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UNIVERSITY OF PERADENIYA

My No: Ag/D/183/NSC

Your No:



OFFICE OF THE DEAN
FACULTY OF AGRICULTURE
PERADENIYA
TELEPHONE 08 18041

02th January, 197.

3A-48

Director General
NRESA
47/51, Maitland Place
Colombo 7.

RG/AID/C1 Progress Report for the Period July -
December, 1986

Ref. above, please find the attached Progress Report
for the above period.

~~Prof. H.P.A. Gunasena
Dean/Agriculture.~~

c.c. Mr. Oswin Silva
USAID
44, Galle Road
Colombo 3.

Rec'd in SCI: FEB 5 1987

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Progress Report - July - December 1986

Title of Project - Collection, Classification and Evaluation of
Dioscoreas, Aroids and Plectranthus spp

1. Research Undertaken During the Period Under Review

(a) Evaluation on Rapid Multiplication Techniques

Two experiments are in progress on vegetative propagation techniques (seed tuber production) in 10 different cultivars of yam (*Dioscorea* spp.) selected from the germplasm collection.

1. Evaluation of Mini sett; Technique
2. Experiment on production of seed tubers using rooted vine cuttings.

The 10 cultivars used for the experiments are as follows:

1. Ini ala
2. Nigerian yam
3. Raja ala
4. Thambala
5. Kahata ala
6. Rata ala
7. Ley-danta
8. Angili ala
9. Hingurala
10. Kombuwalli

Experiment 1.

" Evaluation of Mini Sett Technique"
being

This experiment is carried out field of Experimental Station, University of Peradeniya, Dodangolla, Kundasale.

5 different sizes of tuber pieces were used in this experiment, weighing 25, 50, 75, 100, and 125 g per piece.

Experimental Design used - 2 factor experiment in Randomized Complete Block Design with 3 replicates.

Treatment combinations - 50

(10 cultivars X 5 sizes of tuber pieces)

The growth parameters were measured every month i. e. from August upto now. Final readings are to be taken in the month of January, 1987.

Growth parameters measured in the experiment.

1. Vine length
2. Number of leaves per vine
3. Leaf area
4. Leaf dry weight
5. Tuber fresh weight
6. Tuber dry weight
7. Dry weight of vines
8. Root dry weight
9. Final yield characters to be measured

Experiment 2.

" Experiment with rooted vine cuttings "

being
This experiment is/carried out in the plant house in the Experimental Station, University of Peradeniya, Dodangolla, Kundasale.

with
Semi hard vine cuttings / 3 nodes from the selected 10 cultivars were used in the experiment.

Block
Experimental Design used - Completely Randomized/Design with 3 replicates

Vine cuttings were rooted under high humidity conditions (bamboo frames and polythene were used to maintain high humidity required) in sand beds. Later the plants were hardened by decreasing humidity and increasing light.

Growth parameters were measured monthly i.e. from October upto now. Final readings are to be taken in the month of January, 1987.

Growth parameters measured in the experiment are as follows:

1. Number of shoots produced par cutting
2. Length of the shoots
3. Number of leaves produced
4. leaf dry weight
5. Root dry weight
6. Dry weight of vines
7. Fresh weight of tubers

8. Dry weight of tubers

9. Final yield characters are to be measured

(b) Experiments on Cocoyam (Colocasia esculenta)

Cocoyam, *colocasia esculenta* (L) Schott is tuber crop planted in small scale in Sri Lanka. The fertilizer response of this crop has not been studied fully. Therefore, experiment was commenced to find out the nitrogen and potassium fertilizer response on cocoyams at University Experimental Station, Dodangolla during in June 1986.

Cocoyam tubers of 75g ($\frac{1}{4}$ 10g) were selected as planting material. Four levels of nitrogen (0,50,75 and 100 Kg of N/ha) and four levels of potassium (0,100,150 and 200 Kg of K₂O/ha) were used in combinations on a randomized complete block design with two factor factorial arrangement and three replicates. Seeding emergence, growth parameters and yield parameters were used to find out the fertilizer response.

Seeding emergence starts at 3WAP and continued for about 4 weeks. Nitrogen and potassium fertilizer do not effect on seedling emergence. Optimum leaf area per plant was attained at 20th WAP and the highest leaf area was recorded by the highest nitrogen application. Shoot, leaf, Corm and tuber dry weight per plant were not significantly affected by nitrogen and potassium fertilizers. However the highest tuber yield/ha was given by the highest ^{fertilizer}/application. No interaction between nitrogen and potassium was observed on growth and yield of cocoyam.

Tuber yield of 6.75 MT/ha and 7.20 MT/ha were obtained with no nitrogen and potassium applications respectively, whereas a respective tuber yield of 7.95 MT/ha and 7.32 MT/ha was resulted with highest nitrogen and potassium levels.

This experiment will be continued until 9 months, and will be harvested around March, 1987.

(c) Evaluation of Dioscorea Yams

This experiment was commenced to study the growth and yield of a few selected cultivars at University Experimental Station, Dodangolla in July, 1986.

Angili ala showed significantly high leaf numbers at every stage of growth while Kahata ala had the lowest number of leaves. Leaf number of Ini ala, Kukul ala, Nigerien and Kahata ala increased even after at 24 weeks of emergence, but leaf senescence of other cultivars had already started. Rate of leaf senescence in Thambala was higher than the others.

Relatively long stems was attained by Angili ala and the shortest by Kukul ala. Length of stems in Nigerien, Kahata ala, Ini ala and Kukul ala were increased over the season while the rest were dying back at 24 weeks after emergence.

The highest number of branches were recorded in Angili ala at every stage of growth upto 20 weeks after emergence. After that Kukul ala exceeded it. Rate of branching was fairly low in Raja ala. The senescence of branches were firstly observed in Angili ala and Thambala followed by Raja ala. At that time, number of branches in rest of the cultivars were increasing.

When the weight of tubers were increasing dry weight of roots tended to decrease in all cultivars, but rate of decrease in Kukul ala was relatively low.

Generally, dry matter content of all the cultivars had increased at every stage of growth. Angili ala was the highest in total dry matter content while Kukul ala and Hingurala were the lowest.

The highest yield was observed in Angili ala followed by Thambala and Ini ala. Kukul ala took relatively more time before initiating the tuber. Rate of tuber growth in Raja ala, Kukul ala and Angili ala were faster between 5-6 months after emergence compared to 4-5 months, while ^aconstant rate were observed in Ini ala and Kahata ala.

Sapogenins, Minerals and Starch Analysis

The analysis conducted so far with the assistance of two students and Dr. U. Samarajeewa were presented at the SLAAS sessions in 1986. This was reported in Progress Report for January - June 86. The Abstracts of the two papers are listed for information. More analytical work is being undertaken and will be completed in March-April, 1987.

Sapogenins and Minerals in Some Yams In Sri Lanka

M.I. Sufiyan, U. Samarajeewa and H.P.M. Gunaseena, Faculty of Agriculture University of Peradeniya.

Fifteen cultivars of locally available yams of the species *Dioscorea alata* ("Mingurala", "Ini-ala", "Katuwala", "Khatangal", "Kiri-ala" "Kirikondol", "Leydanta", "Rajala" and "Rasawalli") *D. esculenta* ("Jawala", and "Kukulala", *D. bulbifera* ("Udala"), *Coleus rotundifolius* ("Innala") and *Amorphophallus componulatus* ("Kidarana") were examined for the presence of sapogenins by thin layer chromatography

All the cultivars examined contained a compound giving the same Rf in two solvent systems and colour reaction with antimony chloride spray as diosgenin. There were unidentified sapogenins observed in some cultivars. "Jawala", "Kiriala" and "Kukulala" showed a purple spot and "Ini-ala" "Khatangal", "Kiri-ala", "Kukulala" and "Udala" showed a pink spot on spraying with antimony chloride reagent. The cultivars examined for minerals by atomic absorption spectrometry contained the following mean concentrations (mg/100g) Calcium = 33.3, Copper=4.4, Iron=7.0, Potassium=1136.9, Manganese =21.1, Magnesium= 66.2, Sodium=80.5, and hnc = 2.9

The levels of Iron and Calcium available are much higher than what is available in staples such as rice (Iron = 0.5, Calcium = 4) and potatoes (Iron = 0.5, Calcium = 9). Consumption of 100 g of the yams could supply 50% Iron 22% Zinc and the total daily requirements of Copper and Manganese.

The yams therefore, form a very important source of minerals, specially Iron, in addition to their values as carbohydrate and proteins (6-12%) sources.

References

1. Gelman, A.L. (1972). Determination of cobalt in plant material by atomic absorption J.Sci.Food Agric. 23, 299-305.
2. Harbone, J.B. (1980). Phytochemical methods. Chapman and Hall, London, 113-117.

A STUDY OF STARCH GRANULES IN LOCAL CULTIVARS OF YAMS

D.M.A.V. Senaratne, U. Samarajeewa and
H.P.M. Gunasena

Faculty of Agriculture, University of Peradeniya

Starch granules from 33 cultivars of yams belonging to species *Dioscorea alata*, *D. esculenta*, *D. bulbifera*, *D. obconata*, *D. rotundata* and unclassified cultivar from Puerto Rico were examined for their size, shape and striations.

Cultivars belonging to *D. alata* ("Angili-ala", "Raja-ala", "Sudu-Raja-ala", "Kahata-ala", "Hingurala", "Kahata angala", "Kiri-ala", "Ini-ala", "Ley-danta", "King yam", "Dandila", "Rata-ala", "Ratu-ala", "Wal-ala", "Rata Hingurala" and "Raja Hingurala") except "Kirikondol" and "Raja-ala" were characterized by large starch granules of size (8-64 μ) *D. esculenta* cultivars ("Kukulala", "Jawala", and "Siruwalli" had clusters of small (2-2 μ) hexagonal granules. *D. bulbifera* (Udala) had sickle shaped or triangular granules with sharp corners. White flesh variety of "Combuwalli" showed similar granules but the purple flesh variety contained granules similar to *D. alata*, *D. obconata* ("Hitithala" and "Jamburala") contained oval granules whereas *D. rotundata* ("Urumpirei", "Thambala" and "Motakewalli") were characterized by triangular granules with distinct striations.

Other shapes of granules were observed in the aerial yams "Kiri-udala" (oval with sharp pointed end). "Kiri-kondol" (polygonal to circular) and Puerto Rico yam triangular with blunt apices).

The classification of *Dioscorea* spp at present, is based on the morphological characters of the plant and the yams. The information on starch granules support the present classification and could be used in the identification of the cultivars. It may also be a useful basis for classification of hitherto unclassified cultivars (and inter-examining the present classification).

Reference

1. de Fonseka, R.H. and Vinasathamby, S. A provisional index to the local names of flowering plants of Ceylon. Dept. of Botany, University of Peradeniya.

Proc. SLAAS 42, pages 62 & 63, 1986.

Distribution of Germplasm

The germplasm of *Dioscorea* yams collected in these investigations is the only complete set available in Sri Lanka. Therefore, it is a very important collection which has to be maintained and preserved. It has been decided to distribute the germplasm to the relevant organizations in Sri Lanka and to International Centers of Yam Collection for duplication. It is also planned to provide a complete set of the germplasm to the Department of Agriculture for maintenance and issue to the farmers. The offer for the germplasm will be made around February/March, 86.

Involvement of Post-graduate Students

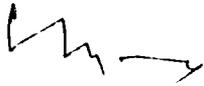
Mrs. N. Harischandra has completed the writing of her M.Phil Thesis. It will be presented for the Thesis defence examination within the next few weeks. The date of examination has not been scheduled by the Postgraduate Institute of Agriculture.

Mr. D.A.P. Dissanayake has completed a major part of the field work. He will have to conduct at least one more field experiment during 1987. This will commence around March/April.

Plan of Work

1. The experiments already in the field will be continued until about end of January.

2. The chemical analysis is being carried out, and that will be continued with the new harvest.
3. A palatibility test will be conducted as soon as the yams are harvested. This was due to be completed in November/December, 86 but was purposely delayed as the yams have been in storage for a long period.
4. Depending on the results of the ongoing trials new field trials will be planted in March/April.
5. The yam germplasm will be offered to the relevant Sri Lankan research institute for maintenance and preservation around February/March. They will also be made available to the International Root Crop Centers for duplication.



Prof. H.F.M. Gunasena
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