long and creeping. Leaves are heart-shaped and broad and the top leaves are yellow green in colour. Tuberous roots of Naeshirazu are spindle-shpaed, medium size with yellow white in skin colour. The flesh is also yellow white. Most characteristics both of top and root are similar to those of Koganesengan but root type is indirect-daughter type like Chugoku 25. The number of days for sprouting in the field is about one month and the vigorous growth in early stage may be advantaged under stress conditions. Naeshirazu has a high yield potential and its starch content is as high as that of Koganesengan, and it produces small roots which would be used as "seed" roots the following year. Naeshirazu can be cultivated rather easily and has a wide adaptability. Therefore, it is recommended for producing raw material of starch and livestock fed in southwestern Japan from Kanto to Kyushu district. Naeshirazu is generally strong for weather stress, though its resistance to black rot and root nematode is not so high. (Authors' summary).

265. SPENCE, J. A. 1971. Cultivation of detached sweet potato *Ipomoea batatas* (L) Lam. leaves with tuberous roots for photosynthetic studies. Photosynthetica, 5(4): 424-425.

Rooted sweet potato leaves have been induced to form tubers by growth in sand culture and provide a new system for photosynthetic studies.

266. STINO, K. R., A. K. GAAFAR, A. T. HEGAZY et al. 1969. Grafting as a means of inducing hard blooming varieties of sweet potato to flower and set seeds. Journal of Botany, U.A.R., 12(2): 115-122.

Studies were carried out on three hard blooming and two easy blooming varieties of sweet potatoes. Reciprocal grafting was utilized to induce hard blooming varieties to flower and set seed. Hard blooming varieties flowered when grafted on easy blooming. Varietal differences in percentage of flowering plants, daily number of flowers and time required for appearance of first flower were found. Under the condition of these experiments flowering of hard blooming varieties may be due to stimulating hormone moving upwards. Easy blooming varieties produced flowers even when grafted on hard bloomers. Pollen grains proved to be fertile, however, seeds were not obtained by means of controlled pollination. This might be due to self and cross incompatibility in sweet potatoes. It can be concluded that grafting can be used as an efficient tool to induce hard blooming varieties of sweet potato to flower. To obtain seeds large number of varieties should be included to avoid self and cross incompatibility. (Authors' abstract).

F. 4. Land Preparation, Spacing, Mulching; and Staking

267. CARPENA, A. L., E. T. REBANCOS, Jr., and M. P. ESTOLANO. 1970. Screening sweet potato varieties for adaptability to paddy field cultivation. The Philippine Journal of Crop Science, 2(4): 209.

Several varieties of sweet potato were tested for their yield performance in terms of both roots and vegetative parts in uncultivated low-land paddies before and after rice cultivation. The post-rice screening was done for two successive years, involving a total of eighty-seven varieties. The post-rice screening yielded nine varieties with performance comparable to what is usually obtained under normal up-land culture. In the pre-rice screening involving fifty-three varieties, all varieties gave vegetative yields similar to those obtainable under upland conditions. None, however, gave what can be considered respectable root yields.

268. CORPUZ, I. T. 1971.
A tillage and nitrogen fertilization study of some upland crops grown on irrigated lipa clay loam. A thesis... London, University Microfilms International, 1971. 177p.

Sweet potato was one of the five crops studied with respect to tillage and nitrogen fertilization. The effects of tillage on seedling emergence, growth and yield were considered. The percentage recovery of sweet potato cuttings for the four cropping periods (presented in a table) was not affected by the differences in clod size distribution. The average recovery percentages were 96, 98, 95 and 96 for the 1968 early wet, late wet, early dry and late dry cropping periods respectively. The data on the total yield of sweet potato are also presented in a table. The yields of the cropping periods in which tillage operations (plowing and harrowing treatments applied in preparation for planting) were used were generally higher than those without tillage operations. Three-and-five harrowing treatments produced significantly higher yields than the one-harrowing treatment, without any difference in yields between three-and-five-harrowing treatments. Response of sweet potato nitrogen application in all cropping seasons showed the application of 40 kg N/ha increased the yields by 1860, 2180, and 1770 kg/ha at 3 different levels of harrowing treatment. The yield of marketable and non-marketable tubers as well as that of vines of sweet potato were also studied.

269. GOLLIFER, D. E. 1973.
Staking trials with sweet potatoes. Tropical Agriculture, 50(4): 279-284.

The results of two staking trials with sweet potato cv. 'Faunalea', a cultivar that climbs well unassisted, are presented and discussed. It was found that staking could significantly increase the yield of tubers. Applied nitrogen depressed yields of tubers and significantly increased the yield of vines. (Author's abstract).

270. GRAVES, B. 1979.
Influence of row spacing and nitrogen rate on yield and root set of sweet potatoes. The Vegetable Growers News (Virginia), 33(10): 3.

Reported here are the results of an experiment started in 1976 using 12 and 18 inch within row spacing and fertilizer

applications of 30, 45, and 60 pounds per acre of nitrogen and twice these amounts of phosphorus and potassium for a growing season of about 110 days (mid-June to early October). Two varieties of sweet potato were used. An application of 45 pounds of nitrogen per acre resulted in significant yield increases of one variety only with the 12 inch spacing. That was the combination that gave the highest yield increase.

271. JOHNSTONE, Jr. F. E., H. D. MORRIS, K. W. HANSON, et al. 1957. The effect of soil conditioners on the yields of sweet potatoes. Proceedings of the American Society for Horticultural Science, 70: 403-406.

The objectives were: (1) to study the effects of different amounts and types of chemical soil conditioners on the yield and grade of sweet potato roots and, (2) to determine whether or not there is a significant residual effect of soil conditioners on the two soils used in tests. Yields of sweet potatoes were significantly increased for at least one year on soils of the types used by the proper incorporation of 1000 to 2000 pounds per acre of active ingredient of either a polyacrylontrile or vinylacetate maleic acid type soil conditioner. Grades of sweet potatoes were not appreciably affected by the use of soil conditioners. Physical properties of the soil were markedly improved by the conditioners during the first growing season, but the beneficial effect had been greatly reduced by the end of the second season. This is shown by both yield results and measurement of the physical properties of the soil.

272. KIMBER, A. J. 1970.
Some cultivation techniques affecting yield response in the sweet potato. In Plucknett, D. L. ed. Proceedings of the 2nd International Symposium on Tropical Root and Tuber Crops, Aug. 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Hawaii, the University. Vol.1. pp.32-36.

The paper describes the method and results of five trials carried out to determine the effects of cultivation methods on the yield response of sweet potato in Papua New Guinea Highlands, a region of periods of high rainfall regime. The trials were also aimed at discovering any variety - cultivation method interactions, as each of these aspects could have an important bearing on future variety experiments. Mounds performed better than ridges and flat land planting

in that order. The higher yields obtained from mounds are attributable to better soil aeration permitted by mounds as well reduced tendency to soil compaction. With respect to size of mounds, large ones generally yielded more but where soil structure and drainage were ideal small mounds were superior probably because of the more even spacing which they give for an equivalent plant density. Varieties were shown to differ very substantially in their marketable and stock feed yields and in their average tuber size.

273. PATERSON, D. R., D. E. SPEIGHTS and J. E. LARSEN. 1970. Some effects of soil moisture and various mulch treatments on the growth and metabolism of sweet potato roots. Journal of the American Society for Horticultural Science, 95(1). 42-45.

Studies were conducted to determine the effects of mulch treatment and soil moisture on plant production, soil temperature and the metabolism of sweetpotato roots. The use of petroleum agricultural mulch resulted in the harvest of sweetpotato slips 2 weeks before any of the other mulch treatments produced usable plants. A single layer or clear plastic, roofing felt, and also black plastic increased the earliness of sweetpotato plant production. The use of a single and a double layer of clear or clear over black plastic resulted in lower slip production and injury to the bedded roots. At a depth of 3 inches all the mulch treatments increased average soil temperatures when compared to the unmulched treatment. A double layer of clear plastic gave the highest average soil temperature at the 3 inch depth. There was little difference in average soil temperature 3 inches under the clear over black plastic, clear plastic, or petroleum mulch treatments. Sweetpotatoes growing in soil and in soil covered with a layer of petroleum mulch (ENCAP) or hexadecanol (TAGE) had a higher respiration rate than roots growing in air at 30°C. ENCAP and TAGE increased the CO_2 emission of sweetpotato roots in comparison to non-mulched controls. Roots growing in soil and in soil mulched with ENCAP had more top and root growth than roots growing in air. TAGE restricted top and root growth of sweetpotato roots growing in soil. Soil moisture increased the respiration rate of sweetpotato roots more than ENCAP at 30°.

274.

F. 5. Fertilizers, Plant Nutrition, and Effect of Soil Types

275. AHN, J. K., W. W. COLLINS, and D. M. PHARR. 1978. The effect of wet and/or cold soils on sweet potatoes. HortScience, 13(3): 268.

Sweetpotatoes grown in pots were treated for 1 week before harvest with the following soil conditions: warm dry, warm wet, cold dry, and cold wet. Roots were harvested, cured and stored for 83 days. Rotted roots were counted periodically. Roots from warm wet soil showed more rotting during curing than roots from other treatments, and rotting continued during storage. Roots from cold wet soils rotted to a lesser extent during curing but rotted rapidly during storage. Roots from cold dry soils showed no rotting during curing; however after 52 days of storage, the number of rots began to increase sharply. Buildup of CO_2 in roots of wet soil resistant and susceptible cultivars after submergence in water was rapid with anaerobic conditions occurring after 6 hrs of submergence. Resistance to wet soil damage may be due to detoxification of anaerobic respiration products rather than to the occurrence of anaerobic respiration.

276. ARUNA, F., J. VICENTE-CHANDLER, J. RODRIGUEZ et al. 1979.

Crop response to soil acidity factors in ultisols and oxisols in Puerto Rico V. Sweet potato. The Journal of Agriculture of the University of Puerto Rico, 63(2): 250-267.

The effect of various soil acidity factors on yield and foliar composition of sweet potato *Ipomoea batatas* (L.) Lam. were determined in three ultisols and one oxisol. Sweet potatoes responded moderately in yield to variations in soil acidity factors of three Ultisols, but did not on the Oxisol. On the Ultisols, soil acidity factors had very little effect on leaf composition. Yield increased with increasing soil pH, decreasing exchangeable Al content and decreasing exchangeable Al/base ratio. When all the soils, except Coto, were grouped together, the ratio of exchangeable Al to exchangeable bases explained 83% of the variation, the

percent Al saturation 79%, and pH only 66%. Highest yields were obtained when pH was above 5, percent Al less than 20% and the Al exchangeable bases ratio less than .2. The lack of response in the Oxisol seems to be related to a reduced Al activity resulting from a high Mn concentration in the soil solution. Apparently sweet potato is very tolerant to high Mn concentrations in the soil solution.

277. BALERDI, F. F. 1971.
The response by sweet potatoes to various calcium salts applied to Providence silt loam and Stough very fine sandy laom soils. A dissertation... London, University Microfilms International. 118p.

Field experiments were conducted with sweet potatoes on a Providence silt loam soil with a low native calcium content in order to study the effects of different calcium salts on the yield, percent dry matter, firmness of the canned roots, and concentrations of calcium, manganese, magnesium, potassium, and phosphorus in leaves and fleshy roots, and on the soil reaction, extractable soil calcium, manganese, magnesium, and potassium. The results are presented in detail and included in the abstracts. A greenhouse experiment with two soils and four levels of calcium acetate application showed that plants growing of Stough very fine sandy loam (very low in extractable calcium) gave a more definite response to calcium than those on Providence silt loam soil (higher in calcium). Of the elements studied in the field and greenhouse experiments, potassium was the highest in the leaves followed in descending order by calcium, magnesium, phosphorus, and manganese. In the fleshy roots, potassium was again the highest, followed by phosphorus, magnesium, calcium, and manganese. (Author's abstract modified).

278. CANNON, J. M. 1971.
The effect of soil amendments and fertilizer applied to an Olivier silt loam on the soil reaction and the growth and productivity of Centennial sweet potatoes. A dissertation... London, University Microfilms Internation, XIV, 134p.

Sweet potatoes were grown on an Olivier silt loam soil at Chase, Louisiana in which the pH of the experimental plots ranged from 3.8 in the sulfur treated plots to 7.4 in the limed plots. Soil and leaf samples were taken periodically both during and after symptoms of abnormality so as to

determine the relationship between the presence and severity of the symptoms and the soil pH, the level of extractable manganese, aluminium, iron, calcium and magnesium from the soil and the concentration of these same elements plus phosphorus in the leaves. It was found that the presence and the severity of the leaf symptoms were regularly related to the soil pH. There was a negative relationship between the soil pH and the levels of extractable manganese, aluminium and iron from the soil and a positive relationship between pH and the levels of calcium and magnesium. The fertilized control plots produced the highest total yield of fleshy roots during both years, but the yield was not always significantly greater than that of the other fertilized plots. The plants from the sulfur-treated soil produced the best grade of roots, while the limed soil produced the lowest grade due to the high incidence of soil rot infection.

279. CHEW, W. Y. 1969.
The performance of tapioca, sweet potato and ginger on peat at the Federal Experiment Station, Jalan Kebun, Selangor. Planter, 45(521): 445-451.

Malaysia has a large area of acid peat with a low mineral content, high water table, coarse woody texture and high timber content. Drainage, liming and fertilizing with major and trace elements are necessary for short-term crops. Cassava, sweet potatoes and ginger yield well on peat. Information is given on how to prepare the land and plant these crops, recommended var., fertilizer rates, cultural practices and harvesting. (Summary by CIAT).

280. CONSTANTIN, R.J., L. G. JONES and T. P. HERNANDEZ. 1975.
Sweet potato quality as affected by soil reaction (pH) and fertilizer. Journal of the American Society for Horticultural Science, 100(6): 604-607.

'Centennial' and 'L4-89' cultivars of sweet potatoes grown in soil with a pH of 4.4-5.1 had a higher dry matter content than when grown in soil with a pH of 5.3-6.0 or 6.4-7.2. Soil pH had no influence on dry matter content of 'L4-186'. Soil pH did influence firmness of the canned product; however, cultivar differences occurred. 'L4-89' when grown on soil with a pH of 4.4-5.1 had firmer roots than when grown at higher soil pH. Firmness of 'L-186' was not affected by soil pH. Roots from 'Centennial' grown at the higher soil pH in combination with fertilizer were softer after canning;

however, without fertilizer, roots from the intermediate soil pH were the firmest. Carotenoid content (flesh color) of either fresh or processed roots was not affected by varying soil pH. Varying soil pH had a slight influence on fiber content of 'Centennial' but no effect on fiber content of 'L4-89' and 'L4-186'. Protein content and splitting of canned roots were not greatly affected by varying the pH of the soil. (Authors' abstract abridged).

281. CONSTANTIN, R. J., L. G. JONES, and T. P. HERNANDEZ. 1977. Effects of potassium and phosphorus fertilization on quality of sweet potatoes. Journal of the American Society for Horticultural Science, 102(6): 779-781.

Potassium applications from 0 to 140 kg/ha at 4 locations had more influence on quality of sweet potatoes than P applications of 0 to 73.9 kg/ha as an average of years and locations. As the rate of K but not P applications increased, percent dry matter decreased. K and P applications reduced protein content and firmness of canned roots. K slightly increased the crude fiber content (dry wt basis) of the roots, whereas P applications had no affect on fiber content. K and P fertilization had no influence on carotenoid content (fresh or processed), percent splitting of canned roots, or crude fiber content (fresh weight basis). Year and location effects were noted for some of the quality variables studied. Most of the differences observed were of low magnitude, thus had little effect on the overall quality of sweet potatoes. The most outstanding effect was the reduction in dry matter content due to K applications. (Authors' summary).

282. DUNCAS, A. A., L. E. SCOTT and F. C. STARK. 1958. Effect of potassium chloride and potassium sulfate on yield and quality of sweet potatoes. Proceedings of the American Society for Horticultural Science, 71: 391-397.

Effects of soil application of potassium chloride and potassium sulfate to Nemagold and Maryland Golden sweet potatoes were measured during 1954 and 1956. Yield, chemical composition and storage behavior of the raw product, and the firmness of processed roots were some of the attributes measured. The results show that:

(1) Total yields were influenced by rates but not sources of potash.
(2) Dry matter content decreased with increased rate of potash fertilization in all cases.

284. KUSHMAN, L. J and D. T. POPE. 1970.
Changes in pH and total acidity of sweet potatoes exposed to wet, cold soil conditions before harvest. HortScience, 5(6): 510-511.

Changes in pH and total acidity comparable to those that occur in chilled roots during storage, take place in the field while the roots are still in the ground if wet, cold, soil conditions develop.

285. LEONARD, O. A., W. S. ANDERSON and M. GIEGER. 1949.
Field studies on the mineral nutrition of the sweet potato. Proceedings of the American Society for Horticultural Science, 53: 387-392.

(1) Plants of Unit 1 Porto Rico were grown in Ruston sandy loam and were supplied with zero, moderately high, and high quantities of available nitrogen, phosphorus, potassium, calcium, and magnesium to determine the relation of the mineral content of the leaf blades to the yield of the fleshy roots.
(2) The applications of available nitrogen and of available potassium were definitely associated with the nitrogen and potassium content of the leaf blade and with the yields of the roots.
(3) Plants with leaf blades varying from 4.7 to 5.0 per cent nitrogen in early summer and from 3.0 to 3.8 per cent at the harvest and with at least 2.0 per cent potassium during all stages of growth produced higher yields than those supplied with lesser quantities of available nitrogen and potassium. (Authors' summary).

286. LIANGLI, L. 1970.
Study of the effect of nitrogen, phosphorus and potassium on sweet potato yield by response surface. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops, August 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol.1, pp.13-15.

Two sets of sweet potato yield data from a 3 x 3 x 3 NPK factorial experiments under irrigated and non-irrigated conditions on silt loam soil were used to fit the quadratic model by multiple regression analysis. The quadratic regression yield equations were constructed by these data for determining the yield response surfaces isoquants and economic fertilizer optima. (Author's summary).

(3) Potassium content of sweet potatoes increased as the rate of potash application increased. There was more potassium in the roots of plants fertilized with potassium chloride.
(4) Chloride content of the roots was influenced relatively little by the fertilizer treatments regardless of the source of potash used.
(5) Storage behavior of the sweet potatoes was not affected by rate or source of potash, except in the zero potash rate in the 1956 experiment in which weight loss was found to be primarily due to severe surface rot *(Fusarium oxysporum)* infection.
(6) Firmness of processed sweet potatoes was progressively decreased by fertilization with potassium regardless of source.

283. GODFREY-SAM-AGGREY, W. and M. J. GARBER. 1977. Effect of potash fertilizer on leaf nutrients and their relationships to tuber yields of sweet potato. Communications in Soil Science and Plant Analysis, 8(8): 629-644.

The fourth, fully-expanded leaves at sweet potato vine tips were sampled at harvest from two separate but similar experiments on Njala upland soils after 7 years bush fallow to study the effects of timing and rates of K fertilizers on leaf nutrients and their relationships to sweet potato tuber yields. Potash showed significant effects on leaf P, leaf Zn, leaf Ca, leaf Mn, leaf K/P and leaf Ca/Mg. K x timing interaction affected leaf K/Mg and leaf K/P but timing of K application did affect significantly neither leaf nutrients nor leaf nutrient ratios. Significant quadratic effect of K on tuber yields as well as significant cubic K x timing interaction effect on tuber yields were observed. There were significant negative correlations between tuber yields and leaf N and between tuber yields and leaf P, indicating that increases in either leaf N or leaf P depressed yields. On the basis of coefficient of determination, increases in leaf N contributed significantly more to yield variation than increases in leaf P. Analysis of covariance and multiple regression studies showed lack of significance of 10 nutrients on tuber yields. Sweet potato tissue which reflects differential nutrient levels with significant effect on tuber yields must be sought. Apart from the added fertilizer, the total effect of other factors which affect nutrient status and crop performance must be considered. (Authors' abstract).

287. LUTZ, J. M., M. T. DEONIER and B. WALTER. 1949.
Cracking and keeping quality of Porto Rico sweet potatoes as influenced by rate of fertilizer, nitrogen ratio, time and borax. Proceedings of the American Society for Horticultural Science, 54: 407-412.

Neither rate of borax application nor rate of fertilizer had any significant effect on cracking or keeping quality of sweetpotatoes in storage. High nitrogen did increase the yield but also increased cracking, so that the marketable yield was not influenced. Lime increased cracking and decreased marketable yield. Both lime and nitrogen had a slightly adverse effect on keeping quality in storage.

288. NAIR, G. M. and N. SADANANDAN. 1973.
Performance of sweet potato varieties under varying levels of nitrogen and time of its application in red loam soil of Vellayani. Agricultural Research Journal, Kerala, 11(1): 14-16.

Investigations were carried out at the Agricultural College, Vellayani during October 1971 to February 1972 to study the performance of three sweet potato varieties under different levels and timings of nitrogen application. It was found that the variety J 14 recorded the highest yield of tubers and lowest yield of vines, whereas the local variety Kottaranchola produced the lowest yield of tubers and highest yield of vines. Application of nitrogen beyond 50 kg per hectare was found to improve the yield of vines, but not that of tubers. Split application of nitrogen had no effect on the yield of tubers as well as vines. (Authors' abstract).

289. NETTLES, V. F. 1960.
Results of fertilizer trials with sweet potatoes. Proceedings of the Florida State Horticultural Society, 73: 179-183.

Increases in the rate of application of nitrogen from 20 to 60 pounds per acre in 1956 and from 40 to 100 pounds per acre in 1958 and 1959 resulted in a greater yield of U.S. No.1 and total marketable grades of sweet potatoes. These yield increases were in a linear manner and were found both on Kanapaha and Arredondo soil types. Larger harvests of U.S. No.1 and total marketable sweet potatoes were also obtained in 1958 and 1959 with each increasing increment of potassium from 80 to 200 pounds per acre. A similar increase was noted in 1956 for the U.S. No.1 grade, but the

harvest of the roots of the marketable grade was affected by an interaction of the potassium and phosphorus levels. In 1957, when only the total yield of the sweet potato crop was obtained, the highest average yield was found on plots receiving 60 pounds of nitrogen per acre. The yield differences obtained from plots receiving increasing increments of potassium resulted in a cubic curve with the highest yields being obtained at 120 and 200 pounds per acre. The results would indicate that, under the present system of applying fertilizer early in the growing season, higher rates of nitrogen and potassium than are generally used could be efficiently employed.

290. NUSBAUM, C. J. 1947.
Studies on boron defficiency in sweet potatoes. Phytopathology, 37: 435.

The influence of different rates of application of B at high and low levels of N, P, K, and Ca upon the incidence of B-defficiency, growth cracking, yield and quality of sweet potatoes was studied in a replicated field experiment. The highest yields and returns were obtained from the standard (3-9-9) fertilizer plus borax. With this fertilizer treatment, regardless of the Ca level, the returns from the 5 and 20 lbs. applications of borax were about the same and generally exceeded the values for no borax by about $100.00 per acre.

291. PATERSON, D. R. and D. E. SPEIGHTS. 1964.
Influence of crop rotation, fertilizer and variety on yields and cracking of sweet potato roots. Proceedings of the American Society for Horticultural Science, 84: 431-435.

Two soil rotation treatments, using land that had been in pasture for at least 11 years and land that had produced a crop of sweet potatoes the previous year were interacted with the Porto Rico, Copperskin Goldrush and Redgold sweet potato varieties and a 3 x 3 x3NPK complete factorial experiment on an Izagora fine sandy loam soil at Hearne, Texas in 1960. Growing sweet potatoes for 2 years on the same soil reduced the percentage of No.1 roots from approximately 33 to 12% of the total yield.
The total yields of the Porto Rico and Copper-

skin Goldrush varieties were reduced more than the total yield of the Redgold variety on the continuous sweet potato rotation. Both the No.1 and total yields of sweet potatoes were increased as the rates of N fertilizer were increased from 0 to 50 to 100 lb/A on the first year of sweet potato rotation. On the second year of continuous sweet potatoes only the 50 lb/A rate of N increased total and No.1 yields. There was no response to P or K in this experiment either in individual grades or in total yields.

292. PATERSON, D. R. and D. E. SPEIGHTS. 1971.
Effects of foliar applications of iron, manganese, zinc and boron on crop yield and mineral composition of sweet potato leaf tissue. Journal of the Rio Grande Valley Horticultural Society, 28: 86-90.

Foliar sprays containing iron, manganese, zinc and boron were applied to Centennial sweet potato plants. Use of a spray containing zinc resulted in a highly significant increase in the zinc concentration of the leaf tissue. Foliar applied iron significantly reduced leaf calcium and boron content. There was a highly significant increase in the boron and a significant reduction in the zinc concentation of the leaf tissue when boron was applied as a foliar spray. None of the 16 spray combinations had any significant effect on the grade or yield of sweet potato roots at harvest. The phosphorus, potassium, molybdenum, manganese, copper, strontium and barium content of the sweet potato leaf tissue was not significantly affected by the foliar sprays noted above. (Authors' abstract).

293. RENDLE, C. J. 1975.
Aspects of the phosphorus nutrition of sweet potatoes *Ipomoea batatas* (L.). (Thesis). Reading, the University. 96p.

The thesis presents data showing changes in dry weight in plant parts with time for two small field experiments and one pot experiment. The field experiments at two locations, involve two phoshorus treatments, the pot experiment, 7 phosphorus treatments with 3 variaties. Results show small responses to phosphorus in top growth in the field, though the tuber data is too variable to show any trend. For the pot experiment, only tops have so far been harvested. These

show very small treatment effects despite a range of phosphorus levels from almost 0 to 1.6 ppm in the soil solution. The second pot experiment involves 2 lime levels with phosphorus sources at 4 rates. Phosphorus uptake is statistically correlated with available phosphorus in the soil, measured by the Bray No.1 method. Yield differences do not reflect uptake differences, expect that the control plants are significantly smaller than those to which phosphorus was applied. The Olsen and Bray No.1 methods for measuring available phosphorus shows a strong linear correlation for the Onne soil.

294. RENDLE, C. J. and B. T. KANG. 1977.
Phosphorous requirements of three sweet potato cultivars. In Cock, J., R. MacIntyre and M. Graham. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops, held in CIAT, Cali, Colombia, 1-7 August, 1976, Ottawa, IDRC. pp.117-121.

Sweet potato cultivars Tib3, Tib4 and Tis2534 were grown in a Shante soil series at seven levels of phosphorous concentrations in a soil solution ranging from 0.01 to 1.6 ppm P. Differential response and external P requirement were apparent between the cultivars. At 0.01 ppm P, over 70% of the maximum yield was obtained with the three cultivars. Yields of 95% occurred at 0.05, 0.10 and 0.15 ppm P, respectively, for the cultivars Tib3, Tib4, and Tis2534. Tissue phosphorous concentrations of 0.22% in the blade and 0.08% in the petiole of the index leaf at 9 weeks after planting appeared to be sufficient for 95% yield for the three cultivars.

295. SAMUELS, G. 1969.
The influence of fertilizer ratios on sweet potato yields and quality. In E. A. Tai, W. B. Charles, P. H. Haynes et. al. eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad, 2-8 April, 1967. Vol.1 pp.II-86-93.

Field experiments in a Catano loamy sand, Sabana Seca sandy clay, and Lares clay were performed to evaluate varying ratios of nitrogen and potassium, and nitrogen and phosphorus on yields of sweet potatoes and their starch and carotene content. The results indicated that for less fertile loamy sand and clay loam there was an increase in yields with a change from a N:K ratio of 0:2 to 1:2, but

yields decreased again when the N:K ratio reached 2:2. The more fertile clay soil gave decreased yields as the N:K ratio changed from 0:2 to 2:2. This indicated that for soils with lower available nitrogen supplies, a 1:2 ratio gave optimum yields. For soils with high available nitrogen, care must be taken to keep a wide N:K ratio. The results with varying P:N ratios were mixed. The influence of fertilizer ratios on starch content was significant. However, carotene tended to increase with narrowing N:K ratio for the loamy sand, and the sandy clay soils. Carotene content of the sweet potato increased with increasing phosphorus application. (Author's summary).

296. STINO, K. R. 1953.
Effect of fertilizers on the yield and vegetative growth of sweet potatoes. Proceedings of the American Society for Horticultural Science, 61: 367-372.

The effect of nitrogen, phosphoric acid, and potash in varying amounts on total yield of roots and on vine growth of sweet potatoes was tested in 1947 and 1948 in clay loam typical of the fertile area of the Nile Delta. The varieties used were Wennop, B-52, and Eskandarani. Potash was found to be more essential than either nitrogen or phosphorus for the yield of the fleshy roots when the crop is grown after Egyptian clover. The vine growth increased as a result of the application of nitrogen or phosphorous but did not increase as a result of the application of potash. Maximum yields were obtained with 25 kilograms per feddan of sodium nitrate; 100 kilograms of calcium superphosphate and 75 kilograms of muriate of potash. The growing of sweet potatoes on fertile clay loam soils of the Nile Delta would seem to be a profitable venture, especially if varieties such as Wennop and B-52 are used and the correct amounts of fertilizers are applied.

297. TALLEYRAND, H. and M. A. LUGO-LOPEZ. 1976.
Effect of five levels and three sources of N on sweet potato yields on an ultisol. Journal of Agriculture of University of Puerto Rico, 60(1): 9-14.

The effect of N levels and sources on sweet potatoes *Ipomoea batatas* was investigated on an Ultisol in the central hilly, interior region of Puerto Rico at about 450 m

above mean sea level. Treatment differentials were: Broadcast, preplant applications of 0, 10, 20, 40 and 50 kg/ha of N from urea and 40 kg/ha of N from two sulfur-coated urea compounds (slow-releasing N sources) containing 39.6 and 37% N in each case. The soil had a pH of 4.7 in the top 25 cm of the profile but it apparently supplied enought Ca for a sweetpotato crop. There was no evidence of Al injury to the crop even though exchangeable Al levels were high, i.e., more than 50% of the sum of cations in the 25-50 cm layer. Maximum marketable yields were 14.6 tons/ha (130 swt/acre). These were obtained with the application of 40 kg/ha (35.6 lb/acre) of N as ordinary urea. Evidently there was no advantage in using slow-releasing N sources. Infact, a slight yield depression was observed. The Capo fertilizer-yield equation was applied to the mean yield data obtained from the urea treatments, and a coefficient of determination of 0.99 was obtained. This equation appeared to be useful in predicting sweet-potato yields in terms of the N fertilizer applied in this experiment. (Authors' abstract).

298. TON, C. S. and T. P. HERNANDEZ. 1978. Wet soil stress effects on sweet potatoes. Journal of the American Society for Horticultural Science, 103(5): 600-603.

Serius effects of wet soil on fleshy roots of sweet potato *Ipomoea batatas* (L.) Lam. were losses from rots at harvest and increased shrinkage losses in storage. Other injurious effects were losses in storage of carotenoid pigments, dry matter content, and baking quality. Highly significant differences occurred among cultivars. Total yield was significantly negatively correlated with dry matter content of fleshy roots in 1975 ($r = -0.22$) and in 1976 ($r = -0.17$). Dry matter content of sweet potatoes at harvest was significantly negatively correlated with weight loss from rots after 30 days storage in 1975 ($r = -0.20$). The weight loss from root shrinkage during curing and after 30 days of storage was positively correlated in 1975 ($r = 0.73$) and in 1976 ($r = 0.87$). Significant differences between cultivars from the control treatment occurred in shrinkage losses over a 140 day storage period in normal storage treatment.

299. URIYO, A. P. and A. KESSEBA. 1973.
Response of sweet potatoes *Ipomoea batatas* Poir. to phosphorus and potassium fertilizers on a red oxisol soil in Tanzania. Beitrage Trop. Landwirtsch. Veterinarmed., II. In Proc. Collog. Int. Potash. Inst., 10th. Abidjan pp.495-497.

The application of phosphoric acid and potassium resulted in a significant increase in the yield of *batata*. The chemical composition of the tubers is shown in tables. P and K fertilization did not have any significant influence on the nutrient and mineral content with the exception of the sodium concentration. (Authors' abstract).

F. 6. Effect of Growth Regulators and other Chemicals

300. ALVAREZ, M. N., B. T. WHATLEY, R. M. ANTHONEY, et. al. 1976.
The effect of polaris on yield and quality of sweet potato roots. HortScience, 11(3): 228

Stem growth, root yield, % dry matter, U.S. grade and % total soluble solids as affected by polaris N, N-Bis (Phosphonomethyl) glycine was studied at Tuskegee Institute during the 1975 growing season. The treatments consisted of six levels of polaris 2.24, 4.49, 6.73, 8.98, and 11.23 kg of active ingredient per hectare. The treatment at 2.24 kg/ha significantly increased the yield of roots over all other treatments except the control. There was no significant difference in the % total soluble solids for any treatment at harvest. The treatment 2.24 kg/ha and the control were significantly different in % dry matter from the treatment at 6.73 kg/ha. Polaris decreased the % dry matter and increased the % total soluble solids at all levels. Treatment in excess of 2.24 kg/ha caused a decrease in yield.

301. AUSTIN, M. E. and B. GRAVES. 1970.
Preharvest treatments on skinning of sweet potato roots. Journal of the American Society for Horticultural Science, 95(6): 754-757.

Chemical and mechanical treatments were applied to 3 cultivars

of field grown sweet potatoes, *Ipomoea batatas* (Lam.), in an attempt to reduce the amount of skinning injury from harvest and handling. Treatments that destroyed the leaves and vines, i.e. sodium arsenite, paraquat, and mowing at soil level, reduced skinning of fleshy roots later during harvest. The reduction in fleshy root skining from harvest treatments was significant but not visually apparent in field containers. Thickness of periderm of the sweet potatoes was not influenced by chemical or mechanical treatments but dates of application and time of harvest influenced periderm development. Skinning was most severe when the periderm was thickest. There appeared to be an association between low soil temperature (60°F) and skinning. Changes in carbohydrate composition of 'Nemagold' roots were partly associated with changes in soil temperature. Accumulation of carbohydrates in roots varied with cultivar and season, and there was no relationship between the carbohydrate composition and severity of skinning. Yield of roots was reduced in most plots where vines were killed or stunted by treatments, especially those made early in the harvest season and in treatments applied 2 weeks prior to harvest.

302. BOUWKAMP, J. C. and J. G. KANTZES. 1977.
Carotene content of sweet potato *Ipomoea batatas* (Lam.) roots as affected by various nematicide treatments. HortScience, 12(2): 167.

The paper reports the result of a study made to observe the effect of Nemagon and Telone C on sweet potato with regard to carotene content since the caroten content of sweet potato is important nutritionally. On the basis of the data collected, analysed and presented here it appears that only Tolene C was effective in increasing carotene levels in sweet potatoes. It is unknown why Vorlex and DD which are closely related compounds were not effective.

303. CONSTANTIN, R. J. and T. P. HERNANDEZ. 1977.
Effects of azide soil treatments on quality and yield of sweet potatoes. HortScience, 12(5): 457-458.

Sweet potatoes *Ipomoea batatas* (L.) Lam. grown on azide treated soils, with or without the addition of other herbicidal treatments, were similar in quality and yield as those grown on untreated soil in all experiments except one. During 1972-75 no differences were observed in yield, dry

matter, protein, fiber and carotenoid contents, firmness, percent splitting of the canned roots, and baking quality. During 1976 azide treatments in the intermediate range resulted in increased yield of U.S. No.2 grade roots over the control. The heavier application of azide resulted in an increase in carotenoid content and percentage of split sweet potatoes after canning. All other quality variables, grade and yield were similar to the control during the 1976 season. Data in general show no adverse effects on quality or yield of sweet potatoes as a result of azide soil treatments when applied alone or in combination with other herbicides. The addition of fertilizer to the soil pH plots resulted in a lowering of dry matter content and softer canned roots of 'Centennial'; however, the reverse was true for 'L4-89'. Carotenoid content and splitting of canned roots were not affected by the addition of fertilizer to the soil pH plots. Fiber content was lowered in 'Centennial' (fresh wt. basis) and in 'L4-186' (dry wt. basis) by the addition of fertilizer to the soil. Roots grown in plots receiving fertilizer were higher in protein content than those grown without fertilization. (Authors' abstract).

304. EL-FOULY, M., Y. A. MASOUD and M. H. EL-HINDI. 1971. Stimulating sweet potato yields. World Crops, 23(3): 133.

The paper reports the results of an experiment undertaken to determine the effect of chlormequat chloride (CCC) on yield of sweet potato. The results show that CCC (chlormequat chloride) can induce increase in yield of sweet potato under Egyptian conditions, thus confirming the postulations of Papadakins (1968) on the possible effect of growth retardants in the tropics and sub-tropics.

305. GREIG, J. K. and A. S. AL-TIKRITI. 1966. Effects of herbicides on some chemical components of sweetpotato foliage and roots. Proceedings of the American Society for Horticultural Science, 88: 466-471.

Herbicides with and without supplementary hand hoeing and no weed control were compared in a sweetpotato planting. Data included yields, weed control, vine weights and chemical analysis of sweetpotato foliage and roots and of weeds. All herbicides reduced the weed population early in the season. Yields were up to 10 times higher with certain herbicide treatments as compared to no weed control. Vine weights were decreased by weed competition on the non-hoed plots; as compared to hoed or herbicide plots. The latter 2 showed no difference. In general herbicide treatments did

not alter the chemical composition of sweetpotato foliage or roots. Mineral element and N uptake in lb/acre by weeds was greatest when weed control was least effective.

306. HOWELL, M. J. and S. H. WITTWER. 1954.
Chemical induction of flowering in the sweetpotato. Science, 120: 717.

It is reported that foliar applications of 2, 4-D (2, 4-dichlorophenoxyacetic acid) on sweet potato plants induced flowering. No flowers occurred on non-treated plants or on those receiving 2, 4-D treatments other than the ones listed here. Flowering in all cases was general, with many flowers occuring on each plant. Relatively small or non-enlarged roots were associated with the treatments that induced flowering, and splitting of stems and petioles and tumefaction near the bases of such plants were common.

307. HOWELL, M. J. and S. H. WITTWER. 1955.
Further studies on the effects of 2, 4-D on flowering in the sweet potato. Proceedings of the American Society for Horticultural Science, 66: 279-283.

Spray applications of the sodium salt of 2, 4-D at concentrations of 100 to 500 ppm were generally effective for the induction of flowering in Porto Rico and Yellow Jersey sweet potato plants grown in the ground bed of a greenhouse during the summer and fall of 1954. In both varieties, flowering was general and was associated with, but not necessarily related to, a significant depression of storage root growth. In Porto Rico flowering occurred from the 20th to the 64th nodes, whereas in the Yellow Jersey it was distributed from the 20th to the 74th nodes. The greatest number of flowers on Yellow Jersey resulted from treatment with 100 ppm of 2, 4-D; concentrations greater than 100 ppm caused severe injury. Porto Rico showed greater tolerance to 2, 4-D and flower numbers were greatest following treatment with 500 ppm. (Authors' abstract).

308. KUSHMAN, L. J. 1969.
Inhibition of sprouting in sweet potatoes by treatment with CIPC. HortScience, 4(1): 61-63.

Tests reported here were conducted to determine whether application of isoprophl - N-(3-chlorophenyl) carbamate (CIPC) to sweet potatoes in a manner similar to that for white potatoes, would provide commercially useful control

of sprouting with residue levels sufficiently low to enable such treatments to be approved for commercial use. The results show that treatment with CIPC reduced apical dominance and sprouts often developed well back on the roots. Sprouts of treated roots often are short and show a rosetting as several roots initiate growth.

309. MARLOWE, G. A., Jr. and R. W. SCHEUERMAN. 1969
The influence of various growth regulators on the yield and grade of Yellow Jersey sweet potatoes. HortScience, 4(2): 182.

Significant and consistent increases in fresh weight of Yellow Jersey sweet potatoes, due to foliar applications of tri-iodo-benzoic acid have been observed in three years testing. Of the many growth regulating chemicals tested, TIBA at 0.1 and 1.0 ppm has resulted in the greatest increase in weight of medium sized roots (U.S. No.1) and least phototoxicity. Time and rate studies showed that early applications are more effective than late. Root numbers and sprouts per root at harvest were essentially unaffected by this material.

310. MULLIN, R. S. 1952.
Control of cracking in sweet potato by soil fumigation. Phytopathology, 42: 15.

Soil fumigation tests were made in 1950 in an attempt to control cracking in sweet potatoes in Eastern Virginia. The material used, dichloropropene-dichloropropane, was put in the soil with a hand injector in five 15-ft. by 50-ft. replications. Sweet potatoes produced in the same land in 1949 had been infected with nematodes, both in the rootlets and in the potatoes, and cracking and black eyes had been severe. Results of the 1950 experiment with Porto Rico variety were 14.69 per cent of the potatoes cracked in treated areas, and 51.8 per cent cracked in non-treated. Nematodes were present in the rootlets and potatoes in both areas, but to a much greater extent in those from the non-treated areas. It is evident that in this field, nematodes have been a factor in cracking of sweet potatoes.

311. MUTHUKRISHNAN, C. R., A. SHANMUGAM and S. THAMBURAJ. 1974. Effect of soil and foliar application of Ethrel on sweet potato *Ipomoea batatas* Lamb. South Indian Horticulture, 22(1/2): 1-4.

Investigations were carried at the Department of Horticulture, Tamil Nadu Agricultural University, Coimbatore to determine the efficacy of two methods of applying Ethrel, i.e., foliar and soil with the variety T. 8. 2 of sweet potato. The results indicated that foliar application increased the yields of tubers to 73.4 per cent over the control besides reducing the foliage weight and leaf area. Among the different concentrations, Ethrel at 250 ppm was found to be economical and may give an additional income of Rs. 189/ha over the control at the present cost of cultivation and the price of the chemical. (Authors' abstract).

312. MUTHUKRISHNAN, C. R., S. THAMBURAJ, A. SHANMUGAM, et. al. 1976. Effect of certain growth regulators on tapioca *Manihot esculenta* Grantz and sweet potato *Ipomoea batata* Labm. Journal of Root Crops, 2(1): 52-56.

The possibility of improving cassava and sweet potato yields with plant growth regulants was investigated at Tamil Nadu Agricultural University, Coimbatore (India). Cassava cv. Malavella was sprayed with Phosphon-D (2000 ppm), maleic hydrazide (2000 ppm), Alar (1000 ppm) and ethephon (250-500-1000-2000 ppm). The 1st 2 products had a negative effect on yield. Alar increased yield 19.75% and starch content, 26.3% over the unsprayed control. At 250 and 500 ppm, ethephon increased yields 17.9 and 20.3% and starch content, 31.8 and 95.5%, respectively. Except for Phosphon-D, these treatments reduced ascorbic acid content. (Summary by CIAT).

313. SHANMUGAM, A. and C. SRINIVASAN. 1973. Influence of ethephon on the growth and yield of sweet potato *Ipomoea batatas* Lam. Horticultural Research, 13: 143-145.

Application of ethephon (2-Chloroethyl phosphoric acid) at 250 ppm to the foliage of sweet potato plants 15, 30 and 45 days after planting increased the number and over-all yield of tubers and reduced the fresh weight of foliage. Application of ethephon to the roots was less effective in increasing tuber yield. (Authors' abstract).

314. SIMONS, Jr. H. M. and L. E. SCOTT. 1952.
Attempts to inhibit sprouting of the sweet potato with growth regulating chemicals. Proceedings of the American Society for Horticultural Science, 59: 426-432.

The use of maleic hydrazide (MH), the methyl ester of alphanaphthaleneacetic acid (MENA), and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) as preharvest foliar sprays or as dip root treatments failed to cause any strongly inhibitory effect on sprout production of sweet potatoes under the conditions of these tests. The foliar sprays of 2,4,5-T caused injury to both foliage and storage roots. Roots from plants receiving foliar sprays of MH produced sprouts with distorted stems and leaves. The treatments had no effect on dry matter, sugar, or alcohol-insoluble solids content of the roots.

314(a) THOMASON, I. J. and H. E. McKINNEY. 1961.
Sweet potato production on soil treated with soil fumigants. Plant Disease Reporter, 45: 497-499.

Total yield of Velvet sweetpotatoes was reduced on soil treated with 1.5 gallons/acre of dibromochloropropane (DBCP), but not at dosages of 0.75, 1.0 or 1.25 gallons/acre, when applied to sandy loam soils 3 to 4 weeks prior to planting. Soil fumigation with DBCP, dibromoethane (EDB) and dichloropropene (Telone) increased yields of U.S. No.1 roots, with the largest increases occurring on soil treated with EDB and Telone. (Authors' summary).

315. TOMPKINS, D. R. and R. D. HORTON. 1973.
Plant production by sweet potato roots as influenced by ethephon. HortScience, 8(5): 415-416.

Roots of 'Centennial' and 'Julian' sweet potato *Ipomoea batatas* (L.) Lam. treated with (2-chloroethyl)-phosphonic acid (ethephon) and bedded after removal from 15.5°C storage, consistently produced more early plants in electric hotbeds than did untreated roots. The ethephon treatment also increased midseason production of plants in some tests. Plants from ethephon-treated roots were of the same height and weight as controls in many of the tests. Treating roots with ethephon and then presprouting before bedding did not increase plant production over that of presprouting alone. Early plants from ethephon-treated roots transplanted as well as controls in field tests.

F. 7. Irrigation Effects

316. CONSTANTIN, R. J., T. P. HERNANDEZ and L. G. JONES. 1974. Effects of irrigation and nitrogen fertilization on quality of sweet potatoes. Journal of the American Society for Horticultural Science, 99(4): 308-310.

Whenever supplemental irrigation was applied to sweet potatoes root quality was reduced. Dry matter content, color of both fresh and processed sweet potatoes, firmness of the canned product, and percent protein decreased as the moisture content of the soil increased. Moisture content had little or no influence on fiber content or cortex thickness of fleshy roots. Nitrogen levels also influenced quality factors. As N levels increased there was a reduction in flesh color and increases in protein content and firmness of the canned potatoes. Nitrogen had little effect on fiber content, dry matter content or cortex thickness. Yearly variations occurred for dry matter content, fiber content, firmness of the canned product and flesh color.

317. HERNANDEZ, T. P. and T. HERNANDEZ. 1969. Irrigation to increase sweet potato production. In E. A. Tai, W. B. Charles and P. H. Paynes, et. al. eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 2 - 8 April, 1967. Vol.1. pp.III-31-36.

Irrigation studies reported here were conducted on a Richland silt loam soil at the Sweet Potato Research Center, Chase, Louisiana for several years to determine the effects of supplemental irrigation on sweet potato production. The results showed that the water requirements for high fleshy root production varied during any growing season. Usually, sweet potato transplants have little or no feed (or fibrous) roots at the time of planting. If the soil contains available soil moisture with soil temperature above 70°F in the top soil where the feed roots develop first, the root system grows rapidly, whereas, if the soil moisture is very low, the roots develop poorly. Sweet potato required an average of 0.10 acre-inch of water per day in the early part of the growing season. This

gradually increased to as much as 0.25 acre-inch of water in mid-summer, depending on the stage of plant growth, temperature, humidity, wind and other environmental factors. High soil moisture levels over a period of several days, 40 to 50 days after transplanting - especially with good fertility, can cause sweet potato plants to become excessively vegetative at the expense of storage root formation and growth. Drought approximately 40 days after transplanting of sweet potatoes, allowing the soil to drop much below 20 per cent available moisture for a few weeks before fleshy root set, caused great reduction in yield. Also, droughts in the latter part of the growing season will slow down fleshy root growth and reduce yields of marketable roots. The use of irrigation water in 1953 - 1956 produced an average increase of 154 bushels of marketable sweet potato roots per acre or an increase of approximately 23 bushels for each acre-inch of irrigation water used. Supplemental irrigation significantly increased sweet potato yields in 1964 and 1965. However, there was no response of sweet potato to nitrogen levels used.

318. JONES, S. T. 1961.
Effect of irrigation at different levels of soil moisture on yield and evapotranspiration rate of sweet potatoes. Proceedings of the American Society for Horticultural Science, 77: 458-462.

Sweetpotatoes irrigated whenever the available soil moisture fell to 20% of the total available capacity produced as high yields of U.S. No.1 grade sweetpotatoes as did those irrigated at higher levels of soil moisture. There was no stage of growth when available moisture levels above 20% resulted in increased yield. Irrigating at 20% available moisture required approximately 15 inches of water and an average of 6.5 irrigations for the season. Evapotranspiration losses were approximately the same as the potential evapotranspiration predicted by Penman's formula during the middle of the growing season, but considerably less both early and late in the growing season. From data presented it seems feasible that growers might predict irrigation needs of sweetpotatoes by a system based on evapotranspiration data. Fifty-one per cent of all the roots in the top 4 feet of soil were within the top 9 inches and 81% within the top 18 inches.

319. LAMBETH, V. N. and L. E. PETERSON. 1970.
Soil moisture relationships and irrigation (in sweet potatoes). In Thirty Years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series Bulletin: (U.S.A.), No.159: 29-32.

This report indicates that the development of practical, rapid methods for field measurements of available soil moisture has facilitated investigations in (1) correlating crop response with soil moisture, (2) determining rates of water utilization, and (3) tracing relative moisture movement. Much of the research had been directed toward finding how to keep the soil wet and, more recently, toward determining the depth of effective rooting and how deep the soil should be wetted. The research reported here describes more precisely these relationships for sweet potato. It covers the following aspects: water requirements and water loss, depth of rooting, determining irrigation frequency and amounts, and yield and quality responses to irrigation.

320. LANA, E. P. and L. E. PETERSON. 1956.
The effect of fertilizer-irrigation combinations on sweet potatoes in Buckner coarse sand. Proceedings of the American Society for Horticultural Science, 68: 400-405.

A split-plot irrigation-fertilizer study was conducted from 1952 through 1954. Irrigation rates were used as the main plots and consisted of 1 inch of water applied every seven days and 1 inch of water applied every three to four days if rainfall did not supply these amounts. The sub-plots consisted of fertilizer treatments derived from utilizing a 3-9-18 fertilizer ratio at 700, 1200, or 1700 pounds per acre and designed as a 3 x 3 x 3 factorial. Varying seasonal rainfall necessitated different amounts of irrigation in each year. Continuous irrigation appeared to be most efficient for production of high yields. The irrigation level of 1 inch each seven days, if rainfall did not supply this amount, produced yields as good as those produced under the heavier irrigation treatment of 1 inch of water each three to four days. Water applied at the rate of 1 inch each seven days maintained the field water capacity up to almost 50 per cent of available moisture. Fertilizers produced the greatest yields of No.1 and total yields at the 1700-pound rate of nitrogen and potash. Phosphorus was most efficient at the 1200-pound rate. The gross effect of fertilizers was an increase of the yield of

No.1 sweet potatoes. No.2 yields of sweet potatoes were not significantly affected by fertilizer rates except for nitrogen in 1952. There were no significant fertilizer by irrigation level interactions in the single season or combined data.

321. NANDPURI, K. S., R. S. DHILLON and S. SINGH. 1971. The influence of fertilizers and irrigation on growth and yield of sweet-potato. Indian Journal of Horticulture, 28(2): 139-143.

The studies revealed that as the nitrogen application was increased from 28 kg to 56 kg/ha. there was a corresponding increase in the total vine growth, root size and yield. By increasing nitrogen dose from 56 kg to 84 kg there was slight increase in the vegetative growth but yield was decreased. Application of potash and various irrigation intervals did not affect the top growth and root development significantly. Among the various interactions I x K affected only root circumference. Combination of potash 34 kg with 7 days and 5 days interval and without potash with 5 days and 3 days interval were equally effective for increasing the root thickness. The interaction I x N x K affected number of roots per plant and length and thickness of roots. The best combinations for these characters were nitrogen 84 kg, potash 34 kg with 3 and 7 days interval and nitrogen 84 kg without potash with 5 days interval. (Authors' abstract).

322. PETERSON, L E. 1961. The varietal response of sweet potatoes to changing levels of irrigation, fertilizer and plant spacing. Proceedings of American Society for Horticultural Science, 77: 452-457.

A study of main effects and interactions of irrigation level, variety and fertilizer application was conducted in a split plot design over a 3-year period. Irrigation treatments when rainfall was inadequate consisted of ½ , 1 and 1½ inches of water applied at weekly intervals. The application of 1 inch at weekly intervals appeared to be efficient for production of high yields. Production under this treatment was as high as with 1½ inches weekly. Reducing the applied water to ½ inch each seven days gave highly significant yield reductions during the prolonged hot, dry weather period in 1955. On the basis of 3-year averages of varieties at 1 irrigation level, there

were no significant yield differences between Orlis and Nemagold at the higher water levels. However, Nemagold produced significantly higher yields than Orlis at a weekly irrigation level of ½ inch. The overall effect of increasing the fertilizer level from 700 to 1200 pounds of 3-9-18 per acre was small. No significant fertilizer interactions were found in the single season data or in the combined data. Spacing the plants 15 inches in the row, as compared with 21 inches, generally increased the yields per acre. The varieties Nemagold, Goldrush and Kandee responded more to the close spacing than did Orlis.

F. 8. Seasonality

323. BADILLO-FELICIANO, J. 1976.
Effect of planting season on yield of sweetpotato cultivars. Journal of Agriculture of University of Puerto Rico, 60(2): 163-171.

Nine sweetpotato cultivars were evaluated in six bimonthly plantings on a Coto clay (Oxisol) to determine effect of planting season on yields. All crops were harvested 5 months after planting. The tests included the white-fleshed cultivars Miguela, Mina, Chardon, Poncena, and Blanquita, and the Yellow-fleshed Gem, Cobre, L 963-3, and R 59-36. Maximum yields of roots, either white-or yellow-fleshed, were obtained from November 1973 plantings. Yields from March or May 1974 planting generally were low. Of the white-fleshed cultivars, Miguela and Mina were consistently high yielders. Peak yields from cultivars Poncena and Blanquita were obtained from November 1973 plantings and low yield from July 1973 and May 1974 plantings. Chardon made poor yield throughout the year. Gem produced high yields throughout the year and seemed to be less photosensitive than the other three yello-fleshed cultivars. Cultivar R 59-36 seemed most affected by day-length with peak yield from the November planting and the lowest yield were obtained during 1971-72 and the lowest 14.6 tons/ha during 1968-69. The highest Blanquita yield (34.1 tons/ha) was obtained during 1970-71. At Fortuna, the highest Miguela yield (39.1 tons/ha) was obtained

during 1971-72. Mina reached its production peak during 1972-73 with 28.3 tons/ha. However, Poncena's 32.9 tons/ha were obtained during 1971-72. Chardon peak yield (27.8 tons/ha) was obtained during 1969-70, and Blanquita's 33.0 tons/ha was obtained during 1971-72. (Author's summary).

324. HUETT, D. O. and G. H. O'NEIL. 1976.
Growth and development of short and long season sweet potatoes in sub-tropical Australia. Experimental Agriculture, 12(4): 385-394.

The growth and development of a short-season sweet potato (Nemagold) and a long-season cultivar (White Maltese) were compared quantitatively in sub-tropical Australia and also with growth data for Nemagold in a temperate environment. Total and storage root dry matter production (DMP) followed autocatalytic equations, with similar whole plant DMP from planting to week 25 for both cultivars but plateauing (at 90% of asymptotic weight) at week 23 for Nemagold (448 g) with favourable temperatures and at week 38 for White Maltese (813 g) when temperatures were unfavourable. Storage root DMP of Nemagold plateaued at week 23 (246 g) and at week 36 (219 g) for White Maltese. Data are given on other attributes and on phasic development.

324(a). PURCELL, A. E., D. T. POPE and W. M. WALTER, Jr. 1976.
Effect of length of growing season on protein content of sweet potato cultivars. HortScience, 11(1): 31.

Protein and dry matter contents were determined for 16 cultivars of sweet potatoes *Ipomoea batatas* (L.) Lam. planted May 28 and harvested on 4 different dates. Means of protein contents of cultivars differed significantly and ranged from 4.17% to 6.51%, dry basis. Protein content decreased at the rate of 0.006% per day and dry matter decreased at the rate of 23% per day.

325. YONG, C. W. 1970.
Effects of length of growing season and NPK fertilizers on the yield of five varieties of sweet potatoes *Ipomoea batatas* Lam. on peat. Malaysian Agricultural Journal, 47(4): 453-464.

Three experiments on the performance of five varieties of sweet-potatoes on acid peat as affected by length of growing season and NPK fertilizers are described.

The order of decreasing yield of fresh tubers for the five varieties was Serdang 1, Large White > Kangdong 58 > Keledek Biru > Centennial. (The order of decreasing tuber quality is the reverse of this). That of vine yields was Kangkong 58 > Keledek Biru > Large White > Serdang 1, Centennial. The longer the plants were allowed in the ground (up to a maximum of 5 1/2 months) the higher the yield of tubers and the lower the production of vines. The NPK fertilizers suitable for sweet-potatoes on virgin peat should consist of 20-40 lb of N, 25 lb of P_2O_5 and 60-120 lb of K_2O per acre.

F. 9. Herbicidal Weed Control

326. BARRY, J. R. and H. S. DE VALCOURT. 1975. Efficacy studies with devrinol for weed control in transplanted tomatoes, peppers, eggplants and sweet potatoes. HortScience, 10(2): 6.

During the spring of 1974 Devrinol (common name: napropamide) was tested for its efficacy as an herbicide for transplanted tomatoes, peppers, eggplants and sweet potatoes. Experiments were conducted on a Richland silt loam soil at the USL Horticulture Farm. Devrinol rates ranged from .5 to 2 lbs ai/A as ppi treatments and from 1 to 4 lbs ai/A as pes treatments. The high rates for each method of application proved most effective in terms of weed control. Yields and crop vigor ratings for sweet potatoes were not significantly influenced by herbicide treatments.

327. HERNANDEZ, T., W. O. DRINKWATER and L. E. PETERSON. 1970. Herbicides (in sweet potato). In Thirty Years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series Bulletin, (U.S.A.), 159: 33-35.

It is reported that following herbicidal chemicals for the control of grasses and broadleaf weeds in sweet potato were tested and recommended: CIPC, Randox, Alanap 10 G. all at the rate of 6 lbs active material per acre as a blanket application, applied as post-planting sprays before weed germination and emergence. Other recommended herbicides for the crop include diphenamid (Eride or Dymid), Amiben and

Dacthal applied on a band or blanket basis. The rates and other requirements are presented too.

328. KASASIAN, L. and J. SEEYAVE. 1969.
Weed control in root crops grown in the West Indies. In E. A. Tai, W. B. Charles, P. H. Haynes, et al eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad, 2-8 April, 1967. Vol.2. pp.IV 20-25.

This paper reports further work on weed control in root crops undertaken by the authors. As for sweet potatoes several years' experiments had shown that the most promising treatments are mixtures of amiben with TCA or diphenamid applied immeidately after planting slips, or paraquat (using a spray shield to keep the spray off the crop) when vines were turned. A screening experiment, using a logarithmic sprayer, carried out early in 1966 suggested that propazine and Glembar were also promising treatments. The results of 2 replicated (x4) yield trials subsequently carried out later in 1966 are presented in table. It would appear that spraying with propazine either alone or in mixtures should be delayed for a few days following planting. The weed control requirements of the crop were also studied in a weed competition laid down towards the end of 1966. The results presented here in tables indicate that weeding should not be delayed as long as three weeks, since at four weeks a permanent set back has been caused.

329. MEISSNER, R. 1977.
Herbicidal weed control in sweet potato. Agroplantae, 9(1): 31.

Sweet potato cuttings *Ipomoea batatas* Poir. are normally planted during December when warm and moist weather conditions prevail. During this period weeds grow profusely. Mechanical or hand weeding adversely affects the rooting of the cuttings, hence the use of herbicides. Previous research has indicated that chlorthal, dichlobenil, diphenamid and trifluralin provide adequate weed control without injury to the crop (Taylorson, 1965; Welker, 1967; Peterson, Robbins & Weigle, 1972). Robbins & Peterson (1970) reported that chlorthal inhibited the formation of adventitious roots on vines, resulting in easier harvesting of the crop. It appears that all this work was done on sweet potatoes grown in unridged soil. This report deals with the evaluation of some herbicides suitable for use

on sweet potatoes. According to the two growing practices followed in South Africa, the cuttings were (1) grown in unridged soil. and (2) planted on small ridges which were earthed up four to five weeks after planting. The weed population consisted of approximately 60% of annual grasses, predominantly *Setaria pallidefusca*. The broadleaf weeds consisted mainly of *Chenopodium album*, *Datura stramonium*, *Schkuhria pinnata* and *Tribulus terrestris*. (Author's abstract).

330. PETERSON, L. E., M. L. ROBBINS and J. L. WEIGLE. 1972. Herbicidal control of weeds in sweet potato, *Ipomoea batatas* Poir. HortScience, 7(1): 65-66.

Dimethyletrachloroterephthalate (DCPA) and N,N-dimethyl-2, 2-diphenyl-acetamide (diphenamid) were effective herbicides for sweet potato on coarse sand soil. DCPA applied through a sprinkler irrigation system proved effective and reduced costs.

331. ROBBINS, M. L. and L. E. PETERSON. 1970. Reduction of adventitious root formation on sweet potato *Ipomoea batatas*, Vines. HortScience, 5(4): 317.

Dacthal (2,3,5,6-tetrachloroterepthalate), in addition to effectively controlling weeds in sweet potatoes, reduced adventitious root formation on runner vines, prevented fibrous root formation on crown stems, and caused enlargement of crown stems. Runners of plants in Dacthal-treated soil rooted down less, making harvesting the crop easier.

332. TAYLORSON, R. B. 1965. New herbicides for sweet potatoes. Proceedings of the American Society for Horticultural Science, 86: 517-522.

Six herbicides were applied on newly set sweet potato slips in Georgia. The herbicides EPTC at 7.5 lb/A, PPTC at 7.5 lb/A, diphenamid at 5 lb/A, and amiben at 4 lb/A gave satisfactory weed control without appreciable injury to sweet potato plants. Yields following herbicide treatments were generally equal to those of cultivated control plots, and storage and eating qualities of roots were not impared. Further studies are needed to ascertain the safety of DCPA as a post-transplanting treatment to slips and the safety of all the herbicides to vine cuttings.

F. 10. Mechanization and Harvesting

333. AUSTIN, M. E. 1970.
Various methods of harvesting sweet potatoes. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops , August 23-30, 1970, Honolulu, Hawaii and Kapaa, Kauai, Hawaii. Vol.I, pp.45-48.

If the sweet potato industry is to continue, some means must be found to replace as much of the harvest labor as possible. Much effort has been expended and progress has definitely been made. It appears that within a few years, machines will be commercially available to remove much of the labor from sweet potato harvest. (Author's summary).

334. AUSTIN, M. E. and B. GRAVES. 1970.
Mechanical harvesting of sweet potatoes. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops. August 23-30, 1970, Honolulu, Hawaii and Kapaa, Kauai, Hawaii, Vol.I, pp.44-45.

The John Bean sweet potato harvester was modified to allow a feeding conveyor, an expanding "V" sizer, and a No.1 sweet potato bulk loading conveyor to be added to the machine. The machine is described. Factors studied were accuracy of the roller and pinch bar assembly, the sizing unit and skinning damage due to the digging process and sizing operation. (Authors' summary abridged).

335. BELL, J. B. and M. E. AUSTIN. 1970.
Evaluation of hand and mechanical harvest of sweet potatoes. In Plucknett, D. L. ed. Proceedings of the Second International Symposium on Tropical Root and Tuber Crops, August 23-30, 1970, Honolulu, Hawaii and Kapaa, Kauai, Hawaii, Vol.I, pp.48-51.

Cost and quality comparisons were made between hand and mechanical harvesting of sweet potatoes using a case study on the Eastern Shore of Virginia. The methods used and results obtained are presented and discussed.

336. HUMPHRIES, E.G. and C.F. ABRAMS. 1975.
Mechanical vine-root separation of sweet potatoes. Transactions of the ASAE, 18(6): 1043-1046.

Studies of maximum force and direction of pull as related to vine-root separation of sweet potatoes indicated that up to 378 N of force was required for separation and that an inclined pull tended to reduce force requirements. Three basic mechanical devices (counter revolving cylinders, pneumatic tires, and transverse rollers) for separation of the vine-root system prior to digging were built and field tested. The transverse roller system was found to be capable of operating at or near the limit of separation attained in hand tests (90 + percent) and possessed operational advantages over the other two approaches.

337. JEFFERS, J.P.W. 1977.
Mechanization of yam and sweet potato production in Barbados. In: Cock, J,R., MacIntyre and M. Graham. eds. Proceedings of the International Society for Tropical Root Crops held in CIAT, Cali, Colombia, 1-7 August, 1976, Ottawa, IDRC. pp. 275-277.

A locally constructed planter and an imported transplanter were used to plant yam and sweet potatoes respectively on a field scale. Harvesting was carried out using a locally constructed harvesting-aid and an imported digger-elevator. The digger elevator was successful in sweet potatoes, but will have to be modified to work on yams.

338. POOLE, W.D., M.E. AUSTIN and J.R. HAMMERLE. 1970.
Mechanization (of sweet potato production). In: Thirty years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series, Bulletin, (U.S.A.), No.159: 80-87.

This report reviews the progress achieved towards the development of machinery and techniques for mechanization in the growing, harvesting and handling of sweet potatoes. Since the harvesting and handling of sweet potatoes have always required more man-hours than any other operation, the development of a "Sweet potato Combine Harvester" has been an objective of many researchers.

G. PESTS, DISEASES AND THEIR CONTROL

G. 1. Sweet Potato Weevil

339. BONFILS, J. and A.J. BART. 1969.
Distribution of sweet potato weevils in the French West Indies. In: E.A. Tai, W.B. Charles, P.H. Taynes et al., eds. Proceedings of the International Symposium on Tropical Root Crops... St. Augustine, Trinidad. 1967. Vol. 2: pp. IV 27-29.

The status of the sweet potato as a food crop in this area is outlined. The main insect pests of sweet potato there belong to three genera of the *Curculionidae* viz *Euscepes*, *Pavisacalles*, and *Cylas*. The bionomics of the weevils are given and the three species are discussed as they bear on the sweet potato in the area.

340. COCKERHAM, K.L. and P.K. HARRISON. 1952.
New sweet potato seedlings that appear resistant to sweet potato weevil attack. Journal of Economic Entomology, 45(1): 132.

The results of part II of research conducted between 1939 and 1946 and continued through 1950 on the resistance of new sweet-potato seedlings and varieties to attack by the sweet potato weevil, *Cylas formicarius elegantulus* (sum) are presented covering the two most promising sweet potato seedlings designated as L 187 and L 244.

341. COFFELT, J.A., K.W. VICK, L.L. SOWER. et al. 1978
Sex pheromone of the sweet potato weevil, *Cylas formicarius elegantulus:* laboratory bioassay and evidence for a multiple component system. Environmental Entomology, 7(5): 756-758.

The female sweet potato weevil *Cylas formicarius elegantulus* (Summers), produces a sex pheromone to which only males are responsive. A laboratory bioassay was devised to monitor isolation of the pheromone that was collected either from whole body extracts or from filter paper on which virgin female had rested. Females extracts could be separated into 3 distinct areas of sex pheromone activity by liquid chromatography. (Authors abstract)

342. JAYARAMAIAH, M. 1971.
Bionomics and control of sweet potato weevil *Cylas formicarius* (Fabricuius) Olivier. (Coleoptera: Curculionidae). Abstracts of thesis accepted for award of post-graduate degrees in the University of Agricultural Sciences, Bangalore. Mysore Journal of Agricultural Sciences, 5(2): 240.

Study of biology and control of the sweet potato weevil was undertaken during the period of July 1969 through July 1970. Observations made around Bangalore revealed that 16 to 40% of the tubers were infested in the field. Besides, the weevil was observed to feed and breed on *Thunbergia* sp. *Ipomoea barleirioides* and *Ipomoea acarica* in nature. The life-history and activities of the different stages of the weevil were studied in detail and described here.

An unidentified braconid parasite and a fungus *Beauversia* sp. was found parasitic on the grubs of the weevil. None of the varieties screened was found completely immune to the weevils. However, local varieties were found less susceptible to weevil damage. DDT, Trithion, dimecron, carbofuran,tobacco dust, and malathion were tested against the weevil and the results are given. (Author's abstract).

343. JAYARAMAIAH, M. 1975.
Studies on the chemical control of the sweet potato weevil, *Cylas formicarius* (Fabricius) Olivier (Coleoptera: Curculionidae). Mysore Journal of Agricultural Sciences, 9: 307-313.

In the preliminary study, six insecticides, namely DDT, carbophenothion, phosphomidan, carbofuran, tobacco dust and Malathion were applied in the field at two levels and in two methods (soil and foliar application). The results are presented.

344. SING, S.R. 1973.
Identification of resistance to and insecticidal control of sweet potato weevil, *Cylas puncticollis*. Third International Symposium on Tropical Root Crops, IITA, Ibadan. 2-9 Dec. 1973. Vol. 3: 8p. (Mimeo).

The paper reports studies on *C. puncticollis* in relation to varietal resistance in sweet potatoes; control of the weevil by foliar insecticide sprays; control of the weevil by soil insecticides; comparative root yield of six selected sweet-potato varieties with and without insecticide protection. All the studies were conducted under field conditions.

344(a). SOENARJO, R. 1976.
Resistance of sweet potato (*Ipomoea batatas* (L.) Lamb), cultivars to the sweet potato weevil *(Cylas punticollis* Boh) A dissertation.... Ibadan, the University. 178p.

A series of genetic and entomological studies on the 8 x 8 diallel cross in sweet potato was carried out at IITA, Ibadan, in 1976. From these studies, it was found that the heritability of field resistance was low. It was concluded from the results obtained that low heritability values of stem and tuber resistance and tuber depth indicated that environmental variance was more important in character expression for these three traits. Since tuber depth and carotene content were related to tuber resistance, selection for tuber resistance should be based on tuber depth and carotene content. However, the occurrence of negative correlation between tuber depth and yield would necessitate a careful utilisation of this principle in the selection of sweet potato cultivars by breeders. (Author's abstract modified).

345. WADDILL, V.H. and P.A. CONOVER. 1978.
Resistance of white-fleshed sweet potato cultivars to the sweet potato weevil. Hortscience, 13(4): 476-477.

Five cultivars and 34 selections of white fleshed and one breeding line of orange-fleshed sweet potatoes (*Ipomoea batatas* (L.) Lam.) were evaluated in field plots for resistance to the sweet potato weevil, *Cylas formicarius elegantulus* (summers). There were significant differences in susceptibility. The variation in weevil susceptibility offers possibility for developing resistant cultivars.

346. WOLFENBARGER, D.O., J.A. CORNELL and D.A. WOLFENBARGER. 1974.
Dispersal distances attained by insect populations of different densities. Researches on Population Ecology, 16: 43-51.

Different population categories of apterous green peach aphid, adult sweet potato weevils, mature Caribbean fruit fly larvae and tobacco budworm larvae were permitted to move on dispersion ranges in the laboratory. Determinations of distances dispersed by the larvae were made to show the effects of population sizes. In general, longer distances were dispersed by more individuals when larger numbers were released as compared with smaller ones. (Authors' abstract).

347.

G. .2. Other Insect Pests

348. HAMILTON, M.G. and R.P. GRIFFIN. 1979.
Sweet potato soil insect and nematode control investigations. Hortscience, 14(2): 123.

Broadcast preplant (PP) application (Al/ha) of 2.24 kg chlorpyrifos, 4.48 kg oftanol, 4.48 kg fonofos or 6.72 kg ethoprop provided very good control of the wireworm, *Conoderus* spp., cucumber beetle, *Diabrotica* spp., and elongate flea beetle, *Systena elongata*, (WDS) insect complex in sweet potato soils. The first three treatments also provided very satisfactory control of sweet potato flea beetles (SFB). The results are discussed.

349. HILDEBRAND, E.M. and F.F. SMITH. 1956.
Aphid transmission of sweet potato cork virus in the greenhouse. Phytopathology, 46(8): 468.

Internal cork virus has been transmitted by *Myzus persicae* (Sulz) from sweet potato to sweet potato, from *Pharbitis diversifolia* to scarlett O'Hara morning story, from scarlett O'Hara to scarlett O'Hara and from sweet potato to scarlett O'Hara. *Macrosiphum solanifolii* also transmitted the virus. The method and results are given.

350. KANTACK, E.J. and F.P. CUTHBERT, JR. 1970.
Insects (of sweet potatoes). In: Thirty years of cooperative sweet potato research. Southern Cooperative Series, Bulletin, (U.S.A), No.159: 72-79.

The summary of results from studies made since 1959 attempting to correlate various insect species with amounts of injury is presented. Such studies were stimulated by knowledge of fluctuation of populations of insect species affecting sweet potatoes. The results of biological findings are reviewed together with chemical control practice and research.

351. KANTACK, E.J., MARTIN, W.J. and L.D. NEWSOM. 1960.
Relation of insects to internal cork of sweet potato in Louisiana. Phytopathology, 50: 447-449.

Caged and uncaged plants in mother beds and field plantings indicated that the majority of spread of internal cork virus from sweet potato plant to sweet potato plant occurs in field plantings. Results of tests conducted, related time of maximum field infection with peak flights of cotton aphid, *Aphis gosypii*.

352. KUSHIDA, T. and K. KATAGIRI. 1975.
Infection of *Aedia leucomelas* L. (Lepidoptera: Noctuidae) by an *Entomophthora* species of the "Grylli" type in Japan. Applied Entomology and Zoology, 10(3): 226-230.

Field observations of an epizootic in *Aedia leucomelas* L. by an *Entomophthora* sp. of the "grylli" type were conducted during the autumn of 1974 in many fields of sweet potato in the Kanto District of Japan. Greater than 99% of the larval population was killed by the fungus. Most of the dead larvae were found at elevated parts of the plants. The infected larvae died within 9 days. The morphological characters of the fungus were similar to those of *Entomophthora grylii* FRES. (Authors' summary)

353. PARRELLA, M.P. and L.T. KOK. 1977.
The development and reproduction of *Badellia sommulentella* on hedge bindweed and sweet potato. Annals of the Entomological Society of America, 70(6): 925-928.

Badellia sommulentella (Z.) is a leaf miner found on hedge bindweed (*Convolvulus sepium* L.) in southwestern Virginia from Sept. through Oct. its life history is described.

354. PATEL, H.K., J.R. PATEL and S.N. PATEL. 1973.
Bionomics and control of sweet-potato tortoise beetle *Cassida circumdatta* Hbst. (Cassididae: Coleoptera). Pesticides, 7(8): 41-42.

Cassida circumadatta Hbst. is a pest on *Ipomoea batatas* Lam. The larvae and adults are destructive to the leaves during monsoon. Information on the life history and various stages has been given. The development from egg to adult took on an average 83.69 days. Laboratory trials on the control indicated that endosulfan 0.05%, endrin 0.02% emulsion spray and BHC 5% dust were found best amongst all the insecticides tried in controlling the larvae and adults after 24 hours. The economics of the insecticides are also presented. (Authors' abstract).

355. SCHAEFERS, G. and E.R. TERRY. 1976.
Insect transmission of sweet potato disease agents in Nigeria. Phytopathology, 66: 642-645.

Two infective agents have been separated from a sweet potato disease complex in Nigeria. One is a nonpersistent virus a filamentous rod (850 nm)) which is transmitted most efficiently by the aphids *Myzus persicae* and *Aphis gossypii*

and less efficiently by *A. citricola*. It is latent in sweet potato, but produces marked veinclearing and leaf twisting in *Ipomoea setosa*. Following infection, symptoms disappear after about eight new leaves are produced. The disease is referred to as sweet potato veinclearing. The second agent is transmitted by the whitefly, *Bemisia tabaci*. It also is latent in the sweet potato cultivars tested. In *I. setosa* it produces mild chlorosis and severe stunting of the plant. The disease is referred to as sweet potato chlorotic stunt. In combination, the two disease agents produce severe symptoms in sweet potato. Depending on the cultivar, veinclearing, puckering, leaf strapping, chlorosis, and stunting may occur. Dual infection in *I. setosa* results in stunting, severe chlorosis followed by necrosis of older infected leaves, and a severe reduction in leaf lamina. (Authors' summary).

356. SHEFFIELD, F.M.L. 1954.
Erinose of sweet potato. Empire Journal of Experimental Agriculture, 22(86): 97-101.

Excessive hairiness, often completely covering the stems and leaves, is the most obvious symptom of this disease (Erinose), which is widespread in parts of Africa. Plants are stunted, stems are thickened, and axillary buds, after prococious development, either cease to grow or are killed. The disease is highly contagious. Mites, of the genus *Aceria* (Keifer) of the family *Eriophyinae* (Nal), are shown to be the direct cause of the disease. (Author's abstract).

357. TYSOWSKY, Jr., M. 1971.
The sweet potato flea beetle: its subterranean damage, ecology and control (Coleoptera: Chrysomallidae). Dissertation. London, University Microfilms International. 79p.

A new problem concerning subterranean insect injury to sweet potato roots arose in the early 1960's on the eastern shore of Maryland. The damage most commonly encountered was a series of narrow, winding groves on the root which is often referred to as "writing". This damage was thought to have been caused by the larval stage of the sweet potato flea beetle, *Chaetocnema confinis*.

Experiments were designed to learn more about the life habits, seasonal abundance, life conditions which enhance injury and methods for control of the sweet potato flea beetle in Maryland.

358. WEBB, R.E. and R.H. LARSON. 1954.
Mechanical and aphid transmission of the feathery mottle virus of sweet potato. Phytopathology, 44: 290-291.

Mechanical and aphid-transmission studies of the feathery mottle virus were initiated to determine its possible relationship to a sweet potato virus occurring in Wisconsin and Louisiana. The feathery mottle virus proved mechanically transmissible to sweet potato varieties Porto Rico Unit 1, Texas Bunch, Georgia Bunch, Ranger, and L240 and aphid-transmissible to Porto Rico Unit 1, Texas, Bunch, and Georgia Bunch. Also, the virus was found to be transmitted to new plants through the fleshy roots.

Cross-protection tests indicated a close relationship between the feathery mottle virus and the naturally occurring sweet potato virus found in Wisconsin and Louisiana.

G. 3. Nematode Pests

359. BIRCHFIELD, W. and W.J. MARTIN. 1965.
Effects of reniform nematode populations on sweet potato yields. Phytopathology, 55: 497.

Soil fumigation studies in Louisiana were made in 1962-64 to determine effects of reniform nematode (*Rotylenchulus reniformis*, Linford & Oliveira, 1940) on production of sweet potato variety Porto Rico. The data indicate that damage to sweet potatoes by reniform nematodes may vary from light to severe depending on initial nematode population and seasonal increase of the nematodes.

360. BIRCHFIELD, W. and W.J. MARTIN. 1968.
Evaluation of nematocides for controlling reniform nematodes on sweet potatoes. Plant Disease Reporter, 52(2): 128-131.

Nematocides were evaluated during a 5-year period for control of the reniform nematode, *Rotylenchulus reniformis*, on sweet potatoes. Significant nematode control and higher sweet potato yields and grades were obtained with the nematocides listed in the paper. The injurious effects of reniform nematodes on sweet potatoes were greatest when population levels were high at planting time and increased during the growing season.

Nematocide treatments that reduced initial nematode populations and prevented their subsequent increase resulted in best yield and grade improvements of sweet potatoes.

361. BIRCHFIELD, W. and W.J. MARTIN. 1971.
New nematicide increases sweet potato grade. Louisiana Agriculture, 15(1): 3 and 16.

The author conducted seven tests for control of root knot nematodes, *Meloidogyne incognita*, and four tests for the reniform nematode, *Rotylenchulus reniformis* both of which cause severe damage to sweet potato in Louisiana. It was found that a nonfumigant nematicide, Mocap, registered in late 1969, gave efficient control of both nematodes at low rates, was easy to apply as a 10% granule, and could be placed on sweet potatoes without toxic effects to the plant.

362. JOHNSON, W.A. and E.J. CAIRNS. 1971.
Effects of different nematicides on yield and quality of Centennial sweet potato and root-knot nematode damage. Journal of the American Society for Horticultural Science, 96(4): 468-471.

Effects of different nematicides on yields of sweet potatoes and on root-knot nematode (*Meloidogyne incognita*) damage at two different locations were studied over a period of 3 years. Average yields of marketable size roots were significantly increased on Hartsells fine sandy loam from use of Penphene, D-D, Dowfume W-85, Telone, and Nellite; the increased yield from Furadan was nearly significant. All nematicides reduced the root-knot infection counts on steam-peeled roots and root-knot larvae per pint of soil at harvest. Furadan gave the best nematode control. Average yields were increased on Alaga sand from use of Penphen, D-D, D-D + SD14647, Vorlex, Furadan, Temik, and Mocap. Average root-knot infection counts and root-knot larvae per pint of soil at harvest were significantly reduced by all nematicides used; the greatest reductions followed applications of Temik, Mocap, Furadan, and D-D + SD14647.

362(a) KRUSBERG, L.R. and L.W. NIELSEN. 1957.
The influence of root-knot nematodes on the growth of Porto Rico sweet potato. Phytopathology, 47: 21.

The influence of *Meloidogyne incognita acrita* on the growth, yield, and quality of Porto Rico sweet potato was investigated. The difference in nematode populations in treated and non-treated soil decreased until at 10 weeks after treatment, and thereafter, there were no differences. In comparison with

plants grown in treated soil, those in non-treated soil had larger root-knot indices, smaller top and root weights, and fewer enlarging roots, in addition, roots formed were more severely malformed and cracked.

363. KRUSBERG, L.R. and L. W. NIELSEN. 1958.
Pathogenesis of root-knot nematodes to the Porto Rico variety of sweet potato. Phytopathology, 48: 30-39.

Porto Rico sweet potatoes were planted in soil naturally infested with *Meloidogyne incognita acrita* to study the pathogenesis of this nematode in sweet potato. The methods applied and the results obtained are described.

364. LUC, M. and G. DE GUIRAN. 1960.
Nematodes associated with palnts in West Africa. A preliminary list. [Les nematodes associés aux plantes de l'quest Africain. Liste préliminaire]. L'Agronomie Tropicale, 15(4): 434-449.

Nine kinds of plant parasitic nematodes affecting sweet potato were identified in soil samples collected from french speaking West African countries and Ghana by the nematology laboratory of IDERT in Adiopodoume in Ivory Coast. [Le laboratoire de nématologie de l'IDERT, Adiopodoume (Côte d'Ivoire), a effectué des centaines d'analyses de sol en vue de la recherche des nématodes phytoparasites provenant de quelques pays de l'Ouest Africain.Chez *Ipomoea batata* (Lam.) (Convolvulacees) il en s'agit de neuf espèces].

365. MARTIN, W.J. 1960.
The reniform nematode may be a serious pest of the sweet potato. Plant Disease Reporter, 44(3): 216.

Results of recent greenhouse pot experiments indicated for the first time that the reniform nematode, *Rotylenchulus reniformis* (Linford & Oliveira) may cause severe damage to sweet potato, *Ipomoea batatas*.

366. MARTIN, W.J. 1962.
Controlling root-knot nematodes in sweet potatoes. Louisiana Agriculture, 6(1): 6-7.

The mode of infection of root-knot nematodes is briefly discussed, followed by a description of the three recommended phases of control: the mother root phase, the seedbed phase and finally the field planting phase.

367. MARTIN, W.J. 1962.
Elimination of root-knot nematodes from infested sweet potato roots and plants. Plant Disease Reporter, 46(1): 21-23.

Hot air treatment (50°C for 4-8 hours) of sweet potato variety Goldrush mother roots was effective in eliminating root-knot nematodes (*Meloidogyne incognita acrita*) from infested roots. O,O-diethyl O-2-pyrazinyl phosphorothioate (Cynem) as a dip for sweet potato plants at concentrations (active ingredient) of 1: 1600, 1: 2,400 and 1: 3,200 for 12 hours eliminated root-knot nematodes from infested plants. The same concentrations at ½ and 2 hours appear to have greatly reduced nematode populations in treated plants.

368. MARTIN, W.J. 1970.
Elimination of root-knot and reniform nematodes and scurf infections from rootlets of sweet potato plants by hot water treatment. Plant Disease Reporter, 54(12): 1056-1058.

Root-knot nematodes (*Meloidogyne incognita* group) and reinform nematodes (*Rotylenchulus reinformis*) in rootlets of 'Centennial' sweet potato plants were eliminated by placing the plants in water at 50°C for 3 to 5 minutes with comparatively light heat injury to the plants. Scurf (caused by *Monilochaetes infuscans*) was reduced in plants kept in water at 50°C for 5 minutes, and eliminated from plants held at 50° for 10 minutes. Plants held in water at 50° for 10 minutes suffered moderate to severe heat injury. (Author's abstract).

369. MORRISON, L.S. 1970.
Nematode diseases (of sweet potatoes). In: Thirty years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series. Bulletin, (U.S.A), No.159: 56-59.

It is reported that sweet potatoes are damaged by nematodes particularly some species of the root-knot group *Meloidogyne* which are parasitic on the crop. The host range, pathogenicity, and control of the nematodes infesting this crop have been investigated. Method of control considered include the use of resistant varieties, chemical control using nematicides and control by heat.

370. NIELSEN, L.W. and J.N. SASSER. 1957.
The relationship of nematocides, dosage, carrier and soil types to the control of root knot in sweet potato. Phytopathology, 47: 314.

Dowfume W-85 (1,2-dibromoethane) and D-D (1,3-dichloropropene; 1,2-dichloropropane) were applied in the row for control of root knot (caused by *Meloidogyne incognita acrita*) in sweet potato production. In a factorial experiment conducted for 2 seasons, the nematocides were applied at 0, 1/2, 1 and 2 times the recommended dosages of 10 gal/acre for D-D and 4 1/2 gal/acre for Dowfume W-85. The fumigants were applied at these dosages in 2 forms: liquids and impregnated on vermiculite. The experiments were located on light, intermediate and heavy soils infested with root knot nematodes. All treatments involving fumigants resulted in greater yields (than in non-treated plots) in light and intermediate soils but not in heavy soils. The fumigants impregnated on vermiculite were more efficient at the lower dosages than were the comparable liquid treatments, but they adversely affected yields at the high dosage. This effect on yield was most serious in heavy soil. Regardless of soil type, there was less cracking of sweet potato roots from treated plots than of those from untreated plots.

371. NIELSEN, L.W. and J.N. SASSER. 1959.
Control of root-knot nematodes, *Meloidogyne* spp. affecting Porto Rico sweet potatoes. Phytopathology, 49: 135-140.

Various soil nematocide treatments were investigated for 3 growing seasons in relation to Porto Rico sweet potato production and quality. *Meloidogyne incognita acrita* was the principal nematode species present in the soils studied. The methods and results observed are presented.

372 & 373.

G. 4 Fungal and Bacterial Diseases

374. ARENE, O.B. and A.O. NINAIKITI. 1978.
Sweet potato diseases in Nigeria. PANS, 24(3): 294-305.

In Nigeria only six pathogens were recorded on sweet potato in 1966. Between 1973 and 1977 about twenty were documented. These cause various foliage, stem, root and tuber diseases. They include diseases caused by *Albugo ipomoeae, Phaeoisariopsis bataticola, Pseudocercospora timorensis, Phyllosticta batatas, Septoria bataticola, Corticium sp., Elsinoe batatas, Meliola*

clavulata, Coleosporium ipomoea, Puccinia spp., Uromyces sp., Fusarium oxysporum, Plenodomus destruens, Sclerotium rolfsii, Rhizopus stolonifera, Monilochaetes infuscans, mosaic virus and internal cork virus. Detailed studies on the nature of the diseases incited under Nigerian conditions have not been carried out on most of the pathogens. However, there are indications that although the foliar diseases may not be of serious economic importance, the stem, root and tuber diseases may be major contributors to post-harvest loss, a common problem in root and tuber production in Nigeria. (Authors' summary).

374(a)AVILA, M.G. 1972.
Algunos estudios sobre *Sclerotium rolfsii* en Cuba. Revista de Agricultura (Cuba), 5(2):

Pathogenecity of *Sclerotium rolfsii* Sacc. in fleshy roots of sweet potato was confirmed. Two different forms of the fungus were determined in regard to size and color of *Sclerotia.*

Information was gathered from different studies in the world about the control of this pathogen. (Author's abstract).

375. BARRY, J.R. and W.J. MARTIN. 1967.
Effects of plant-bed application of 2,6-dichloro-4-nitroaniline on control of sclerotial blight and on plant production in sweet potatoes. Plant Disease Reporter, 51(3): 191-194.

The results of three experiments indicated that 2,6-dichloro-4-nitroaniline (DCNA) was effective in controlling sclerotial blight, caused by *Sclerotium rolfsii* in sweet potato plant beds. In each experiment a different variety was used as bedding stock and different rates of DCNA were tested. The superior plant production and the greater weight per plant resulting from DCNA treatments indicated a high level of tolerance to the fungicide by the sweet potato varieties tested. (Authors' abstract).

376. CHUN, J.K. 1968.
Biochemical study on soft-rotted sweet potatoes. Journal of Korean Agricultural Chemistry Society, 10: 47-61.

Sweet potato infected by soft-rot, *Rhizopus nigricans,* has been investigated for its biochemical changes. The results of the present experiment are summarized as follows: (1) From the soft-rotted tuber, nineteen Ehrlich's positive substances and 3 fluorescent compounds which had not been found in a healthy tuber were detected with thin layer chromatography.

(2) Ipomeamarone and umbelliferone, each of which are predominating substances among the Ehrlich's positive and fluorescent compounds, were isolated by silica gel column chromatography and studied for their identities. (3) Time course biosynthesis of the metabolites was studied and discussed for their possible biosynthetic pathways. (4) Among the metabolites, ipomeamarone and ipomeamarone-like substances have enzyme inhibitive action against α-amylase and probably other enzymes; the inhibition type was determined as the uncompetitive one. (5) Impomeamarone obtained from soft-rotted sweet potato was proved to have an uncoupling action as 2,4-dinitrophenol. (Author's summary).

377. DABEK, A.J. and C. SAGAS. 1978.
Witches broom chlorotic little leaf of sweet potato in Guadalcanal, Solomon Islands, possibly caused by mycoplasma-like organisms. Phytopathologische Zeitschrift (Journal of Phytopathology), 92(1): 1-11.

Sweet potato (*Ipomoea batatas* L. Lam.) cv. Gina is sporadically affected by a disease on Guadalcanal, Solomon Islands, which causes a reduction in leaf size, chlorosis, stunting and axillary shoot proliferation. Plants affected early in the growing period often defoliated extensively and yielded no tubers. We propose to call the disease witches broom chlorotic little leaf (WBCLL). The consistent presence of mycoplasma-like organisms (MLO) in diseased but not healthy phloem tissue, the suppression of symptoms with tetracycline but not penicillin and the disappearance of MLO in recovered tissue suggests that they are the causal agents. The disease was transmitted by grafting but not by mechanical means, aphids or four species of hopper. During grafting experiments three sweet potato cultivars other than cv. Gina were shown to be highly susceptible to WBCLL; one was slightly susceptible and two seemed resistant.

At least one of the latter cultivars may be immune. *Ipomoea setosa* Ker. stocks were always killed when grafted with WBCLL scions. WBCLL is discussed in relation to similar sweet potato diseases in other areas. (Authors' abstract).

378. DAINES, R.H. 1955.
Sweet potato scurf control studies in New Jersey. Plant Disease Reporter, 39(10): 739-745.

Sweet potato scurf (*Monilochaetes infuscans*) is more severe and difficult to control in heavier soils than in sandy loam.

Data are presented that show seed sweet potato dip treatments, soil (in plant bed) treatments, and sprout treatments to be of

aid in the control of sweet potato scurf.

Of the sweet potato seed treatments used in these tests, ferbam and thiram were most effective. Although borax 1 pound to 5 gallons water showed considerable promise in the control of scurf, it occasionally produced injury as expressed in retarded sprout emergence and blackened leaf margins. Borax at a lower dilution (1-10), while not effective against scurf, did not produce the injury here noted. The degree of control provided by Semesan Bel (1-7 1/2) in sassafras loam was disappointing.

Ferbam, at the rate of 500 pounds per acre, worked into the soil in the plant bed, proved to be effective in the control of scurf.

Of the sprout treatments used, Tersan (thiram) (1 or 2-5) and Fermate (ferbam) (1 or 2-5) proved to be most satisfactory.

379. DUKES, P.D. and A. JONES. 1979.
Production, standardization and longevity of inoculum of *Fusarium oxysporum* f. sp. *batatas*, the sweet potato wilt pathogen. Hortscience, 14(2): 123.

Techniques for production, preparation and standardization of inoculum of the sweet potato *Fusarium* wilt (stem rot) pathogen, *Fusarium oxysporum* f. sp. *batatas* (FOB), were developed. These techniques are reliable and allow wilt evaluations to be made readily in the greenhouse. The longevity of composite inoculum of FOB was also tested at weekly intervals for 8 weeks in pathogenicity studies. The inoculum, consisting of 10^5 propagules/ml in an aqueous suspension, was kept at 8 C. Spore counts and germination data were collected weekly. Effectiveness of the stored inoculum was carefully tested by inoculating sweet potato varieties and lines that have known reactions. In these tests the inoculum remained viable and adequate for selecting resistant lines for at least 8 weeks.

380. HAARD, N.F. and P.D. WEISS. 1976.
Influence of exogenous ethylene on ipomeamarone accumulation in black rot infected sweet potato roots. Phytochemistry, 15(2): 261-262.

Ipomeamarone accumulation in sweet potato (*Ipomoea batatas*) roots infected with *Ceratocystis fimbriata* (black rot) was decreased by one-third when roots were stored under 100 ppm ethylene. This effect of ethylene was not observed when infected tissue was also treated with benzylisothiocyanate. Ethylene treatment and long term infection were associated with

the accumulation of 4-ipomeanol and 1-ipomeanol. (Author's abstract).

381. HOOKER, W.J. and L.E. PETERSON. 1952.
Sulfur soil treatment for control of sweet potato soil rot incited by *Streptomyces ipomoea*. Phytopathology, 42: 583-591.

Soil rot is an important disease of sweet potatoes in the sandy soils of southeastern Iowa. Many fields have been abandoned for further sweet potato culture because of the disease. Reduced stands and plant vigor result from the attack of *Streptomyces ipomoea* on the fibrous roots and lower stems. Fleshy roots are disfigured by the lesions and often distorted.

Sulfur as a soil treatment was effective in controlling the disease. Total yields and plant vigor were often increased following sulfur treatment and the appearance of the fleshy roots was appreciably improved. Although disease was present in soils with pH as low as 4.7 practical control was usually obtained somewhere around pH 5.0. In these soils, total yields and plant vigor were adversely affected at approximately pH 4.0.

The 800 lb sulfur rate provided conditions for optimum plant growth and satisfactory disease control. Maximum soil rot control was obtained with 1200 lbs. of sulfur, but in certain locations this rate was above the optimum for plant growth. Disease control was not satisfactory with 400 lbs of sulfur.

There was no evidence that stem rot (*Fusarium oxysporum* f. *batatas*) had been influenced by variation in hydrogen-ion concentration of the soil.

382. JONES, A. 1964.
A disease of pollen mother cells of sweet potato associated with *Fusarium moniliforme*. Phytopathology, 54(12): 1494-1495.

This is the first report of a disease of sweet potato pollen mother cells, and to the author's knowledge, the first such report for any plant species. Because of the consistent association in preliminary investigations of *F. moniliforme* with the disease symptoms, this fungus is suspected as being the causal organism. If this suspicion is correct, the disease may be widely spread in the tropical and subtropical areas of sweet potato production because of the widespread occurrence of *F. moniliforme*. Because of the lack of adequate checks, absolute proof that *F. moniliforme* is the causal organism has not been attained. (Author's abstract).

383. JONES, A., P.D. DUKES and F.P. CUTHBERT, JR. 1977.
Pesticides increase true seed production of sweet potato. Hortscience, 12(2): 165-166.

Application of systemic fungicides to sweet potato (*Ipomoea batatas* (L.) Lam.) increased the total number of healthy seed harvested 50% by increasing pod set, number of seed per pod and the proportion of healthy seed. Insecticides aldicarb and naled gave dramatic responses and increased the number of seedlings obtained per parent plant 2- to 5-fold. Insect damage appeared to be an important cause of low seed set and low seed quality in sweet potato. (Authors' abstract).

384. JONES, A. and C.R. JACKSON. 1968.
Fungi from floral parts of sweet potato. (*Impomoea batatas* (L.) Lam.). Hortscience, 3(2): (2p.)

This study provides information on the fungi of sweet potato floral parts and preliminary results of their effect on seed set. Fungicides should increase seed set if low seed set is due to diseases, such as the pollen mother cell abnormalities associated with *Fusarium moniliforme* (Sheldon) Emend. Snyd. & Hans. In 1965 a test was conducted to determine the fungi present in and on floral parts and the effect of chemical control of these fungi on seed set. *Fusarium moniliforme* was isolated more frequently than other fungi from all floral parts, and although its occurence was reduced by all treatments, none eradicated it.

Flowers setting pods and seed per pod were not increased by any treatment. Like-wise no change in bud abscission was detected. It appears that seed set is not improved by the application of fungicides, even when the frequency of various fungi is reduced. Therefore, disease organisms, do not seem to be a significant contributing factor to seed set.

385. KATO, C. and I. URITANI. 1976.
Changes in carbohydrate content of sweet potato in response to cutting and infection by black rot fungus. Annals of Phytopathological Society of Japan, 42: 181-186.

Changes in carbohydrate content were examined in cut tissue and *Ceratocystis fimbriata* infected tissue (diseased tissue) of sweet potato. Determination of carbohydrate in various layers from the surface toward inner part indicated that starch was more decreased in diseased tissue than in cut tissue at the corresponding layers, and starch degradation was gradually low toward inner part both in cut and diseased

tissues. The time course analysis of changes in carbohydrate showed that carbohydrate was metabolized sequentially i.e. reducing sugars were utilized firstly, sucrose secondly and starch, thirdly. Time course patterns were affected by the storage period. Ten month-stored tissue showed a less response to cutting or infection in terms of changes in carbohydrate content than two month-stored tissue. (Authors' abstract).

386. KIM, W.K. and I. URITANI. 1974.
Fungal extracts that induce phytoalexins in sweet potato roots. Plant & Cell Physiology, 15(6): 1093-1098.

Soluble extracts from mycelia and conidia of two strains of *Ceratocystis fimbriata* induced formation of terpenes in sweet potato root tissue. Factors inducing terpene formation are water- or 0.02 m KCl-soluble, heat stable, organic solvent-insoluble, and dialyzable, and have neither cationic nor anionic properties. They caused cellular injury of root tissue, accompanied by production of ethylene. (Authors' abstract).

387. KOCH, W. 1974.
Tropical tuber plants and their diseases. Nachrichtenol Disch Pflanzenschutzdienstes (Braunschw), 26(9): 129-135.

After a short description of the most important tropical and subtropical tuber crops: including sweet potato, camote: *(Ipomoea batatas), (Convolvulaceae)*, their virus, mycoplasmal, bacterial- and fungal diseases are compiled on the basis of the author's observations during six years of research work in Central America, many trips in the tropics and literature reports. (Author's summary modified).

388. KUC, J. 1972.
Compounds accumulating in plants after infection. In: Kadis, A., Ciegler and S.J. Ajl. eds. Microbial toxins, Vol. 8. Fungal toxins. New York, Academic Press. pp. 211-247.

The accumulation of compounds in plant tissue following stress or infection is a general and widespread observation. With respect to sweet potato, infection, injury, or treatment with mercuric chloride or iodoacetate all lead to the accumulation of chlorogenic acid, isochlorogenic acid, caffeic acid, scopoletin, esculentin, umbelliferone, and ipomeamarone in sweet potato root. The peel of sweet potato contains all of the above, including ipomeamarone at levels equivalent or greater than that produced by infected pealed tissue. Thus the stress metabolites are not unique as a response to infection, but reflect increased synthesis of compounds normally localised in

the peel of the root. Uritani and his co-workers have tried to elucidate the mechanism of resistance of some varieties of sweet potato root to *Ceratocystis fimbriata* the incitant of the black rot disease. They studied the compounds accumulating in susceptible and resistant roots after inoculation, the effect of these compounds on the growth and development of the fungus, and the metabolic alterations in the root associated with the synthesis and accumulation of the compounds.

389. MARTIN, W.J. 1949.
Coffee and sweet potato strains of *Ceratostomella fimbriata*. Proceedings of the Association of Southern Agricultural Workers, 46: 127.

Studies of a fungus obtained from the bark of a coffee plant indicated its similarity to *Ceratostomella Fimbriata*, which causes black rot of sweet potato. Cross inoculations were made on the two host plants with the coffee and sweet potato isolates. The coffee fungus did not cause black rot on sweet potato and the sweet potato fungus did not cause rotting of the bark of coffee seedlings. Although the coffee fungus is morphologically very similar to C. Fimbriata from sweet potato, the two fungi apparently are quite different genetically as evidenced by differences in pathogenicity and by the high degree of sterility in ascospores obtained from perthecia formed by mating self-sterile strains from these two hosts.

390. MARTIN, W.J. 1958.
Reaction of sweet potato varieties and seedlings to soil rot. Phytopathology, 48(8): 445-448.

Studies on varietal reaction to soil rot of sweet potato incited by *Streptomyces ipomoea* (Person and W.J. Martin) Waksm & Henrici, have shown rather clear-cut differences among varieties, selections, and breeding lines, ranging from very striking susceptibility (in Unit 1 Porto Rico, the principal variety planted in Louisiana) through some degree of tolerance (in the Heartogold and Acadian varieties) to considerable resistance (in certain other selections and breeding lines) (Author's abstract).

391. MARTIN, W.J. 1964.
Effectiveness of fungicides in reducing soft rot in washed, cured sweet potatoes. Plant Disease Reporter, 48(8): 606-607.

Two fungicides, sodium O-phenylphenate and 2,6-dichloro-4-nitroaniline, when applied on cured sweet potatoes after washing and

before packaging for shipment to market, were found remarkably effective in reducing *Rhizopus* soft rot. (Author's abstract).

392. MARTIN, W.J. 1964.
Length of slender attachment root as related to scurf development in sweet potatoes. Phytopathology, 54: 624-625.

Length of the slender root attaching the enlarged root to the stem in sweet potatoes was suggested as a factor in determing field resistance to scurf disease (caused by *Monilochaetes infuscans* Ell. & Halst. ex Harter). To investigate this, a 4-replication field experiment using 12 sweet potato selections was planted with sprouts from mother roots severely affected with scurf. At harvest, measurements were made of the slender attachment roots on a plant from each plot, and a scurf severity rating (from 1, none to 5, severe) for each of the corresponding enlarged roots was recorded. The correlation coefficient was determined for length of attachment root and scurf severity rating for each of the 12 selections. Highly significant negative correlations were obtained for six selections. Significant negative correlations were obtained for two. Correlation coefficients were not significant at the 5% level for four selections. The data indicate 2 types of resistance to scurf in sweet potatoes.

393. MARTIN, W.J. 1969.
Sweet potato diseases and their control. In: Tai, L.A., W.B. Charles, P.H. Haynes, et al. eds. Proceedings of the International Symposium on Tropical Root Crops ... St. Augustine, Trinidad. 2-8 April, 1967. Vol. 2: pp. IV-1-12.

It is apparent that disease resistance at present plays an important role in controlling the ravages of sweet potato diseases. The author believes that resistance to additional diseases will be discovered as more and more sweet potato seedlings and selections are systematically screened for resistance to particular diseases. It is also apparent that other control measures are very important in combatting sweet potato diseases. These include the following practices: (a) use of disease-free "seed" potatoes; (b) selection of planting sites (c) "seed" and soil treatment with fungicides and/or nematocides, and (d) use of cuttings instead of root-bearing sprouts for making field plantings. (Author's summary).

394. MARTIN, W.J. 1971.
Evaluation of fungicides for effectiveness against the sweet potato black rot fungus (*Ceratocytis fimbriata*). Plant Disease Reporter, 55(6): 523-526.

Twenty-seven fungicidal chemicals were tested in the laboratory for effectiveness against the sweet potato black rot fungus *Ceratocystis fimbriata*. Several of the fungicides had good fungistatic action, preventing growth of the fungus but not killing it. Relatively few had good fungicidal action, killing the fungus, required of a sweet potato "seed" treatment. Thiabendazole (60% W.P. of 2-(4-thiazolyl)-benzimidazole) at 0.2 to 0.4% in water had exceptionally good fungicidal action. In preliminary tests, 'Centennial' sweet potatoes tolerated up to eight times the concentration of thiabendazole required for fungicidal effectiveness against *C. fimbriata* (Author's abstract).

395. MARTIN, W.J. 1971-72.
TBZ: a promising fungicide for sweet potato "seed" treatment. Louisiana Agriculture, 15(2): 3 & 16.

Seed treatment is a necessary step in controlling three important fungus diseases of sweet potatoes - black rot, scurf, and foot rot. Method of application is described. Laboratory and green house tests with a new fungicide known as TBZ, thiabendazole or 2-(4-thiazolyl) benzimidazole, showed that it was just as effective as the standard Semesan Bel treatment in controlling the three fungus diseases. Field experiments with TBZ, Semesan Bel and Botran on four different varieties of sweet potato showed that TBZ treatments were just as effective as the Semesan Bel treatment in reducing decay of mother potatoes by miscellaneous soil fungi. The advantages of TBZ over mecury fungicides for this purpose are given.

396. MARTIN, W.J. 1972.
Further evaluation of Thiabendazole as a sweet potato "seed" treatment fungicide. Plant Disease Reporter, 56(3): 219-223.

Thiabendazole (60% WP of 2-(4-thiazolyl)-benzimidazole) prevented development of black rot caused by *Ceratocystis fimbriata*, on inoculated sweet potatoes dipped in a suspension of ½ lb/7½ gal. water before bedding in sterilized soil in green house pot tests. A concentration of ¼ lb/7½ gal water in these tests greatly reduced black rot and foot rot, caused by *Plenodomus destruens*, and eliminated scurf caused by *Monilochaetes infuscans*. Results of seed bed tests in the field showed no adverse effects from thiabendazole on plant production by sweet potatoes dipped in concentrations ranging up to 2 lb/7½ gal. water. A mixture of ¼ lb thiabendazole and 1 lb 75% W of 2,6-dichloro-4-nitroaniline/7½ gal water also gave good results in the seed bed tests. (Author's abstract).

397. MARTIN, W.J. and P.D. DUKES. 1977.
Bacterial stem and root rot of sweet potato. Plant Disease Reporter, 61(3): 158-161.

A bacterial soft rot damaged sweet potato plants in field plantings of cultivars Georgia Jet and Georgia Red in the vicinity of Tifton, Georgia in 1974. The causal bacterium appears to be *Erwinia* sp. Inoculations with the causal organism induced lesions on tomato stems and soft rot in sweet potato stems and roots, potato tubers, and petioles and leaves of pepper and eggplant. This is the first record of economic loss caused by bacterial soft rot of sweet potatoes. (Authors' abstract).

398. MARTIN, W.J. and T.P. HERNANDEZ. 1966.
Scurf development in sweet potatoes as affected by length of the slender attachment root. Phytopathology, 56(11): 1257-1259.

Length of slender attachment roots in sweet potatoes was negatively correlated with scurf severity in 15 sweet potato selections studied. Data are given supporting a "positional effect" of fleshy sweet potato roots in the soil as related to scurf resistance. Indications were, however, that unknown factors also contribute to scurf resistance in sweet potatoes.

399. MARTIN, W.J., L.G. JONES and T.P. HERNANDEZ. 1967.
Sweet potato soil rot development in olivier silt loam soil as affected by annual applications of lime or sulfur over a seven year period. Plant Disease Reporter, 51(4): 271-275.

In an olivier silt loam soil at Chase, Louisiana, sweet potato soil rot incidence in 1965 and 1966 generally was high in plots receiving annual applications of lime and ranging in pH from 6.3 to 6.8, low in plots receiving annual applications of sulfur and ranging in pH from 4.1 to 4.8, and low to high in plots receiving neither amendment and ranging in pH from 4.8 to 5.8. The data (1) emphasize the importance of not adding lime to sweet potato soils that are, or might become, infested with soil rot; (2) confirm the effectiveness of sulfur application to the soil in controlling soil rot; and (3) give additional evidence that soil rot is not a serious problem in silt loam soils in Louisiana with pH below 5.2. (Authors' abstract).

400. MARTIN, W.J. and L.H. PERSON. 1951.
Surface rot of Porto Rican sweet potatoes. Phytopathology, 41(3): 228-230.

A surface rot of Porto Rican sweet potatoes is described as

being distinct from that reported on other varieties of sweet potatoes. Inoculation experiments have shown the causal agent to be a *Fusarium*. Isolates of the surface rot *Fusarium* were relatively innocuous to young sweet potato roots, although small-rot lesions were evident on plants grown in heavily inoculated soil. The surface-rot *Fusarium* did not cause stem rot of sweet potatoes, nor did the stem-rot *Fusarium* cause surface rot.

401. MISHRA, B. and S.N. SINGH. 1977.
Studies on a new *Helminthosporium* leaf spot disease of sweet potato. Indian Phytopathology, 30(1): 80-83.

Hither to unrecorded *Helminthosporium euphorbiae* Hans. on sweet potato (*Ipomoea batatas* Lamb), collected during April, 1973 from Agricultural Research Institute, Dholi and other localities in India, has been described.

The effect of eight media on the linear growth, cultural characters and sporulation was studied. Maximum growth was obtained on Maize Meal Agar and Sabouraud's agar whereas PDA supported best sporulation.

Amongst eighty-two varieties and cultures of sweet potato tested, the variety C 71 was found to be resistant and the rest gave moderately susceptible to very susceptible reaction to *H. euphorbiae* Hans. (Authors' abstract).

402. NIELSEN, L.W. 1970.
Fungus and miscellaneous diseases (of sweet potatoes). In: Thirty years of Cooperative Sweet Potato Research. Southern Cooperative Series, Bulletin No. 159: 60-71.

This review presented on the basis of individual diseases is limited to post-1939 publications and to sweet potato diseases reported for the U.S.A. Diseases known outside the USA are excluded but foreign contributions to diseases found in USA are included.

The diseases covered are *Fusarium* wilt or stem rot, black rot, scurf, soft rot, soil rot or pox, circular spot and sclerotial blight, surface rot, new and miscellaneous diseases. The causal pathogens are indicated. Control methods are discussed.

403. NIELSEN, L.W. 1977.
Control of sweet potato *Fusarium* wilt with benomyl and thiabendazole. Plant Disease Reporter, 61(1): 1-4.

Sweet potato roots and sprouts of *Fusarium* wilt-susceptible cultivar Porto Rico were dipped 1 minute in suspensions of benomyl, or thiabendazole, or both, to control infection of roots in storage, sprouts in the plant bed, and sprouts planted in infested soil. In comparison with captan, the percentages of inoculated roots that became infected in storage were control, 80; captan, 44; thiabendazole, 25; and benomyl, 14. Sprouts dipped in suspensions of benomyl and thiabendazole before planting survived in the range of 86 to 96% as compared with 59 and 37% for nontreated sprouts in 2 years' tests. The results indicate that dipping propagative roots, or sprouts, or both, in suspensions of benomyl or thiabendazole will provide a practical and economic control of sweet potato *Fusarium* wilt. (Author's abstract abridged).

404. NIELSEN, L.W. and J.W. MOYER. 1979.
A *Fusarium* root rot of sweet potatoes. Plant Disease Reporter, 63(5): 400-404.

Fusarium solani was responsible for a newly recognized root rot of stored sweet-potatoes. The disease is characterized by circular, necrotic lesions with superficial, concentric rings radiating from wound infection sites. The infection progresses internally beyond the vascular ring and may rot the entire root. Roots of cv. Jewel were more susceptible than were roots of Jersey, Orange, Georgia Red, Centennial, Nugget, or Porto Rico. Infection of succulent vine cuttings of Jewel and Porto Rico was limited to a necrosis of internodal tissue below the first node with no detectable effect on plant growth. The optimum temperature for *F. solani* isolates in culture was 28°C; however, optimal temperature for disease development in enlarged roots was 24°C. Control of the disease on Jewel roots was achieved by either curing immediately following harvest or treatment with thiabendazole. (Author's abstract abridged).

405. NUGENT, T.J. and R.E. BALDWIN. 1973.
Control of sweet potato diseases. The Vegetable Growers News (Virginia), 27(8): 1-4.

Field and storage diseases may take a heavy toll in the production of sweet potatoes unless proper preventive steps or control measures are followed. These control measures include (1) The use of resistant varieties, (2) plant bed sanitation; (3) bedding of the disease free seed; (4) chemical seed treatments in the plant bed; (5) use of disease free sprouts or slips; (6) field rotation, (7) proper curing, storage and marketing of harvested crop. (Author's abstract).

406. NUGENT, T.J. and R.E. BALDWIN. 1973.
Soft-rot of sweet potatoes. The Vegetable Growers News (Virginia), 28(2): 1.

Soft rot disease caused by the fungus, *Rhizopus nigricans*, commonly called bread mould is a major market disease of the crop. Its pathogenicity is discussed, and control measure given.

407. ROBBINS, M.L. and W.L. OGLE. 1965.
The influence of calcium nutrition and duration of holding time on reaction of sweet potato sprouts to *Fusarium* wilt. Proceedings of the American Society for Horticultural Science, 86: 523-526.

A greenhouse sand-culture experiment was conducted to investigate the effect of Ca nutrition and duration of holding time after pulling but before inoculation upon resistance of the sweet potato to *Fusarium* wilt infection. Ca *per se* did not influence the degree of resistance to *Fusarium* wilt. Supplemental Ca applied to the plant growing medium combined with a foliar spray of $CaCl_2$ resulted in a burning and stunting of the plants and increased susceptibility to the disease organism. Holding the sweet potato sprouts for 24, 72, and 96 hours prior to inoculation in a moist rooting media at 85°F increased the resistance to *Fusarium* wilt. There was no significant difference in resistance to infection between sprouts held 24, 72, and 96 hours.

408. SCHAAD, N.W. and D. BRENNER. 1977.
A bacterial wilt and rot of sweet potatoes caused by *Erwinia chrysanthemi*. Phytopathology, 67(3): 302-308.

Erwinia chrysanthemi has been indentified as the cause of a severe wilt and root rot of sweet potato in Georgia. The susceptibility of 14 sweet potato cultivars ranged from the highly resistant Red Jewel to the highly susceptible Georgia Red and Georgia Red 85. Several other plants were also susceptible. *Erwinia chrysanthemi* was isolated from soil and soil debris collected from a harvester, but not from field soil. Of 56 apparently healthy roots collected from a harvester and placed at 32 C in polyethylene bags, 23 were rotted by the bacterium. Se en biochemical tests were highly reliable for distinguishing *E. chrysanthemi* from other species of *Erwinia*. Deoxyribonucleic acid from the sweet potato bacterium exhibited an average 80% relatedness to *E. chrysanthemi* as compared to less than 30% relatedness to *E. carotovora*. (Authors' abstract abridged).

409. STEINBAUER, C.E. 1956.
Types of sweet potato cuttings for most precise evaluation of *Fusarium* wilt susceptibility. Proceedings of the American Society for Horticultural Science, 68: 394-399.

These studies indicate that most sensitive evaluations of wilt susceptibility in sweet potatoes in greenhouse tests can be obtained from use of vine tip (terminal) cutting plants. If sufficient tip cuttings are not available, good but slightly less consistent results can be expected, for varieties having growth habits of the types used in these studies, by using four-node cuttings originating up to about 14 to 16 nodes below the vine tips (from vine growth up to approximately four weeks old) on plants making good vegetative growth. When cuttings are made from relatively young vine growth few cuttings are obtainable far from the terminals. Composite samples of such cuttings including few originating beyond the third or fourth position from the vine tips, can give results as good as, or only slightly less consistent than, when only the first three or four successive cuttings from the vine tips are included in the plant samples.

410. SUZUKI, H., K. OBA and I. URITANI. 1975.
The occurrence and some properties of 3-hydroxy-3-methylglutaryl coenzyme A reductase in sweet potato roots infected by *Ceratocystis fimbriata*. Physiological Plant Pathology, 7(3): 265-267.

Fresh sweet potato (*Ipomoea batatas*, Lam. cv. Norin 1) root tissue had a very low activity of 3-hydroxy-3-methylglutaryl coenzyme A reductase and the activity increased only slightly after the tissue was sliced and incubated. However, when infected by *Ceratocystis fimbriata* Ell. and Halst., enzyme activity increased rapidly, and reached a maximum in 2 days, thereafter, the activity decreased rapidly. Formation of terpenes such as ipomeamarone followed the increase in enzyme activity, and both changes showed a parallel relationship, indicating that the enzyme participates in the formation of terpenes such as ipomeamarone in response to the infection. Optimal activity of 3-hydroxy-3- methylglutaryl coenzyme A reductase occurred at pH 7.3 to 7.5. The relationship between reaction rate and S-3-hydroxy-3-methylglutaryl coenzyme A concentration indicated substrate inhibition at a concentration above 250 μM. The Lineweaver-Burk plot was non-linear and the Hill coefficient was 0.81. The differential centrifugation and sucrose density gradient centrifugation showed high enzyme activity associated with microsomes, and lesser activity with mitochondria.

411. TAKEUCHI, A., I. OGUNI, K. OBA, M. KOJIMA and I. URITANI. 1978. Interactions between diseased sweet potato terpenoids and *Ceratocystis fimbriata*. Agricultural and Biological Chemistry, 42(5): 935-939.

Ipomoeamarone, a furanosesquiterpenoid produced in *Ceratocystis fimbriata* - infected sweet potato root issue, was decomposed by neither sweet potato strain nor oak strain of *C. fimbriata*. Ipomoeamarone inhibited various physiological events of *C. fimbriata* such as endoconidial germination, germ-tube growth, mycelial growth, endoconidial formation, black coloration of mycelia and normal morphological development of mycelia. The inhibitory effects were not so severe in sweet potato strain, pathogenic to sweet potato, compared with oak strain non-pathogenic one.

412. THOMPSON, D.P. 1978.
Studies on nucleic acids and protein in fungal infected sweet potato roots. Annals of Botany, 42(181): 1215-1216.

This short communication reports a study undertaken to investigate data on the nucleic acid and protein contents of sweet potato roots infected with *Rhizopus stolonifer*. The results revealed no significant differences in the RNA content of the infected and non-infected tissues. In contrast, DNA was found to have increased in the infected tissues by almost 25% over that of non-infected tissues.

413. URITANI, I. and T. AKAZAWA. 1955.
Antibiotic effect on *Ceratostomella fimbriata* of Ipomeamarone, an abnormal metabolite in black rot of sweet potato. Science, 121: 216.

The study reported here was undertaken to clarify whether Ipomeamarone (Ip.) disrupts the phosphorus metabolism of the penetrating fungus or not and to clarify the relationship between the accumulated Ip. and the resisting power of the sweet potato root. The germination of *C. fimbriata* is controlled in the Ip.-containing culture medium; its growth, sporulation, spore formation, and respiration are restrained by Ip. The chemical reactions involved in the observations are explained here.

414. YANG, I. 1969.
Studies on witchs' broom of sweet potato in Taiwan. Journal of Taiwan Agricultural Research, 18(4):

This paper reports the experimental results on varietal resistance. Eradication by thermotherapy and host range of sweet potato witchs' broom in Taiwan were conducted. The results show that seventy-three varieties of sweet potato growing in the Chiayi Agricultural Experiment Station were used in this graft transmission test. All of these showed infected symptom and were susceptible ranging from the infection degree of A (Severe form) to D. (Mild form). (Author's summary modified).

415. YANG, I. 1970.
Studies on witches broom of sweet potato. (V) Seed transmission. Journal of Taiwan Agricultural Research, 19(4):

Seed transmission of sweet potato witches' broom disease was examined in artificially infected plants of *Ipomoea batatas* Lam., and other species. The negative results showed that the disease may not be transmitted by seed in different species of host plants so far tested. (Author's summary modified).

G. 5 Virus Diseases

416. ALCONERO, R., A.G. SANTIAGO and F. MORALES. 1975.
Meristem tip culture and virus indexing of sweet potato. Phytopathology, 65(7): 769-773.

Meristematic tips (0.4-0.8 mm long) of axillary shoots of 10 sweet potato cultivars developed into complete plants in 20-50 days in modified Murashige and Skoog agar medium. Several kinetin: indoleacetic acid combinations were adequate, but cultivars differed markedly in response. Of 150 plants tested, 47% did not cause virus symptoms when grafted onto *Ipomoea setosa*. The use of small tips avoided the need for preliminary heat therapy and the appropriate combination of growth factors allowed the use of a single medium for production of complete plants within a short time. (Authors' abstract).

417. AYCOCK, R., J.S. COOLEY, M.B. HUGHES and W.L. SMITH. 1953.
Relation of temperature to internal cork development in stored sweet potato roots. Phytopathological Notes, 43: 50-51.

This paper presents results of study initiated in 1950 of the effect of storage temperature on internal cork development in sweet potato roots.

From a control standpoint, the results indicate that storage temperatures of 50° to 60°F, will prevent any appreciable development of symptoms beyond those already present at harvest. Since sweet potatoes may become chilled if stored continuously at 50°, storage at 55° to 60° is recommended.

418. CENTRE FOR OVERSEAS PEST RESEARCH. 1978.
Sweet potato diseases. In: C.O.P.R. Pest control in tropical root crops. London, C.O.P.R, M.O.D. (PANS Manual No. 4). pp. 57-95.

Sweet potatoes are attacked by various diseases in the field · some of them also affecting the storage life of the tubers. Virus diseases account for the heaviest field losses followed by fungus diseases. The use of clean planting material is the most effective disease control measure while crop rotation assists in controlling many fungus diseases.

The diseases are treated in the following pattern: causal agents, disease caused, symptoms, development and spread, and control measures. The diseases are grouped under fungal, bacterial, virus and mycoplasma diseases. The production of virus-free planting material by heat treatment and meristerm tip culture is illustrated.

419. CLERK, G.C. 1960.
A vein clearing virus of sweet potato in Ghana. Plant Disease Reporter, 44(12): 931-933.

A hitherto unreported virus disease of sweet potato, *Ipomoea batatas*, in Ghana is described. The name Vein Clearing Virus is suggested. (Author's abstract).

420. DAINES, R. and W.J. MARTIN. 1964.
Russet crack, a new virus disease of sweet potatoes. Plant Disease Reporter, 48(3): 149-151.

A new disease of sweet potatoes is described and named russet crack. Evidence is presented that russet crack is caused either by a virus or a complex of viruses. (Authors' abstract).

421. HAHN, S.K. 1979.
Effects of viruses (SPVD) on growth and yield of sweet potato. Experimental Agriculture, 15(2): 1-5.

Sweet potato (*Ipomoea batatas* L.) virus disease (SPVD) causes severe disease symptoms of various combinations of leaf strapping, vein-clearing, puckering and stunting. The disease is widespread, especially in Africa, and yield is adversely affected, though there are no figures to quantify this effect nor is it known how yield is affected. Loss of tuberous root yield due to SPVD was studied in sweet potato showing symptoms of the disease. Slips were obtained from plants with and without symptoms and two yield trials in 2 years were conducted by planting them alternately in rows. Yield of fresh tubers was reduced by 77% in plants showing SPVD symptoms but the reduced chlorophyll level of diseased leaves did not appear to affect yield. (Author's summary).

422. HILDEBRAND, E.M. 1956.
Mechanical transmission of sweet potato internal cork virus aided by cysteine. Phytopathology, 46: 233.

After the discovery that rapid-growing Scarlett O'Hara morning glory is an ideal indexing host for sweet potato internal cork virosis, it still was not possible to study the nature and properties of the causal virus. Apparently the virus in the extract from infected sweet potato plants is inactivated so quickly upon contact with air that the usual mechanical methods of transmission are unsuccessful. The success of a modification of Yarwood's inoculation procedure in locating Scarlett O'Hara morning glory as an indexing host was attributed to the extremely shorter interval of virus exposure (about 2/3 second) by this "squeeze-rubbing" technique.

423. HILDEBRAND, E.M. 1960.
Strain of tobacco ringspot virus found masked in sweet potatoes. Phytopathology, 50: 571.

A strain of tobacco ringspot virus was isolated from sweet potatoes in 1957. During isolation studies on sweet potato viruses from several places, distinctive systemic symptoms developed on Scarlett O'Hara morning glory from 2 sources, the Acadian and Triumph varieties. After warm storage, cork lesions developed only in the Acadian roots. The sweet potatoes had foliage symptoms of the internal cork syndrome. When indexed the morning glory indicator initially expressed typical symptoms of internal cork, but these never became masked. Apparently the presence of the tobacco ringspot contaminant in the virus mixture made the symptoms systemic. Thermal inactivation suggested the probability of a mixture of viruses. Host-range studies demonstrated symptoms simulating tobacco ringspot on several different nicotianas, but only when employing these two

sweet potato sources. Whether the ringspot contaminant was in mixture or alone, the morning glory indicators also exhibited severe necrotic foliage spotting. No symptoms were produced on sweet potatoes. Aphids picked up only the internal cork syndrome from the mixtures. Host range, cross-inoculation, thermal inactivation, and serology tests established these sweet potato ringspot isolates as being tobacco ringspot virus.

424. HOLLINGS, M., O.M. STONE and K.R. BOCK. 1976. Purification and properties of sweet potato mild mottle - a whitefly borne virus from sweet potato (*Ipomoea batatas*) in East Africa. Annals of Applied Biology, 82(3): 511-528.

A virus obtained from sweet potatoes in Kenya, Uganda and Tanzania was transmitted by inoculation of sap and by whiteflies (*Bemisia tabaci*). It infected forty-five of 119 plant species in fourteen of thirty-six plant families. It was propagated in *Nicotiana glutinosa* and *N. tabacum*, in which diagnostic symptoms of vein clearing, leaf curling and distortion developed. *Chenopodium quinoa* was a good local lesion host.

Different seedling lines of sweet potato differed greatly in their susceptibility to infection and in symptoms produced; some developed leaf mottling and were stunted, some were symptomless, and some appeared immune.

The virus was transmitted by dodder (*Cuscuta campestris*) but not by aphids, or through seed of *Ipomoea nil* or *N. clevelandii*. Sweet potato sap contained strong inhibitors of infection, and a low concentration of virus.

Virus-free cuttings of sweet potato were obtained by thermotherapy (4-5 wk at 35°C), or by meristem-tip culture.

The virus remained infective in sap of *N. tabacum* after dilution to 10^{-3}, or after 10 min at 55°C (but not 60°C), 3 but not 7 days at 18°C, 42 but not 49 days at 2°C. Infectivity was abolished by sonication or u.v. irradiation, by 2% formaldehyde or 2% trisodium orthophosphate, and was greatly decreased by 20% $CHCl_3$ or 20% ether.

Purified virus preparations were obtained from *N. tabacum* by clarifying phosphate buffer extracts with n-butanol, virus precipitation with poly-ethylene glycol, and differential centrifugation. The virus sedimented as one band in density gradients, and produced a single sedimenting boundary in analytical centrifugation ($s^{\circ}_{20,w}$ = 155S). It contained one polypeptide species of mol wt 37700, and preliminary digestion experiments

suggested a single-stranded RNA.

Antisera prepared against the virus reacted specifically in precipitin tube tests with titres of 1/16 384, but no serological relationships could be found between the virus and fourteen viruses of the potato virus Y group.

Electron micrographs showed straight, filamentous particles *c.* 950 nm long when mounted in $MgCl_2$, but 800-900 nm long in EDTA. The present cryptogram is: (R/I): */*: E/E:S/Al. This virus is probably the same as Sheffield's virus B. (Authors' abstract).

425. KANTACK, E.J. 1958.
Transmission of internal cork of sweet potato by the cotton aphid, *Aphis gossypii* Glover. Science, 127(3312): 1448.

Because *Myzus persicae* reported by researchers to be the vector of internal cork of sweet potato is virtually absent in sweet potato fields of Louisiana when much of the infection takes place, an intensive study was conducted between 1955 and 1957. The results of the tests indicate that *Aphis gossypii* transmitted an agent, or agents, which resulted in the development of internal cork lesions in the roots of a cork-free stock of the Unit 1 Porto Rico variety sweet potato. This was the only species involved which was capable of transmission of the disease under the conditions of these tests.

426. KANTACK, E.J. and W.J. MARTIN. 1956.
Incidence of internal cork of sweet potato reduced after foliar application of insecticides. Plant Disease Reporter, 40(5): 410.

Both percentage and severity of internal cork lesions in sweet potato roots were markedly reduced in a randomized block design experiment comprising cork-affected and cork-free planting stocks (Table 1). Differences did not become apparent until after 4½ months storage at 70° F. Cock-free planting stocks were divided into treated and untreated plots.

427. KANTACK. E.J. and W.J. MARTIN. 1958.
Effect of internal cork on yield and grade of sweet potato roots. Phytopathology, 48(9): 521-522.

Four field experiments were made over 3 years to study vector relationships as well as determine the effect of internal cork on yield. The yield data, considered sufficiently to be of benefit to other workers in this area are presented in this

report. The results show that internal cork does not appreciably affect the yield of Unit 1 Porto Rico sweet potatoes. But since internal cork severely affects quality, every effort should be made to reduce the disease by using disease-free planting stock.

428. KANTACK, E.J., W.J. MARTIN and L.D. NEWSOM. 1961.
Incidence of field spread of internal cork of sweet potato in insecticide-treated plots. Journal of Economic Entomology, 54(1): 125-127.

Field plots of originally internal cork-free sweet potato plants were treated with insecticides in 1955-59 in Louisiana to reduce spread of internal cork by controlling the principal vector, *Aphis gossypii* Glover. Amounts of disease spread during the season from adjacent cork-affected sources were proportional to vector activity. Reduction of the disease ranged from 0% to 50%. (Authors' abstract).

429. KING, J.R. 1959.
Anatomic effects in the sweet potato root caused by the virus of internal cork. Proceedings of the American Society for Horticultural Science, 73: 463-466.

The initiation and development of a necrotic area are associated with the accumulation of gum in the intercellular spaces and its penetration between cells and later into the cells, causing disintegration and collapse of cellular structure. Internal cork development is considered only as a response of the host to limit the extent of a diseased area.

430. KUSHMAN, L.J. and M.T. DEONIER. 1952.
Effect of curing and storage temperatures on development of internal cork in sweet potato roots. Proceedings of the American Society of Horticultural Science, 60: 359-362.

These data indicate that curing sweet potatoes at 85 or 95 degrees F for 10 days does not affect the subsequent development of internal cork. Storage temperatures of 70 degrees caused a significant increase in severity of internal cork symptoms and number of potatoes showing symptoms.

431. LOEBENSTEIN, G. 1957.
Paper chromatography of sweet potato virus. Nature, 179(4569): 1086.

A quick method for detecting vein-clearing virus by paper chromatography has been developed.

This common virus disease in sweet potatoes which grow in Israel causes great reductions in yields. Hitherto, no test plant for indexing diseased plants has been found. The only reliable method of identification is by grafting the diseased scion on a healthy stock. The disease symptoms, too, are not always clear, especially when masking of symptoms occurs during optimal vegetative growth.

Little work has been done on the use of paper chromatography for identification of virus diseases in general. Paper chromatography was used by Cochran in 1947 and Gray in 1952 for identification but more specifically for separation of pure tobacco mosaic virus. Identification of tobacco mosaic virus by this method has theoretical value only, since identification generally is carried out by test plants.

In the absence of suitable test plant for detecting vein-clearing virus in sweet potatoes, we found that paper chromatography could be used as a reliable method.

This chemical method of quick identification of vein-clearing virus in leaves and tubers of sweet potatoes will be of considerable use in the routine work of keeping a virus-free stock.

432. LOEBENSTEIN, G. and I. HARPAZ. 1959.
Virus diseases of sweet potatoes in Israel. Phytopathology, 50: 100-104.

Three different virus diseases were found to infect s2 sweet potato in Israel enough to cause complete failure of this crop. These are, in order of importance: (a) sweet potato vein-clearing virus disease (a type and three variants described) transmitted by *Bemisia tabaci;* (b) ringspot virus disease, which is aphid-borne (*Myzus persicae*); and (c) leaf pucker virus disease, vector unknown. Simultaneous infection by the two former viruses causes a complex disease with symptoms varying with the sweet potato variety. All three viruses are neither sap-transmissible nor soil-borne, but easily transmitted by graft. These viruses are believed distinct from any sweet potato viruses hitherto described. (Authors' abstract).

433. MARTIN, W.J. 1950.
Internal cork of sweet potatoes in Louisiana. Phytopathology, 40: 789.

A complex of viruses rather than a single virus is suggested to be responsible for the internal cork disease of sweet potatoes.

434. MARTIN, W.J. 1953.
Circular spot, a disease of sweet potato roots. Phytopathology, 43(8): 432-433.

A disease of sweet potato roots in Louisiana called circular spot is described and attributed to the fungus *Sclerotium rolfsii*. The disease was demonstrated as being distinct from other diseases of sweet potato caused by *Streptomyces ipomoea*, *Fusarium* sp. and *Pythium* sp. Possible field control measures for circular spot were indicated as a result of soil fumigation experiments with DD-mixture and ethylene dibromide. Soil rot was not reduced in soil fumigation experiments with these chemicals.

435. MARTIN, W.J. 1955.
Effect of storage temperature on development of internal cork in sweet potato roots. Plant Disease Reporter, 39(8): 619-621.

Results of experiments in Louisiana on the effect of storage temperature on the development of internal cork lesions in Porto Rico sweet potatoes have verified results reported by others that there is rapid increase in incidence and severity of lesions during storage at 70°-80°F, and that there is little or no increase during storage at 50°-60°. In addition the following new information was obtained from the tests reported herein: (1) In roots which had been stored at 50° or 60° F for about 150-200 days, then removed and placed at 80° storage, there was little or no increase of cork lesions during a period of 14 days at 80°. During a period of 36 days at 80° there was some increase in cork lesions, but the incidence and severity was still low compared to that in roots held at 80° since harvest. During a period of 58 days after removal from the cooler storages, the cork lesions had increased to a level near that in roots which had been stored at 80° since harvest. These results suggest that there would be adequate time for the process of marketing roots, between the time of removal from cold storage and the time of severe increase in the amount of cork lesions. (2) While there is no increase in cork lesions in roots held at 60°F, there appears to be a definite increase in roots held at 65°.

436. MARTIN, W.J. 1957.
The mosaic and similar diseases of sweet potato. Plant Disease Reporter, 41(1): 930-935.

This paper is a literature review up to 1957 of sweet potato mosaic and related diseases aimed at informing research, extension and regulatory personnel of these diseases. It

discusses some twenty-one previous reports of these diseases.

437. MARTIN, W.J. 1962.
Susceptibility of certain convolvulaceae to internal cork, tobacco ringspot, and cucumber mosaic viruses. Phytopathology, 52(7): 607-611.

Virus symptoms developed on 12 of 18 species of Convolvulaceae grafted on sprouts produced by sweet potato mother roots affected with internal cork. Internal cork virus (ICV) was recovered from the grafted plants of only 3 of the 6 species in which recovery was attempted. Of the 3 species infected with ICV, none was considered an important reservoir in the dissemination of ICV to sweet potato plantings in Louisiana. Tobacco ringspot virus (TRSV) infected 7 of 10 species tested and produced symptoms similar to those caused by ICV, in some hosts; and quite different symptoms, in others. Six new hosts were discovered for TRSV. Cucumber mosaic virus (CMV) infected 4 of 7 species tested, producing symptoms distinct from either of those produced by ICV and TRSV. Three new hosts were discovered for CMV. (Author's abstract).

438. MARTIN, W.J. 1970.
Virus diseases (of sweet potato). In: Thirty years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series, Bulletin, (U.S.A.), No.159: 49-55.

Recognized virus diseases of sweet potato are briefly summarized. They include feathery mottle, internal cork, leaf spot, mosaic, russet crack, a ringspot virus, cucumber mottle virus, vein clearing, witches broom, dwarf and others. They are characterized largely by symptomatology, transmissibility and vector relationships. Relatively little is known about the causal viruses of these diseases. Control methods are also discussed.

439. MARTIN, W.J. and E.J. KANTACK. 1958.
Isolation for controlling internal cork of sweet potato. Phytopathology, 48: 395-396.

Experiments in Louisiana over a 4-year period have shown that there was relatively little spread of internal cork disease to sweet potato plantings 100 yards or more from diseased plantings. Incidence of the disease in cork-free plantings adjacent to, or short distances from, diseased plantings varied from year to year and locality to locality, ranging from less than 5% to as much as 70% of the roots affected at harvest, and generally much higher than in isolated plantings. From 6 isolated plantings made in 1957 the mean percentage of affected roots were 1.3 at

harvest and 6.9 after 4 months in storage. Plots in each of the 6 plantings in 1957 were dusted at weekly intervals during the growing season with a combination of malathion (S-(1,2-dicabethoxyethyl) 0,0-dimethyl-dithiophosphate) and DDT dust. After storage, the mean percentages of cork-affected roots from the dusted and untreated plots were, respectively, 6.3 and 7.5.

440. MARTIN, W.J. and E.J. KANTACK. 1958.
Spread of internal cork of sweet potatoes under field conditions. Louisiana Agriculture, 1(3): 2p.

It is reported that the only known method of controlling internal cork is through the use of cork-free seed stock. Because of the various reasons discussed here the study of the spread of the disease was continued in 1956. The mode of spread of the disease was tested in field planting. The results again emphasize that it is highly important that sweet potato growers plant their cork-free seed as far away as possible from internal cork affected plantings. The data collected and reported here indicate that the virus spread which resulted in internal cork lesions in the roots in this experiment was of a non-persistent nature in the vector.

441. MARTIN, W.J. and E.J. KANTACK. 1960.
Control of internal cork of sweet potato by isolation. Phytopathology, 50(2): 149-152.

Experiments made in Louisiana since 1956 have shown that internal cork of sweet potato can be controlled by planting cork-free plants of susceptible varieties 100 yards or more away from cork-affected plantings. (Authors' abstract).

442. MOYER, J.W. and G.G. KENNEDY. 1978.
Purification and properties of sweet potato feathery mottle virus. Phytopathology, 68(7): 998-1004.

An isolate of sweet potato feathery mottle virus was recovered from Georgia Red sweet potato plants exhibiting interveinal chlorotic spotting and vein mottling. The virus was readily sap-transmissible when diluted 10-fold in 0.05 M potassium phosphate buffer, pH 7.2. It was nonpersistently transmitted by *Aphis gossypii, A. craccivora, Lipaphis erysimi,* and *Myzus persicae.* The rest of the results are described.

443. MUKIIBI, J. 1977.
Effect of mosaic on the yield of sweet potatoes in Uganda. In: Cock, J., R. MacIntyre and M. Graham, eds. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops, held at CIAT, Cali, Colombia. 1-7 August, 1976, Ottawa IDRC. pp. 169-170.

The sweet potato mosaic virus disease caused a 57% reduction in yield, both in terms of the weight and the number of root tubers produced by the sweet potato variety Kyebandula. The sample plots were grown at the Makerere University farm in Uganda. (Author's abstract).

444. MUKIIBI, J. 1977.
Synonymy in sweet potato virus diseases. In: Cock, J., R. MacIntyre and M. Graham, eds. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops, held at CIAT, Cali, Colombia. 1-7 August 1976. Ottawa, IDRC. pp. 163-168.

The literature pertaining to virus or virus-like diseases of sweet potatoes suggests that there only two diseases definitely caused by viruses. Sweet Potato mosaic, with many synonyms and sweet potato internal cork. The other viruslike diseases are either caused by mycoplasma mites or are physiological in nature. (Author's abstract).

445. NIELSEN, L.W. 1952.
Effect of temperature on the development of internal cork lesions in sweet potato roots. Phytopathology, 42: 625-627.

Sweet potato roots infected with internal cork virus were grown in soils artificially heated from mid-September until early November, and more necrotic lesions developed in them than in similar roots grown in non-heated soils.

Storage temperature markedly influences lesion development in diseased roots. Additional infected roots developed lesions and the lesions became larger and more numerous at storage temperatures of 70°, 85° and 94°F. In contrast, no additional lesions developed in roots stored at 55°F; however, there was evidence that the lesions present enlarged slowly over a 7-month period.

446. NIELSEN, L.W. 1952.
Internal cork of sweet potatoes: production of corky lesions in core-grafted roots. Plant Disease Reporter, 36(4): 132-134.

The development of cork lesions in Porto Rico roots core-grafted with diseased tissue may be a helpful tool in studying this disease of sweet potatoes. The procedure reduces the time required for obtaining disease reading, and the tedious process of growing a root crop to demonstrate the effect of various treatments. The method may prove to be an essential step in appraising internal cork resistance in various sweet potato breeding stocks and selections.

447. NUSBAUM, C.J. 1950.
Internal cork of sweet potatoes. South Carolina Agricultural Experiment Station Bulletin, 381: 23p.

It is suggested that a virus is responsible for internal cork disease of sweet potatoes. Though it greatly impairs the eating quality of sweet potatoes, it does not seem to appreciably affect yield. This worker observed small yield differences in favour of cork-free stocks in both high and low fertility levels and early to late planting dates of the growing season.

448. OVERDELI, A.J. and R.F. ELLIOT. 1971.
Virus infection in *Ipomoea batatas* and a method for its elimination. New Zealand Journal of Agricultural Research, 14: 720-724.

Virus infection was demonstrated in Kumara, the New Zealand sweet potato (*Ipomoea batatas* (L) Lam.). Leaf symptoms were widespread in young plants of the popular variety 'Owairaka Red', but they did not persist during most of the growing season. Virus symptoms were eliminated from this and seven other varieties by heat treatment followed by shoot tip culture. (Authors' abstract).

449. RANKIN, H.W. 1950.
Studies of internal cork of sweet potatoes. Phytopathology, 40: 790.

Internal cork of sweet potatoes is a virus disease. Insect transmission experiments show that leafhoppers probably are not vectors but that aphids (*Myzus persicae*) and perhaps other species are. Use of steamed plots in combination with unsteamed plots and walk-in cages indicated soil-inhabiting insects are not vectors. Several insecticides used in field spray tests did not control the transmission of internal cork virus satisfactorily. Plants grown from potatoes with internal cork symptoms produced varying amounts of corky potatoes in the field tests.

In none of the plants were all the roots corky, and 16% of the plants had no roots with internal cork. The expression of the internal cork symptoms appears to be influenced by environment.

450. SHEFFIELD, F.M.L. 1953.
Virus diseases of sweet potato in parts of Africa. Empire Journal of Experimental Agriculture, 21(83): 184-189.

The author traces the earliest reported occurrences of the diseases in Africa, describes their symptomatology, distribution and spread in the continent. It is suggested that the ultimate control must be the use of resistant varieties.

451. SHEFFIELD, F.M.L. 1957.
Virus diseases of sweet potato in East Africa. I. Identification of the viruses and their insect vectors. Phytopathology, 47(10): 582-590.

At least 2 viruses attack sweet potatoes in East Africa. Virus A, found in only 1 locality, causes a relatively mild disease and is transmitted by *Myzus persicae* (Sulz.), which can acquire it in a 2-minute feeding. Virus B is widespread throughout East Africa. It is transmitted by *Bemisia tabaci* (Genn). The virus-vector relationships are obscure; under the experimental conditions used, *B. tabaci* acquired the virus in 5 minutes but it was a very inefficient vector. Virus B exists in a number of strains, the mildest of which may cause no symptoms in some sweet potato varieties whereas others cause extremely severe diseases. Infection with virus A does not protect a plant from infection with virus B, but infection with a mild strain of the latter protects against infection by a severe strain. Neither virus is transmitted mechanically to healthy sweet potatoes. Infection by virus B may be masked or not fully systemic in dull, cold conditions, but all attempts to inactivate it in the tubers before germination by heat treatment or by chilling failed. Virus A might be the same as one of the sweet potato viruses described from the United States, but virus B is distinguished from them by its insect vector.

452. SHEFFIELD, F.M.L. 1957.
Virus diseases of sweet potato in East Africa. II. Transmission to alternative hosts. Phytopathology, 48(1): 1-6.

Virus A of sweet potato was transmitted by grafting, but not mechanically, to some species of *Ipomoea*. It was not transmitted to some solanaceous plants by means of aphids. Virus B, the more important of the 2 viruses in East Africa, was not transmitted mechanically to sweet potato but was so transmitted to some other hosts. Plants of several species of *Ipomoea* and of some members of the *Solanaceae* became infected with virus B when inoculated mechanically, by graft, and/or by means of white

flies. All such plants showed systemic symptoms that varied in intensity among the species. In *Gomphrena globosa* L., the virus was confined to local lesions. All attempts to transmit virus B to members of the *Chenopodiaceae, Compositae, Euphorbiaceae,* and *Malvaceae* failed. Both viruses seem to be distinct from others described in sweet potato; virus B could not be identified with any of the whitefly-transmitted viruses previously recorded.

453. WILCOX, M.S. and B.D. EZELL. 1951.
Storage temperature and the development of internal cork in sweet potato. Phytopathology, 41(5): 477-479.

Since Martin (1949) reported an increase from 19.4% infection at harvest time to 80% after 5 months in storage in three lots of sweet potatoes the study reported here was undertaken to determine the effect of storage temperature on the development of the disorder. The results show that while 70°F is a higher temperature than is generally recommended for sweet-potato storage, it is better for appraising internal cork susceptibility and latent infection than the temperature usually recommended for sweet potato storage.

H. CURING, CHILLING AND STORAGE

454. ANDERSON, W.S. 1956.
Some effects of curing and storage on the weight and carotene content of certain sweet potato varieties. Proceedings of the American Society for Horticultural Science, 68: 412-416.

It can be concluded from the results of this study that the Porto Rico variety, at least the strains for which there is information available, gain in absolute carotene content after harvest, with this gain taking place slowly and probably not being large enough to be of practical importance during the curing period alone. During the total storage season, however, the gain may approach 10 to 15 per cent of the original amount of carotene. It can also be concluded that varieties differ in the way caroten changes take place after harvest, despite the fact that all varieties lose weight in approximately the same proportion. The data show that both of the other varieties tested with Porto Rico Unit 1 under the same conditions actually lost carotene in significant amounts. In the case of Allgold the total was 17 per cent, or at the end of the storage season the roots contained only 83 per cent as much carotene as they did when harvested. In Goldrush the total loss amounted to 13 per cent of the original carotene content. These results show, therefore, that any new selection or variety should be tested in order to be certain of the changes in carotene content after harvest. These results also show that in studying carotene of sweetpotatoes comparisons should be made on the absolute content basis rather than unit weight basis.

455. BARRY, J.R. and D.R. PATERSON. 1961.
Some effects of chilling temperature, variety and Maleic hydrazide on water absorption by sweet potato tissue. Proceedings of the American Society for Horticultural Science, 77: 479-482.

Storage of 3 varieties of sweet potatoes for 4 weeks or more at 59°F and 41°F resulted in a much higher percentage of water absorption by discs from 59°F than from those stored at 41°F. Chilled Porto Rico sweet potato slices absorbed less than 1/2 as much water as chilled slices of

L3-79 and NC-172. Water absorption of sweet potatoes stored at both temperatures increased with increasing periods of storage at first, and later decreased. Preharvest foliar applications of maleic hydrazide at 2000 and 8000 ppm decreased the per cent water absorption of sweet potato tissue.

456. BARRY, J. R. and D. R. PATERSON. 1965.
Some effects of a chilling temperature on IAA inactivation by sweet potato root tissue. Proceedings of the American Society for Horticultural Science, 86: 542-546.

Copperskin Goldrush sweet potatoes were treated with preharvest foliar sprays of maleic hydrazide (MH) at 0 to 10,000 ppm and then stored for 6 weeks at 5°, 15°, and 25°C. All treatment combinations of MH, storage temperature and weeks in storage were assayed for indole acetic acid (IAA) inactivation and per cent water absorption of the root tissue. After 1 week of storage at 5°, there was a highly significant reduction in the ability of sweet potato root tissue to inactivate IAA. Storage at 5° resulted in a highly significant decrease in per cent water absorption by root tissue in comparison with tissue from roots stored at 15° and 25°.

457. BROWN, H. G. and R. W. BUESCHER. 1979.
Evaluation of cured and non-cured sweet potatoes. HortScience, 14(2): 125.

Four varieties of sweet potatoes (Georgia Jet, Jasper, Jewel and Centennial) were placed at curing conditions or at 15.5°C conditions after harvest. After 11 days all roots were held at 15.5°C. Roots were baked and evaluated by a trained taste panel using a triangle difference test after storage for 5, 11, 25 and 54 days. There were detectable differences between the taste of cured and non-cured sweet potatoes. After 5 days non-cured roots were preferred. Changes in sugars, acidity and pH were probably responsible for flavor differences.

458. BUESCHER, R. W. 1977
Hardcore in sweet potato roots as influenced by cultivar, curing and ethylene. HortScience, 12(4): 326-327.

Hardcore in sweet potato roots (*Ipomoea batatas*) (L.) is induced by chilling and subsequent exposure to nonchilling temperatures prior to cooking. The defect is detected only

after cooking and could adversely affect consumer acceptance and utilization. Of seven cultivars tested, 'Red Jewel' and 'Jewel' were the least susceptible to hardcore, while 'Georgia Jet' and 'Jasper' were the most susceptible. Cured roots were more susceptible than those freshly harvested in all cultivars except 'Centennial'. Exposure to ethylene during the post-chilling induction period did not reduce the incidence of hardcore but significantly reduced its severity. (Author's abstract).

459. BUESCHER, R. W., W. A. SISTRUNK and A. E. KASAIAN. 1976. Induction of textural changes in sweet potato roots by chilling. Journal of the American Society for Horticultural Science, 101(5): 516-519.

Hardcore was apparent in cooked sweet potatoes *Ipomoea batatas* Lam. which had been chilled and transferred to non-chilling temperatures prior to cooking. The severity increased with duration of chilling at 2°C. Hardcore was not observed in roots boiled immediately after chilling, although these roots were firmer than those not chilled. Enhanced levels of pectic substances, soluble in sodium hexametaphosphate, were associated with hardcore tissue, while starch, protopectin, and hemicellulose were related to enhanced firmness of continuously chilled roots. No differences in pectinmethylesterase activity were observed between storage treatments. Reduced levels of alpha amylase activity in continuously chilled roots probably accounted for the enhanced levels of starch after the roots were processed. From data on U.V. absorption, phenolic levels, and electrolyte leakage, we believe that hardcore develops when phenolics or related substances, and possibly cations, bind with cell wall materials.

460. CHEW, S. T. and T. P. HERNANDEZ. 1975. Effect of different water pressure treatments on storage ability and other quality factors on several sweet potato cultivars. HortScience, 10(3): 7.

A comparison of ten sweet potato cultivars was made as to their ability to keep in storage. Roots were harvested, cured at 29.4°C and 85% relative humidity for 10 days, and stored for 98 days at 15.6°C. A second group of roots was submerged for 72 hours in tap water (24°C), cured and stored for 33 days at 15.6°C. Data on weight loss, shrinkage, and rots were recorded every two weeks. There were highly significant differences between cultivars stored at

15.6°C for 98 days. Percent weight loss ranged from 12.47% (L)-360) to 35.77% (Centennial). When the roots were submerged in water for 72 hours, cured, and stored, loss in weight ranged from 20.25% (L)-360 to 100% (L9-27). Three cultivars - LO-360, L9-323, and LO-162 - were outstanding in storage ability and in ability to withstand water submergence. LO-360 withstood 78 hours of submersion in water with little loss, while Centennial roots rotted.

461. DEMPSEY, A. H., L. J. KUSHMAN and J. E. LOVE. 1970. Storage (of sweet potato). In Thirty Years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series Bulletin, (U.S.A.) No.159: 36-38.

Sweet potato storage research and practice are reviewed. Curing and storage of the crop are essential for its greatest utilization. It is noted that many changes occur in the chemical composition of sweet potatoes during curing and storage while excessive sprouting of sweet potatoes in storage results in reduced quality. Solutions have been found to the problems involved.

462. GOODING, H. J. and J. S. CAMPBELL. 1964. The improvement of sweet-potato storage by cultural and chemical means. Empire Journal of Experimental Agriculture, 32(125): 65-75.

Storage conditions for sweet potatoes, in which weight loss is low and sprouting reduced, and which could easily be reproduced by smallholders, were achieved by storage in sealed pits or clamps for 8 weeks after using maleic hydrazide as a foliage spray, or the methyl ester of ¢-naphthalene acetic acid applied after harvest. The lowest weight loss over eight weeks in a trial with a cultivar 08/58 was 3 to 4 per cent, and sprouting was reduced to 58 to 64 per cent from 95 per cent in the control. A seedling selection A26 showed no sprouting after 8 weeks' storage at prevailing temperatures. (Authors' abstract).

463. HOOVER, M. W. and L. J. KUSHMAN. 1966. Influence of raw product storage treatments on the quality of sweet potato flakes. Proceedings of the American Society for Horticultural Science, 88: 501-506.

The effects of storage of raw sweet potato roots at different temperatures and storage periods on the quality

and production of sweet potato flakes were investigated. Freshly harvested roots of the Goldrush variety were held at storage temperatures of 55, 70, 85, 95, and 105°F for various periods up to 28 days before processing. Other samples were cured at 85° for 7 days and then stored at 58° for up to 24 weeks before flaking. Short time storage of roots at 105°F resulted in the most rapid improvement in the quality and processing characteristics of the flakes, but more than 4 days at this temperature resulted in breakdown and decay. Quality and processing characteristics improved for only a few days at temperatures above 70°. Roots stored at lower temperatures gave a product approximately equal to the higher temperature storage when held for 2 weeks or longer. Storage of cured roots at 58° for up to 6 or 8 weeks improved the quality and processing characteristics of flakes made from them, and these characteristics did not decline appreciably during 24 weeks storage at 58°.

464. HOOVER, M. W. and V. F. NETTLES. 1956.
Effect of variety and fresh storage upon the quality of frozen sweet potatoes. Proceedings of the Florida State Horticultural Society, 69: 142-145.

A study was made to determine the effect of variety and fresh storage upon the quality of frozen sweet potatoes. The influence of cooking methods upon the carotene content was also studied. Sweet potatoes of five varieties were cured at 85°F.for 10 days followed by fresh storage at 60°F. for periods of time ranging from zero to 105 days before freezing. The frozen potatoes were reheated and graded by the taste panel for color, texture, and flavor. The carotene content was also determined. Sweet potatoes of the Georgia Red variety were preferred over the other varieties as a frozen product. However, a good frozen product was produced with potatoes of the Goldrush, Porto Rico, and Heartogold varieties. Fresh storage up to 105 days did not seem to affect the quality of frozen potatoes when good sound potatoes were used. The method of cooking the potatoes in preparation for freezing had a significant effect upon their carotene content. There was a greater loss of carotene from the potatoes when they were cooked with dry heat than occurred when steam was used.

465. KUSHMAN, L. J. 1975.
Effect of injury and relative humidity during curing on weight and volume loss of sweet potatoes during curing and storage. HortScience, 10(3): 275-277.

Weight and volume losses of roots of sweet potato (*Ipomoea batatas* (L.) Lam. cv. Centennial) during curing were reduced by increasing relative humidity (RH) from 80 to 90, 90 to 97, but not from 97 to 100%. Loss of skin increased loss of weight at all RH but significantly only at 80% RH. Loss of weight during storage was about the same for injured and non-injured roots unless weight loss during curing was high (above 6%), which resulted in a high loss during storage. Loss of weight during curing was highly and positively correlated with subsequent development of decay. During curing RH should be near saturation but during storage RH should not exceed 90%.

466.

467. KUSHMAN, L. J. and M. T. DEONIER. 1957.
Effects of storage temperatures on Porto Rico, Allgold and Goldrush sweetpotatoes. Proceedings of the American Society for Horticultural Science, 70: 425-431.

Sweetpotato roots stored continuously at 70 degrees F did not keep quite as well as those stored at 60 degrees, but produced more plants. Roots stored continuously at 50 degrees did not have good keeping, culinary, and plant-producing qualities. Such roots developed high respiration rates and accumulated more CO_2 and sugars than comparable roots stored at 60 or 70 degrees. All three varieties were similarly affected by low temperatures. Culinary quality did not deteriorate, and carbon dioxide did not accumulate appreciably in roots stored at 50 degrees for six days and at 70 degrees for one day each week for 19 weeks. Decay developed rather rapidly, however, in these roots after the thirteenth week. Build-up of carbon dioxide and depletion of oxygen occurred when roots stored at 32 or 50 degrees were placed at 70 degrees.

468. KUSHMAN, L. J. and M. T. DEONIER. 1958.
Effects of weather, date of harvest and curing treatments on keeping qualities of Porto Rico sweet potatoes. Proceedings of the American Society for Horticultural Science, 71: 369-375.

For tests in 1951-53 sweetpotatoes were dug, cured, and

stored successfully, as long as the soil was workable and the weather fair, up to and well after frost. Roots that did not keep well either were injured when dug from very hard, dry soil or were harvested very late in the season after the soil became cold and very wet. Further work is needed to clarify the effects of soil temperature and moisture. Roots that did not keep well following late harvests tended to develop internal breakdown and were poor in cooking quality after storage even in the absence of internal breakdown. Internal breakdown increased with curing temperature. Partial or complete failure of periderm formation was often detected in roots harvested so late that they failed to keep well. In these tests keeping quality was apparently not associated with changes in ascorbic acid or sugars although sugar content was high in roots that did not keep well when harvested late.

469. KUSHMAN, L. J. and M. E. DEONIER. 1959.
Relation of internal gas content and respiration to keeping quality of Porto Rico sweet potatoes. Proceedings of the American Society for Horticultural Science, 74: 622-641.

In 3 seasons Porto Rico sweetpotatoes harvested so late that they did not keep well were obtained from very wet and sometimes cold soil. Such roots contained very high levels of carbon dioxide, usually low levels of oxygen, very little reducing sugars but high levels of non-reducing sugar, and developed high respiration rates during curing. In additional tests conducted in 2 seasons, roots harvested before and after frost from soils very wet for a week or more also contained high levels of carbon dioxide at harvest, developed high respiration rates during curing and did not keep well in storage. Loss of vines before frost increased the detrimental effect of the wet soil.
Porto Rico sweetpotato roots chilled during storage developed high levels of carbon dioxide, high respiration rates and failed to keep well when returned to non-chilling temperatures. When chilled roots were injured and placed at 85°F periderm formation was abnormal. Non-chilled roots held 2 days at 110° also developed high levels of carbon dioxide and failed to keep.
Roots held a week in atmospheres containing high levels of carbon dioxide and about 20 per cent oxygen developed high respiration rates when returned to normal atmospheres, failed to develop wound periderm properly and did not keep well.

Although the level of oxygen in the roots was often depressed by wet soil or high respiration rates and sugar content was increased by wet soil, late harvesting, or chilling, the factor most closely associated with poor keeping quality in all instances was a high level of carbon dioxide in the roots. The effect of the carbon dioxide appeared to depend on temperature and duration of exposure as well as concentration of carbon dioxide.
Since in these tests, as in previous tests, frost alone was not associated with poor keeping quality, more emphasis should be placed upon soil moisture and temperature because of their effect on carbon dioxide accumulation in the roots and subsequent poor keeping quality.

470. KUSHMAN, L.J., M.T. DEONIER, J.M. LUTZ and B. WALTERS. 1954. Effects of temperature and soil moisture at harvest and of delay in curing on keeping quality of Porto Rico sweet potatoes. Proceedings of the American Society for Horticultural Science, 63: 415-419.

When sweet potatoes were cured immediately after digging, soil moisture and temperature differences at harvest were not associated with differences in the keeping quality in two out of the three years in these studies. In one year when the sweet potatoes were harvested after a long cold, wet period losses in storage were very high despite prompt curing. The greatest losses occurred following the greatest delay (7 days) in curing.

Pitching the roots into heap rows before putting them into crates caused slightly but not statistically more loss than placing the roots directly into crates.

Delaying the start of curing was detrimental in two years out of three and was more detrimental when the sweet potatoes were harvested during cold weather than when they were harvested during warm weather.

For best keeping, sweet potatoes should be harvested before cold weather sets in and placed under good curing conditions promptly. Prompt curing is especially important with sweet potatoes that are harvested during or after a period of cold weather. Excessive delays in harvesting and curing may result in storage losses of 30 percent upward to complete loss in contrast to losses of but 10 to 15 percent for roots harvested under good conditions and promptly cured.

471. KUSHMAN, L.J. and D.T. POPE. 1969.
Influence of curing, variety, size of root, evacuation time and holding time upon the accuracy of intercellular space measurements of sweet potato roots. Journal of the American Society for Horticultural Science, 94: 505-506.

Intercellular space measurements of "Nugget" and "Centennial" sweet potatoes were significantly different due to variety, evacuation and holding periods, and the interaction of curing with evacuation and holding periods but not different because of curing alone, root length, dry-matter content, or uncorrected specific gravity. To determine intercellular space accurately, evacuation time should be no less than 10 min and holding in water after evacuation no less than 15 min.

472. KUSHMAN, L.J. and F.S. WRIGHT. 1968.
A new system for storing sweet potatoes: Curing in one room and storing in another with palletized handling, overhead ventilation, and trench heating and humidification. North Carolina Agricultural Experiment Station Technical Bulletin, 187: 46p.

A two-year study was carried out in a large commercial storage house located at Clinton, North Carolina to develop methods of curing and storing sweet potatoes with fork-lift handling of palletized field boxes.

Data showing electricity consumed, hours of blower or furnace operation, and fork lift operating time are discussed along with construction, seasonal differences, and management practices.

473. LEWIS, D.A. and L.L. MORRIS. 1956.
Effects of chilling storage on respiration and deterioration of several sweet potato varieties. Proceedings of the American Society of Horticultural Science, 68: 421-428.

Eleven named and unnamed varieties of sweet potatoes were stored at 59 and 50 degrees F, and Porto Rico was also stored at 41 degrees F. Chilling injury developed on all varieties at 50 degrees F and was severe on Porto Rico at 41 degrees F. Storage at 50 degrees F resulted in accelerated respiration, increased decay, surface pitting and shriveling, inhibition and death of sprouts, taste differences, and, in some varieties, flesh discoloration after cutting. Differential responses by varieties were observed.

474. LUTZ, J.M. 1952.
Influence of temperature and length of curing period on keeping quality of Porto Rico sweet potatoes. Proceedings of the American Society for Horticultural Science, 59: 421-425.

In these experiments with a fairly high humidity during curing it was found that: 1) decay was less following curing at 84 degrees F than at any of the other temperatures used, although at 90 there was only slightly more; 2) curing at 84 degrees F for four days was ample. The longer periods usually recommended are not necessary, are wasteful of heat, and are more conducive to sprouting; 3) curing at 95 degrees F for longer than 2 days was harmful; 4) curing at 80 degrees F resulted in more decay than at 84 and curing at 74 degrees gave even poorer results; 5) nearly all curing treatments resulted in less decay than not curing; 6) the longer curing periods at 90 and 95 degrees F resulted in higher weight losses than the other treatments; and 7) no adverse effect of any of the curing temperatures on table quality was noted.

475. LUTZ, J.M. PARK, and M.T. DEONIER. 1951.
Influence of methods of harvesting sweet potatoes on their storage behaviour. Proceedings of the American Society for Horticultural Science, 57: 297-301.

Of the various methods of digging sweet potatoes, the best keeping quality was obtained by digging with a 16-inch turning plow. About the same amount of loss occurred when the roots were dug with a rod wing middlebuster, but this implement caused more skinning. Digging with a mechanical Irish potato digger gave poorest results, although a digger with most of the shakers removed was fairly satisfactory. Results from digging with an ordinary middlebuster or a 12-inch turning plow were intermediate.

Best results in picking up were obtained when sweet potatoes were picked up directly into the storage crates. Throwing into heap rows was slightly less satisfactory. Leaving overnight when exposed to frost was undesirable. Very poor keeping quality was obtained when sweet potatoes were picked up into sacks.

476. MARR, C.W. 1970.
An investigation of several physical and chemical factors associated with chilling injury in stored sweet potato cultivars. A dissertation . . . London, University Microfilms International. 95p.

The objective of this research was to evaluate the effect of chilling temperatures on the appearance of raw roots of selected sweet potato cultivars and on the color and flavor of baked roots of these same cultivars. Details of the study and its results are presented.

477. MARR, C.W. and H.D. SWINGLE. 1970.
Some factors associated with chilling injury in four varieties of stored sweet potatoes. HortScience, 5(4): 316.

Four sweet potato varieties were stored at 35°,45° and 55°F for weekly storage periods up to 6 weeks. Both cured and non cured roots were studied. Roots were evaluated for visual symptoms of chilling injury. Measurements of several physical and biochemical factors associated with chilling injury were made.

478. MATTUS, C.E. and F.M. HASSAN; 1968.
Controlled Atmosphere Storage Studies with Sweet Potatoes. Hortscience, 3(2): 90.

Several cultivars of sweet potatoes were held as test lots under different levels of controlled atmospheres (CA). Cured and uncured roots were held in refrigerated CA rooms and in non-CA refrigerated rooms. Sweet potatoes stored at above 10% CO_2 or below 7% O_2 often developed alcoholic or off-flavors. Roots at 2 to 3% CO_2 and 7% O_2 were better than check roots as indicated by percent of acceptable tasting roots and lower total losses due to decay, weight loss, and dry matter loss. Centennial and Jersey benefited most from CA storage. Porto Rico and Goldrush benefited to a lesser extent but Oklamar and Nemagold did not respond well to CA. Decay losses were greatest for uncured roots that were not held in CA storage.

479. MC COMBS, C.L. and D.T. POPE. 1958.
The effects of length of cure and storage temperature upon certain quality factors of sweet potatoes. Proceedings of the American Society for Horticultural Science, 72: 426-434.

Roots of the Porto Rico variety of sweet potatoes were cured for four and ten days at 85 degrees temperature with a relative humidity of 90-92 per cent and then held at 55, 60, or 65 degrees F for an extended period of storage. Weight loss, and the content of dry matter, total sugar, reduced and total ascorbic acid (reduced plus dehydroascorbic acid) were determined at harvest and at bi-monthly intervals during storage. This study was conducted for three seasons.

It is concluded from this experiment that a four day period, employing the conditions specified, is ample curing time for the Porto Rico variety. The length of cure (four or ten days) had no effect on the composition of the roots during storage, and only a minor effect on weight losses. Roots cured for four days lost on the average about one per cent more weight than roots cured for ten days.

Roots stored satisfactorily from November through the following June at 55 or 60 degrees F. At the lower temperature the total sugar content was higher and the weight losses were less, particularly with roots cured for ten days. For an extended storage period, 65 degrees F is not recommended as sprouting is excessive and the roots become "pithy". The weight losses were greatest at the higher storage temperature.

Although present in varying amounts during storage, the content of dehydroascorbic acid was relatively stable in contrast to reduced ascorbic acid. During the early part of the storage period the content of dehydroascorbic acid was approximately one-half that of reduced ascorbic acid, but during the latter part of storage the two forms of ascorbic acid were present in almost equal amounts. The inclusion of the dehydro form in ascorbic acid determinations resulted in considerably higher Vitamin C values than are usually reported for this variety.

479(a) MCDONALD, R.E. 1970.
Some effects of post-harvest handling methods on sugars and inositol in the sweet potato. (*Ipomoea batatas poir*). A dissertation . . . London, University Micro-films International. 64p.

The behavior of individual sugars and inositol of Acadian, Centennial, Goldrush and Julian sweet potatoes were followed during normal curing, storage and baking. The "Standard" ethanol sugar extraction method and a chloroform-methanol extraction were compared. Determinations of sugar trimethylsilyl derivatives by gas-liquid chromatography were examined. The results are presented and discussed.

480. MILLER, J.C., R.M. MELLAMPY and T.P. HERNANDEZ. 1949.
Effect of storage on the carotene content of fourteen varieties of sweet potatoes. Proceedings of the American Society for Horticultural Science, 59: 399-401.

The results of this investigation show that there is a wide range in the beta carotene content of the roots of different varieties of sweet potatoes. An increase was observed in the beta carotene content of some varieties during the first month of storage at 75 degrees F and a decrease after

4 months storage. Furthermore, it was found from the ratio of carotene to other pigment in the root of the sweet potato that the principal pigment is beta carotene. This confirms the earlier finding of Matlack.

480(a). OHASHI, H. and I. URITANI. 1972.
The mechanism of chilling injury in sweet potato. IX. The relation of chilling to changes in mitochondrial respiratory activities. Plant and Cell Physiology, 13: 1065-1073.

To examine the mitochondrial activity of chilling-stored sweet potatoes a method of isolating mitochondria with a good respiratory control (R.C.) ratio from healthy sweet potato tissue was established. Mitochondria were isolated from two varieties of sweet potatoes. The results are discusssed.

481. PORTER, W.C. 1975.
Biochemical studies of varietal response of sweet potato (*Ipomoea batatas*, (L.) (L/M.) roots to chilling injury. Thesis . . . London, University Microfilms International. 60p.

The thesis reports the results of studies undertaken to investigate the response of the roots of three sweet potato lines to a chilling temperature. The chlorogenic acid oxidase enzyme was studied to see if its activity could explain the discoloration of chilled tissue, if its loss of activity could cause the increase in chlorogenic acid content as claimed for sweet potato roots or if it was connected to the increased susceptibility to decay. A peroxidase enzyme was studied to see if it was associated with discoloration of chilled tissue or if it was associated with the increased susceptibility to decay. The anioic isozyme patterns of both enzymes were investigated to see how they responded if the enzyme activity changed with chilling. The concentration of chlorogenic acid was followed to see if it increased during chilling storage as reported. Observations of decay and tissue discoloration were made after chilling storage and after subsequent removal to a non-chilling temperature. In this study both the outer cortical and central parenchyma tissue were studied in order to determine if both areas of the root responded in a similar manner. (Author's summary abridged).

482. PORTER, W.C., D.M. PHARR, and L.D. KUSHMAN. 1976. Discoloration of chilled sweet potato (*Ipomoea batatas L. Lam.*) roots: factors related to cultivar differences. Journal of Food Science, 41(4): 938-941.

Roots of sweet potato cultivar Jewel, and two unnamed selections were stored at 5°C or 14°C for 10 weeks. Increased discoloration of certain cultivars of chilled sweet potato roots is apparently not due to an increase in the amount of extractable peroxidase or chlorogenic acid oxidase activity. The data indicate that differences among cultivars in discoloration resulting from chilling injury may be due to differences in tissue P.H. and chlorogenic acid content. (Author's summary modified).

483. PORTER, W.C., D.M. PHARR, L.J. KUSHMAN, and D.T. POPE. 1975. Biochemical studies of varietal response of sweet potato roots to chilling injury. Hortscience 10(2): 5.

Roots of cultivars Jewel, 213 x 228-1 and 257 x 255-8 were stored at 40 F or 57 F. They were sampled at 2 week intervals for 10 weeks. The cortical and parenchyma tissues were analyzed separately for peroxidase activity, chlorogenic acid oxidase activity, pH, and chlorogenic acid content. Chilling storage did not affect the amount of extractable peroxidase or chlorogenic acid oxidase activity in any tissue of any variety. The cortical tissue always has a higher enzymatic activity than the paranchyma tissue. 213 x 228-1 and 257 x 255-8 exhibited dramatic increases in pH of both tissues when chilled. 213 x 228-1 exhibited a large increase in chlorogenic acid content during 40 F storage. Non-chilled roots did not show any change in any parameters measured. The possibility of a pH induced discoloration of chlorogenic acid in relation to chilling injury was discussed.

484. RHODES, M.J.C., and L.S.C. WOOLTORTON. 1978.
Changes in the activity of hydroxycinnamyl CoA: Quinate hydroxycinnamyl transferase and in the level of chlorogenic acid in potatoes and sweet potatoes stored at various temperatures. Phytochemistry, 17(8): 1225-1229.

A large increase in the activity of hydroxycinnamyl CoA: quinate hydroxycinnamyl transferase (CQT) occurred in potatoes stored at 0 and 2^{0} and such an increase was prevented by storage at either 5 or 10^{0}. The increase was most rapid in potatoes stored at 0^{0} where it reached a maximum after 28 days and then declined slowly during storage for up to 6 months. The role of PAL, ligase and CQT in the control of chlorogenic acid accumulation in these commodities and the significance of changes in their activities in relation to physiological changes at low temperatures are discussed.

485. SCOTT, L.E. and W.A. MATHEWS. 1957.
Carbohydrate changes in sweet potatoes during curing and storage. Proceedings of the American Society for Horticultural Science, 70: 407-413.

Determinations of weight loss and carbohydrate changes during the curing period, and at intervals during a six-month storage period of 16 sweet potato varieties and selections showed the following: 1) Distinct varietal differences were found at time of harvest and during the storage period in dry matter, starch and sugar content of the roots; 2) Starch content of the roots decreased during the entire storage period. Sugar content increased during curing and the first two months of storage, decreasing slightly during the final period of storage. The magnitude of change varied among the varieties. (Authors' summary abridged).

486. SISTRUNK, W.A. 1977.
Relationship of storage, handling, and cooking method to color, hardcore tissue, and carbohydrate composition in sweet potatoes. Journal of the American Society for Horticultural Science, 102(4): 381-384.

The effects of bruising and chilling on color, hardcore, and carbohydrate composition in 'Centennial' and 'Georgia Jet' sweet potato roots (*Ipomoea batatas* (L.) Lam.) were observed after baking and boiling. 'Centennial' was better in color than 'Georgia Jet' by both cooking methods. There was a general increase in discoloration as storage was extended to 10 days. Baked roots were better in color than boiled by both Hunter Color Difference Meter and sensory scores. The incidence of hardcore was higher in 'Georgia Jet', and the amount increased with storage time at 2°C. Bruising did not influence hardcore, but bruised lots had more discoloration and received lower color scores. 'Centennial' was higher than 'Georgia Jet' in all carbohydrates except cellulose. All carbohydrates decreased during 10-day storage except sugars and water soluble pictin. Cooking by baking converted more starch to sugar than boiling. Significant interactions occurred among cultivar, storage temperature, storage time, and cooking method that influenced the interpretation of the results.

487. TERESHKOVICH, G. and D.W. NEWSOM. 1964.
The effect of storage and re-curing on the development of periderm tissue in several sweet potato varieties. Proceedings of the American Society for Horticultural Science, 85: 434-440.

Periderm tissue in roots of L1-80 sweet potato increased significantly more in thickness than any other variety studied. In roots of the Goldrush variety periderm tissue also increased but not as much as in L1-80. Periderm tissue on roots of Centennial and Unit 1 Porto Rico varieties did not increase either in 60°F or in common storage.

Injured Goldrush and L1-80 roots, when re-cured for 10 days under favorable conditions (82-84°F, with a relative humidity of 70-75%), developed wound periderm tissue around bruised areas. However, when bruised Goldrush and L1-80 roots were not re-cured but replaced after re-washing to either 60°F storage or to common storage, wound periderm tissue did not develop near the bruised areas.

488. TERESHKOVICH, G. and D.W. NEWSOM. 1965.
Some effects of date of washing and grading on keeping quality of sweet potatoes. Proceedings of the American Society for Horticultural Science, 86: 538-541.

Sweet potato roots that were either washed or non-washed; 1, 60 or 90 days after harvest kept best and lost least weight when stored at 60°F for 4 months. In common storage, the roots kept best when cured and stored without washing. Roots not washed after harvest had the least number of bruises. Roots washed within 10 days after harvest had more bruises than those washed either 30, 60 or 90 days after harvest. Correlations indicated that roots with fewer bruises lost less weight than those severely bruised.

489. WANG, H. 1974.
Study on the carotene content of sweet potato; effect of storage on the carotene content of sweet potato varieties. Journal of the Agricultural Association of China, 87: 50-56.

This experiment was aimed at studying the variation of carotene content of sweet potato varieties after harvest and storage so as to guarantee their quality for table use or processing. The preliminary results revealed that sweet potatoes could no doubt be stored for at least two months after harvest under the room temperature during the winter season of Taiwan. There was a tendency that the carotene content of sweet potato varieties increased during the storage period. However, the carotene varied with both varieties and storage period. The increase of the carotene content within the early period of storage might be partly attributed to the increase of percentage of dry matter and decrease of moisture content. In addition to the carotene content, no matter how the sweet potatoes are used directly for table use or for canning purpose, the percentage of dry matter which affects the sweetness and the firmness of the treated tuber is also considered an important factor in keeping the quality. (Text in Chinese). (Author's summary).

490. WILSON, L.G., C.W. AVERRE and H.M. COVINGTON. 1977.
Sweet potato production, handling, curing, storage and marketing in North Carolina. In: Cock, J., R. MacIntyre and M. Graham. Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops, held at CIAT, Cali, Colombia. 1-7 August, 1976, Ottawa, IDRC. pp. 146-150.

North Carolina has an excellent climate and soil for producing high yields of quality "yam type" sweet potato cultivars. 'Jewel' which stores well for over 9 months, originated from this state. Over the past 30 years, the combined efforts of research and extension scientists and interested growers and persons in agribusiness industries have minimized the effects of diseases and insects, and introduced improved production, harvesting, curing, storage and marketing techniques. Discussion includes problems, current investigations and future trends.

491. YAMAKI, S. and I. URITANI. 1972.
Mechanism of chilling injury in sweet potato. VII. Changes in mitochondrial structure during chilling storage. Plant and Cell Physiology, 13: 795-805.

Mitochondrial protein-N amounts per the contents of heme a, cytochrome b and cytochrome c, the tightly bound components in the mitochondrial inner membrane, were not changed during 14 days of chilling stored sweet potatoes. However, the lipid-P amount per amount of protein-N in mitochondria decreased by about 20% during the 14 days chilling period. Via electron microscopy, two types of mitochondria were found in the mitochondrial fraction prepared from healthy sweet potatoes. One, which had reticulately-developed cristae and extremely-electro dense matrix spaces, was called Form A. The other, which had cristae which were not clearly distinguished from the matrix spaces, was called Form B. In the fraction prepared from 14 days chill-stored sweet potatoes, a third type of mitochondria was found besides Form A and B. This one, which had an extremely swollen form, was called Form C. Form C is thought to occur through the degradation of Form A or B, concomitant with the release of phospholipid from both the inner and outer membranes during chill-storage. It is quite likely that Form C occurs during physiological deterioration in sweet potato root tissues, which proceeds irreversibly during chill-storage. (Author's abstract).

I. FOOD PROCESSING

I. 1. General

492. CRUMPTON, W.R. 1974.
Thermal diffusivity of sweet potatoes. A dissertation ... London, University Microfilms International, 81p.

This thesis reports research in the physical property of the sweet potato, particularly the determination of the thermal diffusivity of sweet potato materials during commercial sterilization and the resulting firmness of these materials. Since commercial sterilization by thermal processing is the killing of harmful microorganisms likely to be present throughout the food stuffs during the processing operations, it is the most important operation from the standpoint of safe preservation of food. The thermal diffusivity will not only be effectively used in determining sterilization processes, but it will also be helpful in the design of processing equipment for new sweet potato products. (Author's abstract modified).

492(a) LEE, S.R. 1970.
Preparation of drum-dried weaning food based on sweet potato and soybean. Korean Journal of Food Science and Technology, 2(2): 1-7.

(1) A process was described for the preparation of drum-dried weaning food containing about 20% protein and based on a blend of sweet potato, full-fat soy flour, minerals, vitamins and methionine. (2) The protein efficiency ratio of this product was 2.63 as compared to 3.30 for the blend containing corn starch in place of sweet potato. This is attributed to the partial destruction of available lysine in the presence of sweet potato during the drum-drying process. (3) Overall nutritive value of the weaning food was comparable to milk food and control food based on corn starch and soy flour in terms of feed efficiency, body composition and protein retention.

493. McDONALD, R.E. and D.W. NEWSON. 1970.
Extraction and Gas-liquid chromatography of sweet potato sugars and inositol. Journal of the American Society for Horticultural Science, 95(3): 299-301.

The standard ethanol sugar extraction method and a chloroform-methanolethanol ($CHCl_3$-MeOH-EtOH) extraction were compared. Determinations of sugar trimethylsilyl derivatives by gas-liquid

chromatography were examined. The results are discussed.

493(a) SCOTT, L.E., H. HARRIS, R.J. CONSTATINE, et al. 1970. Processing (of sweet potatoes). In: Thirty years of Cooperative Sweet Potato Research 1939-1969. Southern Cooperative Series, Bulletin, (U.S.A.) No.159: 39-45.

This report summarizes the results of research to improve quality of existing sweet potato products ("convenience" food) and develop new products for the market. Syrup and vacuum packs presently constitute the great majority of processed products, although a number of other products have been developed that are attractive and highly nutritious and have shown promise of excellent consumer acceptability.

Processing of sweet potatoes is rapidly changing from the utilization of surplus or off-grades not desired by the fresh market, to processing of a crop specifically for that purpose. Such a change should result in more efficient processing techniques and in products more uniformly high in quality.

Aspects of processing covered by the report include varietal testing, mechanization, removal of peel, internal can corrosion, enzymatic darkening, texture of canned sweet potatoes, and other types of sweet potato products.

I. 2. Cooking and Steaming

494. CODY, M. and N.F. HAARD. 1976. Influence of cooking on toxic stress metabolites in sweet potato root. Journal of Food Science, 41(2): 469-470.

Microwave and bake cooking operations destroyed approximately 90% of the ipomeamarone in sweet potato roots. 4-ipomeanol was more heat stable than ipomeamarone, although it also decreased substantially as a result of normal cooking. These findings are contrary to a previous report which indicated that these toxins were not destroyed by cooking. (Author's abstract).

495. VILLAREAL, R.L., S.C. TSOU, S.H. LAI and S.L. CHIU. 1979. Selection criteria for eating quality in steamed sweet potato roots. Journal of the American Society for Horticultural Science, 104(1): 31-33.

Steamed roots of promising breeding lines of sweet potato (*Ipomoea batatas* (L.) Lam.) and cultivars were evaluated for flavor, dryness, stickness, color, and general acceptability to determine selection criteria that influence general acceptability. The acceptability ranking of roots varied according to the nationality of the panel member. Based on the results of stepwise multiple regression analysis, it appeared that flavor and color would be good eating quality characteristics for predicting general acceptability of steamed sweet potato roots. Alcohol insoluble solids and total soluble solids after steaming contributed 85% to the variation of dryness in sweet potato roots.

I. 3. Baking

496. CONSTANTIN, R.J., T.P. HERNANDEZ, J.C. MILLER et al. 1966.

Inheritance of baking quality in the sweet potato, *Ipomoea batatas*. Proceedings of the American Society for Horticultural Science, 88: 498-500.

The baked roots of sweet potato seedlings from progenies of several parental combinations were evaluated for flesh color, flavor, texture, fiber content, sweetness, moistness, and general acceptability, and all of these ratings were averaged to obtain a baking index for each seedling. Crosses between parents having low baking indexes produced seedlings, most of which had low indexes. When one parent had white flesh, most seedlings in the progeny were white fleshed, and this character contributed greatly to the low baking index of the progeny. In crosses between parents having average or superior baking quality, 74 to 94% of the seedlings had an average or superior baking quality. Correlations between sweetness and flavor, sweetness and moistness, sweetness and baking index, flavor and moistness, flavor and baking index, and color and baking index were positive and highly significant.

497. HAMMET, H.L. and B.F. BARRENTINE. 1961.
Some effect of variety, curing and baking upon the carbohydrate content of sweet potatoes. Proceedings of the American Society for Horticultural Science, 78: 421-426.

The carbohydrates in 2 varieties of sweet potatoes, Porto Rico and Allgold, were studied in both raw and baked roots. The roots were sampled at harvest, after curing for 7 days and at the end of 60 days storage.

Total sugars were highest in Allgold at harvest. Reducing and total sugars increased significantly during curing and storage in both Allgold and Porto Rico. Both varieties decreased significantly in amylose and increased in amylopectin.

When the roots were baked, highly significant changes occurred in the carbohydrate fractions. These changes were greater in roots of the Porto Rico variety. Dextrin was found only in the baked roots, and there was a significant negative correlation between dextrin and amylose. There was a highly significant correlation between total and reducing sugars.

Apparently a high dextrin and low amylose content are closely associated with quality in the baked sweet potato.

498. JENKINS, W.F. and M. GIEGER. 1957.
Curing, baking time, and temperatures affecting carbohydrates in sweet potatoes. Proceedings of the American Society for Horticultural Science, 70: 419-424.

Porto Rico and Allgold sweet potatoes can be baked satisfactorily for eating in 90 minutes by using oven temperatures ranging between 300 and 350 degrees F. Within this range of oven temperatures the internal temperatures of the roots never exceeded 212 degrees F. This maximum temperature was reached in 80 minutes by Porto Rico and in 90 minutes by Allgold roots.

Porto Rico roots contained two or three times as much maltose after baking as Allgold. Dextrin was found only in the cured baked roots of each variety. The cured, unbaked roots contained only traces of dextrin. Dextrin, maltose, and reducing sugars increased in the roots of both varieties from the raw to the baked state. Alcohol insoluble solids were reduced during the first 30 minutes baking.

499. JONES, I.D., D.D. MASON, L.T. POPE and J.H. DIETZ. 1959.
A study of group acceptance of baked sweet potatoes. Proceedings of the American Society for Horticultural Science, 73: 473-478.

(1) Comparative tests of four varieties and one selection of sweet potato have been conducted at intervals during two crop years. Criteria for organoleptic comparison were color, flavor, texture (consistency) and general acceptance. All evaluations were made upon the baked product.

(2) Significant difference in quality between Porto Rico and one or more of the recently introduced varieties tested was observed with respect to each criterion employed.

500. MARTIN, F.W. 1972.
Sweet potato bread from Peru. Tropical Root and Tuber Crops Newsletter, 5: 52.

As an example of a new commercial product utilizing the sweet potato the pan-camote (sweet potato breed) of Peru is outstanding. Developed at the experiment station of the Association of Agricultores of Canete, the new bread, containing 30% flour from sweet potato and 70% wheat flour, appears to be gaining wide popularity. The director of the station publicized the techniques, which utilize principally the varieties Paramonguino Mejorado and CN-S-50: The protein content of the bread is equal to that of regular bread. Its appeal is also enhanced by its high level of moisture. Not only does the bread have an enriched nutritive value, due to the provitamin A obtained from sweet potato, but also the production of this bread reduces the reliance of the country on imports of wheat.

501. SAMMY, G.M. 1970.
Studies in composite flours. I. The use of sweet potato flour in bread and pastry making. Tropical Agriculture (Trinidad), 47(2): 115-125.

Sweet potato flour prepared from cultivar '049' may be used without any difficulty as a substitute for wheat flour at a rate of up to 15 per cent in bread making and at 20 to 30 per cent in pastries. Bread containing 20 per cent was also acceptable although less so than that containing 15 per cent. Flour from this cultivar was of poor quality for bread and pastries. Flour made from peeled and unpeeled sweet potatoes differed little in baking properties. Sodium metabisulphite treatment improved the colour of the flour, but an SO_2 content greater than 100 ppm affected baking properties. Addition of one per cent glyceryl monostearate and one per cent glyceryl monopalmitate to the composite flour only slightly improved the baking properties. A high protein additive had little effect on baking properties. (Author's abstracts).

I. 4. Canning

502. BAUMGARDNER, R.A. and L.E. SCOTT. 1962.
Firmness of processed sweet potatoes (*Ipomoea batatas*) as affected by temperature and duration of the post-harvest holding period. Proceedings of the American Society for Horticultural Science, 80: 507-514.

Firmness of processed sweet potatoes as affected by temperature and duration of short post-harvest holding periods was investigated. Duration of the holding period varied from 2 days to 2 weeks and temperatures ranged from 0 to 30 C. Firmness was measured by both subjective and objective methods. The following conclusions are based on the results obtained during 3 years from tests with 6 different lots of sweet potatoes.

A firm product resulted when roots were processed within 24 hours after harvest. Holding temperature prior to processing had a marked effect upon firmness. A soft canned product was associated with a holding temperature of 15 or 30° C; whereas a firm product resulted when the canning stock was held at 0° C. Varietal differences in response to the effect of storage were evident.

503. HUFFINGTON, J.M., E.R. MCCONNELL and P.M. GOTTSCHALL. 1956.
Sweet potato varieties for canning: influence of storage on quality. Proceedings of the American Society for Horticultural Science, 67: 504-512.

Kandee and shoreland varieties were found to be suitable for use in canning both syrup and vacuum styles sweet potatoes, either when freshly dug or after one month's commercial storage.

Maryland Golden, contrary to commercial experience in recent years and the results of the 1950 and 1951 tests, was satisfactory under 1954 conditions for use in both syrup and vacuum style packs either when freshly dug or after one month in commercial storage.

Heartogold showed considerable variation in firmness and wholeness in individual syrup style samples when packed after one month in commercial storage, but when freshly dug made satisfactory packs, both in syrup and vacuum styles.

Porto Rico and Jersey Orange (Orlis) varieties were suitable for use in syrup style packs both when freshly dug and after one month in commercial storage, but were suitable only in vacuum style when freshly dug. Porto Rico showed considerable variation in color within and between samples, which lowered its color score. The limited number of Jersey Orange (Orlis) samples stored at cold (outside atmosphere) temperatures gave at least indication that this variety would be unsuitable for packing after one month at these conditions.

Sunnyside variety was suitable for canning in syrup both when freshly dug and after one month in commercial storage, but not suitable for use in vacuum packs. These results are contrary to those obtained during the more nearly normal conditions of the 1950-1951 season.

Virginian variety was suitable for canning in syrup when freshly dug, but because of its variation in firmness and wholeness, could not be considered as satisfactory for use in vacuum packs or in syrup packs made after storage.

Cadino and Nemagold varieties, considering only the 1954 seasonal conditions, were not suitable for canning. Yields of Nemagold, however, in total bushels per acre (not canning size) have been consistently high.

From the few samples of Earlyport and Goldrush varieties it appears that except for its variable color Earlyport may be suitable for canning in both syrup and vacuum styles both when freshly dug and after storage. Goldrush had good color but appears to be suitable for packing only in syrup and when freshly dug.

504. JENKINS, W.F. and W.S. ANDERSON. 1956.
Geographical location and storage affecting carbohydrates and canning quality in sweet potatoes. Proceedings of the American Society for Horticultural Science, 68: 406-411.

Sweet potatoes grown at two separate locations in Mississippi in 1955 varied in carbohydrate contents, internal color, and turbidity of the syrup in which the roots were canned. Roots grown at State College had more sugars and more alcohol insoluble solids than those grown at Stoneville. Porto Rico contained 3 to 5 per cent more alcohol insoluble solids in the raw roots than Allgold or Goldrush. Storage caused an increase in sugars and a corresponding decrease in the alcohol insoluble solids content of each variety.

Canning the roots in 25% sugar syrup increased the total sugar content by 12% and decreased the alcohol insoluble solids by 7 to 10%. Reducing sugars in the canning syrup increased from 0 to 5%, while non-reducing sugars increased 10%. Syrup from canned Porto Rico roots, especially in those canned at harvest, was more turbid than that from the other two varieties canned.

Canned roots from Stoneville had a more uniform, though lighter, color than those from State College but State College roots canned were the firmest. Stored roots from State College when canned had fewer cracks, less turbid syrup, and were more desirable than roots from Stoneville. The location where grown, varieties, and storage after harvest were factors affecting the carbohydrate content and canning quality.

505. KATTAN, A.A. and D.L. LITTRELL. 1963.
Pre- and post-harvest factors affecting firmness of canned sweet potatoes. Proceedings of the American Society for Horticultural Science, 83: 641-650.

A 3-year study was conducted to investigate the effects of certain pre- and post-harvest factors on firmness of canned sweet potatoes, as measured objectively by the ASCO Firmness Meter. Early September harvest consistently produced a firmer product than the October harvest. Delay in harvest was associated with decrease in A.I.S. Irrigation increased the firmness of the canned product and this effect was more pronounced in late harvest. Irrigation also increased the percentage of A.I.S.

Of all the factors under study, post-harvest handling had the greatest effect on firmness. When the raw product was stored at room temperature or when cured at 85° F and stored at 60° F, firmness of the canned product decreased progressively with storage duration, and was associated with rapid decrease in A.I.S. and starch. In contrast, when the raw product was stored at 35° F, firmness of the canned product continued to increase, and was associated with increase in A.I.S. and starch of the canned product. Length of processing time at 240° F had very little effect on firmness. Prolonged processing slightly decreased firmness, only when considerable hydrolysis had already taken place in the stored raw product. The firmness values obtained by the ASCO meter were highly correlated with percentage of A.I.S. and starch in the canned product.

506. MATHIA, G.A. and R.A. KING. 1962.
Planning data for the sweet potato industry. Raleigh (N. Carolina), the State University at Raleigh. 73p.

This is a study of the optimum number, size and location of sweet potato processing plants in 43 counties in Eastern North Carolina. Among the variables considered were the quantity of potatoes produced, production density, assembly costs and processing costs. Only specialised sweet potato canning plants were considered. The results are presented and discussed.

The study indicates that savings in processing costs exceed the increases in assembly costs by 5% when one plant processes the commercial production in the 138 townships instead of three. (Author's abstract abridged).

507. McCONNELL, E.R., P.B. COTTSCHALL, JR. and J.M. HUFFINGTON. 1956.
Influence of variety and storage on the quality of canned Louisiana sweet potatoes. Proceedings of the American Society for Horticultural Science, 67: 493-502.

Periodic evaluation of the canned product during six months' storage at room temperature was carried out on ten selected varieties of sweet potatoes grown and packed in Louisiana under controlled conditions. These test samples were canned in both syrup and vacuum styles respectively, when freshly dug, after one month, and after three-months commercial storage. To determine which varieties might prove most suitable for canning in this area, the samples were judged for quality by scoring for firmness, wholeness, texture, color and flavor.

Judged solely on the quality of the canned product made from the test sweet potatoes grown and packed in Louisiana during the 1954 season, the following conclusions were drawn.

Earlyport, Kandee, Sunnyside, and Nemagold varieties of sweet potatoes were suitable for use either in syrup or vacuum style packs when freshly dug, but were suitable only for syrup style packs after being held in storage. However, some variation was encountered in the firmness and wholeness of Nemagold.

Allgold variety was suitable for canning in syrup both when freshly dug and after the sweet potatoes had been in storage; however, when canned after storage, it showed only fair firmness. This variety did not make a good vacuum pack.

Goldrush, Porto Rico, and Heartogold varieties were suitable for canning either in syrup or vacuum pack styles, when freshly dug. Goldrush when canned after storage retained good wholeness, but showed rather poor firmness. Neither Porto Rico nor Heartogold were considered suitable for canning after storage.

Orlis (Jersey Orange) had too poor a color to be acceptable for canning when grown in the Louisiana area.

Shoreland variety apparently cans well, but its poor growth characteristics in the Louisiana area discourages its use there.

Although when freshly dug several varieties could be used to make acceptable vacuum packs, the general quality of the vacuum packed sweet potatoes was not as good as that of the syrup packs canned in this area.

508. MILLER, J.C. 1957.
New aspects for processing sweet potato products. Proceedings of the Florida State Horticultural Society, 70: 221-223.

The aspects discussed are canning, freezing, pre-peeling chips and flakes.

509. NANZ, R.A. 1953.
Sweet potato canning in Florida. Proceedings of the Florida State Horticultural Society, 66: 276-277.

Research on improved varieties for canning, better yields from these acreages, is aimed toward expanding the industry. The future of profitable canning of sweet potatoes depends on such research. The demand for canned sweet potatoes exists strong and Florida can be a factor in providing this need.

Active sales depend on a quality pack. Care to follow all precautions during the canning preparation and handling is essential. In order to have a product equally as acceptable as those packed in other sweet potato growing areas, the Florida canner must use recommended technics. Grading the peeled product to remove substandard pieces, poorly peeled or under size, is of great help in getting the quality pack.

No carry over of the pack should result if the sweet potato is canned under careful supervision.

510. SMITTLE, D.A. and L.E. SCOTT. 1968.
Internal can corrosion by processed sweet potatoes as affected by phenol oxidase activity and nitrate content. Hortscience, 3(2): 100. (Also in Journal of the American Society of Horticultural Science, 94(6): 649-654. 1969).

Cultivars of sweet potatoes which caused severe can corrosion had a high nitrate content and a high phenol oxidase activity. Can corrosion was increased by high levels of nitrogen fertilization when the phenol oxidase activity was not controlled. However, when phenol oxidase activity was restricted, very little corrosion occurred regardless of nitrate level. Tin removal from the can is proposed to be a solubilization-chelation reaction. Nitrates or other oxidizing agents oxidize the tin, thus increasing solubility. Quinones produced by phenol oxidase activity then chelate the tin from solution. Severe can corrosion did not occur if either the nitrate content of the sweet potatoes was low or quinone formation was controlled. Addition of EDTA increased tin removal while addition of iron or calcium salts had the opposite effect. It is proposed the Fe^{++} and Ca^{++} compete with tin for chelation sites.

511. WOODROOF, J.G. 1958.
Processing sweet potatoes. Proceedings of the Florida State Horticultural Society, 71: 223-227.

Aspects of processing include canning, freezing or manufacturing them into speciality. Aspects of canning discussed are: size, curing effects, uncurred versus cured, peeling, styles of packs, the use of corn syrup in canning sweet potatoes, discoloration. It is noted that while the sweet potato is composed chiefly of starch and sugar, they also contain calcium, phosphorus, and iron, as well as carotene, thiamine, riboflavin, niacin and ascorbic acid.

I. 5. Flaking

512. GROSS, M.O. and V.N.M. RAO. 1977.
Flow characteristics of sweet potato puree as indicators of dehydrated flake quality. Journal of Food Science, 42(4): 924-926.

Mouthfeel attributes of dehydrated sweet potato flakes can be

predicted by viscometric analysis of puree. Georgia Red, Red Jewel and Rose Centennial were stored at 15°C, 95% RH for 0, 7, 14 and 47 days to insure varying degrees of starch conversion. The flow behavior of the pureed cultivars was analyzed to yield a suitable flow model and apparent viscosity at selected shear rates. The remaining puree was double drum dehydrated and the resulting flakes were evaluated for mouthfeel qualities. The flow index, coefficient of shear rate and apparent viscosity obtained from viscometric analysis were found to be significantly correlated to mouthfeel descriptors used for evaluation of the flakes. (Author's abstract).

513. KUSHMAN, L.J. and M.W. HOOVER. 1965.
Effects of temperatures on acidity of sweet potato roots and flakes made from them. Proceedings of the American Society for Horticultural Science, 87: 391-397.

Tissues taken from Goldrush sweet potatoes at intervals during storage at chilling temperatures first became more acid and then less acid than tissues of nonchilled roots. These changes occurred more rapdily at temperatures of 35° or 40° F than at 45° or 50°. Flakes made from chilled and nonchilled roots retained the differences in acid found in fresh roots. Processing into flakes did not remove the factors for off-flavor usually detected in chilled roots.

Changes in acidity are discussed in relation to other physiological reactions associated with chilling injury.

514. LOPEZ, A. 1976.
Changes in some monocarbonyl classes during processing and storage of sweet potato flakes. Journal of Food Science, 41(3): 524-527.

Dehydrated sweet potato flakes were prepared in a pilot plant by (1) peeling and comminuting fresh sweet potatoes; (2) heating sweet potato puree to 75.5° C and holding at that temperature to allow naturally present amylase to convert a certain proportion of the starch into sugars; (3) heating puree to 105° C to inactivate enzymes; (4) atmospheric drum drying and flaking; and (5) packing flakes in cans under N_2 atmosphere. Total monocarbonyls in fresh sweet potatoes generally increased with time of storage of the roots. During processing of freshly dug sweet potatoes into dehydrated flakes, monocarbonyls increased as processing progressed. During processing of "cured", and of up to 4-months' stored sweet potatoes the content of monocarbonyls peaked during conversion of starch to sugars, and decreased after heating to 105° prior to drum drying. These and more results of the study are discussed.

515. WALTER, W.M., A.E. PURCELL, W.M. HOOVER and A.G. WHITE. 1978. Lipid autoxidation and amino acid changes in protein-enriched sweet potato flakes. Journal of Food Science, 43(4): 1242-1244.

Three sweet potato flake formulations, containing (1) soy flour plus methionine, (2) casein and (3) no supplementary protein, were prepared and stored at room temperature (21-23° C) in air for 16 months. The formulations were analyzed periodically to ascertain changes in carotene content, amino acid levels and water-binding capacity. On the basis of carotene delegation as a measure of lipid autoxidation, it was found that after an induction period of 19 days required by the flakes supplemented with soy-methionine, all formulations were oxidized in an identical manner. Among the amino acids, only glutamic acid was lost from all three formulations, and isoleucine levels decreased in the control formulation only. Lysine concentration in the fortified flakes decreased while histidine decreased in the soy-methionine formulation. Storage had no effect on the water-binding capacity of any of the three formulations.

516. WALTER, Jr., W.M., A.F. PURCELL, M.W. HOOVER and A.G. WHITE. 1978. Preparation and storage of sweet potato flakes fortified with plant protein concentrates and isolates. Journal of Food Science, 43(2): 407-410.

Sweet potato flakes supplemented with soy flour, soy flour plus DL-methionine, cottonseed flour and wheat gluten flour were prepared. The fortified flakes had higher protein calorie to total calorie ratios but had lower water-binding capacity than flakes with no supplementary material. The amino acid pattern of soy flour, soy plus methionine and cottonseed flour formulations compared favorably with that of non-supplemented flakes. Each formulation was stored at 23° and 40° C under nitrogen for 8.25 months. Although the levels of several amino acids appeared to change significantly during storage, only glycine in the gluten formulation linearly decreased. Tyrosine in the soy formulation appeared to increase during storage. Flakes stored at 40°C appeared to develop off flavors and to lose water-binding capacity.

J. CHEMICAL COMPOSITION AND NUTRITIVE VALUES

J. 1. Proteins and Amino Acids

517. CROSBY, D.G. 1964
The organic constituents of food. III sweet potato. Journal of Food Science , 29 : 287-293.

The status of sweet potato as a world feed and food crop is discussed. Data are presented on the following aspects of the composition of sweet potato: macromolecular constituents (water, protein, fat, total sugar and other carbohydrate); its total amino acid composition; its common constituents of low molecular weight. A discussion of the results of the analyses is given.

518. GRAVES, B. 1976.
Sweet potatoes and protein. The Vegetable Growers News (Virginia), 31(4): 2.

The author discusses the potential of sweet potato as a source of varying amounts of protein depending on certain factors. It is concluded that if, as some experts of the world food situation predict we find in the not too distant future that we must consume much less meat, fish, eggs and dairy products, sweet potatoes could become an even more important food crop in the U.S.A as well as throughout the world.

519. PURCELL, A.E., H.E. SWAISGOOD and D.T. POPE. 1972.
Protein and amino acid content of sweet potato cultivars. Journal of the American Society for Horticultural Science, 97(1): 30-33.

Protein content of sweet potatoes fron North Carolina root collection was determined. Protein content ranged from 1.73% dry basis to 0.14%. The amino acid composition of protein extracted from 6 selected cultivars was determined. Tryptophan and total sulfur amino acids were limiting by comparison with the FAO reference protein. Other essential amino acids were in excess suggesting that sweet potato protein may be useful in supplementing other plant proteins.

520. PURCELL, A.E., W.M. WALTER, JR. and F.G. GIESBRECHT. 1976. Distribution of protein within sweet potato roots (*Ipomoea batatas* L.). Journal of Agricultural and Food Chemistry, 24(1): 64-66.

Distribution of protein within roots of three sweet potato cultivars was studied. End-to-end gradients of protein concentration were small but significant in Jewel and Centennial, with higher concentration toward the stem end. Circumferential protein gradients in Jewel and Centennial were consistent year to year but were not statistically significant. Cultivar 213-228-1 had no significant gradients. There was no evidence of radial gradients in any cultivar. All gradients were too small to suggest modified processing to obtain high protein products. (Authors' abstract).

521. PURCELL, A.E., W.M. WALTER, JR. and F.G. GIESBRECHT. 1978. Protein and amino acids of sweet potato (*Ipomoea batatas* L. Lam.) fractions. Journal of Agricultural and Food Chemistry, 26(3): 699-701.

Sweet potatoes contain nutritionally significant amounts of high-quality protein but usually do not have enough to provide an adequate protein calorie ratio. A method of fractionating sweet potatoes into fiber, starch, chromoplasts, syrup, and protein is presented. Nearly half of the nitrogen contained in the sweet potato may be recovered as a concentrate containing over 80% protein. Amino acid composition of the protein shows it to be limiting in total sulfur-containing amino acids. There is an excess of lysine, suggesting usefulness as a supplement to grain products.

522. PURCELL, A.E., W.M. WALTER and F.G. GIESBRECHT. 1978. Root, hill and field variance in protein content of North Carolina sweet potatoes. Journal of Agricultural and Food Chemistry, 26(2): 262-264.

Variation in protein content of Centennial and Jewel sweet potatoes grown in North Carolina was studied. Standard deviations of percent protein dry basis between roots of single hills were 0.79 for Centennial and 0.069 for Jewel and between hills within fields, 0.81 for Centennial and 0.73 for Jewel. The range of protein content from a number of hills was 5.27-7.24% for Centennial and 3.99-8.81% for Jewel.

J. 2. Vitamins and Minerals

523. HAMMETT, H.L. 1974.
Total carbohydrate and carotenoid content of sweet potatoes as affected by cultivar and area of production. Hortscience, 9(5): 467-468.

Three cultivars of sweet potato (*Ipomoea batatas* Lam.) were grown at 7 production sites in Mississippi during 1959 and 1960, using plants from a common source. Forty U.S. No. 1 roots of each cultivar at each production site were sampled and carbohydrate and carotene content determined. Variation in carotene content was much greater among cultivars when compared to variation among production sites, however, there were highly significant differences within a cultivar among the various production locations. Carbohydrate content within a cultivar varied among production sites more than among those at any one production site. The feasibility of establishing a nutrient content range for fresh vegetable products is highly questionable.

524. LAUBER, J.J., G.A. TAYLOR and W.O. DRINKWATER. 1967.
The use of tristimulus colorimetry for the estimation of carotenoid content of raw sweet potato roots. Proceedings of the American Society for Horticultural Science, 91: 472-477.

Correlation and regression studies were carried out over 3 seasons to determine the suitability of utilizing tristimulus colorimetry for the estimation of carotenoid content of sweet potato roots. Two series, each consisting of 20 cultivars differing widely in carotenoid content, and 1 series of 'Jersey Orange' roots were studied. Simple correlations between carotenoid content and either Hunter "Rd" or "a" were as precise as multiple correlations of Hunter "Rd", "a", and "b" color attributes.

The regression coefficients of log carotenoid on Hunter "Rd" differed significantly among the 3 series studied. There were no significant differences in slope or intercept of the regressions of log carotenoid on Hunter "a" in the 3 series and thus an average regression employing Hunter "a" was computed for carotenoid prediction.

525. LIEBERMAN, M., C.C. CRAFT and M.S. WILCOX. 1959.
Effect of chilling on the chlorogenic acid and ascorbic acid content of Porto Rico sweet potatoes. Proceedings of the American Society for Horticultural Science, 74: 642-648.

Chlorogenic acid increased and ascorbic acid declined during chilling of sweet potato roots at 7.5° C. After 10 weeks chlorogenic acid increased 100 to 400 per cent and ascorbic acid declined 50 to 90 per cent. The increase of chlorogenic acid and the decline of ascorbic acid was related in a reciprocal way which suggests a metabolic relationship. With respect to chlorogenic acid accumulation and ascorbic acid decline, the chilling effect up to 2 weeks at 7.5° C was arrested by transfer to 15°. However, after 4 and 6 weeks at the chilling temperature, removal to 15° did not reverse the chilling injury.

526. YAMAMOTO, Y. and Y. TOMITA. 1955.
Studies on the bio-pigments and vitamins: V. correlative changes among the carotene, total carotenoids and the other constituents of sweet potatoes in relation to the variety and storage (2). Bulletin of the Faculty of Agriculture, Kagoshima University, 4: (pagination not given).

The correlative changes among the carotene, total carotenoid pigments and water soluble vitamins (B_1, B_2 and C) were examined during the period in storage. Three varieties of the sweet potatoes were used.

The results obtained may be summarized as follows:
(1) Both carotene and total carotenoids content were the highest in K-variety, an intermediate in H-variety and the lowest in N-variety not only at harvest but also at any stage in storage.
(2) Most of the thiamine, riboflavin and ascorbic acid content of the three varieties showed a decrease during storage.
(3) A tendency was observed that the variety containing the higher carotene content possesed reversably the less ascorbic acid content, both at harvest and at any stage in storage.
(4) In the case of changes in vitamin B_1 content during storage there was found no varietal consistency, differing from the results obtained in the case of carotene and ascorbic acid.
(5) On the contrary, a positive correlation due to the variety of sweet potatoes was clearly recognized between carotene increase and riboflavin levels during storage; the variety richest in carotene had also the highest riboflavin contents.

J. 3. Charbohydrates

527. CHADHA, Y.R. and J. DAKSHINAMURTHY. 1965.
Sources of starch in Commonwealth territories - Part V: sweet potato. Tropical Science, 7(1): 56-62.

The sweet potato plant is widely grown in the tropical and some parts of the temperate areas of the world for its starchy tubers which serve as a staple food in some of the countries. Africa is the largest producer of the crop followed by Asia. The tubers are usually eaten after boiling or steaming, baking, or frying. They are sometimes candied with syrup or eaten in the form of slices, or ground into flour for use in a variety of ways. Sweet potatoes have been used in Japan and the U.S.A. for the manufacture of starch which finds application in the textile, food, paper and cosmetic industries. The bulk of the crop grown in African Commonwealth territories, is consumed locally as food and hardly any attention has been paid to starch production from the tubers. This article describes the sweet potato plant and its cultivation, composition and utilization of its tubers, and the methods followed in Japan and the U.S.A. for the production of sweet potato starch. The uses of the vine and leaves are also given.

528. JENKINS, W.F. and E.L. MOORE. 1956.
Carbohydrates and ascorbic acid in sweet potatoes as affected by time and sampling techniques. Proceedings of the American Society for Horticultural Science, 67: 490-492.

The data presented show that the placing of samples of the fleshy roots of Allgold sweet potatoes in alcohol in either 10 minutes, two, five, and six hours after the samples have been prepared produced no significant changes in non-reducing sugars, reducing sugars, and alcohol insoluble solids. However, the placing of samples in alcohol seven hours after the material had been prepared produced a non-significant decrease in non-reducing sugars and a marked and significant increase in reducing sugars. Thus, it may be concluded that with refrigeration as employed herein, the preservation of carbohydrate samples in alcohol can be delayed up to six hours after rasping without any harmful effects. The data also show that samples obtained by means of a power rasp had a significantly lower ascorbic acid content than those obtained by dicing root tissue into small pieces. On this basis dicing as described in this paper would seem to be more satisfactory than the use of the power rasp obtaining samples for ascorbic acid analyses.

529. WEBB, R.E., J.C. MILLER and J.B. EDMOND. 1949.
Studies on total soluble solids and sugar content of sweet potatoes. Proceedings of the American Society for Horticultural Science, 54: 403-405.

Studies were made to determine the dry weight, total soluble solids, sugar content and shrinkage of 10 varieties and seedlings of sweet potatoes and to show the relation of total soluble solids to the sugar content of the juice.

For all periods combined, White Star, the only starch-feed type in the test, had a greater dry weight and a lower sugar content than the table stock types. There were significant and insignificant differences in dry weight, total soluble solids, sugar content and loss of weight in storage between White Star and the table stock types.

For all the varieties combined, dry weight increased during the first 7 days of curing and remained practically constant during the remaining periods; total soluble solids increased rapidly during the first 7 days of curing and increased gradually during the remaining periods; total sugars increased rapidly during the entire curing period and remained practically constant during the storage period and loss in weight was rapid during the curing period and gradual during the storage period.

No relation was found between total soluble solids and dry weight and between dry weight and total sugars. However, a close and highly significant correlation occurred between total soluble solids and total sugars.

The results show that total soluble solids, as determined in these studies, are a fairly reliable index to the sugar content of table stock types of sweet potatoes.

J. 4. Human Nutrition

530. CATALONO, E.A., V.C. HASLING, W.A. PONS, Jr., et al. 1979.

Analysis of sweet potato products for lung edema toxins. Hortscience, 14(2): 124.

A high-performance liquid-chromatograpic method was developed for determining lung edema toxins in sweet potato products to a level of 0.2 parts per million. The technique is more

selective and five times more sensitive than our previous method. Authentic primary standards were procured, and calibration plots were made for 1-ipomeanol, 4-ipomeanol, and 1,4-ipomeadiol. Comparable to the more prevalent furanoterperiod toxin, ipomeamarone, the lung edema toxins are also found in blemished and diseased areas of sweet potatoes. Trimming inedible areas, even after baking or boiling, leaves healthy tissue with little or no detectable lung edema toxins. Cooking does not diffuse toxins into the healthy tissue. This improved method for detecting lung edema toxins, as well as previously developed techniques adapted for determining ipomeamarone in sweet potato products, will help the industry provide consumers with safe sweet potato products.

530(a) CHEN, M.L., C.S. HUANG and J.S. CHEN. 1974.
Dietary and nutritional study on aborigines in Taiwan.
Nutrition and Metabolism, 17: 112-120.

A dietary and nutritional survey of Taiwan aborigines, Atayals and Paiwans, as a follow-up study, and as a new survey on Yamis who live on an off-shore island, has been carried out recently. Great improvements in the nutritional status of the first two tribes during the last 15 years were observed. They may be attributed to a series of socio-economic reforms including education, sanitation, agriculture, and employment. Traditionally, Yami adults accept no other vegetables than taro and sweet potatoes. (Authors' abstract abridged).

531. FERRO-LUZU, G.E. 1974.
Food avoidances during the puerperium and lactation in Tamilnad.
Ecology and Food and Nutrition, 3: 7-15.

Over a period of six months, 1200 women of 54 castes and 55 tribal women in Tamilnad (South India) were interviewed about food avoidances during the puerperium and lactation. Avoidances included sweet potatoes. All abstensions were primarily conceived in the interest of the baby, to whom harmful influences would be transmitted through the breast milk. Sweet potato was the most dreaded of all the tubers. Most women avoided it for at least one month while over 1/3 of the interviewees avoided it for approximately the whole of their lactating period. The most frequent reason for its avoidance, as well as the avoidance of tubers in general, was that it caused vayu. Some women feared it would cause infantile fits, cramps,diarrhoea and constipation or render the mother's milk too thick.
(Authors summary modified).

532. FITZGERALD, T.K. 1976.
Ipomoea batatas: The sweet potato revisted. Ecology of Food and Nutrition, 5: 107-114.

As part of a larger community nutrition study, one section of our research was devoted to the examination of sweet potato consumption in a North Carolina community in transition from a rural to a suburban way of life. One key question guided our research: What social and cultural factors affect the acceptance or rejection of this vegetable in or from the diet? Since sweet potatoes are an important crop in North Carolina and a valuable source of the provitamin A carotenoids, the decline in its use deserves immediate and serious scientific attention. This study should shed some light on the probable causes for the decline of the sweet potato in the North Carolina and national dietaries. (Author's summary).

533. IDUSOGIE, E.O. and S.O. OLAYIDE. 1973.
Role of roots and tubers in Nigerian nutrition and agricultural development. Third International Symposium on Tropical Root Crops, I.I.T.A., Ibadan. 2-9 Dec. 1973. Vol. 2: 23p. (Mimeo).

There is a wide measure of agreement that the widespread incidence of protein-calorie malnutrition in the developing countries today is mostly the result of an inadequate quantity of food and the critical factor is energy intake and not protein. Therefore, one of the most practical means of combating hunger and malnutrition in a developing country like Nigeria would be to increase the production and consumption of local root and tuber staples such as cassava, yams, cocoyams and sweet potatoes which are rich in energy and which also furnish very high amounts of energy per unit land.

Root and tuber crops are also in demand in neighbouring West African countries and Overseas, both for food and industrial uses and they could therefore become good sources of foreign exchange earnings.

There is therefore a compelling need to give greater prominence to root and tuber crops development in the national agricultural planning to meet both the nutritional and socio-economic needs of the people and the nation.

534. MALOLM, L.A. 1970.
Growth retardation in a New Guinea boarding school and its response to supplementary feeding. British Journal of Nutrition, 24: 297.

Children attending a boarding school in the New Guinea highlands, and receiving a protein deficient diet of sweet potato and taro showed, when compared with village children, a progressive retardation of growth which was related to the number of years at school.

Feeding of supplementary protein resulted in a dramatic acceleration of growth in both height and weight, whereas the feeding of extracalories produced an increase in only weight and skinfold thickness.

This response to protein feeding appears to be greater than previously reported in the literature. (Author's summary).

535. MILER, J.C. and T.P. HERNANDEZ. 1970.
The sweet potato as a world food crop and how research has improved its nutritional quality. In: Plucknett, D.L. ed. Proceedings of the 2nd International Symposium on Tropical Root and Tuber Crops, Aug. 23-30, 1970. Honolulu, Hawaii and Kapaa, Kauai, Hawaii, the University, Vol. 1: pp. 16-18.

The paper mentions the nutritional value of the sweet potato, traces its origin and spread to many countries. It describes the sweet potato cooperative program in the United States and the objectives of the program at the Louisiana State University seeking to develop improved varieties possessing the following desirable characteristics: high yield; high beta-carotene content; good culinary qualities, such as baking, canning, flaking and freezing; good shape; good keeping or storage quality; good plant production, good skin colour; high dry matter content; multiple disease resistance (particularly *Fusarium* wilt, internal cork, and soil rot); and nematode resistance. Some 100,000 varieties were produced each year. Several breeding parents were found to have good combining ability with others, the Centennial with a wide range of adaptability, being the leading variety in USA and some other countries.

536. OOMEN, H.A.P.C., W. SPOON, J.E. HEESTERMAN et al. 1961.
The sweet potato as the staff of life of the highland Papuan. Tropical and Geographical Medicine, 13: 55-66.

The sweet potato occupies a very monopolistic position in the Papuan diets in the highlands of New Guinea, supplying over 90% of the caloric intake, three quarters of the protein intake and the bulk of the mineral constituents of the diet. The protein and mineral composition of the local sweet potato are

therefore important from a health view-point. Twelve nature varieties and nine imported varieties were analysed. The percentage of crude protein in the dry matter varied between 2.2 and 9.4. The highland clones analysed were considerably poorer in crude proteins than many other popular varieties of the crop. The deficit is somewhat compensated by a higher moiety of real protein and higher figures for the often critical amino acids lysin and methionin. Increasing the protein portion in highland diets depends very much on upgrading the local sweet potato.

The mineral constituents of the highland sweet potatoes are characterized by a very low sodium content (0.10 - 0.19% of total ash) and a high potassium content (33.8 - 46.9%). (Authors' summary modified).

537. OOMEN, H.A.P.C. 1971.
Ecology of human nutrition in New Guinea. Evaluation of subsistence patterns. Ecology of Food & Nutrition, 1(3): 1-16.

Food intake in the autochthonous environments of New Guinea is determined primarily by climate and landscape, secondarily by the improvising skills of the inhabitants, their cultural preferences and their isolation.

In the hilly interior, taro, yam, sweet potato and bananas in various combinations are the mainstay of diets. In a narrow altitudinal zone in the mountains, where climatic factors determine cultivation, the sweet potato is almost exclusively the staple food.

In the highlands, whether the daily protein intake contains 10 or 30 g per day depends chiefly on the variety of sweet potato consumed. It was the adoption of the sweet potato which made extensive settlement in the highlands possible but in doing so the settlers preferred quantity above quality. Tuber diets usually result in very low intakes of sodium and very high intakes of potassium and ascorbic acid. (Author's abstract modified).

538. OOMEN, H.A.P.C. 1972.
Distribution of nitrogen and composition of nitrogen compounds in food, urine and faeces in habitual consumers of sweet potato and taro. Nutrition and Metabolism, 14: 65-92.

In view of the complications in distinguishing between exogenous and endogenous compounds, and the limitations of these observations, it is impossible to conclude definitely whether the

hypothetical benefit suggested by the nutritional state of the consumers is due, for instance, to recycling of common N compounds, or to additions by bacterial N_2 fixation in the large intestine. One would, nevertheless, expect, at low protein intakes, less N to be 'wasted' by faecal losses. In every autochthonous group so far examined, the reverse has proved to be true. The repetition of similar values in diverse sites and age groups suggests that this type of faecal N dominated nitrogen metabolism must be widespread under highland conditions. Apart from the validity of the balances, the most striking aspect of these studies is the disproportionately large amount of N lost by faeces. (Author's abstract).

539. ORTALIZA, I.C., L.A. SALAMAT, B. DE LA CRUZ et al. 1974. Iron absorption studies using biologically labelled vegetables. Philippine Journal of Nutrition, 27(3): 22-29.

Iron absorption from some local vegetables tagged biosynthetically with Fe was evaluated using normal rats.

The technique used for tagging the vegetables is described.

Mean iron absorption ranging from 4.5 to 9.1 was found with lettuce, kamote tops, and other vegetables. When absorption values were computed in relation to the absorption of an iron salt, no statistical differences were found among the vegetables studied. (Authors' abstract).

J. 5. Sweet Potato Leaf as Vegerable

540. GODFREY-SAM-AGGREY, W. and H.S. BUNDU. 1971. Growing sweet potato for tubers and leaves. Njala, the University College. University of Sierra-Leone. Department of Agronomy Circular No. 2: 6p.

Sweet potato ranks third after rice and cassava as staple carbohydrate food crops in Sierra Leone where both its leaves and tubers are consumed. The leaves provide substantial protein while the tubers supply starch and vitamin A. Its acreage, preferred soil types, local cultivars, planting system, planting material and time, fertilizer application for either tuber or leaf production; weed control, disease control, harvesting tubers or leaves; and preparation of tubers for market.

541. VILLAREAL, R.L. and S.C. TSOU. 1979.
Sweet potato tips as vegetables. Hortscience, 14(3): 469.

Sweet potato tips could serve as additional leafy vegetable during the wet season when it is more difficult to grow other kinds of leafy vegetables in Southeast Asian countries. This vegetable can also be acceptable in many other tropical and temperate countries as well, because it is inexpensive, easy to grow, nutritious and many recipes can be prepared from it. We observed wide variation in the morphological traits of sweet potato tips. Thus, a large number of cultivars and breeding lines are available from which further selection can be made for yield, palatability, tenderness, flavor and nutritional quality. Some studies on eating quality evaluation as normally done in conventional vegetables (i.e. cabbage, lettuce and Chinese cabbage) are discussed.

542. VILLAREAL, R.L., S.K. LIN, L.S. CHANG and S.H. LAI. 1979.
Use of sweet potato (*Ipomoea batatas*) leaf tips as vegetables 1. Evaluation of morphological traits. Experimental Agriculture, 15(2): 113-116.

There is wide variation in the morphological characteristics of sweet potato leaf tips which are acceptable as a vegetable for human consumption. Thus many cultivars are available from which further selections can be made for yield, palatability, tenderness, flavour, and nutritional quality. A list is given of some cultivars which combine a number of desirable traits. (Authors' abstract).

543. VILLAREAL, R.L., S.C.S. TSOU, S.K. LIN and S.C. CHIU. 1979.
Use of sweet potato (*Ipomoea batatas*) leaf tips as vegetables II. Evaluation of yield and nutritive quality. Experimental Agriculture, 15(2): 117-122.

Yields of sweet potato tips varied from 10 to 16 t/ha in weight and 61 to 352/m2 in number, whilst yields of markatable roots varied from 1 to 16 t/ha. Cultivar differences in dry matter, fibre, ash, vitamin B_2 and oxalate were also observed. The tips appeared to provide an excellent source of vitamin B_2 which is important for Asian diets deficient in this vitamin. Application of 120 kg N/ha gave higher tip yields than no nitrogen, primarily due to increase in their number and size. Among the leaf types evaluated, Kinangkong (a fine leaf cultivar) produced the highest yield, and had the highest amount of protein, lowest oxalate, and fairly high dry matter, which makes it a very desirable leafy vegetable. (Authors' abstract).

544. VILLAREAL, R.L.; S.C. TSOU, S.C. CHIU and S.H. LAI. 1979. Use of sweet potato (*Ipomoea batatas*) leaf tips as vegetables III. Organoleptic evaluation. Experimental Agriculture, 15(2): 123-127.

Blanched leaf tips of ten sweet potato cultivars were evaluated for eating qualities such as tenderness, flavour, stem and leaf colour, and hairiness to determine selection criteria. Some cultivars compared favourably with the control in most quality attributes, with a general agreement on the acceptability ranking of three cultivars. Stepwise multipla regression analysis suggested that all the quality attributes studied are important in predicting general acceptability of blanched tips, but the use of stem colour and hairiness for initial selection should be sufficient to reduce the number of lines prior to further evaluation. (Authors' abstract).

J. 6. Animal Nutrition

545. FETUGA, B.I. and J.A. OLUYEMI. 1976. The metabolizable energy of some tropical tuber meals for chicks. Poultry Science, 55: 868-873.

Two consective experiments were conducted with 360 white leghorn cockerels, approximately two weeks old, to compare the metabolizable energy (M.E.) and metabolizable energy corrected to nitrogen equilibrium (M.E. $_n$) for dehydrated cassava, cocoyam, yam, plantain and sweet potato meals. These were tested at 40 and 25% levels of substitution in the first and second experiment respectively. No consistent differences were observed for the M.E. and M.E.$_n$ values due to level of substitution. The results suggest that sweet potato and cassava are superior energy sources compared to the others, although the growth promoting ability of the cassava diet tended to be reduced by the possible presence of some residual growth inhibitory factors in the dehydrated meal. (Authors' abstract abridged).

546. GARLICH, J.D., D.M. BRYANT, H.M. COVINGTON, et al. 1974. Egg yolk and broiler skin pigmentation with sweet potato vine meal. Poultry Science, 53: 692-699.

Dehydrated sweet potato vine meal (SPVM) was evaluated as a xanthophyll pigment source for broiler skin and egg yolks.

In the experiment with hens SPVM was compared with alfalfa meal in a diet in which these sources provided the only source of pigment. The two diets were formulated to contain the same quantity of pigmenting xanthophylls based on chemical analysis. Egg yolk pigmentation was evaluated by use of the Roche color fan and by chemical analysis. The results indicated that the pigments of this particular sample of SPVM, which was of below average quality, were ingested, absorbed, and deposited in the egg yolk 79% as well as the pigments of alfalfa meal. It is concluded that the foliage of the sweet potato plant is a potential source of xanthophyll pigments for poultry. (Authors' summary modified).

547. MALYNICZ, G.L. 1971.
Use of raw sweet potato, raw peanuts and protein concentrate in rations for growing pigs. Papua New Guinea Agricultural Journal, 22(3): 165-166.

Twenty-seven weaner Berkshire cross pigs were used in an experiment with three replicates to study the performance of three diets:

(1) A control ration based on ground sorghum and protein concentrate.
(2) Raw sweet potatoes and raw whole peanuts.
(3) Raw sweet potatoes and 55% crude protein concentrate.

Diets (2) and (3) were fed according to a modified Lehmann system. There were significant differences between treatment means for weight gain and food consumption for the three diets. Average daily gain (lb), average daily voluntary food consumption (lb of dry matter) and feed efficiency (dry matter basis) for the three treatments were (1) 1.246, 4.561, 3.663; (2) 0.208, 1.726, 8.533; (3) 0.7193, 3.538, 4.919. One of the pigs on the peanut/sweet potato ration died.. (Author's summary).

548. MALYNICZ, G.L. and H. NAD. 1973.
The effect of level of feeding and supplementation with sweet potato foliage on the growth performance of pigs. Papua New Guinea Agricultural Journal, 24(4): 139-141.

Three groups of six pigs were fed one of three rations. The first group received ad libitum an 18% crude protein grower ration. The second received the same ration up to a maximum of 1.82 kilogram (4 lb) daily, while the third group was also restricted to 1.82 kilograms daily but received ad libitum sweet potato foliage. Growth rate and food consumption were significantly increased by the high plane of nutrition, while

food conversion ratio was significantly and adversely affected. Feeding sweet potato adversely affected both weight gain and food conversion ratio when compared to the restricted unsupplemented group. Neither of the differences reached significance. (Authors' summary).

549. OYENUGA, V.A. and B.L. FETUGA, 1975.
Chemical composition, digestibility and energy values of some varieties of yam, cassava, sweet potatoes and cocoyams for pigs. Nigerian Journal of Science, 9(1): 63-110.

The chemical composition, apparent nutrient digestibility, digestible energy (DE), metabolizable energy (ME) and total digestible nutrients (TDN) were determined at the University of Ibadan for raw, cooked peeled and unpeeled yams, cassava and sweet potatoes and for cooked peeled and unpeeled cocoyams, using growing pigs. All tubers had low fat and crude fiber content, the fiber in the unpeeled samples being slightly higher than in the peeled. The range of crude protein in cassava (1.8-2.8%) was distinctly lower than that in the other tubers. The different tubers showed similar high digestibility values for DM and N-free extract, but the digestion coefficients for other nutrients were much lower. Peeling significantly enhanced the digestion of crude protein, ether extract and crude fiber in all the tubers except cassava. DE and ME were highest for the different cassava forms and least for the yams. Peeling significantly influenced the energy values of the yams but not those of cassava, cocoyams and sweet potatoes. Cooking did not significantly improve the utilization of energy in the cassava and sweet potato forms. (Author's summary).

550. PECKHAM, J.C., F.E. MITCHELL, O.H. JONES, Jr. et al 1972.
Atypical interstitial pneumonia in cattle fed moldy sweet potatoes. Journal of the American Veterinary Medical Association, 160(2): 159-172.

Sixty-nine adult cattle in a herd of 275 died after being fed moldy cull sweet potato (*Ipomoea batatas*) roots. Clinical signs and necropsy findings were characteristic of atypical interstitial pneumonia. The disease was experimentally reproduced in cattle by oral administration of homogenized sweet potato cultures infested with *Fusarium solani* (*F. javanicum*) isolated from the moldy sweet potatoes fed the herd. (Author's summary).

551. WILSON, B.J., D.T.C. YANG and M.R. BOYD. 1970.
Toxicity of mould-damaged sweet potatoes (*Ipomoea batatas*).
Nature, 227(5257): 521-522.

This paper reports the result of studies on a devastating enzootic of fatal disease of beef cattle in Tifton, Georgia, associated with the consumption of mouldy sweet potato tubers. A search for toxic factors in the mouldy sweet potato extract revealed numerous pink, red or grey spots on thin chromatograms sprayed with Ehrlich reagent. Three of these substances were studied because of their toxicity for mice.

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