BIBLIOGRAPHY OF SOYBEAN RUST 1895-1986

PN-AED-495

Bibliography of Soybean Rust

1895-1986

Errata

(Bibliography of Soybean Rust 1895-1986)

Page no.	Document no.	Printed text	Should read
10	0033	Soybean is one of the	Soybean rust is one of the
24	0083	Infection site symptoms,	Site of infection symptoms,
43	0152	yam bean showed a hypertensive reaction	yam bean showed a hypersensitive reaction
50	0176	Telia formation appears to require	Clearly, telia formation requires
76	0262	The genotypes ... PI 200492, rppl rppl rpp2 rpp2 rpp3 rpp3; and PI 230970, rppl rppl rpp2 rpp2 rpp3 rpp3; and PI 462312, rppl rppl rpp2 rpp2 rpp3 rpp3.	The genotypes ... PI 200492, Rppl Rppl rpp2 rpp2 rpp3 rpp3; and PI 230970, rppl rppl Rpp2 Rpp2 rpp3 rpp3; and PI 462312, rppl rppl rpp2 rpp2 Rpp3 Rpp3.
76	0263	The genotype ... is rppl rppl rpp2 rpp2 rpp3 rpp3 rpp4 rpp4.	The genotype ... is rppl rppl rpp2 rpp2 rpp3 rpp3 Rpp4 Rpp4.

Note on use of the Subject Index: When subjects are indented they should be read with the capitalized first word at the left margin under which they appear, i.e.:

	Cajanus 0147 cajan 0163	means	Cajanus 0147 C. cajan 0163
or	Colletotrichum dematium 0279 glycines 0136		Colletotrichum dematium 0279 C. glycines 0136
or	Greenhouse conditions 0281 culture 0144		Greenhouse conditions 0281 Greenhouse culture 0144

Bibliography of Soybean Rust 1895-1986

AVRDC Library Bibliography Series No. 4

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Tropical Vegetable Information Service
The Asian Vegetable Research and Development Center

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Contents

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Introduction

Soybean rust, caused by *Phakopsora pachyrhizi*, is the most destructive disease of soybean in the tropics and subtropics of the Eastern Hemisphere. It may be one of the reasons why soybean has not been established as a major crop in this part of the world.

The disease has been studied for more than 50 years by many agricultural researchers from various viewpoints. Studies include: biology of *P. pachyrhizi*, host plant resistance, and chemical and cultural control. However, to date, no soybean variety has been found to be immune to this disease and, although chemical control is available, its economic feasibility is questionable for the small farmer in the tropics.

The purpose of this bibliography is to gather the available literature together and provide the information to those who are interested in this field. A total of 321 references, from 1895 to 1986, have been collected in this volume. These papers were gathered from 90 journals and 59 books.

This bibliography has eight subject headings: i.e. general, pathogen morphology and taxonomy, physiology and biochemistry, epidemiology, pathogenic specialization, etiology, yield loss, and disease management.

Although an attempt has been made to include all references, some may be missing. Readers are requested to bring to the attention of the Library and Documentation Service of AVRDC any missing references.

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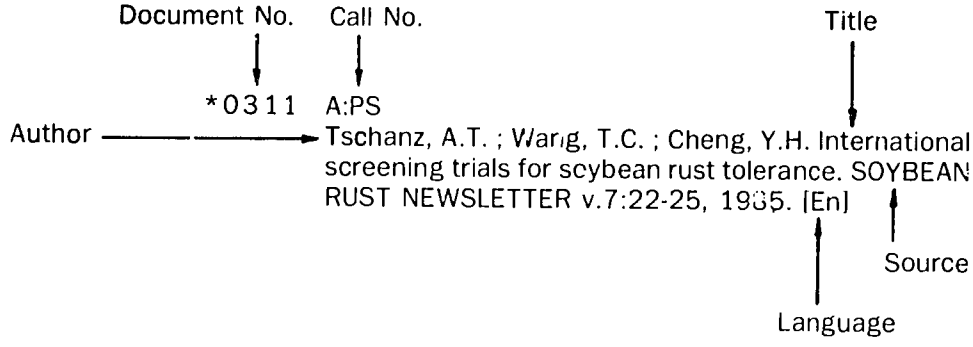
Explanatory Note

Sample Entry



Abstract

In tests at two locations in Taiwan and 1 in Thailand the line GC 30082-8-14-6-7-68 was identified as having a level of tolerance to *Phakopsora pachyrhizi* equal to or higher than that of the check, AGS 181. It also had the highest mean yield across treatments in all three trials. [PLH]

Abstractor/Translator

Language Codes

Ch	-	Chinese	Ja	-	Japanese
De	-	German	La	-	Latin
En	-	English	Pt	-	Portuguese
Fr	-	French	Th	-	Thai
In	-	Indonesian			

General

*0001 REP.SB-769
Anonymous. Soybean diseases. QUEENSLAND AGRICULTURAL JOURNAL v.100:194-201, 1974. [En]

Soybean diseases caused by bacteria, fungi, and viruses in Australia are discussed. The site of infection, host stages, recognition and control of the pathogen are reviewed. [PLH]

*0002 SB205.S7A8 1975
The Asian Vegetable Research and Development Center. Soybean report for 1975. Shanhua, Tainan, AVRDC, Taiwan, ROC. 68p., 1976. [En]

AVRDC 1975 soybean research is reported. Germplasm collection, developing varieties with high yield, disease and insect resistance, nitrogen-fixation activity of symbiotic bacteria and soybean roots, translocation of pesticides to soybean seed, effect of nitrogen fertilizers, soil moisture requirements weed control, and soybean uses are included. Nine soybean cultivars were classified as being moderately resistant to rust. Dithane M-45, a preventive fungicide, provided better control of rust than other fungicides. Another 25 cultivars were determined to be resistant to purple seed stain. AVRDC's staff assisted in the formation of the International Working Group on Soybean Rust; a standard system of evaluating rust attack was developed by this group and is presented in this report. [PLH]

*0003 SB205.S7A8 1976
The Asian Vegetable Research and Development Center. Soybean report for 1976. Shanhua, Tainan, AVRDC, Taiwan, ROC. 63p., figs., tables, 1977. [En]

During 1976, research was conducted into breeding, physiology, pathology, entomology, nutritional chemistry, nitrogen fixation, soil science, and crop management at AVRDC. In the breeding program, 44 crosses were obtained with rust resistance and 25 with photoperiod insensitivity or high yield. In the pathology department, 70 F_1 plants from 41 different crosses were screened for soybean rust in the lab. Results showed that the susceptibility to soybean rust was governed by a recessive gene(s). G 8586 and G 8587 rated moderately resistant, showed fewer pustules, and had greener leaves until maturity. The chemical control experiment showed that Bayleton 25 WP gave the lowest disease index, while Bavistin C-65 and Dithane M-45 were nearly equal in controlling the rust. Sicarol 50 WP was phytotoxic. [PLH]

*0004 S542.A8p 1981
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1981:29-38, 1982. [En]

In 1981, AVRDC soybean breeders worked to develop a new generation of narrow- and broad-leaflet breeding lines with substantially better yield potential. Multi-location trials conducted in 1981 demonstrated that these lines could provide yields in excess of 2 t/ha, with highs of 4.5, 3.9 and 3.6 t/ha recorded in the spring, summer, and fall seasons, respectively. A major effort was also made during the year to gain new insights into the epidemiology of soybean rust. Studies indicate that the physiologic

age of the soybean plant plays an important role in rust development, with later maturing plants appearing more resistant than those that are early maturing. Experiments were conducted to develop a soybean that can sustain yields even under heavy pressure from insects such as beanflies and pod borers. [PLH]

*0005 S542.A8p 1980
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1980:51-67, 1981. [En]

In 1980, achievements in the plant breeding program included germplasm collection, hybridization, advanced trials for high yield and early maturity, selection for wide adaptability, photoperiodic response of advanced yield trial selections, genotypic response with and without management, plant population densities, and day-neutral soybean flowering. In the plant pathology department, experiments were conducted on screening for soybean rust resistance, teliospore formation by *Phakopsora pachyrhizi*, the effect of environmental factors on soybean rust development, resistance to root-knot nematode, rust severity and yield loss, and soybean mosaic virus. In the entomology department, beet armyworm resistance screening, defoliation and depodding, pod borer resistance, chemical control, and soybean tolerance to beanfly were studied. In the plant physiology department, studies were conducted on VA mycorrhizal inoculation and soybean performance, and mycorrhiza and soybean as affected by soil properties and host specificity. [PLH]

*0006 S542.A8p 1979
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1979:56-68, 1981. [En]

Experimental results in 1979 were presented for germplasm collection, including: an early maturity and high yield combined study, early-maturing selections for spring and summer, yield trials, day-neutral soybean flowering, beanfly resistance inheritance, soybean stem diameter and beanfly infestation, intercropping soybean for beanfly control, varietal resistance to pod borer, greenbeetle infestation, carbofuran in acidic and alkaline soil, chemical control of beanflies, resistance to soybean rust, host range of soybean rust, soybean rust epidemiology, screening for resistance to root-knot nematode, and fungicide evaluation for soybean rust control. For soybean rust resistance, a total of 674 accessions was evaluated in the spring and another 230 in the fall under epiphytotic conditions. Twenty rated resistant in the spring trial when flowering was delayed. Nine of the most resistant were retested in the fall, but all were rated susceptible. Eleven new collateral hosts of rust from 9 different genera were tentatively identified in AVRDC trials which tested 122 legume species from 45 genera. [PLH]

*0007 S542.A8p 1978
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1978:92-117, 1979. [En]

Studies on germplasm collection of *Glycine*, crossbreeding, yield trials, resistance screening to soybean rust, the epidemiology of soybean rust, resistance to root diseases, root-knot nematode, breeding lines tolerant to flood and drought stress,

beanfly and aphid resistance, pod borer resistance, ecology of soybean insect pests, and control of beanflies. Eight hundred and twenty-four accessions were screened for resistance to soybean rust (*Phakopsora pachyrhizi*) under natural conditions and epiphytotic conditions. The objectives of studying the epidemiology of soybean rust are: (1) a determination of the effect of environmental factors and sources of initial inoculum on disease incidence and development, (2) an evaluation and correlation between yield loss and disease development, rate of disease intensification and spread, and (3) development and use of a quantitative rust assessment scheme. [PLH]

*0008 S542.A8p 1977
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1977:55-62. 1978. [En]

In 1977, the *Glycine* germplasm collection was increased to 8,901 with 40 selected breeding lines evaluated for yield stability. G 8132 and G 8140 were verified to be insensitive to photoperiod. Results from 4 crosses indicated that early flowering was completely dominant to late flowering under a 10-h photoperiod. As the plant density increased, the plant height increased in all 3 tested lines. To select for rust tolerance, 1,682 AVRDC accessions and 1,587 F_3 and F_4 breeding lines from AVRDC and TARI were screened in the field. Sixty accessions were selected as moderately resistant with G 2198 and G 6750 from Manchuria appeared most promising among them. In a host range study, it was found that rust could infect and sporulate on 8 out of 11 legume species. In a fungicide trial, no significant difference in yield appeared among treatments. Varietal resistance to SMV, downy mildew, bacterial pustule, and purple seed stain was identified. [PLH]

*0009 S542.A8p 1976
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1976:31-41. 1977. [En]

Experimental results of various programs by AVRDC during 1976 are presented. The *Glycine* germplasm collection was increased with the addition of 349 entries from 10 countries. Photoperiod insensitivity was apparently found to be controlled by a single recessive gene as we were able to combine longer days to flowering with photoperiod insensitivity. Two selections, 60040-1 and 3006-2-11, and 3 cultivars, PI 230970 (green seed), PI 230970 (black seed), and PI 230971 were determined to be moderately resistant to rust in a series of field and laboratory tests. Two cultivars, PI 176486 and PI 157409, were consistently resistant to Sclerotial blight (*Sclerotium rolfsii*) in 2 successive screenings of 136 entries. Cultivars PI 371611, PI 189402, and PI 374157 were determined to be resistant to bacterial pustule (*Xanthomonas phaseoli*). More than 700 cultivars were artificially inoculated with soybean mosaic virus and 72 entries remained symptomless in a preliminary field screening. A total of 1,060 cultivars was screened for relative resistance to beanfly (*Melanagromyza* sp.) infestation in a series of 9 trials. Seven cultivars had zero infestation levels and another 116 entries had relatively low infestation rates. Three cultivars were determined to have relative resistance to spider mites (*Tetranychus truncatus*). A survey of 21 soybean cultivars using acetylene reduction assays demonstrated that substantial varietal differences exist in soybeans' ability to fix atmospheric nitrogen. [PLH]

*0010 S542.A8p 1975
The Asian Vegetable Research and Development Center. The golden pearl:

1975 soybean highlights. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1975:18-24, 1976. [En]

At AVRDC, cultivars with photoperiod insensitivity were screened from the germplasm collection for development of prototypes with flexible planting dates. Soybean production and yield are greatly reduced by disease and insect problems in the humid tropics. Of particular importance is soybean rust caused by *Phakopsora pachyrhizi*, which has reduced soybean yields by 68% in AVRDC experimental fields. Other diseases of concern at AVRDC are soybean mosaic virus, purple seed stain, downy mildew, and root-knot nematodes. Sources of resistance to each of these diseases have been obtained and identified and are being used in the breeding program. Soybean plants attacked by a number of foliar-feeding insects were observed. The collection and exchange of germplasm from different countries was mentioned. A total of 1,309 successful crosses was made involving 349 single, double, triple, and backcross combinations. Selections from KS 628 and KS 535 yielded more than 4 t/ha at AVRDC. Five entries which produced more than 3 t/ha in 1974 did equally well in 1975. Nine soybean cultivars were identified as moderately resistant to soybean rust after artificial inoculation in a field screening of 1,080 entries. A biweekly spraying of Dithane M-45 effectively reduced yield loss due to soybean rust if begun 15 days after planting. [PLH]

*0011 S542.A8 1974
The Asian Vegetable Research and Development Center. Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, ANNUAL REPORT 1974:1-26, 1975. [En]

In this report, some studies done on soybean by AVRDC in 1974 are presented. They include plant breeding, yield trials, a crossing program, photoperiod insensitivity, sources of disease resistance, fungal diseases, bacterial diseases, entomology, plant physiology, soil science, agricultural economics, and international activities. Soybean rust (*Phakopsora pachyrhizi*), is the most serious soybean disease in Asia and Australia and can be regarded as a potential threat to other soybean producing regions. A simple rust nursery was established to provide a year-round supply of rust inoculum for field screening trials. The host range of soybean rust was investigated. All varietal collections planted at different locations in Taiwan were susceptible to rust. Various degrees of field resistance to rust were identified among some soybean breeding lines and segregating populations. A detached whole leaf technique was used sucessfully as a means of growing rust fungus. Results from chemical control showed that yield loss and disease intensity were significantly related. Several isolates of *Phakopsora pachyrhizi* were designated by their local origin. Two physiological races of this rust fungus were identified. [PLH]

*0012 S542.A8 1973
The Asian Vegetable Research and Development Center. The soybeans. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, ANNUAL REPORT 1972-73:23-26, 1974. [En]

The goal of AVRDC's soybean improvement program is to develop and select varieties that are particularly well adapted to the tropics and subtropics, where today, soybean production and yields are low. This year an effort was made to accumulate a sizable germplasm collection from around the world to serve as the basis of a breeding and selection program. Some accessions of germplasm were tested for yield, resistance to insects and diseases, photoperiod sensitivity, protein content, and oil content. Soybean rust is the most serious soybean disease in Taiwan. Of 1,996 entries screened

in the world collection during the summer of 1973, no varieties proved to be free of disease. [PLH]

*0013 S542.A8p 1983
The Asian Vegetable Research and Development Center. Soybean breeding: evaluation of new germplasm. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1983:207-299, 1985. [En]

In 1983, several soybean rust research programs were conducted by the breeding and pathology departments at AVRDC. Preliminary (PRTT), intermediate (IRTT), and advanced (ARTT) rust tolerance trials, were established to evaluate and select high-yielding and early-maturing soybean lines with improved levels of rust tolerance. Results from biological control indicated that *Gliomastix* sp. and *Trichothecium* sp. can reduce the reproductive capacity of *P. pachyrhizi* by destroying its uredia. Thus they should be able to slow the development of soybean rust epidemics, and reduce rust intensities and yield losses. The predominant races of soybean rust found at AVRDC are complex, and possess multiple virulence factors which allow compatibility with most known differential soybean cultivars. Environmental factors such as precipitation and temperature were found to affect rust development. *Phakopsora pachyrhizi* has a much wider host range than do most rust pathogens. Over 90 legume species of 32 genera have been identified as hosts. American and Asian biotypes of *P. pachyrhizi* can be distinguished on the basis of host range. [PLH]

*0014 REP.SB-771
Boedijn, K.B. The Uredinales of Indonesia. NOVA HEDWIGIA v.1:463-496, 1960. [En]

A number of species under Uredinales that occur in Indonesia was collected and identified. *P. pachyrhizi* was identified on *Pachyrrhizus erosus*. *P. vignae* (Bres.) Arth. was identified on *Pueraria triloba* and *Rhynehosia mollissima*. *Uromyces sojae* (Henn.) Syd. was identified on *Glycine max*. The original material was collected between 1949 and 1954. [PLH/ATT]

*0015 SB608.S7F6
Bromfield, K.R. U.S. research effort in soybean rust pathology. IN: Ford, R.E.; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 42-43, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

In the U.S., soybean rust was investigated by the Plant Disease Research Laboratory (PDRL) as a nonendemic disease that appears to have the potential for serious damage on a major agricultural crop. Organizations and universities in the U.S. working on soybean rust are briefly introduced. PDRL's research effort into soybean rust is mentioned. [PLH/ATT]

*0016 SB608.S7F6
Bromfield, K.R. Soybean rust and the pathogen - some needed research. IN: Ford, R.E.; Sinclair, J.B. Rust of soybean: the problem and research needs;

Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 34-39, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

This report summarizes the distribution, nomenclature, and discovery of *P. pachyrhizi*. Research done on 'formae speciales', physiologic races, nonspecific resistance, rust assessment method, the effect of temperature and leaf surface moisture on uredospore germination and penetration, and epidemiology, is included. Further studies and confirmation are needed. These include: (a) to identify and quantify general resistance mechanisms, (b) to detect tolerance in the soybean-soybean rust system, (c) to study research on the appropriate assessment method of rust development, (d) to determine quantitatively the effect of temperature on sporulation, (e) to confirm the effect of moisture on post-penetration phases of the pathogen, (f) to study the effect of the major environmental factors, and (g) to induce teliospore formation and to complete the life cycle of *P. pachyrhizi*. [PLH]

*0017 A:PS
Bromfield, K.R. Soybean rust in mainland China. SOYBEAN RUST NEWSLETTER v.3(1):3, 1980. [En]

Of the 6 provinces visited, Heilangjiang, Liaoning, Hebei, Shaanxi, Henan, and Shandong, only the last two reported the occasional appearance of soybean rust, but the disease is considered to be unimportant. The visiting team was informed, however, that soybean rust occurred regularly in southern China in the provinces of Jiangsu, Anbui, Hubei, Zhejiang, Fujian, Jiangxi, Hunan, Guizhou, and Guandong. In southern China, losses of 50% may occur in occasional years of rust and losses of 10-30% occur frequently. [PLH]

*0018 SB608.S7B7
Bromfield, K.R. Soybean rust. St. Paul, The American Phytopathological Society, USA. v, 65p., figs., tables, 1984. [En] (The American Phytopathological Society, Monograph No. 11)

This monography addresses the soybean rust disease and covers wide areas including geographical and seasonal distribution of soybean rust, symptoms, yield loss, pathogen taxonomy and nomenclature, pathogen morphology, epidemiology, life cycle of the pathogen, pathogenic specialization, and disease management, as well as a brief introduction of the host plant soybean. [EMS]

*0019 REP.SB-735
Bromfield, K.R. ; Yang, C.Y. Soybean rust: summary of available knowledge. IN: Goodman, R.M. Expanding the use of soybeans; Proceedings of a conference for Asia and Oceania. Urbana-Champaign, IL, INTSOY, USA. p. 161-164, 1976. [En] (INTSOY Series No. 10)

MEETING: Conference on Expanding the Use of Soybeans, Chiang Mai, Thailand, Feb 1976

The objective of this article is to summarize the information on the general distribution of soybean rust, the host range, mycology, and biology of the pathogen *Phakopsora*

pachyrhizi Syd., breeding for host resistance, fungicide tests, and specific problems in India, Taiwan, Thailand, Indonesia, Australia, the Philippines, and the United States. PI 200492 is the source of genes for both specific and general resistance. A zinc ion-maneb complex, benomyl, and oxycarboxin have potential for effective control on soybean rust. The life cycle of the rust pathogen is still not confirmed. When the environment temperature is above 30°C, heavy rainfall and overhead irrigation all tend to decrease sporulation, but the mechanisms remain unknown. [NMC]

*0020 REP.SB-787
Bromfield, K.R. World soybean rust situation. IN: Hill L.D. World soybean research; Proceedings of. Danville, IL, Interstate, USA. p. 491-500, 1976. [En]

MEETING: Conference on World Soybean Research, 1st, Champaign, IL, USA, Aug 3-8, 1975

The distribution, taxonomy, etiology, and epidemiology of soybean rust is outlined. In Japan, the sources of primary inoculum had not been identified, although the disease was intensively studied. At AVRDC, it had been observed that plants of all ages can be infected in the field if viable inoculum is present and if weather conditions are favorable. In Australia, this disease was often found at coastal locations in Queensland and New South Wales. Yield losses caused by soybean rust were not consistent, varying from 10% to 80%. Soybean varieties immune to rust had not been found, nor were there currently available varieties with a high degree of physiological resistance. Use of resistant cultivars, chemical, biological, and cultural controls are discussed. Current research is summarized. [PLH/ATT]

*0021 REP.SB-748
Bromfield, K.R. Review of research on soybean rust. IN: Vakili, N.G. Proceedings of the Workshop on Soybean Rust in the Western Hemisphere. Washington, D.C., USDA, USA. p. 16-23, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

This is a review of the occurrence and symptomatology of soybean rust (*Phakopsora pachyrhizi*), its morphology and taxonomy, disease detection, epidemiology, and breeding for resistant soybean varieties. [NMC]

*0022 REP.SB-718
Bromfield, K.R. Soybean rust: some considerations relevant to threat analysis. PROTECTION ECOLOGY v.2(3):251-257, 1980. [En] [En Abst]

The world distribution of soybean rust and its causal agent, *Phakopsora pachyrhizi*, are briefly reviewed and some crop loss information presented. The pathogen, an economic factor in the eastern hemisphere, has not been reported in the U.S. Tests to date show that U.S. cultivars are susceptible to isolates of the pathogen from the Orient. General resistance has been recognized. Three sources of specific resistance are identified and characterized. Environmental influences on uredial and telial stages of the pathogen and implications for U.S. soybean crops are discussed. It is tentatively concluded that viable inoculum of *P. pachyrhizi* introduced into U.S. soybean production areas during a 'normal' growing season could establish disease foci from which rust could spread. [AS]

*0023 REP.SB-821
Byth, D.E. Some concepts of soybean improvement in the lower latitudes. IN: Goodman, R.M. Expanding the use of soybeans; Proceedings of a conference for Asia and Oceania. Urbana-Champaign, IL, INTSOY, USA. p. 18-25, 1976. [En] (INTSOY Series No. 10)

MEETING: Conference on Expanding the Use of Soybeans, Chiang Mai, Thailand, Feb 1976

Some general concepts of soybean adaptation that may influence soybean improvement were discussed. Factors included are: photoperiodic response and adaptation, regional adaptation and agronomic use, plant habit, germplasm base, response to environments, soil and soil fertility, disease and pest resistance, environmental adaptation, and seed quality. *Phakopsora pachyrhizi* was mentioned as a regional disease pathogen. [PLH]

*0024 REP.SB-762
Casey, P.S. Spectral reflectance of a soybean canopy infected with rust. APP, AUSTRALASIAN PLANT PATHOLOGY v.7(4):48-50, 1978. [En]

This paper is concerned with the relationship between reflectance and disease severity for a soybean crop (*Glycine max* (L.) Merr.) infected with rust (*Phakopsora pachyrhizi* Syd.). The most significant dependence of reflectance on soybean rust severity is in the red (600-675 nm) and the infrared (750-850 nm) regions of the spectrum. However, the special characteristics of color infrared film make it most sensitive to reflectance in these regions of the spectrum. Densitometric analysis of the red and infrared sensitive layers of color infrared film should make it possible to detect and quantify soybean rust when disease severities of 1.5 percent occur in an infected canopy adjacent to a healthy canopy. [NMC]

*0025 REP.SB-848
Chan, K.L. [Tainung 3: a rust-resistant and high-yielding variety]. HARVEST [TW] v.19(24):22, 1969. [Ch]

Tainung 3, a new variety with rust resistance, is a hybrid from NS H-11 and PI 200492. Cultivar H-11 matures early with a good yield and PI 200492 is so far the most rust-resistant line. The breeding program started in the summer of 1960. The line was fixed after 3 years. Yield trial results showed that this line gave higher yields than the prevailing varieties. [PLH]

*0026 A:PS
Chaves, G.M. ; do Vale, F.X.R. Research on soybean rust in Brazil. SOYBEAN RUST NEWSLETTER v.4(1):6-10, 1980. [En]

Soybean rust has so far been detected only in areas where the soybean crop is not economically important. An artificial inoculation study revealed significant differences among the five cultivars tested for both the average number of uredia/lesion and the average percentage of sporulating uredia. The Santa Rosa cultivar had the lowest average number of uredia/lesion as well as the lowest average percentage of sporulating uredia and is thus considered the least susceptible to the date used. Additional cultures of the pathogen have been collected from different hosts and their pathogenicity on soybean and other leguminous species has been evaluated. [PLH/EMS]

*0027 REP.SB-869
Cheng, Y.W. ; Chen, H.F. [The effect of temperature on soybean rust uredospores]. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT v.5:106-107, 1963. [Ch]

The optimum temperature for germination of *Phakopsora pachyrhizi* was studied in order to improve the efficiency of artificial inoculation. The germination percentage of uredospores was investigated after 24 hr incubation. The germination percentage was maximal at 25°C (85%). The vigor of uredospores at temperatures higher than 31°C at various stages of uredospore germination was described. [PLH/EMS]

*0028 REP.SB-781
Chung, B.J. ; Park, C.S. Soybean rust in Korea. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. University of Illinois, Urbana- Champaign, IL, USA. p. 49-50, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Soybean rust in Korea is generally described. The distribution, host range, and damage of this disease are included. Soybean and Kudzu vine (*Pueraria thunbergiana*) are natural hosts of rust in Korea. Soybean rust usually occurs after the maturation stage (mid-September) in Korea, thus not affecting yield significantly. Rust can cause damage in the southern parts of Korea, especially Jeju Island. [PLH/ATT]

*0029 REP.SB-724
Deverall, B.J. ; Keogh, R.C. ; McLeod, S. Responses of soybean to infection by, and to germination fluids from, urediniospores of *Phakopsora pachyrhizi*. BRITISH MYCOLOGICAL SOCIETY, TRANSACTIONS v.69(3):411-415, 1977. [En] [En Abst]

Germ-tubes of *Phakopsora pachyrhizi* penetrate cuticles of leaves of soybeans and grow through the underlying epidermal cells before giving rise to intercellular hyphae which pass between palisade cells and develop uredinial initials in the spongy mesophyll. The rust causes the early death of the penetrated epidermal cells and alters the ability of palisade cells to retain trypan blue stain. Emerging uredinia are surrounded by areas of dead tissue. Phytoalexins form at an early stage in rust development and accumulate to substantial amounts. The phytoalexins comprise at least two fractions probably containing related pterocarpanoid compounds. Germinating urediniospores release a thermostable toxic substance into water. This substance may be significant in the host-parasite interaction because it causes necrosis in soybean pods. [AS]

*0030 SBC [illegible].S7F6
Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. x, 110p., 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

The papers collected in this book were presented at the Asia-Oceania Soybean Rust Workshop held in Manila, Philippines, 28 Feb. to 4 Mar., 1977. The subjects included

reviews, current research efforts, breeding for resistance, and control of soybean rust. [PLH]

*0031 A:PS
Hepperly, P.R. ; Victoria, J. Soybean rust on soybean. FAO PLANT PROTECTION BULLETIN v.28(2):77, 1980. [En] [En Abst]

The uredial stage of *Phakopsora pachyrhizi* was identified on rusted leaves of soybean (*Glycine max*) on several plants growing in the Cauca Valley of Colombia in December 1979. The Cauca Valley is the principal area of soybean production in Colombia (80,000 ha cultivated annually). This is the first report of soybean rust on this crop in a major production area in the Western Hemisphere. In the Eastern Hemisphere soybean rust is the major disease limiting soybean production. [AS]

*0032 REP.SB-862
Hiratsuka, N. ; Sato, S. A contribution to the knowledge of the rust-flora of Mt. Fuji and its vicinities, Fuji-Hakone National Park. NAGAOA: MYCOLOGICAL JOURNAL OF NAGAO INSTITUTE v.3:57-100, 1953. [Ja] (Contributions to the Rust-Flora of Eastern Asia. 7)

This paper presents an inventory of rust fungi identified in the Fuji-Hakone National Park, in the vicinity of Mt. Fuji, Japan. *Phakopsora pachyrhizi* Sydow was found on *Glycine max* (Daidzu) at Otawa, Narusawa-mura, in 1950. [THH/EMS]

*0033 SB205.S7C49
Hu, J.C. ; Guo, S.G. ; Yu, Z.L. Major diseases and pests of soybeans in China. IN: Irwin, B.J. ; Sinclair, J.B. ; Wang, J.L. Soybean research in China and the United States; Proceedings of. Urbana-Champaign, IL, University of Illinois, USA. p. 52-55, 1983. [En] (INTSOY Series No. 25)

MEETING: China/USA Soybean Symposium and Working Group Meeting, 1st, Urbana-Champaign, IL, USA, Jul 26-30, 1982

Major diseases and pests of soybean in China are introduced. Soybean disease and pest control includes resistant cultivars, rotation, cultivation, and chemical and biological control. Soybean is one of the most serious diseases of soybean in southern China. Bayleton is used to control rust. [PLH]

*0034 A:PS
Javaid, I. ; Ashraf, M. Some observations on soybean diseases in Zambia and occurrence of *Pyrenochaeta glycines* on certain varieties. PLANT DISEASE REPORTER v.62(1):46-47, 1978. [En] [En Abst]

Pyrenochaeta glycines caused a major disease on some varieties of soybeans in Zambia. Some other pathogenic fungi frequently observed causing diseases were *Phakopsora pachyrhizi* (the cause of soybean rust), *Phyllosticta glycines*, *Ascochyta phaseolorum*, and *Cercospora sojina*. Bacterial pustule, caused by *Xanthomonas glycines*, bacterial blight, caused by *Pseudomonas glycinea*, and wild fire, caused by *Pseudomonas tabaci*, were important bacterial diseases. Soybean mosaic virus, and injury from root-knot nematodes (*Meloidogyne* spp.) were also important on some soybean varieties. [AS]

*0035 TH-112
Keogh, R.C. Studies on *Phakopsora pachyrhizi* Syd.: the causal agent of soybean rust. Sydney, University of Sydney, Australia. 148p., 1974. [En] [En Abst] (Thesis - M.Sc.)

Some morphological features of *Phakopsora pachyrhizi* Syd. were recorded. The disease symptoms produced by the organism on *Glycine max* (L.) Merr. and other hosts were described. The effects of various components of the environment on the pre-penetration stages of infection (germination and appressorium formation) by *Phakopsora pachyrhizi* were assessed. In general, these studies indicate that the environmental tolerances of the organism reflect its tropical origins. Some results, however, differ from those recorded for other rust species, in such instances the effects are consistent with the different mode of infection of this organism. The mode of infection has been described. This description shows that the organism gains entry to its host by direct penetration of the cuticle. Studies were also conducted into the effect of the temperature and moisture conditions on the infection processes. The studies have expanded the known host range of the rust and have included representatives of the Australian native flora. The scope of this host range was considered in relation to three classifications of the legumes. The known distribution of the rust in Eastern Australia has been recorded. The distribution in New South Wales was related to the distribution of some native legume hosts and the areas in which soybeans are grown in this state. The behavior of this rust was compared with that of other intensively studied rust species. Some possible implications of the biology of the organism were discussed. [AS]

*0036 SB205.S7K4
Keogh, R.C. Studies on the survival, distribution, and host-parasite relationships of *Phakopsora pachyrhizi* Syd. Sydney, N.S.W., University of Sydney, Australia. 1978. [En] [En Abst] (Thesis - Ph.D.)

I. The susceptibility of a number of soybean cultivars grown commercially in Australia to the isolate of *Phakopsora pachyrhizi* used in these studies is established. II. The known host range of the rust is expanded and the results demonstrated the existence of naturally occurring resistances to the rust in *Kennedia rubicunda* and suggest that similar resistances probably occur in native Australian *Glycine* species. Also, the occurrence of a physiologically different race of the rust on *Kennedia rubicunda* is indicated. III. The ability of the rust to survive throughout the year on natural stands of *Kennedia rubicunda* is demonstrated and climatic factors which favor the multiplication and spread of the rust are suggested. IV. The development of the fungus in two soybean cultivars, Dave and Komata, which have markedly different reactions to invasion by this isolate of the rust, is described from studies on cleared and stained whole leaf material and fixed, embedded section specimens. V. The cytological and histochemical reactions of the two soybean cultivars to invasion by the rust are described from these studies. VI. The rate and amount of phytoalexin production in the two cultivars are compared. Phytoalexin formation in *Kennedia rubicunda* is also reported. [PLH]

*0037 REP.SB-867
Kitani, K. Soybean rust and its control measures. AGRICULTURE AND HORTICULTURE [JP] v.27:907-910, 1952. [Ja] NOTE: Text in Japanese, partially translated into English by Prof. H.G. Su

Studies were conducted on soybean rust in the Chiukoku and Shikoku areas of Japan. They included time for disease occurrence, crop losses, disease distribution, symptom

expression and disease control. The older parts of a plant were more susceptible than new growth, e.g. 8.8% disease index on the upper part, 24.6% in the middle, and 72.7% on the lower part. The pathogenic fungus, *Phakopsora pachyrhizi*, was described. Disease control consisted of cultural control (delay of sowing time, selection and cultivation of resistant varieties) and fungicide application. [HGS]

*0038 REP,SB-758
Kuchler, F. ; Duffy, M. ; Shrum, R.D. ; Dowler, W.M. Potential economic consequences of the entry of an exotic fungal pest: the case of soybean rust. PHYTOPATHOLOGY v.74(8):916-920, 1984. [En] [En Abst]

This report presents an analysis of the economic consequences if a virulent race of the soybean rust pathogen *Phakopsora pachyrhizi*, were to become established in the United States. The analysis uses an econometric simulation model to estimate the consequences of soybean rust under two alternative environmental and grower response assumptions. Although profits to some soybean farmers and producers of other feed grains would rise, total losses to consumers and other sectors of the U.S. economy are forecasted to exceed $7.2 billion per year even with a conservative estimate of potential damage. The extent and nature of these losses depend on the assumed severity and spread of the disease. [AS]

*0039 A:PS
Kumar, S. ; Verma, R.N. Soybean rust in N.E. Hills of India: further observations. SOYBEAN RUST NEWSLETTER v.7:17-19, 1985. [En]

An intensive survey in West Tripura around Agartala in 1983 revealed the presence of the soybean rust (*Phakopsora pachyrhizi*). Thus, the disease had been identified in all the NEH states, including Sikkim. The viability of the uredospores was studied by the hanging-drop method using infected leaves stored for different periods. Uredospores stored for more than 15 days did not germinate. No significant difference was observed between spores stored at room temperature and at 25°C. However, a significant increase in germination was recorded when the spores were suspended in a 100 ppm sucrose solution. Two soybean cultivars, Bragg and PK 71-21, were subjected to a fungicide treatment. Data indicated a significant difference in rust incidence and grain yield for both cultivars. [PLH]

*0040 A:PS
Kurata, H. Studies on fungal diseases of soybean in Japan. NATIONAL INSTITUTE OF AGRICULTURAL SCIENCES, BULLETIN (C: PLANT PATHOLOGY AND ENTOMOLOGY) no.12:1-154, 1960. [Ja] [En Abst]

This paper deals with the results of field surveys and experimental studies in Japan of fungal diseases of the soybean. The field diseases of the soybean caused by fungi are fully considered, with respect to the history of disease occurrence, geographical distribution of various diseases, economic importance, symptoms, pathogenicity, morphology, physiology, life history, and mode of dissemination of the causal fungi. Diseases included target spot disease, soybean scab, soybean anthracnose, purple seed stain, frogeye, downy mildew, brown spot, brown leafblotch, Phyllosticta canker and leaf spot, ring leaf spot, pod canker, sclerotial blight, rust, Rhizoctonia aerial blight, stem rot, charcoal rot and basal stem rot. [AS/PLH]

*0041 A:PS
Ling, L. Host index of the parasitic fungi of Szechwan, China. PLANT DISEASE REPORTER v.173:1-38, 1948. [En]

Phakopsora pachyrhizi Syd.was found on *Glycine soja* in the Province of Szechwan, China, in 1948. [PLH]

*0042 A:PS
Ling, L. Bibliography of soybean diseases. PLANT DISEASE REPORTER Suppl.204:110-173, 1951. [En]

This bibliography covers approximately 500 titles published from 1882 to 1950, including a number about soybean diseases in the Orient. Following each title in this bibliography, a brief annotation is included to indicate its nature and contents in a general way. Ten articles about soybean rust are featured. [PLH]

*0043 REP.SB-773
Liu, K.C. Studies on soybean rust and its control. TAIWAN AGRICULTURE QUARTERLY v.2:92-100, 1966. [Ch] [En Abst]

Rust caused by *Phakopsora pachyrhizi* Sydow is one of the most destructive diseases of soybean in Taiwan. Occurrence of the disease results in early leaf falling and decrease in yield. Annual loss of soybean from rust disease in Taiwan is estimated at 20 to 30% of total production. All commercial varieties of soybean in Taiwan are moderately or severely susceptible to rust disease. So far, no variety immune or strongly resistant to rust has been bred or selected for commercial cultivation. However, it is noticed that varieties differ in the degree of susceptibility to rust. Further studies on the disease reaction of soybean in different localities and on the possible existence of physiological races of the pathogenic fungus will be very valuable to breeding rust resistant varieties. Several genera and varieties of legume are susceptible to rust under artificial inoculation. As pathogenic inoculum is concerned, susceptibility of these hosts in the field needs to be investigated. At present, application of fungicide is the only way to control the disease. Dithane M-22 or Dithane M-45 sprays at 7-day intervals four times during the susceptible period are recommended. [AS]

*0044 A:PS
Maiti, S. ; Dhar, V. ; Verma, R.N. Rust of soybean in India - a reappraisal. SOYBEAN RUST NEWSLETTER v.4(1):14-16, 1981. [En]

The identity, occurrence, and epidemiology of soybean rust and field reactions of different cultivars were reviewed. Soybean rust was present in Meghalaya as early as 1977, when it occurred in the experimental plots of the ICAR research farm at Nayabunglow. The disease appeared in epiphytotic form during September, when the maximum and minimum temperatures were 23.5°C and 16.4°C, respectively, and relative humidity was in the range of 80% to 90%. A comparative performance of the cultivars found that only 11 cultivars were moderately resistant, while others were moderately susceptible to susceptible. [PLH]

*0045 A:PS
Maiti, S. ; Kumar, S. ; Verma, R.N. ; Dhar, V. Current status of soybean diseases in North East India. SOYBEAN RUST NEWSLETTER v.6(1):14-21, 1983. [En]

In the present paper, the fungal, bacterial and viral diseases of soybean recorded from the North Eastern Hill region are discussed briefly, including their distribution, diagnostic symptoms, and work so far done on them. Soybean rust is present in all the states of N.E.H. region except Tripura. Control both by resistant varieties as well as fungicides has been tried. A large number of soybean varieties has been tested for resistance. None of the varieties was found to be free from the disease. Only a few varieties were identified as moderately resistant. Results of chemical control trials indicate that Saprol is the most effective fungicide followed by Delan and Dithane M-45. [PLH]

*0046 A:PS
Manandhar, J.B. ; Sinclair, J.B. Occurrence of soybean diseases and their importance in Nepal. FAO PLANT PROTECTION BULLETIN v.30(1):13-16, 1982. [En] [En Abst]

Sixteen fungal diseases, three bacterial diseases and three virus diseases of soybean (*Glycine max*) have been found in Nepal. The occurrence of the following diseases varied with elevation: frogeye leaf spot (*Cercospora sojina*), a blight associated with *Cercosporella* sp., anthracnose (*Colletotrichum dematium* var. *truncata*), charcoal rot (*Macrophomina phaseolina*), bacterial pustule (*Xanthomonas campestris* pv. *phaseoli*), and yellow mosaic (virus). Soybean rust (*Phakopsora pachyrhizi*) was found at all elevations. The following fungi and bacterium were recovered from soybean seeds grown in Nepal and were causes of reduced seed quality: *Diaporthe phaseolorum* var. *sojae* (*Phomopsis* spp.), *C. dematium* var. *truncata*, *M. phaseolina*, *Cercospora kikuchii*, *C. sojina*, and *Bacillus subtilis*. Seeds showing symptoms of soybean mosaic virus were recorded. Indigenous cultivars were resistant to *C. sojina*, but susceptible to *X. campestris* pv. *phaseoli*. [AS]

*0047 SB205.S7M35
McLean, R.J. Studies of resistance in soybean (*Glycine max* (L.) Merr.) to rust (*Phakopsora pachyrhizi* syd.). Queensland, University of Queensland, Australia. xii, 443p., 1981. [En] [En Abst] (Thesis - Ph.D.)

Field and glasshouse studies demonstrated the existence of physiologic races. The two races identified can be distinguished by their differential virulence on soybean lines PI 200492, Tainung 3, PI 224268, PI 227687, and HY 2217. These observations are discussed in relation to their significance to breeding rust resistant soybeans. Histological comparisons were made of susceptible, resistant, and highly resistant responses of soybean to infection by *P. pachyrhizi* at intervals after inoculation. Development of uredospores on the leaf surface and host penetration proceed in the same manner in all hosts, but quantitative differences were found between soybean lines in percentage germination of uredospores, and smaller differences were found between lines in appressoria formation and penetration from germinated uredospores. The differences were not related to infection type. The significance of these differences in contributing to a 'slow rusting' type of resistance is discussed. In the susceptible hosts, there was extensive hyphal growth and vigorously sporulating urcdia developed. The highly resistant hosts showed no macroscopic symptoms, but a hypersensitive reaction limited to a few cells could be detected macroscopically. In the resistant host, the hypersensitive response as well as fungal development and associated host cell necrosis were more extensive, and infection symptoms were visible macroscopically. The inheritance of rust resistance was studied, and in several lines was shown to be due to a single dominant gene. Three resistant accessions (PI 200492, Tainung 3, and Tainung 4) and breeding lines derived from crosses involving them were tested

in field trials. It was possible to select resistant and agronomically acceptable lines after a single cross to an adapted but susceptible cultivar. [AS/PLH/EMS]

*0048 REP.SB-765
Melching, J.S. ; Bromfield, K.R. Factors influencing spore germination and infection by *Phakopsora pachyrhizi* and intensification and spread of soybean rust under controlled conditions (abst). AMERICAN PHYTOPATHOLOGICAL SOCIETY, PROCEEDINGS v.2:125, 1976. [En Abst]

MEETING: Annual Meeting of the American Phytopathological Society, 67th, Houston, TX, USA, Aug 10-14, 1975

Uredospores of 4 cultures of *Phakopsora pachyrhizi* Syd., the cause of soybean rust, did not germinate on H_2O agar below 9 or above 28°C; the optimum was 12-21°C. All 4 cultures (from widely separated locations) caused rust on 9 major U.S. soybean cultivars and 10 'ancestral' varieties. Culture Taiwan-72-1 appeared to be the most pathogenic and was selected for more intensive investigation. It has infected and sporulated on all cultivars and breeding lines tested to date. A dew period >6.5 h was necessary for infection. Optimum dew temperature was 18-21°C; with 16 h dew some disease occurred at 10.5 and 26 but none at 28°C. On 'Wayne' 25-30 spores/cm^2 caused an average of 1 lesion/cm^2. The fungus penetrated either leaf surface directly. In a 9 x 45 ft planting rust spread from an inoculated focus when 'dew' was provided (16 h, 2 per week), causing complete defoliation and yield losses up to 60%. Maneb and Plantvax applied to plants in pots before inoculation gave complete control, but some phytotoxicity was noted with Plantvax. Differences in number of lesions produced/unit inoculum, average area of lesion and number of uredia/lesion were evident among 24 cultivars inoculated with Taiwan-72-1; these parameters collectively may be useful for evaluation of germplasm for rust resistance. [AS]

*0049 REP.SB-838
Nuntapunt, M. ; Surin, P. ; Kereetaveep, R. ; Kajornmalee, V. Current research on soybean rust in Thailand. IN: Napompeth, B. ; Subhadrabandhu, S. New frontiers in breeding researches; Proceedings of. Bangkok, Kasetsart Univ., Thailand. p. 805-811, 1986. [En] [En Abst]

MEETING: International Congress Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), 5th, Bangkok, Thailand, Nov 25-29, 1985

During the past ten years, more than 1,000 soybean lines were investigated with regard to their degree of resistance to soybean rust (*Phakopsora pachyrhizi* H. Syd. P. Syd.). Major factors contributing to rust epidemics are abundant inoculum, cultivars, and a favorable environment. Optimum frequency of fungicide applications to control soybean rust was studied. Rust development was found to be rapid and severe in October and November, because of high relative humidity and cool temperature. The best planting date is early August. Rust development in the same cultivar varied with planting date, season, and location. Rainfall was an important factor favoring initial infection by *P. pachyrhizi*, and thus causing greater rust severity. The excess moisture from midnight to early morning was highly correlated to rust severity. [AS]

*0050 REP.SB-818
Park, M. Report on the work of the division of plant pathology. IN: Administration report of acting director of agriculture for 1939. p. D20-D22, 1941. [En]

Uromyces sojae, a synonym of *Phakopsora pachyrhizi*, was observed on *Glycine max* in 1939 by the division of plant pathology. Some investigation was also made on tobacco, tomato, brinjal and ginger. [PLH/ATT]

*0051 REP.SB-766
Poonpolgul, S. ; Pupipat, U. Soybean diseases in Thailand. KASETSART JOURNAL (NATURAL SCIENCE) v.12(2):143-154, 1978. [Th] [En Abst]

Of the 22 diseases encountered during the survey in the soybean growing area of Thailand, soybean rust, caused by *Phakopsora pachyrhizi* Syd., is the most serious disease. Anthracnose, downy mildew, purple stain, and bacterial pustule are also severe in some locations. Other diseases found are stem canker, pod and stem blight, brown leaf spot, Alternaria leaf spot, charcoal rot, Corynespora leaf spot, Phyllosticta leaf spot, leaf blight, caused by *Blakeslea trispora*; seedling blight, bacterial blight, soybean yellow mottle, leaf mottle, soybean mosaic, phylloidy, mungbean yellow mosaic, nematode root knot, yellow spot and bud blight. The unidentified are yellow spot and bud blight. [AS]

*0052 REP.SB-728
Pothidee, K. ; Pupipat, U. ; Manoch, L. Using lyophilization techniques to preserve uredospores of *Phakopsora pachyrhizi* Syd. (abst). IN: The second Southeast Asian symposium on plant diseases in the tropics: program and abstracts. p. 76, 1980. [En Abst]

MEETING: Southeast Asian Symposium on Plant Diseases in the Tropics, 2nd, Bangkok, Thailand, Oct 20-26, 1986

Preservation of uredospores of *P. pachyrhizi* Syd., the fungus inducing rust of soybean, was attempted by lyophilization techniques. The uredospore morphology was unchanged after storage for more than two months in various suspending media, but viability decreased sharply. Only 14.1% of the uredospores germinated after having been lyophilized in 10% skim milk and they proved to be non-pathogenic. No infection resulted from smearing the lyophilized products onto detached whole leaves of soybean. [AS]

*0053 REP.SB-717
Pua, A.R. ; Ilag, L.L. Ingress and pathogenic development of *Phakopsora pachyrhizi* Syd. in soybean. PHILIPPINE AGRICULTURIST v.63(1):9-14, 1980. [En] [En Abst]

The ingress and pathogenic development of *Phakopsora pachyrhizi* in soybean (variety TK-5) was studied. Leaf penetration occurred directly through the cuticle within 20 hours after inoculation by an infection hypha arising from an appressorium. Mycelial colonization continued and 5 to 7 days after inoculation the first uredial primordia became evident. In 7 to 9 days the uredospores were differentiated and by the ninth day the uredia opened and erupted through the epidermis liberating the uredospores. New uredia continued to form for about 3 weeks after inoculation. Differences were noted in the uredial development of the fungus in three soybean cultivars of varying resistance to rust. TK-5 was susceptible, Clark 63 intermediate and PI 230970 resistant. The resistance of PI 230970 is attributed to the late formation of uredia and uredospores and a shorter duration of active uredospore release compared with susceptible TK-5 which had earlier uredial development, earlier release of uredospores and a longer period in which uredia continued to release spores before they became senescent.

*0054 A:PS
Pupipat, U. Soybean rust research in Thailand. SOYBEAN RUST NEWSLETTER v.1(1):7-10, 1977. [En]

A summary of research work on soybean rust done in Thailand is presented. Included are: yield loss assessment, factors that influence soybean infection, host range studies, development of *Phakopsora pachyrhizi* in soybean, testing of rust resistance in soybean varieties, and chemical and cultural control. [PLH]

*0055 REP.SB-119
Quebral, F.C. Diseases affecting soybeans in the Philippines. IN: Second annual conference on corn, sorghum, soybean, mungo and peanut; Proceedings. College, Laguna, U.P. College of Agriculture, Philippines. p. 122-126, 1971. [En]

MEETING: Annual Conference on Corn, Sorghum, Soybean, Mungo and Peanut, 2nd, College, Laguna, Philippines, Mar 22-27, 1971

Soybean rust, bacterial pustule, seedling diseases and root rot are the most common and serious diseases in the Philippines. A brief summary is given of these diseases, their importance and current research being conducted on them. Heavy infection with rust has been observed during dry season plantings (Oct-Mar). The yield loss may be of as much as 30 to 80%. Some hybrids have shown resistance to rust. The most promising of them is L 114. [PLH/EMS]

*0056 REP. SB-656
Reichert, I. Palestine: diseases of field crops. INTERNATIONAL BULLETIN OF PLANT PROTECTION v.13:204M-210M, 1939. [En]

This list of field crop diseases in Palestine reports that *Sclerotium bataticola* caused black spots on stem and a wilt of *Glycine soja* Sieb. et Zucc. (soybean), and *Uromyces sojae* (Henn) Syd., a synonym of *Phakopsora pachyrhizi*, caused a leaf rust. [THH]

*0057 REP.SB-663
Reinking, O.A. Host index of diseases of economic plants in the Philippines. PHILIPPINE AGRICULTURIST v.8:38-54, 1919. [En]

Soybean (*Glycine max*) has been attacked by the following diseases in the Philippines: downy mildew (*Peronospora trifoliorum*), blight (*Rhizoctonia*), blight and stem rot (*Sclerotium*), black mildew (*Trotteria venturioides*) and rust (*Uromyces sojae*), which is a synonym of *Phakopsora pachyrhizi*. [PLH]

*0058 REP.SB-859
Reinking, O.A. Philippine plant diseases. PHYTOPATHOLOGY v.9:114-140, 1919. [En]

The paper lists and briefly describes diseases encountered on a wide array of agricultural crops in the Philippines. Rust, due to *Phakopsora pachyrhizi*, is one of the diseases reported on soybean. [EMS]

*0059 REP.SB-853
Reinking, O.A. Diseases of economic plants in southern China. PHILIPPINE AGRICULTURIST v.8:105-135, 1919. [En]

The list of diseases given in the present paper included only a part of those on economic plants in southern China. It comprises the collections on the author's trip around Canton, Macao, Hongkong, and Kwang Si Province during May and June 1919. Downy mildew and rust, *Uromyces sojae* (*Phakopsora sojae*), were recorded on soybean (*Glycine max*). [PLH]

*0060 A:PS
Sato, T. ; Katsuya, K. ; Sato, S. [Infection structures of uredospore of soybean rust fungus (*Phakopsora pachyrhizi*) formed on artificial film]. PHYTOPATHOLOGICAL SOCIETY OF JAPAN, ANNALS v.47(3):385, 1981. [Ja] NOTE: Text in Japanese, translated by Dr. H.G. Su

It has been reported that characteristic infection structures were formed from uredospores of soybean rust fungus, *Phakopsora pachyrhizi* P. et H. Sydow during cuticular penetration of soybean and the other leguminous plants. The authors made germination trials of uredospores on collodion film, and found the germination structures similar to the infection structures in host plants within 48 hours. Some structures, which were not found in the host plants, were also formed to the same extent. The nucleus behavior during the former development observed by means of Giemsa-HCl method, and revealed a pattern principally identical to that in the infection structures produced by the rust fungi of stomatal infection. In view of the above-mentioned experimental results, the present uredospores showing cuticular infection developed the infection structures on artificial film as similar as the other rust fungi of stomatal infection. [HGS]

*0061 SB608.S7F6
Shanmugasundaram, S. International rust nursery. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 71-72, 1977. [En] (INTSOY Series No. 12)

MEETING:Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Interest was expressed by the breeders and pathologists at the conference in 1976 at Chiang Mai, Thailand, in establishing an International Soybean Rust Nursery (ISRN) with the following objectives: (1) to identify sources of soybean rust resistance; (2) to determine the race pattern of the fungus in the soybean growing areas of the individual countries; (3) to identify the germplasm potentially available as international differentials; and (4) to enable the participating countries to choose the best available resistant source for breeding. [PLH]

*0062 SB608.S7F6
Shanmugasundaram, S. The International Working Group on Soybean Rust and its proposed soybean rust rating system. IN: Sinclair, J.B. ; Ford, R.E. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 11-13, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

A soybean rust rating system was introduced. A rating system containing a 3-digit scientific notation was adopted by the International Working Group on Soybean Rust at the 1976 Chiang Mai Conference. The rating notation is explained: 1st digit - denotes examined leaf position of soybean plant; 2nd digit - denotes the density of rust lesions on the examined leaves; 3rd digit - denotes the reaction to rust. [PLH]

*0063 REP.SB-312
Shanmugasundaram, S. The role of the Asian Vegetable Research and Development Center in the improvement of soybean and mungbean for the developing tropical countries. 38p., 1980. [En] NOTE: Paper presented at the Symposium on Grain Legumes Production, Chiang Mai, Thailand, Nov 9-15, 1980

In this paper, the intensive research effort into the agronomic aspects of soybean and mungbean farming at AVRDC and relevance to the needs of developing countries are discussed. In agronomic practices, soybean planted in paddy fields shortly after rice harvest showed that no tillage is better than tillage and that irrigation did not influence yield. Soybean yields are significantly increased, compared to controls, when an inoculum is applied containing efficient strains of *Rhizobium japonicum* in sufficient numbers, in a viable state, and under optimum environmental conditions. Nine germplasm accessions with moderate resistance to soybean rust are listed. [PLH]

*0064 REP.SB-743
Shanmugasundaram, S. Varietal development and germplasm utilization in soybeans: Republic of China (Taiwan). FOOD AND FERTILIZER TECHNOLOGY CENTER, TECHNICAL BULLETIN v.30:17-21, 1976. [En]

Taiwan's varietal improvement program commenced in 1953. The major breeding objectives in Taiwan have been: a) wide adaptability, with minimum sensitivity to photoperiod and temperature, b) early maturity, so that the variety can be used in multiple cropping systems, c) resistance to soybean rust, and d) high yield. In 1960, Chan of the Taiwan Agricultural Research Institute obtained 3,000 accessions from USRSL at Urbana, Illinois. Of 2,907 accessions which have been screened, 2.4% (or 70 accessions) have been selected for the breeding program. Although 70 different accessions have been identified (among these, 25 were forage types), only PI 200492 has been used in the hybridization program, primarily because of the seriousness of soybean rust disease. [AS/PLH]

*0065 SB605.A8S5
Simmonds, J.H. Host index of plant diseases in Queensland. Queensland Dept. of Primary Industries, Brisbane, Australia. 111p., 1966. [En]

This index of plant diseases in Queensland is arranged in alphabetical order. The diseases of any one host are listed in the order: fungi, bacteria, viruses, nonparasitic, and undetermined. Also included is the year in which the particular disease was first recorded and the name of the person responsible for its collection or identification. Leaf spot, wilt, stem rot, bacterial pustule, rust, seedling blight, soybean mosaic virus, and tomato big bud virus have been found on *Glycine max*. [PLH]

*0066 SB608.S7F6
Sinclair, J.B. Soybean rust in the Western Hemisphere. IN: Ford, R.E.; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 18-21, 1977. [En] (INTSOY Series No 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

The history, distribution, identification, and host range of *Phakopsora pachyrhizi* in the Western Hemisphere are presented. The fungus was observed in Brazil in 1940; Costa Rica in 1976; Cuba in 1926; Guatemala in 1940 and 1941; Puerto Rico in 1913, 1916, 1917, 1918, 1926, 1963, 1975 and 1976; St. Thomas in 1926; and other islands of the West Indies in 1926 and 1975. [PLH]

*0067 SB608.S7S55 1982
Sinclair, J.B. Compendium of soybean diseases. [2nd ed.] St. Paul, MN, American Phytopathological Society, USA. v, 104p., ill., 1982. [En]

Diseases and disorders in this compendium have been arranged according to general causal agents: fungal, bacterial, viral, nematode and noninfectious diseases. Soybean rust was collected in this review. Yield loss symptoms, pathogen epidemiology, host range, and control of diseases are discussed. [PLH]

*0068 REP.SB-751
Sinclair, J.B. Infectious soybean diseases of world importance. PANS: PEST ARTICLES AND NEWS SUMMARIES v.23(1):49-57, 1977. [En] [En Abst]

The most important diseases of soybeans are reviewed. Bacterial blight (*Pseudomonas syringae*) and bacterial pustule (*Xanthomonas ampelina*) are widespread. Anthracnose (*Colletotrichum truncatum*) causes considerable damage in warmer regions. Charcoal rot (*Macrophomina phaseolina*) tends to occur when growing conditions are adverse and can be controlled by good agronomic practices. *Diaporthe* spp. cause pod and stem blight and stem canker which can be controlled by disease-free seed, good cultural practices and fungicides where necessary. *Pythium* spp. attack soybeans at the seedling stage. *Thanatephorus cucumeris* causes various symptoms. Soybean rust (*Phakopsora pachyrhizi*) is a serious disease in the East and has been reported to occur in the Caribbean. Mildews are caused by *Pernospora manshurica* and *Microsphaera diffusa*. Leaf spot diseases are *Cercospora sojina*, *Septoria glycines* and *Pleosphaerulina sojicola*. Virus diseases and nematodes are also discussed. [AS]

*0069 SB608.S7F6
Singh, B.B. ; Thapliyal, P.N. Breeding for resistance to soybean rust in India. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of, Urbana-Champaign, IL, University of Illinois, USA. p. 62-65, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Soybean rust was first noticed at Pantnagar in 1970 and was subsequently observed at Kalyani (W. Bengal) and the low hills of Uttar Pradesh. It is now considered one of the most devastating diseases of soybean in Northern India. Soybean germplasm consisting of over 3,300 lines was screened in the field in 1971. The lines were classified into three groups. Resistant (without any rust pustules even though adjacent to severely infected lines): PI 200465, PI 200466, PI 200477, PI 200490, PI 200492 and PI 224268. Moderately resistant (hypersensitive reaction; no further rust development nor premature senescence of infected plants): E.C. 11695 (UPSM-91),

E.C. 50081 (UPSM-168), PI 88816-S, PI 181567, PI 200455, PI 200474, PI 200476, PI 224270, PI 200487, PI 285089, PI 341352, E.C. 22694 (UPSL-18), E.C. 36956 (UPSL-85), Ankur, and PK-71-39. Except for the lines mentioned above, and the very early ones which escaped infection, all other accessions were susceptible to rust. Some of the rust-resistant lines were selected and crossed with high-yielding but susceptible cultivars such as Bragg, Clark-63 and Hardee. A number of high yielding rust-resistant breeding lines was developed. Inheritance studies, though not conclusive, suggest that rust resistance is a simply inherited trait. Dithane M-45 and Dithane Z-78 provided partial control and were better than Benlate and Plantvax. Although soybean rust was widespread and severe in India from 1970 to 1974, it was not observed in either 1975 or 1976, probably because the fungal spores were killed by the unusually hot temperatures of the summer of 1975. [EMS]

*0070 SB608.S7F6
Sudjadi, M.S. ; Amir, M. ; Sumarno, R.S. Reaction of soybean cultivars and chemical control of soybean rust in Indonesia. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 73-78, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Rust is considered the most destructive disease of soybean in Indonesia, especially in the wet season (October to March). Screening trials were carried out at different stations scattered through the length of the Java Island and involved 200 accessions, 24 of which were found moderately to highly resistant. Three hundred and eighty lines were also screened. A few lines outyielded the check and showed resistance to rust. The five fungicides Daconil, Topsin M, Dithane M-45, Benlate and Bavistin were evaluated for rust control. Although most of them significantly reduced rust infection, they did not reduce leaf defoliation nor increase grain yield. [EMS]

*0071 REP.SB-863
Taiwan Provincial Department of Agriculture and Forestry [Resistance screening for soybean rust]. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT v.16:332, 1974. [Ch]

A rating system for soybean rust was proposed. The investigated date, sampling, and resistance grade are discussed. [PLH]

*0072 SB205.S7C49
Tan, Y.J. ; Yu, Z.L. ; Liu, J.L. Studies on the epidemic regulation and control of soybean rust caused by *Phakopsora pachyrhizi* Syd. IN: Irwin, B.J. ; Sinclair, J.B. ; Wang, J.L. Soybean research in China and the United States; Proceedings of. Urbana-Champaign, IL, University of Illinois, USA. p. 169-174, 1983. [En] (INTSOY Series No. 25)

MEETING: China/USA Soybean Symposium and Working Group Meeting, 1st, Urbana-Champaign, IL, USA, Jul 26-30, 1982

Uredospores of *Phakopsora pachyrhizi* germinated within a range of 8 to 36°C with an optimum of 15 to 26°C. Uredospores germinated over a pH range of 2.2 to 10.0

with an optimum pH of 5 to 6. Uredospore penetration took place under moist conditions in a range of 15 to 28°C. Successful inoculation required keeping plants under moist conditions for at least 7 hours, Uredia developed and matured within 6 to 8 days after inoculation. Uredospores were released after the thirteenth day. Serious epidemics only occurred under moderate temperatures (below 27°C) and rainy weather. Soybean plants are more resistant during the vegetative stages than during the flowering and reproductive stages. There were differences in disease index between the 10 commercial cultivars tested. Cultivar Jiu-Yue-Wang had the lowest disease index and was considered resistant. Bayton and Daconil effectively controlled the disease. [EMS]

*0073 A:PS
Thompson, A. ; Johnston, A. A host list of plant diseases in Malaya. MYCOLOGICAL PAPERS no.52:1-38, 1953. [En]

The present list includes records published since 1920 and unpublished information collected by members of the Plant Pathology Division of the Department of Agriculture. Soybean rust, *Phakopsora pachyrhizi*, was collected on *Glycine max* and reported as *P. vignae*. [PLH]

*0074 REP.SB-795
Thurston, H.D. Threatening plant diseases. ANNUAL REVIEW OF PHYTOPATHOLOGY v.11:27-52, 1973. [En]

Emphasis is on plant diseases that have potential international importance, but are limited to a few countries or a continent. Brief descriptions of the diseases give examples that illustrate the importance of obtaining additional knowledge of threatening plant diseases. Soybean rust is included as a disease of intermediate threat potential. [A,T]

*0075 REP.SB-850
Tokunaga, Y. ; Hashioka, Y. [A preliminary list of diseases of agricultural crops on Hainan Island]. TAIWAN AGRICULTURAL RESEARCH INSTITUTE, AGRICULTURAL BULLETIN 2:131-134, 1948. [Ch]

Soybean rust was recorded as *Phakopsora sojae* (P. Henn.) Sawada, during the investigation made by the authors on Hainan Island, 1942. [PLH]

*0076 SB205.S7W6 1985
Tschanz, A.T. ; Shanmugasundaram, S. Soybean rust. IN: Shibles, R. World soybean research conference III; Proceedings. Boulder, CO, Westview Press, USA, p. 562-567, 1985. [En]

MEETING: World Soybean Research Conference, 3rd, Ames, IA, USA, Aug 12-17, 1984

This paper is a brief review of studies on soybean rust. It includes the following subjects: disease symptoms, epidemiology, host plant resistance, pathogen specialization, and international cooperation. [PLH]

*0077 SB608.S7V3
Vakili, N.G. Field observations and host range of soybean rust, *Phakopsora pachyrhizi*, in Puerto Rico. IN: Vakili, N.G. Proceedings of the workshop on

soybean rust in the Western Hemisphere. Mayaguez, Mayaguez Institute of Tropical Agriculture, Puerto Rico. p. 4-15, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

This is a review about soybean rust development in Puerto Rico. Field identification, a disease survey in western Puerto Rico, general ecological observations, and host range studies are discussed. The disease is more prevalent in cool, humid highlands than in hot lowlands. *Dolichos lablab* is the most frequently observed host of the soybean rust, followed by *Phaseolus lunatus*. Both *D. lablab* and *P. lunatus* are widely distributed throughout the entire Caribbean area. Prolonged wet and cool periods, shade, and blustery rains favor rust epidemics. *P. pachyrhizi* has a wide host range. [PLH/EMS]

*0078 SB608.S7V3
Vakili, N.G. Proceedings of the workshop on soybean rust in the Western Hemisphere. Washington, D.C., USDA, USA. vi, 81p., ill., figs. tables, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

This paper covers such aspects of the soybean rust disease as symptoms, distribution, epidemiology, host range, and physiologic specialization. Symptoms of soybean rust may be confused with those of bacterial pustule, or with angular leaf spots. *Dolichos lablab* is the most frequently observed host of the soybean rust, followed by *Phaseolus lunatus*. There appears to be different strains of the rust as suggested by inoculation of three isolates from different host species out of a wide range of plant species. Two characteristics of soybean rust separate it somewhat from other rust fungi. The first is uredial development on necrotic lesions, which may explain the wide host range of the pathogen. The second is the affinity of uredospores to form clumps instead of becoming pulverulent after emission from the uredial cone, which favors rain splash dissemination rather than wind-borne dispersal. It is remarkable that soybean rust has not yet reached the North American Continent in spite of the proximity of the Carribbean islands. [EMS]

*0079 REP.SB-811
Wolf, F.A. ; Lehman, S.G. Diseases of soybeans which occur in North Carolina and the Orient. JOURNAL OF AGRICULTURAL RESEARCH v.33(4):391-396, 1926 [En] [En Abst]

It has been found that various diseases of soybean are transmitted by means of the seed. Because of this fact it was to be expected that these diseases would occur in eastern Asia, where soybean is native. To date the following diseases are known to be common both to the Orient and to North Carolina: wilt (*Fusarium tracheiphilum* Smith); mildew (*Peronospora manshurica* (Naoum.) Syd.); brown spot (*Septoria glycines* Hemmi); pod-and-stem blight (*Diaporthe sojae* Lehm.); anthracnose (*Glomerella glycines* (Hori.) Lehm. and Wolf); Cercospora leaf spot (*Cercospora daizu* Miura); and bacterial blight (*Bacterium sojae* Wolf). A number of other fungi in Manchuria have been found to be associated with soybean diseases, some of the most important of these being *Hypochnus centrifugus* Tul., *Uromyces sojae* (P. Henn) Syd., and *Pleosphaerulina sojaecola* (Massal.) Miura. whose conidial stage is *Phyllosticta sojaecola* Massal. [AS]

*0080 SB608.S7V3
Yang, C.Y. Soybean rust in Asia. IN: Vakili, N.G. Proceedings of the workshop on soybean rust in the Western Hemisphere. Mayaguez, Mayaguez Institute of Tropical Agriculture, Puerto Rico. p. 34-43, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

A summary of studies on soybean rust at AVRDC is given, including epidemiology, yield loss, host range, resistance screening, inoculation techniques, chemical control, and alternate hosts. *Paedaria scandens*, a common wild plant in Asia is suggested as alternate host. Out of all soybean accessions screened for rust resistance, only PI 230970 and PI 230971 consistently showed a moderate level of resistance. Dithane M-45 was the most effective fungicide for rust control. [EMS]

*0081 A:PS
Yang, C.Y. The IWGSR rust rating system. SOYBEAN RUST NEWSLETTER v.1(1):4-6, 1977. [En]

A rating system utilizing a three-digit notation adopted by the International Working Group on Soybean Rust (IWGSR) is introduced. The first digit denotes the position of infected leaves, the second the rust lesion density, and the third the reaction type. [PLH/EMS]

*0082 REP.SB-127
Yang, C.Y. Past and present studies on soybean rust incited by *Phakopsora pachyrhizi* Syd. KYUSHU UNIVERSITY, INSTITUTE OF TROPICAL AGRICULTURE, BULLETIN v.2:78-94, 1977. [En] (AVRDC/JP/41)

MEETING: Soybean Culture in Tropics, Fukuoka, Japan, Dec 9-10, 1976

This review includes the occurrence and symptomatology of soybean rust, its distribution and host range, economic importance, yield losses, pathogen morphology and taxonomy, disease detection epidemiology, and chemical control. [THH]

*0083 REP.SB-774
Yang, C.Y. Foliar disease of soybeans. IN: Goodman, R.M. Expanding the use of soybeans; Proceedings of a conference for Asia and Oceania. Urbana-Champaign, IL, University of Illinois, USA. p. 82-85, 1976. [En] (INTSOY Series 10)

MEETING: Conference on Expanding the Use of Soybeans, Chiang Mai, Thailand, Feb 1976

Foliar diseases of soybeans are described, including soybean rust, downy mildew, purple seed stain, target spot, frogeye leaf spot, brown spot, bacterial blight, and bacterial pustule. Infection site symptoms, and life cycle of the pathogen are also discussed. [PLH]

*0084 REP.SB-761
Yang, C.Y. ; Yeh, C.C. ; Chen, C.H. Studies on soybean rust, caused by *Phakopsora pachyrhizi* (abst). AMERICAN PHYTOPATHOLOGICAL SOCIETY, PROCEEDINGS v.2:66, 1975. [En Abst]

MEETING: Annual Meeting of the American Phytopathological Society, 67th, Houston, TX, USA, Aug 10-14, 1975

Soybeans in Southeast Asia have suffered heavily in recent years from rust caused by *Phakopsora pachyrhizi*. Extensive surveys revealed that soybean accessions PI 200492, PI 200490, PI 200451, T.K. No.5, KH No.3, CH No.1, CH No.3 and others known to be rust resistant in the past as well as all commercial US varieties were susceptible. Variety Tainung No.4 had much more field tolerance. No 'rust immune' variety of soybeans has been found. However, various degrees of 'field tolerance' by some varieties have been observed; they offer promise in rust resistant breeding work. Young soybeans can become infected if freshly released uredospores are abundant and weather conditions for the rust infection and development are favorable. Primary rust infection becomes apparent in six to eight days at temperatures 20-30°C with high relative humidity in the early morning hours. At temperatures below 20°C and above 32°C, or during continuous rainy days rust development in the field is delayed. Secondary spread in the field requires a similar length of time. Six to 8 cycles of the uredospores can be produced within a soybean growth season. Any number of these cycles might occur on the same leaf depending in the length of time it survives. Evidence from scanning electron microscopic studies reveals at least two types of spores in the uredia. Both self-inhibitory and self-stimulating compounds can be extracted from the uredospores. The common bean (*Phaseolus vulgaris*), wild soybean (*Glycine ussuriensis*) and yam bean (*Pachyrhizus erosus*) are hosts of this pathogen. [AS]

*0085 REP.SB-783
Yang, C.Y. Soybean rust. 22 leaves, 1974. [En] NOTE: Unpublished seminar handout

A survey of soybean rust research is presented. Pathogen taxonomy, distribution, host range, rust race development and yield loss are described. This disease has been recorded in the northeastern, central, and southwestern provinces of China. It has also been reported in the USSR, Korea, Okinawa, Taiwan, the Philippines, Indonesia, Australia, Ceylon, India, Malaya, Thailand, Cambodia and Vietnam. Cultivated varieties of soybean known to be rust resistant in the past were susceptible. Tainung 4 was found to have much more field tolerance to the rust in terms of showing relatively less numbers of rust pustules than other cultivated varieties. Two physiological races of this rust had been identified through their characteristic pathogenic reactions. Other leguminous hosts had been successfully infected by uredospore of the soybean rust pathogen. Six to eight days are required for the primary rust infection to become apparent at a temperature range between 20°C and 30°C and with high relative humidity in the early morning hours. It is believed that there can be 6 to 8 cycles of the rust produced within a growing season. [PLH]

*0086 REP.SB-750
Yang, C.Y. ; Yeh, C.C. [How to set up a rust nursery for studies of soybean rust caused by *Phakopsora pachyrhizi* (abst)]. PLANT PROTECTION BULLETIN (R.O.C.) v.17:9-10, 1975. [Ch Abst]

MEETING: Annual Meeting of the Plant Protection Society of China, Taichung, Taiwan, ROC, Dec 6-7, 1975

Since the soybean rust fungus is an obligate parasite, it cannot be cultivated on an artificial culture medium and will grow only inside the plant tissue of its living host. A simple rust nursery was established at AVRDC to provide a year-round supply of rust

inoculum for field screening trials. The nursery area was 180 m^2, and divided into four sections. One section was planted each month in rotation with a susceptible soybean cultivar such as Shih-Shih (or TK 5). To encourage rust development, a high population density of plants was used (400,000 to 600,000 plants per hectare). Young seedlings in the nursery are artificially inoculated twice with uredospore suspensions (20,000 spores/ml) prepared from older plants in the nursery to accelerate the development of rust. The first inoculation is made three weeks after emergence, and the second, 10 days later. After the first inoculation, the plants are watered twice a day for 20 minutes using a perforated pipe system. Rust symptoms are usually evident on soybean leaves 10 days after the first inoculation. Beside its use for inoculum supply, the nursery can also be used for evaluating fungicides and disease resistance of soybean cultivars. [PLH]

*0087 REP.SB-820
Yang, C.Y. Soybean rust in Eastern Hemisphere. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs. Urbana-Champaign, IL, University of Illinois, USA. p. 22-33. 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

This review of soybean rust in the Eastern Hemisphere outlines occurrence, symptomology, distribution, and host range of soybean rust. Pathogen morphology and taxonomy are described. Factors contributing to the development of soybean rust are discussed, including metabolites and temperature. The establishment of a rust nursery at AVRDC is noted. The surveys found that the currently cultivated varieties of soybean which were previously reported as rust resistant are now susceptible. These varieties include PI 200492, PI 200490, PI 200451, TK #5, KH #, CH #1, and CH #3. Tainung #4 showed more field tolerance to the rust, in terms of the number of rust pustules formed, than did other cultivars. The rating system of soybean rust developed at the IWGSR conference is explained. [PLH]

*0088 SB608.S7Y4
Yeh, C.C. Rust and purple seed stain of soybeans. Urbana-Champaign, IL, University of Illinois, USA. 103p., 1981. [En] [En Abst] (Thesis - Ph.D. (Plant Pathology)) NOTE: Also issued in 'Soybean Rust Newsletter' v.5(1):42-43, 1982

Telia and teliospores of *Phakopsora pachyrhizi* were induced on leaf tissue of *Cajanus cajan*, *Glycine canescens*, *G. javanica*, *G. wightii*, *Pachyrhizus erosus*, *Phaseolus lunatus*, *P. vulgaris*, *Rhynchosia minima*, and *Vigna unguiculata*. *Glycine tabacina* var. *latifolia*, *G. wightii*, *Rhynchosia minima*, *Sesbania exaltata* and *S. vesicaria* are reported for the first time as hosts of the soybean rust. *Sesbania* spp. could serve as a reservoir of *P. pachyrhizi* if introduced into the southern United States. Telia were only induced at temperatures below 20°C. Mature uredia were observed 8 days after inoculation of two soybean lines, and new uredia continued to form for 30 days reaching a mean of 8.2 uredia/lesion. Seed transmission of *P. pachyrhizi* seems unlikely. Soybean plots inoculated between 6 March and 10 April did not show any difference in yield or in disease progress curves, whereas plots inoculated between 17 April and 8 May showed a delay in rust development and had significantly higher yields than those from earlier inoculations. [EMS]

*0089 REP.SB-662
Yen, J.M. Etude sur les champignons parasites du sud-est asiatique. 23. Les uredinees des Philippines. [A study on the parasitic fungi of Southeast Asia. 23. Uredinales of the Philippines]. BULLETIN TRIMESTRIEL DE LA SOCIETE MYCOLOGIQUE DE FRANCE v.90(3):195-200, 1974. [Fr] [Fr Abst]

The present paper describes six species of Uredinales (rusts) of the Philippines, one of which is a new species. They parasitize crops and wild species from 5 botanical families. The species studied were: *Goplana dioscoreae* (Berk. & Br.) Cumm. on *Dioscorea alata*, *Phakopsora pachyrhizi* Syd. on *Glycine soja*, *Puccinia cymbopogonis-brevipedis* Yen on *Cymbopogon* sp., *Puccinia philippinensis* Syd. on *Cyperus rotundus*, *Puccinia purpurea* Cke. on *Sorghum vulgare*, *Uredo musicola* Yen (nov. sp.) on *Musa* sp. [EMS]

*0090 REP.SB-880
Yorinori, J.T. Doenças da soja causadas por fungos. [Soybean diseases caused by fungi]. INFORME AGROPECUARIO v.8(94):40-46, 1982. [Pt] NOTE: Text in Portuguese, translated by 'CIAT'

The main soybean diseases caused by fungi in Brazil are described. These include frogeye leaf spot, mildew, brown spot, anthracnoses, pod and stem blight, target spot, purple seed stain, damping-off, charcoal rot, rosellinia root rot, Rhizoctonia rot, southern blight, Sclerotinia stem rot, and soybean rust. Rust caused by *Phakopsora pachyrhizi* was found for the first time in soybean and other leguminous crops in 1979. No yield loss data are available, but preliminary observations suggest that the disease can be serious in some locations. Twenty-one legume species commonly found in Brazil are susceptible to soybean rust. Cultivar 'Santa Rosa' has shown some resistance to the disease. [PLH/EMS]

*0091 REP.SB-364
Yu, Z.L. ; Tan, Y.J. ; Liu, J.L. [Current status of soybean rust research]. OIL CROPS IN CHINA v.1:47-55, 1980. [Ch] [Ch Abst] NOTE: Text translated by Charles Y. Yang

The studies of soybean rust in China before 1980 are reviewed, including taxonomic status, rust distribution, host range, morphological characteristics of the pathogen, epidemiology, and control. [PLH]

Pathogen Morphology and Taxonomy

*0092 REP.SB-646
Arthur, J.C. Uredinales of Puerto Rico based on collections by F. L. Stevens. MYCOPATHOLOGIA v.7:315-332, 1915. [En]

This paper describes the Uredinales of Puerto Rico, based on collections by F. L. Stevens. *Uredo concors* sp. is reported in this paper on *Dolichos lablab* L. and *Teramnus uncinatus* (L.) Sw. [PLH/ATT]

*0093 REP.SB-822
Arthur, J.C. Uredinales of Porto Rico based on collections by H. H. Whetzel and E.W. Olive. MYCOLOGIA v.9:55-104, 1917. [En]

From *Dolichos lablab* L. collected in Puerto Rico by H. H. Whetzel and E. W. Olive, *Uredo concors* Arth. was redesignated *Physopella concors* (Arth.) Arth. [PLH/ATT]

*0094 REP.SB-827
Arthur, J.C. Relationship of the genus *Kuehneola*. TORREY BOTANICAL CLUB, BULLETIN v.44(11):501-511, 1917. [En]

The genera under Melampsoraceae are introduced. The type species of the genus is given in each instance, and the type species of genera reduced to a synonym. *Phakopsora vignae* (Bres.) Arth., a new combination with synonyms *Uredo vignae* Bres. and *Physopella concors* Arth., was collected on *Vigna lutea*, *Phaseolus lunatus*, *Dolichos lablab*, and *Teramnus uncinatus* in the West Indies. The teliospores of this species were not yet known. [PLH/ATT]

*0095 REP.SB-817
Arthur, J.C. Uredinaceae. NORTH AMERICAN FLORA v.7:662-663; 672-674, 1925. [En]

The index of genera in Uredinaceae including *Phakopsora* is presented and characteristics described. Included is *Phakopsora vignae* (Bres.) Arth., its synonyms, host range, and distribution. [PLH/ATT]

*0096 REP.SB-861
Baker, C.F. The lower fungi of the Philippine Islands: a bibliographic list chronologically arranged, and with localities and hosts. LEAFLETS PHILIPPINE BOT. v.6:2065-2190, 1914. [En]

This list represents some preliminary work toward an illustrated manual of the Philippine fungi. *Uromyces sojae* Syd. was found on *Glycine hispida* in Los Baños. [PLH]

*0097 REP.SB-819
Cummins, G.B. Uredinales of continental China collected by S.Y. Cheo. I. MYCOLOGIA v.42:779-797, 1950. [En]

The rusts reported in this paper were collected in China by S. Y. Chen. *Phakopsora pachyrhizi* had been found and identified in this study on *Glycine soja* in Anhwei, Kweichow, and Kiangsi; on *Glycine* sp. in Anhwei and Kwangsi; on *Pueraria thunbergiana* in Kiangsi and Kweichow; and on *Shuteria* sp. in Kwangsi. The rust on *Shuteria* is presented as uredia and thus there is only tentative reference to this species. [PLH/ATT]

*0098 REP.SB-815
Cummins, G.B. ; Ling, L. An index of the plant rusts recorded for continental China and Manchuria. PLANT DISEASE REPORTER Suppl. 196:520-556, 1950. [En]

This index was initiated as an aid to identification of a collection of Chinese rusts. *Phakopsora pachyrhizi* is reported in this study on a number of hosts including soybean. [PLH/ATT]

*0099 REP.SB-865
Cummins, G.B. Description of tropical rusts - 5. TORREY BOTANICAL CLUB, BULLETIN v.70(1):68-81, 1943. [En]

The host range and teliospore morphology are described for *Phakopsora vignae*. *P. vignae* is considered as a synonym of *P. pachyrhizi* by Hiratsuka. However, both fungi are maintained as two separate species in this paper. [EMS]

*0100 REP.SB-851
Cummins, G.B. Uredinales of New Guinea - III. MYCOLOGIA v.33:143-154, 1941. [En]

The 54 species of Uredinales in this paper were collected by Mrs. Mary Strong Clemens in Morobe District, New Guinea. *Phakopsora pachyrhizi* Sydow. was recorded on *Mucuna*(?) sp. at the Kajabit Mission. [PLH]

*0101 REP.SB-854
Cummins, G.B. Descriptions of tropical rusts. 6. TORREY BOTANICAL CLUB, BULLETIN v.70:517-530, 1943. [En]

The Uredinales reported in this paper were collected, for the most part, by Mrs. Mary Strong Clemens in New Guinea and by C.G. Hansford in Uganda. *Phakopsora vignae* was recorded on *Phaseolus lunatus* collected by Clemens in 1940. [PLH]

*0102 REP.SB-776
Dietel, P. Drei neue Uredineengattungen: *Masseeella*, *Phakopsora* und *Schizospora*. [Three new genera in the Uredinales: *Masseeella*, *Phakopsora* and *Schizospora*]. BERICHTE DER DEUTSCHEN BOTANISCHEN GESELLSCHAFT v.13(7):332-336, 1895. [De]

An early description of 3 new genera in the Uredinales; *Masseeella*, *Phakopsora*, and *Schizospora* is reported. *Phakopsora*, originally described by Barclay as *Melampsora punctiformis*, was found on *Galium aparine* in the Himalayan mountains. [PLH/JWS]

*0103 REP.SB-736
Hennings, V.P. Einige neue japanische Uredineen IV. [A few new Japanese Uredinaceae]. HEDWIGIA v.42(Suppl):107-108, 1903. [De] NOTE: Also issued in 'Sylloge Fungorum' v.17, 1905

This is a Latin description of *Uredo sojae* P. Henn. n. sp. in Japan found on *Glycine soja*. [PLH]

*0104 REP.SB-826
Hiratsuka, N. *Phakopsora* of Japan I. BOTANICAL MAGAZINE v.49:781-788, 1935. [En]

Several pathogens were reclassified under the genus *Phakopsora*. The discovery, synonyms, host, distribution and a key to the Japanese species of *Phakopsora* are included. [PLH/ATT]

*0105 REP.SB-655
Hiratsuka, N. Uredinales collected in Kiushu III. JOURNAL OF JAPANESE BOTANY v.12:265-272, 1936. [En]

This paper presents a collection of *Phakopsora pachyrhizi* on soybean and one of *Glycine ussuriensis* in the province of Chikugo, 1935. [PLH]

*0106 REP.SB-816
Hiratsuka, N. Uredinales collected in Korea I. BOTANICAL MAGAZINE v.49(579):145-152, 1935. [En]

Phakopsora pachyrhizi was collected on soybean in the province of Kannan, Genzan, 1934. [PLH]

*0107 REP.SB-825
Hiratsuka, N. Materials for a rust-flora of Manchoukuo. I. SAPPORO NATURAL HISTORY SOCIETY, TRANSACTIONS v.16:193-208, 1941. [En]

This paper presents a collection of *Phakopsora pachyrhizi* from the province of Kitsurin, Koshurei (Manchuria), September, 1934. [PLH]

*0108 REP.SB-814
Hiratsuka, N. *Phakopsora* of Japan III. BOTANICAL MAGAZINE v.50:2-8, 1936. [En]

This paper discusses the distribution of Japanese *Phakopsora* species, including *P. pachyrhizi*. [ATT]

*0109 REP.SB-852
Kern, F.D. ; Thurston, H.W.,Jr. Additions to the Uredinales of Venezuela - 2. MYCOLOGIA v.35:434-445, 1943. [En]

This list of 33 additional species belonging to 11 genera brought to 238 the species of Uredinales in Venezuela. *Phakopsora vignae*, a synonym of *P. pachyrhizi*, was found on *Phaseolus lunatus*. [PLH]

*0110 REP.SB-856
Kern, F.D. ; Thurston, H.W.,Jr. ; Whetzel, H.H. Annotated index of the rusts of Colombia. MYCOLOGIA v.25:448-503, 1933. [En]

In this paper, 250 species of Uredinales are discussed. *Phakopsora vignae*, a synonym of *P. pachyrhizi*, was recorded on *Teramnus uncinatus*. [PLH]

*0111 A:PS
Koch, E. ; Ebrahim-Nesbat, F. ; Hoppe, H.H. Light and electron microscopic studies on the development of soybean rust (*Phakopsora pachyrhizi* Syd.) in susceptible soybean leaves. JOURNAL OF PHYTOPATHOLOGY v.106(4): 302-320, 1983. [En] [En De Abst] NOTE: Also issued in 'Soybean Rust Newsletter', v.6(1), 1984

The development of *Phakopsora pachyrhizi* from infection to uredospore development was studied by light and electron microscopy. Uredospores germinated with a single

germ tube, formed appressoria and infected always by direct, cuticular penetration. Penetration started with the formation of an appressorial cone which was continuous with the cell wall of the penetration hypha. The penetration hypha entered the epidermal cell, transversed it and reached the intercellular space of the mesophyll where the first septum was formed separating the penetration hypha from the primary hypha. Spread of the fungus in the tissue was followed in whole-leaf mounts. The first haustorium was visible between 24 and 48 hours after inoculation. Haustoria were formed in mesophyll and epidermal cells. Occasionally, encapsulations of haustoria were observed. In sections of uredia, two cells, obviously the pedicel and the sporogenous cell, were observed below developing uredospores. This indicates that uredosporogenesis in *P. pachyrhizi* is the same as known from other rust fungi. As in the case of other rusts partial septa and perforate septa were found in the sporogenous tissue. Perforate septa were also observed elsewhere in hyphae of the infected tissue. [AS]

*0112 SB608.S7V3
Melendez, P.L. The history of *Phakopsora* rust in Puerto Rico. IN: Vakili, N.G. Workshop on soybean rust in the Western Hemisphere; Proceedings of. Washington, D.C., United States Department of Agriculture, USA. p. 1-3, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

This paper gives the history of the soybean rust pathogen in Puerto Rico. The fungus was first reported in 1915 as *Uredo concors* and was later renamed *Physopella concors*, *Phakopsora vignae*. In 1975, all five names *Phakopsora pachyrhizi*, *P. vignae*, *Physopella concors*, *Uredo concors*, and *U. vignae* were listed as synonyms. The paper also gives a number of host plant species on which the fungus was observed. [EMS]

*0113 REP.SB-706
Sarbhoy, A. ; Thapliyal, P.N. ; Payak, M.M. *Phakopsora pachyrhizi* on soybean in India. SCIENCE AND CULTURE v.38(4):198, 1972. [En]

This is the first report of *Phakopsora pachyrhizi* Syd. in India at the U.P. Agricultural University, Pantnagar. The author differentiates between *P. pachyrhizi* and *Uromyces sojae* (P. Henn.) Syd., which had previously been identified in India. A description of uredia and urediospores is included. [ATT]

*0114 REP.SB-780
Sathe, A.V. Identity and nomenclature of soybean rust from India. CURRENT SCIENCE v.41(7):264-265, 1972. [En]

The causal organism of soybean rust in India was identified as *Phakopsora pachyrhizi*. Nomenclature for the fungus is provided. [PLH]

*0115 REP.SB-824
Sawada, K. Descriptive catalogue of the Formosan fungi. Part 6. DEPARTMENT OF AGRICULTURE RESEARCH INSTITUTE, FORMOSA REPORT no.61:47-51, 1933. [Ja]

Phakopsora sojae (*P. pachyrhizi*) is illustrated and described. *Uredo sojae* is reduced to a synonym of *P. sojae*. [PLH]

*0116 REP.SB-801
Shen, G.S. Evaluations on the preservation of specimens for soybean rust diagnosis. Shanhua, Tainan, AVRDC, Taiwan, ROC. 14 leaves, 1977. [En] [En Abst] (AVRDC Summer Trainees' Report)

Three methods of specimen preservation were studied. Besides the color, visual appearance and internal anatomy were studied using paraffin sections and microscopy examination. Formalin-acetic acid-alcohol-oil of cloves (F.A.O.) solution is found to be the best fixative. There are no variations in fungal structures after F.A.O. solution treatment when compared with a fresh leaf. [AS]

*0117 REP.SB-745
Sydow, H. ; Sydow, P. Beitrag zur Kenntnis der parasitischen Pilze der Insel Formosa. [A contribution to knowledge of the parasitic fungi of the Island of Formosa]. ANNALES MYCOLOGICI v.12:108-109, 1914. [La] NOTE: Also issued in 'Sylloge Fungorum' v.23, 1925

This is a taxonomic description of *Phakopsora pachyrhizi* Syd. nov. spec. in Taiwan. [PLH]

*0118 REP.SB-871
Tai, F.L. Uredinales of Western China. FARLOWIA: A JOURNAL OF CRYPTOGAMIC BOTANY v.3(1):95-139, 1947. [En]

This paper lists species of rust fungi identified in western China. Of the 213 species, which are distributed among 25 genera, and include 25 new species, 164 species are from Yunnan. The pathogen of soybean rust, *Phakopsora pachyrhizi*, was found on *Glycine hispida*, *Pachyrhizus bulbosus*, and *Pueraria thunbergiana* in the provinces of Yunnan and Hunan. The uredospores of the Chinese forms are slightly larger, and the teliospores smaller than those given in the original diagnosis. [PLH]

*0119 REP.SB-809
Thurston, H.W.,Jr. The rusts of Minas Gerais, Brazil: based on collections of A.S. Muller. MYCOLOGIA v.32:290-309, 1940. [En]

Phakopsora crotalariae (Diet.) Arth. (*P. vignae* = *P. pachyrhizi* Sydow) was detected in Brazil for the first time in 1936 by A.S. Muller, infecting *Crotalaria stricta*, in Vicosa, state of Minas Gerais. [PLH]

*0120 REP.SB-757
Vakili, N.G. ; Bromfield, K.R. *Phakopsora* rust on soybean and other legumes in Puerto Rico. PLANT DISEASE REPORTER v.60(12):995-999, 1976. [En] [En Abst]

Soybean cultivars Williams, Santa Rosa, Hardee, and Biloxi, *Phaseolus coccineus* (scarlet runner bean), and *Phaseolus vulgaris* (common bean), growing at an elevation of 500 m, were found to be naturally infected with a *Phakopsora* rust during the summer of 1976 at Adjuntas Agricultural Experiment Substation, Limani, Puerto Rico. In surveyed areas of western Puerto Rico, the same rust was found on *Dolichos lablab* (hyacinth bean), *Phaseolus lunatus* (lima bean) and *Centrosema pubescens*. The rust was found on *D. lablab* over a range of elevations from 80-600 m. The rust fungus on representative infected leaves of the severa. hosts was identified as *Phakopsora*

pachyrhizi Sydow. Host range studies indicate that the rust organism has a wide range of pathogenicity among legume species, specific virulence for given cultivars or accessions within a species, and that more than one strain may occur in Puerto Rico. The Puerto Rican cultures of *P. pachyrhizi* were less virulent on 'Wayne' soybean than were three cultures of *P. pachyrhizi* from the Orient. [AS]

Physiology and Biochemistry

*0121 SB608.S7F7
Franje, N.S. The effect of rust on the photosynthetic activity of soybean (*Glycine max* (L.) Merr.) Los Baños, Laguna, University of the Philippines, Philippines. xv, 85p., 19 ; 7. [En] (Thesis - M.Sc. (Plant Pathology)) NOTE: Also issued in 'Soybean Rust Newsletter', v.3(1), 1980 and 'CMU Journal of Agriculture, Food and Nutrition', v.2(2), 1980

Studies were conducted to assess quantitatively the effect of different levels of rust infection in the different growth stages of soybean plants: flowering, early pod formation, and pod filling. Inoculum with different concentrations were inoculated in the soybean plants when flower buds started to develop. Three harvests for dry matter determination were scheduled. At every harvest scheduled there was a minimum degree of pustule development per leaf that maximized dry matter production. On the other hand, the increase in dry weight of the rust-infected plants was governed to a certain extent by the degree of infection. With the multiple secondary infection, the total dry matter production decreased. Plant growth was significantly affected by rust population. Generally, lesser rust pustules give higher net assimilation rate (NAR) value and heavier rust pustules resulted in lesser NAR value. The same was true for other growth parameters, the crop growth rate and the relative growth rate but the reverse was the effect for leaf area ratio (LAR) because the higher the degree of infection at the later stage of growth the higher was the LAR value. This was attributed by the reduction in the total dry weight with increasing number of rust population. Final observation revealed that heavily infected plants defoliated earlier (7 to 10 days ahead of the control) and caused pod abortion, reduced seed size, seed number per pod and seed weight. It could be concluded that photosynthetic activity of soybean was aggravated by minimum rust infection at any stage of growth and as the degree of infection rapidly increased to the maximum, photosynthetic activity was reduced. [AS]

*0122 REP.SB-725
Keogh, R.C. ; Deverall, B.J. ; McLeod, S. Comparison of histological and physiological responses to *Phakopsora pachyrhizi* in resistant and susceptible soybean. BRITISH MYCOLOGICAL SOCIETY, TRANSACTIONS v.74(2):329-333, 1980. [En] [En Abst]

Although cuticular and epidermal penetration by the rust and death of the penetrated cell were similar in two cultivars, subsequent hyphal branching and growth was decreased and retention of trypan blue stain was increased in the resistant cultivar. No uredinia formed in the resistant cultivar. Phytoalexin formation began earlier in the resistant cultivar and at a time when many cells had changed in their physiology as revealed by stain retention. A product of germinating urediniospores caused more rapid browning and phytoalexin formation in pods of the resistant cultivar. [AS]

*0123 REP.SB-737
McLean, R.J. Histological studies of resistance to soybean rust, *Phakopsora pachyrhizi* Syd. AUSTRALIAN JOURNAL OF AGRICULTURAL RESEARCH v.30(1): 77-84, 1979. [En] [En Abst]

Histological comparisons were made of susceptible, resistant and immune responses of soybean to infection by rust, *Phakopsora pachyrhizi*, at intervals after inoculation. In the susceptible host there was extensive hyphal growth and vigorously sporulating uredia developed. The immune hosts showed no macroscopic symptoms of infection, but at the microscopic level exhibited a hypersensitive response which was limited to a few cells. In the resistant host the hypersensitive response was not as limited, fungal development and associated host cell necrosis were more extensive, and symptoms of infection were visible macroscopically. [AS]

*0124 REP.SB-729
Pothidee, K. ; Pupipat, U. ; Manoch, L. The development of uredospores of *Phakopsora pachyrhizi* Syd. on soybean leaves (abst). IN: The second Southeast Asian symposium on plant diseases in the tropics: program and abstracts. p. 74, 1980. [En Abst]

MEETING: Southeast Asian Symposium on Plant Diseases in the Tropics, 2nd, Bangkok, Thailand, Oct 20-26, 1980

The development of uredospores of *Phakopsora pachyrhizi* Syd., the incitant of soybean rust, was studied on infected soybean leaves by employing light and scanning electron microscopic techniques. Uredospores germinate by producing short germ tubes from which spherical appressoria develop on physical contact with the host. The pathogen penetrated the epidermal cells of the host intercellularly. The mycelia grew intercellularly with haustorial formation. New uredia developed after the host was colonized and continued to produce uredospores. Maturing uredia physically ruptured the epidermis and spores were liberated through pores lined with clavated paraphyses. [AS]

Epidemiology

*0125 REP.SB-720
Achavasmit, P. ; Poonpolgul, S. ; Nuntapunt, M.; Surin, P. Soybean diseases in Thailand (abst). IN: The second Southeast Asian symposium on plant diseases in the tropics: program and abstracts. p. 73, 1980. [En]

MEETING: Southeast Asian Symposium on Plant Diseases in the Tropics, 2nd, Bangkok, Thailand, Oct 20-26, 1980

So far 22 diseases of soybean have been recorded in Thailand. In the northern region of the country during the rainy season, soybean rust, anthracnose, and bacterial pustule were severe. In the far north where the climate was cool and humid, soybean rust was the most destructive disease. Anthracnose and bacterial pustule were serious in the warm and wet areas both in northern and central Thailand. Downy mildew was widespread in the dry season. Other diseases found with great potential to limit soybean

yields were, charcoal rot, pod and stem blight, purple seed stain, seedling blight, soybean mosaic virus, and mungbean yellow mosaic virus. [AS]

*0126 REP.SB-749
Bromfield, K.R. Soybean rust and soybean rust research. SOYBEAN GENETICS NEWSLETTER v.1:45-52, 1974. [En]

The distribution of soybean rust and studies carried out by researchers in Australia, Taiwan, Indonesia, Thailand, and the USA are summarized. Particular attention is paid to pathogen epidemiology. [NMC]

*0127 REP.SB-782
Bromfield, K.R. Soybean rust in Central America and in the Caribbean Island. SOYBEAN RUST NEWSLETTER v2(1):5, 1979. [En]

Soybean rust caused by *Phakopsora pachyrhizi* was observed on soybean (*Glycine max*) and on common bean (*Phaseolus vulgaris*) in plots at the University of Costa Rica, San Jose (elev. ca. 1200 m). The rust lesions on the soybean were similar to those observed earlier on soybean in Puerto Rico. They differ in appearance from lesions on soybean in fields in the Orient. Both the Costa Rican and the Puerto Rican lesions were dark reddish brown in color and there were relatively few uredia within each lesion. These were classified as resistant reaction types. In contrast, lesions in the Orient usually appear light tan in color and are crowded with uredia. Soybean rust was also found at Turrialba (elev. ca. 600 m) on hyacinth bean and lima bean (*Phaseolus lunatus*). [PLH]

*0128 REP.SB-806
Bromfield, K.R. ; Marchetti, M.A. Soybean rust - a potential threat. IN: Report of the second national soybean research conference. Urbana, IL. U.S. Regional, Soybean Laboratroy, USA. p. 24, 1973. [En]

MEETING: National Soybean Research Conference, 2nd, Memphis, TN, USA, Mar 5-8, 1973

Although soybean rust has not been found in North America, the nine major U.S. commercial varieties are susceptible to the rust pathogen, which causes significant damage in the Orient. The fungus can germinate, penetrate, and sporulate under temperature and moisture conditions commonly found in U.S. soybean producing areas. It is concluded that rust is a threat to soybean production in the United States. [PLH]

*0129 SB608.S7C3
Casey, P.S. The epidemiology of soybean rust - *Phakopsora pachyrhizi* Syd. University of Sydney, Australia. 203p., 1979. [En] [En Abst] (Thesis - Ph.D)
NOTE: The abstract is also issued in 'Soybean Rust Newsletter' v.4(1):3-5, 1987

Extended periods of leaf-surface wetness and moderate temperatures (18-26°C) were necessary for the development of a severe epidemic. Extreme temperatures (>30°C and/or <15°C) and/or dry conditions retarded the development of the rust. Furthermore, prolonged temperatures above 27°C appear to inhibit the fungus even though leaf wetness is theoretically adequate. Significant yield losses of up to 36% could be recorded under severe rust epidemics, while in other experiments, no significant yield loss occurred. Remote sensing studies were initiated. The most significant relationship

between reflectance and disease severity was in the red (600 nm - 675 nm) and the infrared (750 nm - 800 nm) regions of the spectrum. Increasing disease severity was associated with an increase in reflectance in the chlorophyll absorption wavelengths and a decrease in the near infrared wavelengths. Disease severities where 2% of the leaf area was affected by rust can be unambiguously detected photographically with infrared color film. The potential of remote sensing in plant pathology is discussed. Infection of soybean leaves with rust was observed to cause an increase in stomatal resistance. [EMS]

*0130 REP.SB-760
Casey, P.S. Ground-based measurements of the reflectance factors of a diseased canopy. IN: Epidemiology and crop loss assessment; Proceedings of. 2 leaves, 1977. [En]

MEETING: Workshop on Epidemiology and Crop Loss Assessment, Canterbury, New Zealand, Aug 29-31, 1977

Highly significant correlations were found between rust severity and reflectance, and yield and reflectance for all the four bandpasses used. A positive correlation between severity and reflectance was found for the MSS 4 and MSS 5 bandpasses. In contrast, a negative correlation was found in MSS 6 and MSS 7 bandpasses. The reverse relationships were found between yield and reflectance since severity and yield are negatively correlated. The major limitation of the technique is that it examines only one variable, soybean rust, at one point in time. As a 'tool' in epidemiological research, the technique would have 2 major advantages: minimizing observer error and yielding rapid reproducible disease assessments. [NMC/EMS]

*0131 REP.SB-857
Chan, K.L. ; Tsaur, W.L. ; Ting, S.F. [Artificial inoculation of soybean rust disease]. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT Ser.13:205-208, 1972. [Ch] NOTE: Also issued in 'Annual Report of Taiwan Agriculture Research Institute' 1971:39-41

This experiment was conducted to develop an effective inoculation technique for soybean rust work and genetic studies of resistance. For inoculum preservation, spores were maintained under natural infection conditions and dry freezing storage. Two inoculation methods were applied at different growth stages, i.e. seedling and flower initiation phase. The results showed that under dry freezing conditions, germination decreased with increasing storage periods. Maintaining inoculum on green plants in the field under conditions of natural infection was rather ineffective. Host plants were more susceptible at seedling stage than at early flowering stage. Efficient infection was obtained through the spore dusting method. In rust-resistant varieties, the degree of susceptibility was not affected by the growth stage. [EMS]

*0132 REP.SB-243
Deng, T.C. Studies on uredospore germination of soybean rust (*Phakopsora pachyrhizi*). Shanhua, Tainan, AVRDC, Taiwan, ROC. 16 leaves, 1976. [En] [En Abst] (AVRDC Summer Trainee's Research Report)

A detached-leaf culture technique was used to study sporulation of uredospores of the soybean rust fungus, *Phakopsora pachyrhizi*. A hanging-drop microculture method was used to study uredospore germination. Nine and 15 days were required for the

formations of uredia and telia, respectively. Optimal conditions for uredospore germination were found to be at 22°C under 100% relative humidity. Uredospore germination was confined to a temperature range of 12°C-31°C. Light has no effect on spore germination, germ tube extension, and appressorium formation. Uredospores were found to be viable after storage at -30°C for 7 days, whereas storage at a high temperture of 40°C resulted in quick loss of viability. [AS/EMS]

*0133 REP.SB-719
Deslandes, J.A. Leaf rust on soybean and other cultivated legumes caused by *Phakopsora pachyrhizi* at the state of Minas Gerais. FITOPATOLOGIA BRASILEIRA v.4(2):337-339, 1979. [Pt] [En Abst]

This is the first report of leaf rust, caused by *Phakopsora pachyrhizi*, found on some cultivated legumes in several parts of the state of Minas Gerais and on soybean, in an experimental area of EPAMIG et Lavras. [AS]

*0134 REP.SB-878
Deslandes, J.A. ; Yorinori, J.T. Legume species susceptible to the fungus *Phakopsora pachyrhizi*, causal agent of the soybean rust. FITOPATOLOGIA BRASILEIRA v.6(3):603, 1981. [Pt Abst] NOTE: Text in Portuguese, translated by 'EMBRAPA'

Research carried out in the laboratory, in the greenhouse and in the field, by EMBRAPA (CNPSo/National Center for Research on Soybeans) and EPAMIG, in Lavras, Minas Gerais, has shown that the fungus *Phakopsora pachyrhizi*, causal agent of soybean (*Glycine max*) rust, is pathogenic to a large number of cultivated and wild leguminous species. Among various species tested, 16 proved to be susceptible, of which 7 presented a high number of lesions and sporulation intensity: *G. max* (various cultivars), *Glycine wightii* (perennial soybean), *Phaseolus lunatus* (lima and sieva groups), *P. lunatus* var. *macrocarpus* (fava bean), *P. mung* (moyashi), *Dolichos lablab* (lablab), and *Macroptilium lathyroides* (Murray lathyroides). The legumes *Phaseolus vulgaris* (various cultivars), *P. bracteolatus* (two cultivars) and *Macroptilium atropurpureum* (siratro) presented fewer lesions and less sporulation. A cowpea species (*Vigna* sp.), *Dolichos axilare*, a vigorous climbing plant (believed to be *Phaseolus* sp.) and *Teramnus uncinatus*, rarely presented lesions and showed little sporulation. *Thinchosia minima* and *Crotalaria granziana* were recently verified, being little known up until the present. This study allowed the determination of most susceptible species, with greater intensity of sporulation which can be used as host plants and as an inoculum source for research on sources of resistance in soybean to *P. pachyrhizi* [AS/EMS]

*0135 A:PS
do Vale, F. X. R. ; Chaves, G. M. ; Zambolim, L. Host range study of soybean rust in Brazil. SOYBEAN RUST NEWSLETTER v.7:7-9, 1986 [En]

Twenty-four leguminous species were artificially inoculated with the soybean rust fungus: *Calopogonium mucunoides*, *Canavalia* sp., *Centrosema pubescens*, *Crotalaria granziana*, *C. juncea*, *C. striata*, *Galactia striata*, *Glycine max*, *G. wightii*, *Lablab purpureus*, *Macroptilium atropurpureum*, *M. lathyroides*, *Phaseolus bracteolatus*, *P. lunatus*, *P. vulgaris*, *Pueraria phaseoloides*, *Stylosanthes guianensis*, *S. hamata*, *Teramnus uncinatus*, *Vigna mungo*, *V. unguiculata*, and *V. wilmaii*. All of them could be infected except *Canavalia* sp., *Centrosema pubescens*, *Galactia striata*, *Stylosanthes guianensis*, *S. hamata*, and *Vigna unguiculata*. *Vigna mungo* (blackgram) was the most

susceptible to *Phakopsora pachyrhizi* with the highest average number of lesions per square centimeter of leaf area and the highest sporulation intensity. *Crotalaria striata* did not show any macroscopic symptom of the disease when inoculated several times under greenhouse conditions. However, when plants were maintained in the field close to severely infected *Phaseolus lunatus*, some lesions were observed even in the telial stage. [EMS]

*0136 REP.SB-701
Han, Y.S. Soybean diseases in Taiwan. AGRICULTURAL ASSOCIATION OF CHINA, JOURNAL (NEW SERIES) v.26:31-38, 1959. [Ch] [En Abst]

Soybean (*Glycine max* (L.) Merrill), is a new important crop in Taiwan especially during recent years. A general survey of the diseases of soybean occurring in Taiwan was conducted, revealing eighteen kinds. These include soybean rust, bacterial blight, and bacterial pustule. The distribution, time of appearance, environmental conditions, economic importance and varietal susceptibility of soybean to most diseases have been observed. Two diseases are caused by viruses, two by bacteria, twelve by fungi and two are physiological disorders. This survey shows that the purple stain seed is one of the most destructive diseases in the central part of Taiwan. The most widespread were the two leaf spots known as bacterial pustule and bacterial blight. Fusarium pod blight appears to be increasing in importance annually. Frogeye was not severe in 1957. Downy mildew was prevalent and caused serious damage during the wet period of the year. Sclerotium blight was reported from most of the areas in 1956-1957, but during 1958 the incidence of this disease increased seriously. The data obtained indicate that the varieties Ogden, Dortchsoy str. 2, Palmetto, CNS, and EGI possess the greatest relative resistance to the bacterial pustule and bacterial blight. In general, the hay types are the most susceptible. It appears that Palmetto has a weak resistance to anthracnose and Fusarium pod rot. Of more than 150 varieties examined, none were disease-free. [NMC]

*0137 REP.SB-813
Hiratsuka, N. ; Yoshinaga, T. Uredinales of Shikoku: contributions to the rust-flora of eastern Asia - II. TOTTORI AGRICULTURAL COLLEGE, MEMOIRS v.3(2):265-266, 1935. [En]

Phakopsora pachyrhizi was collected on *Glycine soja* in Tosa and Iyo provinces, Japan. A synonym is presented. [PLH]

*0138 REP.SB-830
Hsu, C.M. ; Wu, L.C. Study on soybean rust. SCIENTIFIC AGRICULTURE v.16(5-6):186-188, 1968. [Ch] [Ch Abst]

In Taiwan, soybean is seriously attacked by rust mainly in the spring and fall seasons when the prevailing temperature is favorable for infection. The life cycle only lasts 10 days, which leads to a rapid increase in infection levels. Uredospores infect soybean plants at night and free water is required for spore germination. Soybean can be attacked by rust at all growth stages. Infection first appears both in the spring and fall seasons at about flowering stage (30 days after sowing). Viability of uredospores of *Phakopsora pachyrhizi* is quickly lost. The primary inoculum may initiate from wind-spread uredospores from other hosts such as wild bean or yam bean. [PLH/EMS]

*0139 REP.SB-716
Kochman, J.K. The effect of temperature on development of soybean rust (*Phakopsora pachyrhizi*). AUSTRALIAN JOURNAL OF AGRICULTURAL RESEARCH v.30(2):273-277, 1979. [En] [En Abst]

Uredospore survival and the development of soybean rust were examined across a range of temperatures. To determine the effect of temperatures on uredospore survival, samples of dry uredospores were exposed to each of a series of eight temperatures for 8 h prior to a germination test on water agar at 21°C for 4 or 16 h. Germination was significantly reduced when uredospores had been exposed to temperatures of 28.5-42.5°C. Development of rust in soybeans was examined under four temperature regimes. Following inoculation with uredospores, plant foliage was sprayed with water and kept under conditions of dew at 21°C for 16 h. Plants were then placed in a selected regime. The 17-27°C regime provided the best conditions for rust development. These findings may partially explain some of the observations on rust occurrence in the field. [AS]

*0140 REP.SB-803
Kochman, J.K. Soybean rust in Australia. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, INTSOY, USA. p. 44-48, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

A survey of soybean rust research in Australia is presented. This work includes a histological study of infected leaves, chemical control of the disease, and temperature effect on the rate of disease development. A histological study indicates that PI 200492 has a resistance which prevents fungal proliferation into mesophyll tissue of the leaf. However, because of the occurrence of a new rust race, PI 200492 is unlikely to be useful in succeeding programs to produce rust resistant lines. Crosses and testing of material are continuing. A number of chemicals was screened for effectiveness against *P. pachyrhizi*. The results indicated that both mancozeb and chlorothalonil provided good control of soybean rust. Differences were significant with the data obtained under different temperature regimes. The shorter generation time and increased sporulation observed in the 17 to 27°C temperature regime would increase: (1) the number of rust generations within a crop and (ii) the number of pustules within a crop per rust generation. Under these conditions the rate of disease development would increase and reach epidemic proportions more quickly than in the other temperature regimes. [PLH]

*0141 A:PS
Maiti, S. ; Verma, R.N. ; Dhar, V. Soybean rust in the North Eastern Hills of India. SOYBEAN RUST NEWSLETTER v.6(1):22-24, 1983. [En] [En Abst]

A survey was conducted during the cropping season of 1982, covering the five hill states of Meghalaya, Manipur, Nagaland, Sikkim, and Tripura and the two Union Territories (U.T.) of Arunachal Pradesh and Mizoram. Soybean rust was present in all areas surveyed, except the west district of Tripura. Absence of the disease in Tripura seems to be related to two factors: (i) the area under soybean cultivation is rather limited and (ii) the areas surveyed were low altitude areas where the maximum daily temperature during the cropping season was too high for the infection and survival of the pathogen. In all other areas surveyed, the disease was consistently most severe

in medium- and high-elevation areas where the daily maximum and minimum temperatures remained below 28°C and 20°C, respectively. [AS/EMS]

*0142 REP.SB-715
Marchetti, M.A. ; Melching, J.S. ; Bromfield, K.R. The effects of temperature and dew period on germination and infection by uredospores of *Phakopsora pachyrhizi*. PHYTOPATHOLOGY v.66:461-463, 1976. [En] [En Abst]

Uredospores of *Phakopsora pachyrhizi* germinated between 10°C and 28.5°C, with a broad optimum in the range 15-25°C. Spores of isolates from Australia, India, Indonesia, and Taiwan germinated over similar temperature ranges, but the optimal temperature range for the Indian isolate was narrower than that for the other isolates. Maximal infection of Wayne soybean leaves occurred at 20-25°C with 10-12 hours of dew and at 15-17.5°C with 16-18 hours of dew. The minimal dew period for infection was 6 hours at 20-25°C, and 8-10 hours at 15-17.5°C. Infection did not occur above 27.5°C. It appears that temperature-moisture requirements for infection of soybeans by uredospores of *P. pachyrhizi* would not preclude the establishment of the soybean rust fungus in major soybean growing areas of the U.S. [AS]

*0143 REP.SB-723
Marchetti, M.A. ; Uecker, F.A. ; Bromfield, K.R. Uredial development of *Phakopsora pachyrhizi* in soybeans. PHYTOPATHOLOGY v.65(7):822-823, 1975. [En] [En Abst]

Uredial primordia were evident in leaflets of 'Lee 68' soybeans 5-7 days after inoculation with uredospores of *Phakopsora pachyrhizi*. Sporulation from the first uredia started 9 days after inoculation, and continued for about 3 weeks. New uredia continued to form until about 4 weeks after inoculation. In contrast, uredia in PI 200492, a soybean accession with field resistance to rust, were about a day behind in development and senesced 2-4 days sooner than in Lee 68; new uredia continued to form in PI 200492 for about 3 weeks after inoculation. [AS]

*0144 REP.SB-759
Marchetti, M.A. Dispersal of uredospores of *Phakopsora pachyrhizi* by simulated rain (abst). AMERICAN PHYTOPATHOLOGICAL SOCIETY, PROCEEDINGS v.1:153, 1974. [En Abst]

MEETING: Annual Meeting of the American Phytopathological Society, 66th, Vancouver, Canada, Aug 11-15, 1974

Soybean rust is caused by *Phakopsora pachyrhizi* Syd., a fungus not yet reported from the Western Hemisphere. It is one of the major diseases of soybeans in the Far East, and if introduced might threaten soybean production in North America. Greenhouse studies are being conducted within containment facilities to elucidate the epidemiology of this disease. Secondary spread in a greenhouse with an average laminar airflow of 40 m/min was negligible, although conditions favorable for sporulation and infection were present. The role of rain as a dispersing agent in the absence of discernible air movement was investigated. Rust-free potted Wayne soybean plants were misted with water to run-off and arranged at various distances from a group of 9 pots of heavily-rusted soybeans. An eighth-inch of 'rain' splashed onto the rusted soybeans, as droplets from a perforated can held 2.5 m above the plants. Rust pustules appeared subsequently on plants that had been 2.75 m from rain-splashed rusted plants. Pustule

counts on plants located 30 cm to 210 cm at 30 cm intervals from the source of inoculum indicated a decrease in inoculum density by 1/2 for every 20 cm increase in distance from the source. [AS]

*0145 REP.SB-730
Melching, J.S. ; Bromfield, K.R. ; Kingsolver, C.H. Infection, colonization, and uredospore production on Wayne soybean by four cultures of *Phakopsora pachyrhizi*, the cause of soybean rust. PHYTOPATHOLOGY v.69(12):1262-1265, 1979. [En] [En Abst]

Under greenhouse conditions, cultures of *Phakopsora pachyrhizi* from Taiwan, India, Australia, and Indonesia were compared for quantitative characteristics related to their ability to colonize and reproduce on plants of soybean cultivar Wayne. All cultures required similar time periods from inoculation until lesion appearance (7 days) and initiation of secondary uredospore production (9 days). The Indian culture produced more lesions per unit leaf area per unit of inoculum than the other cultures. The mean lesion areas at 2 wk after inoculation on both upper and lower leaf surfaces were similar for the Indian, Taiwanese, and Indonesian cultures (range 0.61-0.77 mm^2), but for the Australian culture the mean lesion areas were smaller (0.30 mm^2 on upper surface and 0.42 mm^2 on lower surface). The mean number of uredia per lesion at 2 wk on the upper leaf surface was 1.0 for the Australian culture and 2.0-3.5 for the other three; little increase with time occurred with any culture. On the lower surface, however, new uredia continued to form in lesions induced by all cultures. By 7 wk there were eight uredia per lesion for the Australian and 12.6-14 for the other cultures. Uredospores were collected daily from 13-52 days after inoculation of plants on which numbers of lesions and leaf areas had been determined. The mean mass (fresh weight) of spores produced per lesion each day and the calculated total number of spores produced over the life of the lesion were: Australian, 0.13 μg and 2,028; Indian, 0.24 μg and 3,768; Indonesian, 0.40 μg and 6,268; and Taiwanese, 0.42 μg and 6,600. Uredospores of all cultures were similar in length and width. No consistent differences in germination potential were found in uredospores tested from each culture at each harvest. [AS]

*0146 A:PS
Poolpol, U. ; Pupipat, U. Morphology, development, induced teliospore formation and host range of *Phakopsora pachyrhizi* Syd. SOYBEAN RUST NEWSLETTER v.7:26-27, 1985. [En] [En Abst]

The morphology of *P. pachyrhizi* is described, including telia and teliospores, as well as the infection process. Out of 23 leguminous species, 13 were found infected: *Cajanus cajan*, *Calopogonium mucunoides*, *Centrosema pubescens*, *Lablab purpureus*, *Macroptilium atropurpureum*, *Pachyrhizus erosus*, *Psophocarpus tetragonolobus*, *Pueraria phaseoloides*, *Vicia faba*, *Vigna luteola*, *V. mungo*, *V. radiata* and *V. sinensis* var. *cylindrica*. However, only uredospores from *Pachyrhizus erosus* and *Vigna mungo* were found pathogenic to soybean after cross-inoculation. [EMS]

*0147 A:PS
Poonpolgul, S. ; Surin, P. Study on host range of soybean rust fungus in Thailand. SOYBEAN RUST NEWSLETTER v.3(1):30-31, 1980. [En]

Thirteen leguminous species were grown in the rust nursery and subjected to natural infection by soybean rust. Nine species were infected. These are soybean, *Dolichos*

lablab, *Vigna radiata* var. *radiata* (Uthong 1.), *Vigna mungo* (Uthong 2), *Phaseolus vulgaris* (No.22), *Cajanus* sp., *Canavalia gladiata*, *Pachyrhizus erosus* and *Phaseolus lathyroides*. The back inoculations from legumes to soybean were successful. [PLH/EMS]

*0148 REP.SB-394
Poonpolgul, S. Soybean rust epidemiology. Shanhua, Tainan, AVRDC, Taiwan, ROC. 7 leaves, 1982. [En] (AVRDC Special Purpose Trainees' Report)

The objectives of this study are: 1) to identify physiological races of the fungus; 2) to test the detached leaf technique used for routine maintenance of inoculum and try to improve it to extend longevity of the detached leaves. All isolates had nearly the same reaction on the detached leaves of the tested differential cultivars. Leaf age and the environment prior to detaching probably influence symptom expression. Soybean leaves which were placed in the plates with water agar had an extended longevity, as well as the leaves soaked in various concentrations of kinetin. [PLH/EMS]

*0149 SB608.S7P8
Pua, A.R. Infection pattern and pathogenic variation of *Phakopsora pachyrhizi* Syd. in soybean (*Glycine max*, Merrill). Los Banos, Laguna, University of the Philippines at Los Banos, Philippines. xiv, 82 leaves, 1978. [En] (Thesis - M.Sc)

Uredospores of 5 isolates of the soybean rust fungus collected from different areas in the Philippines were morphologically alike. Uredial development, spore differentiation, and spore release took place 5-7 days, 7-9 days, and 9 days, respectively, after inoculation of the susceptible cultivar and were delayed by a few days on resistant cultivars. Variations in virulence among isolates were observed. Differential interaction between the 9 soybean cultivars used as differentials and the 5 rust isolates was observed. The rate of host colonization varied among isolates. [EMS]

*0150 A:PS
Rytter, J.L. ; Dowler, W.M. , Bromfield, K.R. Additional alternative hosts of *Phakopsora pachyrhizi*, causal agent of soybean rust. PLANT DISEASE v.68(9):818-819, 1984. [En] [En Abst]

Thirty-five species within 23 genera of legumes were tested for reaction to *Phakopsora pachyrhizi*, the soybean rust causal organism. Twelve species are reported as new alternative hosts, including *Coronilla varia*, *Lespedeza striata*, *Lupinus luteus*, *Sesbania sericea*, and *Trifolium repens*. Many of the hosts shown to be susceptible to *P. pachyrhizi* are common in the southern United States and could serve as overwintering hosts for this pathogen. [AS]

*0151 REP.SB-707
Singh, K.P. , Thapliyal, P.N. Some studies on the soybean rust caused by *Phakopsora pachyrhizi*. INDIAN JOURNAL OF MYCOLOGY AND PLANT PATHOLOGY v.7(1):27-31, 1977. [En] [En Hi Abst]

The fungus, *Phakopsora pachyrhizi* Syd. can infect very young plants also. Spraying of the uredospore suspension was the most convenient method of inoculation of the plants. Only uredospores were found in the diseased tissue. The minimum, optimum, and maximum temperatures for uredospore germination were 20, 25, and 30°C, respectively. The germinability and temperature-range for uredospore germination was

markedly influenced by first exposing the spores at a particular temperature. First exposure at 35°C for 6 h , rendered them nongerminable, whereas the first exposure at 0°C rendered them germinable only at 20 and 25°C [EMS]

*0152 A:PS
Sudjadi, M. Host range study for soybean rust in Indonesia. SOYBEAN RUST NEWSLETTER v.3(1):32-34, 1980. [En]

Twenty-seven species of Leguminosae were artificially inoculated with soybean rust. Fourteen species showed a positive reaction. Bean, cowpea, kidney bean, lima bean, mungbean, and yam bean showed a hypertensive reaction with no spore formation. Bambara groundnut, Orok orok, and pea showed delayed lesion formation with no sporulation. However, dog bean, hyacinth bean, yardlong bean, and soybean were positively infected with profuse sporulation. Reinoculation tests from the above plants to soybean was positive. [PLH/EMS]

*0153 REP.SB-263
Suparyono. Study on the development of soybean rust (*Phakopsora pachyrhizi* Syd.) at different growth stages of the soybean plants. Shanhua, Tainan, AVRDC, Taiwan, ROC. 14 leaves, 1979. [En] (AVRDC Research Interns' Report)

R2 and R3 plant growth stages were the most susceptible among the five plant growth stages tested in the greenhouse, whereas V5 and R2 were the most susceptible using the detached-leaf technique. A high-inoculum concentration (20,000 spores/ml) resulted in higher infection than the low concentration (1,000 spores/ml) and was effective in separating resistant from susceptible plants. [PLH/EMS]

*0154 REP.SB-837
Tan, Y.J. Epidemiology of soybean rust in China. IN: Napompeth, B. ; Subhadrabandhu, S. New frontiers in breeding researches; Proceedings of. Bangkok, Kasetsart Univ., Thailand. p. 813-822, 1986. [En] [En Abst]

MEETING: International Congress Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), 5th, Bangkok, Thailand, Nov 25-29, 1985

Soybean rust is an important disease in the southern part of China. The fungal pathogen, *Phakopsora pachyrhizi*, was prevalent in the 1960s and it spread to many southern provinces of China in the 1970s. Uredospores of this pathogen from Hainan Island of Guangdong Province are considered the major source of primary inoculum for rust infection. They are spread by northward air currents seasonally. Susceptibilities of soybean hosts are significantly different according to the growth stages and the soybean cultivars. Epidemiology of soybean rust in China is discussed in this paper. The major factors of epidemiological importance of this rust are climate, planting date and relative humidity in the soybean field. Important factors of meteorology for the rust development are temperature, amount of rainfall, and the number of rainy days. Under optimum temperature for pathogen development, rainfall and number of rainy days are used to forecast the annual disease severity of soybean rust. The forecasting formula was tested in a number of localities and was found useful for forecasting the disease severity of soybean rust in China. An extensive survey of soybean rust, inside and outside China, is considered an important first step to effective control of this rust in the soybean growing regions, tropical, subtropical, or otherwise. [AS/EMS]

*0155 A:PS
Tschanz, A.T. ; Tsai, B.Y. Effect of maturity on soybean rust development. SOYBEAN RUST NEWSLETTER v.5(1):38-41, 1982. [En]

Soybean plants were grown under an extended 14-h photoperiod and compared with the natural photoperiod for the rate of rust development. Development of the soybean plants was delayed under the extended photoperiod. In both cultivars used in the study, the rate of rust development was also lower under the extended photoperiod than under the natural photoperiod. When relative time (defined as the ratio of days after planting to days to full maturity) was considered, however, the rate of rust development remained the same, regardless of photoperiod treatment. To avoid overrating susceptibility of early maturing types, it is recommended that test material be grouped first by maturity duration before screening for rust resistance. [EMS]

*0156 A:PS
Tschanz, A.T. ; Wang, T.C. ; Hu, L.F. Epidemic development of soybean rust and a partial characterization of resistance to soybean rust. SOYBEAN RUST NEWSLETTER v.3(1):35-39, 1980. [En]

To determine disease progress under different environmental conditions, four cultivars were used at five locations within Taiwan during three plantings. Rust development in the susceptible cultivars is similar, but rust development in G 8587 (moderately resistant) is delayed 3-4 weeks. The most rapid rust development in all cultivars occurred in the fall planting, but during the spring and summer planting an environment x variety interaction was observed. The characteristics of resistance to soybean rust were described. The appearance of a probable new race capable of producing TAN lesions on previously resistant cultivars seriously limits the usefulness of the RB lesion type as a screening technique. [PLH/EMS]

*0157 REP.SB-308
Tschanz, A.T. ; Wang, T.C. Soybean rust development and apparent infection rates at five locations in Taiwan. PROTECTION ECOLOGY v.2(3):247-250, 1980. [En] [En Abst] (AVRDC/JP/51)

The progress of soybean rust (caused by *Phakopsora pachyrhizi*) was monitored on four cultivars at five locations in Taiwan. Three susceptible and one resistant cultivars were studied. The rate of disease progression was similar at the five locations as indicated by apparent infection rates. Infection rates for the four cultivars were similar when calculated over the entire epidemic. The resistant cultivar had a much lower infection rate than the others when calculated for the 0-3% disease severity range; the resistant cultivar was thus capable of slowing disease development early in the epidemic. [AS]

*0158 REP.SB-314
Tschanz, A.T. ; Wang, T.C. Soybean rust epidemiology. 11p., 1980. [En] [En Abst] NOTE: Paper presented at the 2nd SEA Symposium on Plant Diseases in the Tropics, Bangkok, Thailand, 1980

An epidemiological study of soybean rust development on four soybean cultivars was conducted at five locations in Taiwan during three seasons. When the disease developed under the same environmental conditions, early initial infection by *Phakopsora pachyrhizi* resulted in slower disease development than did later initial infection.

This phenomenon appears to be related to physiological age of the plant. Disease development in the cultivars varied with season and location. The variation was not uniform between cultivars, seasons and locations. A cultivar x environment interaction was apparent. Cultivar x environment interaction with respect to disease development is a characteristic of general resistance. [AS]

*0159 REP.SB-744
Vakili, N.G. Distribution of *Phakopsora pachyrhizi* on *Lablab purpureus* in Puerto Rico. PLANT DISEASE v.65(10):817-819, 1981. [En] [En Abst]

A survey of soybean rust caused by *Phakopsora pachyrhizi* in Puerto Rico from 1976 to 1979 indicated that hyacinth bean, *Lablab purpureus*, is a major reservoir of this pathogen. The uredinial state was the predominant form of the fungus; telial structures were observed on only two occasions. The indeterminate perennial growth of hyacinth bean helped the rust to survive over the seasons. Optimal ranges of ambient temperature and precipitation for development of soybean rust were 17-23°C and 140-260 cm, respectively. In the mountain valleys of the western interior of the island, seasonal rainfall, orographic precipitation, and dew, along with a temperature range of 19-21°C, provided an optimal environment for the continuous growth of hyacinth bean and the development of soybean rust throughout the year. [AS]

*0160 REP.SB-712
Vakili, N.G. Field survey of endemic leguminous hosts of *Phakopsora pachyrhizi* in Puerto Rico. PLANT DISEASE REPORTER v.63(11):931-935, 1979. [En] [En Abst]

A field survey of endemic leguminous hosts of *Phakopsora pachyrhizi* was conducted from July 1976 to February 1979. Four wild species (*Crotalaria pallida*, *Macroptilium lathyroides*, *Teramnus uncinatus* and *Vigna luteola*) and three cultivated species (*Lablab purpureus*, *Phaseolus lunatus* var. *lunatus*, and *P. vulgaris* var. *vulgaris*) were infected in the field. *Lablab purpureus* and *T. uncinatus* were the major reservoirs of soybean rust on the island. The rust overseasoned in the perennial *L. purpureus* during the dry season, and increased in the remaining species in their annual cycle of growth during the wet season. [AS]

*0161 A:PS
Yeh, C.C. ; Tschanz, A.T. ; Sinclair, J.B. The effect of inoculation date and inoculum concentration of *Phakopsora pachyrhizi* on soybean yield components and rust development. SOYBEAN RUST NEWSLETTER v.4(1): 28-34, 1981. [En]

There were no significant differences in yield between the plots inoculated on 6 and 13 Mar., 20 and 27 Mar., and 3 and 10 Apr. These early inoculations failed to initiate epidemics due to the prevailing dry weather. However, in the plots artificially inoculated on 17 and 24 Apr., and 1 and 8 May, a delay in rust development was recorded. This delay in rust development was associated with the use of Dithane M-45 until 2 weeks before artificial inoculation and resulted in significantly higher yields for these 2 late inoculation dates. There were no significant differences in yield between the plots inoculated with 3 inoculum concentrations (25,000, 50,000, and 100,000 spores/ml), nor between these and the naturally infected plots. Yield reductions in non-fungicide-protected plots ranged from 54% to 63% compared to the fungicide-protected plots. [PLH/EMS]

*0162 A:PS
Yeh, C.C. ; Sinclair, J.B. ; Tschanz, A.T. *Phakopsora pachyrhizi* not transmitted by infested soybean seeds or soil. SOYBEAN RUST NEWSLETTER v 5(1): 44-47, 1982. [En] [En Abst]

No rust symptoms were observed on plants from soybean seeds contaminated with fresh uredospores of *P. pachyrhizi* and grown in conditions favorable for rust development or on plants grown in soil infested with soybean leaves with *P. pachyrhizi* uredia. Seed transmission is unlikely. [AS]

*0163 A:PS
Yeh, C.C. ; Sinclair, J.B. ; Tschanz, A.T. Induced teliospore formation by *Phakopsora pachyrhizi* (soybean rust) on ten hosts (abst). PHYTOPATHOLOGY v.71(8):914, 1981. [En Abst]

MEETING: Annual Meeting of the American Phytopathological Society, 73rd, Aug 2-6, 1981

Teliospores of *P. pachyrhizi* were induced on the following hosts in a growth room programmed for 12-hour photoperiods (2,060 lux), 60 to 100% relative humidity and diurnal temperatures of 24 ± 1°C max for day and 15 ± 1°C for night: *Cajanus cajan*, *Glycine canescens*, *G. javanica*, *G. max*, *G. wightii*, *Pachyrhizus erosus*, *Phaseolus lunatus*, *P. vulgaris*, *Rhynchosia minima* and *Vigna unguiculata*. Telia were produced ad- and ab-axially, singly or in clusters after uredia formation at the edge of uredia or lesions and first on lower and then on upper leaves. Increased inoculum concentration increased number of telia/cm^2. More telia were observed on lower than upper leaves and more on TK 5 than PI 230971. Telia were induced on soybean leaves with uredia after 2 weeks at 10 or 15°C and 3 weeks at 20°C. [AS]

*0164 REP.SB-713
Yeh, C.C. ; Tschanz, A.T. ; Sinclair, J.B. Induced teliospore formation by *Phakopsora pachyrhizi* on soybeans and other hosts. PHYTOPATHOLOGY v.71(10):1111-1112, 1981. [En] [En Abst]

Telia and teliospores of *Phakopsora pachyrhizi*, causal fungus of rust of soybean (*Glycine max*), were formed on *Cajanus cajan* (pigeon pea), *Glycine canescens* (wild soybean), *G. javanica* (wild soybean), *G. wightii* (wild soybean, lines K-51394, PI 277534, and PI 319474), *G. max* (cultivar TK 5, PI 230970, and PI 230971), *Pachyrhizus erosus* (yam bean), *Phaseolus lunatus* (lima bean), *Phaseolus vulgaris* (common bean), *Rhynchosia minima*, and *Vigna unguiculata* (cowpea) when the hosts were inoculated and grown in a growth room programmed for a 12-hr photoperiod (2,060 lux), 60-100% relative humidity, and diurnal temperatures between 24 ± 1°C minimum night temperature. [AS]

*0165 REP.SB-808
Yeh, C.C. ; Sinclair, J.B. ; Tschanz, A.T. *Phakopsora pachyrhizi*: uredial development, uredospore production and factors affecting teliospore formation on soybeans. AUSTRALIAN JOURNAL OF AGRICULTURAL RESEARCH v.33(1): 25-31, 1982. [En] [En Abst]

PI 230971 and TK 5 soybean (*Glycine max*) plants were inoculated with uredospores of *P. pachyrhizi* in a growth room programmed for 12-h photoperiods (2060 lux),

60-100% relative humidity and diurnal temperatures of 24 ± 1°C (day) and 15 ± 1°C (night). Mature uredia were observed 8 days after inoculation and new uredia continued to form for 30 days, reaching 6.2-6.3 uredia/lesion. TK 5 had maximum uredospore production at day 15, and PI 230971 at day 25 after inoculation. Between 9 and 45 days after inoculation, TK 5 produced 2386 and 12646 and PI 230971 produced 1823 and 9396 uredospores per uredium and per lesion, respectively. More telia were recorded on TK 5 than on PI 230971. The number of telia/cm² decreased from the lower to upper leaves on the plant. Source of inoculum from either PI 230971 or TK 5 did not influence telia production. With each increase in inoculum concentration, there was a concomitant increase in telia production. Two-week-old soybean plants could be used for telia induction. Telia were produced in soybean leaves after 2 weeks at 10 and 15°C and 3 weeks at 20°C, but not at 25°C. Telia production on soybean leaves in the field was common when the daily temperature remained below 20°C for more than 15 h and the average temperature did not exceed 25°C for at least 15 days. [AS]

Pathogenic Specialization

*0166 REP.SB-770
Bonde, M.R. ; Brown, M.F. Morphological comparison of isolates of *Phakopsora pachyrhizi* from different areas of the world. CANADIAN JOURNAL OF MICROBIOLOGY v.26:1443-1449, 1980. [En] [En, Fr Abst]

Isolates of *Phakopsora pachyrhizi* from Australia, India, the Philippines, Taiwan, and Puerto Rico were compared with respect to morphology and development of 'Wayne' soybean. The most extensive comparisons were made between the Puerto Rican and Taiwanese isolates; these were indistinguishable in their prepenetration, penetration, and early colonization phases. Examination of uredia of all isolates by light and scanning electron microscopy (SEM) revealed no differences in uredial morphology. All isolates were indistinguishable with respect to uredospore size, shape, and apparently the number and distribution of uredospore germ pores. The only difference observed was the appearance of germ pores; germ pores of the Puerto Rican isolate were easier to see by means of SEM than those of the four Eastern Hemisphere isolates, suggesting that the Puerto Rican isolate may have thinner germ pore plugs. This difference is not sufficient to consider the isolates as taxonomically distinct. [AS]

*0167 APS
Bromfield, K.R. Differential reaction of some soybean accessions to *Phakopsora pachyrhizi*. SOYBEAN RUST NEWSLETTER v.4(1):2, 1981. [En]

Among isolates now on hand at PDRL, Frederick, MD, we can, with confidence, identify 4 races. A table is given for race identification. Four differential cultivars are used: Wayne, Ankur, PI 200492, and PI 230970. The characteristic infection type produced by isolates on differential varieties is being used to investigate the genetics of specific resistance to soybean rust in soybean. [AS/EMS]

*0168 REP.SB-747
Bromfield, K.R. ; Melching, J.S. ; Kingsolver, C.H. Virulence and aggressiveness of *Phakopsora pachyrhizi* isolates causing soybean rust. PHYTOPATHOLOGY v.70(1):17-21, 1980. [En] [En Abst]

Isolates of *Phakopsora pachyrhizi* (the soybean rust pathogen) from Australia, India, Puerto Rico and Taiwan differed in virulence on an array of soybean (*Glycine max*) genotypes. Three distinct infection types were recognized: TAN, RB and 0. Type TAN, a tan lesion about 0.4 mm^2, usually with 2-5 uredia on the abaxial surface of the leaf 2 wk after inoculation, indicated host susceptibility. Type RB, a reddish-brown lesion about 0.4 mm^2, usually with 0-2 uredia on the abaxial surface of the leaf 2 wk after inoculation, indicated host resistance associated with hypersensitivity. Type 0, the absence of macroscopically visible evidence of rust, indicated host immunity or near immunity. With increasing time after inoculation, lesion area and number of uredia per lesion increased for both TAN and RB, but the rates of increase were slower for RB. Culture Australia-72-1 induced both TAN and RB on each of eight accessions; it may be composed of at least two physiologic races. Culture Taiwan-72-1 induced TAN on 13 accessions. Culture India-73-1 induced either RB (on eight) or 0 (on five). On 20 soybean cultivars, culture PR-Comp from Puerto Rico induced RB only, but the other cultures induced TAN. All four cultures induced only RB on PI 230970 and PI 230971. Cultures Australia-72-1, India-73-1, and Taiwan-72-1 induced TAN on soybean cultivar Wayne. The rate of lesion enlargement and the rate of increase in number of uredia per lesion on the lower surface of leaves of Wayne were about equal for India-73-1 and Taiwan-72-1, but were lower for Australia-72-1, which indicates that Australia-72-1 was less aggressive on Wayne than the other two under the test conditions used. Culture Taiwan-72-1 consistently produced more uredia per lesion at a given time on the upper surface of leaves of Wayne than did India-73-1. [AS]

*0169 A:PS
Burdon, J.J.; Speer, S.S. A set of differential *Glycine* hosts for the identification of races of *Phakopsora pachyrhizi* Syd. EUPHYTICA: NETHERLANDS JOURNAL OF PLANT BREEDING v.33(3):891-896, 1984. [En] [En Abst]

Variation in the responses of a wide range of accessions of four native Australian species of *Glycine* (viz. *G. canescens*, *G. clandestina*, *G. tabacina* and *G. tomentella*) to infection by eight Australian isolates of *Phakopsora pachyrhizi* was analyzed. Differences in the infection type responses of the various wild *Glycine* species were sufficient to recognize six differential hosts useful in the identification of different races of the pathogen. This information is presented to facilitate further examination of the virulence structure of the pathogen population. [AS]

*0170 REP.SB-539
Ding, J. Host range and physiological races of soybean rust pathogen (*Phakopsora pachyrhizi*). Shanhua, Tainan, AVRDC, Taiwan, ROC. 14 leaves, 1983. [En] [En Abst] (AVRDC Summer Trainees' Report)

The objective of this study was to investigate the host range and identify races of *P. pachyrhizi* in Taiwan. All 13 leguminous species, used in the experiment showed a positive response to inoculation with uredospores of *P. pachyrhizi*. This indicates that each of the three isolates, used as inoculum, has a wide range of pathogenicity among the legume species tested, and within a given host there appeared to be isolate specificity with respect to uredial development. Two different lesion types, TAN and reddish brown (RB) were observed 9-12 days after inoculation. Based on the differential reaction of 11 soybean cultivars, at least 5 races of *P. pachyrhizi* could be identified, out of 12 isolates collected from the AVRDC farm. PI 459025 differed markedly from the other 10 accessions in its reaction to the rust isolates. This suggests that PI 459025 has a different gene or genes from those which govern resistance in all the other cultivars used in this study. [AS/EMS]

*0171 REP.SB-722
Keogh, R.C. The host range and distribution of *Phakopsora pachyrhizi* in New South Wales. AUSTRALIAN PLANT PATHOLOGY SOCIETY NEWSLETTER v.5(5): 51-52, 1976. [En]

This report summarizes the host range of soybean rust and the distribution of the disease, some of its native host species, and the soybean growing areas in New South Wales. A total of 32 leguminous species from 22 genera are reported to be hosts. [EMS]

*0172 REP.SB-778
Lin, S.Y. Studies on the physiologic races of soybean rust fungus, *Phakopsora pachyrhizi* Syd. JOURNAL OF TAIWAN AGRICULTURAL RESEARCH v.15(3): 24-28, 1966. [Ch] [En Abst]

Nine isolates obtained by single urediospore isolation from rusted soybean leaves collected at three locations in this island were tested on the tentatively selected differential plants, consisting of six soybean varieties and five leguminous plants. No marked differences in pathogenicity of the isolates of the rust fungus were observed on the soybean varieties. However, the nine isolates could be separated into six pathogenic groups differing mainly in their reactions on three leguminous plants: 1) isolate H-CH_1 infects and forms sori on asparagus bean; 2) isolates H-CH_2, H-NK_5, and M-T infect asparagus bean and kidney bean, but form sori only on kidney bean; 3) isolates H-S and H-P infect asparagus bean and kidney bean but no sorus formation on either one; 4)isolate K-P showing no pathogenicity to asparagus bean infects and forms sori on kidney bean; 5)isolate M-64-37 infects neither asparagus bean nor short podded yam bean; 6)isolate KS-55S showing no pathogenicity to asparagus bean, infects short podded yam bean but no sorus formation. [AS]

*0173 REP.SB-805
Shanmugasundaram, S. Variation in soybean rust development in two locations. SOYBEAN RUST NEWSLETTER v.3(1):23-26, 1980. [En]

Forty-one selected F_3 pedigrees from the cross GC 60005 (Shih-Shih x PI 230970) and 34 from the cross GC 60037 (UPSL-85 x PI 230971) were tested at AVRDC and Hualien for their reaction to soybean rust. In Hualien, of the 41 pedigrees from cross GC 60005, 20 were RB, 10 were TAN, and 11 were RB and TAN. However, at AVRDC all 41 were segregating for RB and TAN types. Among the 34 pedigrees from cross GC 60037 evaluated in Hualien, 24 were RB, 3 were TAN and 7 were RB and TAN. However, at AVRDC only 8 were RB and 26 were of RB and TAN type. All the 8 RB pedigrees at AVRDC were also of the RB type at Hualien. [PLH/EMS]

*0174 REP.SB-807
Shanmugasundaram, S. ; Tschanz, A.T. ; Bromfield, K.R. RB and TAN infection types on G 8586 and G 8587 soybean at AVRDC. SOYBEAN RUST NEWSLETTER v.3(1):29, 1980. [En]

Both RB and TAN infection types were observed at AVRDC on soybean accessions G 8586 (PI 230970) and G 8587 (PI 230971) both in the field and in the greenhouse. The F_1 of a cross between G 38 (rust susceptible infection type TAN) and G 8586 (moderately resistant, infection types RB and TAN) also showed both RB and TAN infection types on the same leaf. It appears that the two different infection types on the same host are due to two different races of the pathogen. [AS]

*0175 ::PS
Yeh, C.C. Physiological races of *Phakopsora pachyrhizi* in Taiwan. JOURNAL OF AGRICULTURAL RESEARCH OF CHINA v.32(1):69-74, 1983. [En] [En Ch Abst]

Soybean cultivars Ankur, TK 5, TN 4, and PIs 200492 and 230971 are suggested as differentials for race identification of *Phakopsora pachyrhizi* causing soybean rust in Taiwan. Three races of *P. pachyrhizi*, based on lesion type, were identified among 50 single uredial cultures from soybean leaves collected at five locations in Taiwan. Reaction was determined 14 days after inoculation on intact leaves as well as on detached leaves. The distribution of the three races varied among locations. Common bean, cowpea, hyacinth bean, lima bean, pigeon pea and yam bean were also tested, but because no difference in lesion type was observed they were not used as differentials. [AS]

*0176 A:PS
Yeh, C.C. ; Tschanz, A.T. ; Sinclair, J.B. INTSOY research highlights: soybean rust. INTSOY NEWSLETTER no.27:1-2, 1981. [En]

A new method was developed and used to induce telia and teliospore formation. Telia and telispores formed on both sides of the leaves. Appearing singly and in clusters, young telia were light brown, but darkened with age. In the field, telia formed on soybean leaves infested with *P. pachyrhizi* only when the average daily temperature was below 20°C and the maximum daily temperature less than 29°C. Telia formation appears to require periods of cool temperatures. [PLH/JWS]

*0177 SB205.S7S45
Yeh, C.C. Differential reactions of *Phakopsora pachyrhizi* on soybean in Taiwan. IN: Shanmugasundaram, S. ; Sulzberger, E.W. ; McLean, B.T. Soybean in tropical and subtropical cropping systems; Proceedings of. Shanhua, Tainan, AVRDC, Taiwan, ROC. p. 247-250, 1986 (rev. ed.). [En] [En Abst]

MEETING: International Symposium on Soybean in the Tropics and Subtropics, Tsukuba, Japan, Sep 26-Oct 1, 1 '83

Seven legume species - *Phaseolus vulgaris, Vigna unguiculata, Lablab purpureus, Phaseolus lunatus, Vigna radiata, Cajanus cajan, Pachyrhizi erosus* - and five soybean cultivars - Ankur, TK 5, TN 4, PI 200492, and PI 230971 were used as differentials for race identification of *Phakopsora pachyrhizi* in Taiwan. Three races of *P. pachyrhizi*, based on lesion type, were identified out of 50 single uredium isolates collected at five locations, scattered through Taiwan. Inoculations were performed on intact plants as well as on detached leaves. Sixteen isolates belonged to race 1, 32 to race 2, and 2 to race 3. Distribution of the three races varied among locations. The seven legume species did not interact with isolates and were hence of no use as differentials. All five soybean cultivars are tentatively suggested as differentials. [EMS]

Etiology

*0178 REP.SB-799
Baker, C.F. The lower fungi of the Philippine Islands: first supplement to the list of. LEAFLETS PHILIPPINE BOT. v.7:2417-2498, 1914. [En]

This paper lists both *Phakopsora pachyrhizi* Syd. and *Uromyces sojae* Syd. and the citations where these fungi were previously reported. [ATT]

*0179 REP.SB-734
Bonde, M.R. ; Melching, J.S. ; Bromfield, K.R. Histology of the suscept-pathogen relationship between *Glycine max* and *Phakopsora pachyrhizi*, the cause of soybean rust. PHYTOPATHOLOGY v.66(11):1290-1294, 1976. [En] [En Abst]

Uredospores of *Phakopsora pachyrhizi* germinated on soybean plants 1-2 hours after inoculated plants were placed into a dew chamber at 20°C in the dark. Appressoria began developing within 2 hours, and within 5 hours many had grown to nearly the size of their parent spores. Many appressoria were sessile to their parent spores; measured germ tubes varied from a few μm to at least 320 μm in length. Eighty-five percent of the appressoria developed over anticlinal walls of epidermal cells. Penetration into the leaf epidermis always occurred directly through the cuticle; the earliest that penetration was observed was 7 hours after plants were placed into the dew chamber. Penetration was by means of a structure, the transepidermal vesicle, which transversed the lumen of the invaded epidermal cell. Transepidermal vesicles initially were 3 μm in diameter and eventually grew to form cylindrical structures with an average maximum diameter of 8 μm. By 22 hours a hypha often had grown from the distal end of the transepidermal vesicle, had emerged from the invaded epidermal cell, and had formed an intercellular primary hypha in the leaf mesophyll tissue. From the primary hyphae, intercellular secondary hyphae grew, branched, and within 8 days many had extended to at least 400 μm. [AS]

*0180 REP.SB-786
Bromfield, K.R. Two different infection types under containment greenhouse conditions. SOYBEAN RUST NEWSLETTER v.2(1):6, 1979. [En]

Two photos are presented to show RB and TAN infection types of soybean rust. [PLH/EMS]

*0181 SB608.S7C5
Chiang Mai University Soybean. IN: Studies on diseases of upland rice and soybean under rainfed conditions (1983-1985). Chiang Mai, Chiang Mai University, Thailand. p. 63-80, 1985. [En]

In 1983 two experimental plots of soybean were set up at Mae Hia CMU farm and Mae Jo Field Crop Research Centre. Fifteen cultivars of soybean from Mae Jo were cultivated in two areas. Incidences and disease severity were recorded. A total of eight kinds of disease was found. These were downy miidew, bacterial blight, soybean mosaic virus, anthracnose, bacterial pustule, rust, halo blight and leaf spot. A comparison of cultivars in response to disease was discussed. [PLH]

*0182 A:PS
Ebrahim-Nesbat, F. ; Hoppe, H.H. ; Rohringer, R. Lectin binding studies on the cell walls of soybean rust (*Phakopsora pachyrhizi* Syd.). JOURNAL OF PHYTOPATHOLOGY v.114(2):97-197, 1985. [En] [En De Abst]

Walls of uredospores, infection structures, intercellular hyphae and haustoria of the soybean rust fungus (*Phakopsora pachyrhizi*) were studied by electron microscopy using

gold-labeled wheat germ lectin (WGL) and Concanavalin A (ConA) as cytochemical probes. Receptors for WGL (probably chitin) were detected in all fungal walls included in this study. WGL-binding occurred throughout the entire walls (uredospores, appressorial cone, penetration hyphae, haustorial mother cells) or only to the inner wall layers (germ tubes, appressoria, intercellular hyphae). [AS]

*0183 REP.SB-874
Hiratsuka, N. ; Hashioka, Y. Uredinales collected in Formosa. 1. TOTTORI SOCIETY OF AGRICULTURAL SCIENCE, TRANSACTION v.4:156-165, 1933. [En]

This paper lists rust fungi collected in Taiwan. *Phakopsora pachyrhizi*, the causal agent of soybean rust, was first collected in Taiwan in 1931 from *Glycine max*. [EMS]

*0184 SB608.S7F6
Ilag, L.L. Studies on the biology of the soybean rust fungus in the Philippines. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign IL, University of Illinois, USA. p. 16-17, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Studies on soybean rust at the University of the Philippines were summarized. The effect of temperature and photoperiod on germination and germ tube elongation of *P. pachyrhizi* uredospores was discussed. Normal germination was observed from 10 to 30°C. The various light periods did not appreciably affect the percentage germination of uredospores kept at 20 to 30°C. After 48 h incubation, germ tubes were shortest (380 μ) under continuous light or continuous darkness at 30°C, and were longest (950 μ) when exposed to 15 h darkness and 9 h light at 20°C. Investigations into pathogen survival suggest that the organism does not persist for appreciable periods in diseased leaves or the soil. An inquiry into alternate hosts in the field is given as the next logical step. [PLH/EMS]

*0185 A:PS
Lorsuwan, C. ; Choobumroong, W. ; Tontyaporn, S. ; U-aeim, A. ; Nantaphan, M. ; Surin, P. Induced teliospore formation by *Phakopsora pachyrhizi* on soybean in Thailand. THAI PHYTOPATHOLOGICAL SOCIETY, JOURNAL v.3(4): 211-214, 1983. [Th] [En Abst]

The uredial stage is the only spore-producing stage of soybean rust fungus naturally found in Thailand. For confirmation of the exact species of this fungus, an experiment on induced teliospore formation was conducted. Four-week-old soybean seedling varieties SJ 4, SJ 5, G 38, G 8587, TN 4, and TK 5 grown under controlled temperature of 24°C, light intensity of 600 lux and 100% relative humidity were inoculated with uredospores. Three weeks after inoculation, the temperature was decreased to 10 ± 1°C. Telia with teliospores were formed 5 weeks after this low-temperature incubation. The morphological studies were within the same range as those described for *Phakopsora pachyrhizi* and it was confirmed that soybean rust in Thailand is caused by this fungus. [AS]

*0186 REP.SB-755
McLean, R.J. ; Byth, D.E. Histological studies of the prepenetration development and penetration of soybeans by rust, *Phakopsora pachyrhizi* Syd.. AUSTRALIAN JOURNAL OF AGRICULTURAL RESEARCH v.32(3):435-443, 1981. [En] [En Abst]

Comparisons were made between susceptible, resistant, and highly resistant soybean lines of prepenetration development and penetration of uredospores of rust, *Phakopsora pachyrhizi*, at intervals after inoculation. Differences between lines were found in the percentage of uredospores which germinated on leaves, and smaller differences were found between lines in appressorium formation and penetration from germinated uredospores. The differences between lines were not related to infection type. [AS]

*0187 REP.SB-866
Ramakrishnan, T.S. Additions to fungi of Madras - 11. INDIAN ACADEMY OF SCIENCES, PROCEEDINGS (SECTION B) v.34:157-164, 1951. [En]

Uromyces sojae (P. Henn.) Syd. was found on living leaves of *Glycine max* (Linn.) Merr. (Soybean) grown at the Agricultural Research Station, Palur, India. [PLH]

*0188 A:PS
Sato, T. ; Sato, S. Infective ability of soybean rust to several leguminous plants. SOYBEAN RUST NEWSLETTER v.5(1):22-26, 1982. [En]

The soybean rust pathogen could infect all of the following legume species: *Pueraria lobata* (arrow root), *Vigna angularis* (adzuki bean), *Phaseolus vulgaris* (kidney bean), *Pisum sativum* (pea), *Vigna sinensis* (cowpea), and *Lespedeza bicolor* f. *acuitifolia*. Direct penetration through the leaf cuticle occurred on all these species. *Arachis hypogaea*, and *Vicia faba* could not be infected by the fungus. [EMS]

*0189 SB608.S7S8
Sudjono, M.S. The ecobiology of soybean rust fungus (*Phakopsora pachyrhizi* Syd.) and varietal resistance of soybean (*Glycine max* (L.) Merr.). Bogor, Institute Pertanian Bogor, Indonesia. 66 leaves, 1979. [In] [En In Abst] (Thesis - M.Sc.)

Sporulation of soybean rust fungus caused by *P. pachyrhizi* on infected leaves of Orba variety was studied under laboratory conditions at CRIA Bogor. Temperature effect on uredospore formation indicated a positive cubic parabola curve. At 10 to 15°C spore formation was enhanced. Spore viability reduced linearly under sunlight intensity. Ultraviolet light had the same effect. Temperature treatments on spore germination indicated a positive quadratic curve. At 10 to 20°C spore germination was enhanced. Germination percentage was also more enhanced at pH 4 to 6 and 8 than in a neutral condition. Bean, cowpea, kidney bean, lima bean, mungbean, and yam bean showed a hypersensitive reaction with no spore formation. Bambara groundnut, *Crotalaria juncea* L., and pea showed late infection with no sporulation. However, *Calopogonium mucunoides* Desv., hyacinth bean, yardlong bean, and soybean were positively infected, which produced sporulation. Soybean leaf stages have different susceptibility to the rust fungus under artificial inoculations. The earlier the leaf-stage, the higher its susceptibility to the infection. However, in the resistant varieties most of the upper third leaves from the ground level were free from rust infection. Microscopic examinations showed that differences of cuticular layers on leaf tissues exist between

susceptible and resistant varieties. This is an indication that varietal resistance of soybean seems to have also a mechanical resistance. No. 986, No. 29, No. 1682, No. 50009-1-7, No. 50044-1-3, and G 8529 have shown resistant reaction to rust fungus based on the IWGSR rating system. The lowest infection rate was observed on varieties No. 29, Si Nyonya, Sumbing, Shakti, and Davros. Induction of mutation genes showed that M5 and and M6 generations of Orba and Shakti had a positive linear regression between radiation doses and percentage induction for resistance. [AS/PLH]

*0190 REP.SB-812
Sydow, H. ; Sydow, P. ; Butler, E.J. Fungi Indiae orientalis. Part 1. SYDOWIA: ANNALES MYCOLOGICI v.4:424-445, 1906. [De]

This paper describes the teleuto-stage of *Uromyces sojae* (*Phakopsora pachyrhizi*). This species is very similar with *Ured sojae*, previously reported from Japan. [PLH/EMS]

*0191 SB205.S7S45
Tschanz, A.T. ; Wang, T.C. ; Tsai, B.Y. Recent advances in soybean rust research. IN: Shanmugasundaram, S. ; Sulzberger E.W. ; McLean, B.T. Soybean in tropical and subtropical cropping systems; Proceedings of. Shanhua, Tainan, AVRDC, Taiwan, ROC. p. 237-245, 1986. (rev. ed.). [En] [En Abst]

MEETING: International Symposium on Soybean in the Tropics and Subtropics, Tsukuba, Japan, Sep 26-Oct 1, 1983

Physiologic age influences the rate of soybean rust development. Delays in maturity are associated with delays in rust development. A reduced rate of development gives later-maturing cultivars the appearance of higher levels of rate-reducing resistance than are actually present. The influence of physiologic age negates the effectiveness of current methods of identifying rust resistance. Rate of rust development alone, either based on cultivar growth duration or days after planting does not indicate a cultivar's resistance level. Estimation of rust intensity late in the soybean life cycle is also necessary to evaluate resistance. Evaluation for tolerance (relative yield under rust stress) indicates greater variation between cultivars than is usually found when evaluating for rate-reducing resistance. Tolerance levels are not correlated with yield under fungicide-protected conditions. Therefore, selection for tolerance will not preclude later selection for high yield. Precipitation is directly related to both the initiation of a rust epidemic and the rate of rust development. Low temperatures delay or prevent rust development. Infrequent or short leaf wetness periods delay rust development, even if temperatures are favorable. [AS]

*0192 REP.SB-275
Tseng, C.T. Soybean rust development within cultivars varying levels of resistance and different plant stages. Shanhua, Tainan, AVRDC, Taiwan, ROC. 24 leaves, 1979. [En] (AVRDC Research Interns' Report)

The objectives of this experiment were: 1) to determine the growth stage which is the most susceptible to soybean rust; 2) to investigate the spread and development of rust; 3) to find out the differences of soybean rust development among natural infection, artificial inoculation, and fungicide control treatment; and 4) to compare the difference of rust development between resistant and tolerant varieties under artificial inoculation and natural infection. As lesions began to appear in the field 48 days after sowing, this may be the growth stage of the host that is most easily infected. Rust

development in artificial inoculation plots was one week earlier than in natural infection plots in both varieties. Rust development in the inner subplot of T1 and T2 were 1 week, 10 days and 2 weeks earlier than the middle and outer subplot, respectively. In the susceptible variety, TK #5, disease development was earlier and more severe. [PLH]

Yield Loss

*0193 REP.SB-833
Chan, K.L. ; Tsaur, W.L. Investigation of soybean yields lost due to rust. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT v.16:206-208, 1975. [Ch] [En Abst]

The loss of soybean yields due to rust (*Phakopsora pachyrhizi*) was investigated by the use of chemicals (Dithane M-78) to control the disease in field environments. Infection was lower only in the susceptible variety (Shih-Shih) plots that were sprayed with Dithane M-78 every ten days beginning from the emergence of flower buds. No reduction of rust infection was observed in the plots of resistant varieties (PI 200492 and Tainung 4) that received the same treatment. Treated plots of susceptible Shih-Shih gave a 6% higher yield in the spring crop season and 10% in the summer crop season than check plots (non-sprayed). But, on the contrary, 2-10% lower yields were found in the treated plots of resistant varieties. This abnormal result needs a further study. [AS]

*0194 A:PS
Mawuena, G. Preliminary observations on the soybean rust incidence in Togo. SOYBEAN RUST NEWSLETTER v.5(1):20-21, 1982. [En]

This was the first report of soybean rust in Togo. Soybean rust symptoms were described. Disease incidence was highest during the rainy season. The reduction of yield caused by this disease was estimated at as much as 30 to 50%. [PLH]

*0195 A:PS
Ogle, H.J. ; Byth, D.E. ; McLean, R.J. Effect of rust (*Phakopsora pachyrhizi*) on soybean yield and quality in south-eastern Queensland. AUSTRALIAN JOURNAL OF AGRICULTURAL RESEARCH v.30(5):883-893, 1979. [En] [En Abst] NOTE: Also issued in 'Soybean Rust Newsletter' v.2(1):24-26, 1979, with title changed to 'The effect of soybean rust on soybean yield and quality in eastern Australia'

In a field trial conducted at the University of Queensland Research Farm, Redland Bay, in 1976, plots of soybeans were protected from rust, *Phakopsora pachyrhizi*, with mancozeb sprays for varying periods after sowing. Seed yield losses were 60-70% in the most severely rusted plots. In a glasshouse trial, rust inoculations were commenced at regular intervals during growth, and yield was reduced by 95% in plants inoculated immediately prior to flowering. In both trials, reduced yield was associated with reductions in the number of filled pods per plant, the number of filled seeds per plant and seed weight. The oil but not the protein content of the seed was also reduced in the more severely rusted treatment in the field trial. [AS]

*0196 REP.SB-790
Shin, D.C. 1. Studies on physiological reactions of soybean cultivars tolerant and susceptible to rust (*Phakopsora pachyrhizi* Syd.). 2. Screening for soybean mosaic virus and rust resistance. 3. Soybean seed multiplication and generation advancement. Shanhua, Tainan, AVRDC, Taiwan, ROC. 27 leaves, 1986. [En] [En Abst] (AVRDC Research Interns' Report)

The rust epidemic on the susceptible cultivar began earlier and progressed more rapidly than on the tolerant cultivar. The defoliation by soybean rust infection increased rapidly after the latter half of pod filling. The reduction of LAI by rust in the susceptible cultivar occurred earlier than in the tolerant cultivar. The reduction in the chlorophyll content between the healthy and rust-infected plants was 2.04% in the tolerant, and 16.3% in the susceptible cultivar. The shoot dry weight increased in the fungicide-protected plots, but decreased in the nonfungicide-protected plots after the R6 growth stage onward and the tendency to decrease was more severe in the susceptible than in the tolerant cultivar. The pod and seed dry weigh of the susceptible cultivar in the fungicide-protected plot increased dramatically from the R6 growth stage, but in the nonfungicide plot, there was almost no increase in pod and seed dry weight from R6 growth stage due to rust. In the tolerant cultivar, the pod and seed dry weight was less affected by soybean rust than in the susceptible cultivar. The number of empty pods and imperfect grains was increased by rust infection, but the protein content was not affected. There were reductions of oil content, seed length, seed width, seed thickness, pod thickness, number of pods and seeds, 100-seed weight, and yield due to soybean rust infection. These reductions were greater in the susceptible cultivar than in the tolerant cultivar. The yield losses were 22.3% in the tolerant and 68.7% in the susceptible cultivar. [AS/EMS]

*0197 REP.SB-793
Soegito. Evaluation of soybean rust (*Phakopsora pachyrhizi* Sydow) in the intermediate yield trial. Shanhua, Tainan, AVRDC, Taiwan, ROC. 8 leaves, 1986. [En] (AVRDC Production Trainees' Report)

Thirty AVRDC soybean lines were evaluated in a yield trial and compared for various agronomic traits. They were classified into four groups (resistant, susceptible, tolerant, and intolerant) according to the level of yield loss suffered from rust attack. [EMS]

*0198 A:PS
Tschanz, A. T. ; Tsai, M. C. Evidence of tolerance to soybean rust in soybeans. SOYBEAN RUST NEWSLETTER v.6(1):28-31, 1983. [En]

The purpose of this study was to evaluate the extent of variation in yield loss under stress from a severe soybean rust epidemic (tolerance). Yield losses, as determined by comparing yields of fungicide-protected and nonfungicide-protected plots, ranged from 48.0% to 91.3% in the spring and from 57.7% to 90.2% in the fall. Significant differences in yield and percentage yield loss occurred in both seasons between cultivars grown in the nonfungicide-protected plots. No linear correlation was found between yield in the fungicide-protected plots and yield in the nonfungicide-protected plots. [PLH/EMS]

*0199 A:PS
Wamontree, L.E. ; Quebral, F.C. Estimating yield loss in soybeans due to soybean rust using the critical point model. PHILIPPINE AGRICULTURIST v.67(2):135-140, 1984. [En] [En Abst]

Rust development was earlier in the susceptible cultivar, TK #5, appearing 3 weeks before flowering than in the resistant cultivar, UPL-Sy 2, which was delayed for 1 week. The critical period in the growth of soybean plants infected by fungal rust was at the flowering stage in UPL-Sy 2 and at flowering and 1 week after flowering in TK #5. The estimated yield losses were in close agreement with the actual yield losses. The critical point model was accurate in estimating yield loss in soybeans. [AS]

*0200 REP.SB-829
Yeh, C.C. ; Yang, C.Y. Yield loss caused by soybean rust, *Phakopsora pachyrhizi*. PLANT PROTECTION BULLETIN (R.O.C.) v.17:7-8, 1975. [Ch]

MEETING: Annual Meeting of the Plant Protection Society of China, Taichung, Taiwan, ROC, Dec 6-7, 1975

All four cultivars used in this study were susceptible to soybean rust. However, the yield of TN 4 was reduced by only 13%, whereas the yields of Shih Shih, TK 5, and KS 3 were reduced by 39%, 34%, and 36%, respectively. The 100-seed weight of TN 4, Shih Shih, TK 5 and KS 3 were reduced by 10%, 11%, 15%, and 17%, respectively. The major factors accounting for yield loss are early defoliation, pod-unfilling or decrease in numbers of pods. [PLH/EMS]

Disease Management - General

*0201 A:PS
Kim, H.I. ; Shanmugasundaram, S. Influence of plant population density on the incidence of soybean rust. SOYBEAN RUST NEWSLETTER v.2(1):23, 1979. [En]

Two breeding lines were evaluated at the 3 plant densities of about 350,000, 600,000, and 1,200,000 plants/ha. Disease started at the same time for both lines and all 3 densities; however, disease progress was highest at 1,200,000 plants/ha density, followed in order by 600,000 and 350,000 plants/ha densities. Furthermore, plants at the highest density also had premature defoliation and a smaller 100-seed weight compared with the lower densities. [EMS]

*0202 A:PS
Maiti, S. ; Dhar, V. ; Verma, R.N. Control of soybean rust in India. SOYBEAN RUST NEWSLETTER v.6(1):8-13, 1983. [En]

Field trials were conducted to control this disease both by resistant cultivars and with fungicides. Out of 13 exotic cultivars tested, only two, viz., GC 60037-1-70-6-6 and GC 60037-1-70-13 gave a moderately resistant reaction, while the rest were moderately susceptible to susceptible. Out of 37 indigenous cultivars, 22 exhibited a moderately resistant reaction, while others were moderately susceptible to susceptible. Saprol was the most effective fungicide both in respect to disease control and yield increase. Delan came next followed by Dithane M-45. However, Bavistin, Killex, Panoll, and RH 124 were almost ineffective. [PLH/EMS]

*0203 SB608.S7F6
Sinclair, J.B. Control of soybean rust by means other than breeding for resistance. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, p. 85-88, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Various fungicides have been reported to control soybean rust. In most cases, several sprays are required for effective control, which makes chemical control expensive and often difficult to justify. Other control measures consist of selecting the date of planting, early- and late-maturing cultivars, spacing, control of wild weed hosts, control of alternate hosts, control of cultivated crops hosts, crop rotation, intercropping, transport of host material, planting of nonhost barriers, sanitation measures, surveillance and inspection, and biological control. [PLH]

*0204 REP.SB-255
Smutkupt, S. ; Pupipat, U. ; Lamseejan, S. ; Wongpiyasatid, A. ; Naritoom, K. Induced mutations for rust resistance in soybean. IN: Induced mutations for improvement of grain legume production; Report of. Vienna, IAEA, Austria. p. 27-32, 1980. [En] [En Abst]

MEETING: Research Co-ordination Meeting on the Use of Induced Mutations for Improvement of Grain Legume Production. 1st, Bangi, Kuala Lumpur, Malaysia, May 28-Jun 1, 1979

All three official soybean varieties in Thailand are susceptible to rust. Yield loss due to soybean rust was found to range from 17% to 34%. A mutation breeding program is being initiated at Kasetsart University with the objective of developing rust-resistant soybean cultivars. [EMS]

Disease Management - Chemical Control

*0205 REP.SB-860
Chan, K.L. Experiment of chemical control of soybean rust. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT Ser.6:1-4, 1965. [Ch]

The effectiveness of Dithane Z-78 at the concentrations of 0.3% and 0.15% and with various spray schedules was evaluated against soybean rust. All fungicide treatments provided effective control of soybean rust as compared with the unsprayed check. Control efficiency increased at the higher fungicide concentration. A higher level of control was achieved when sprays were started at early bloom stage than at late bloom stage. Soybean plants sprayed at 10-day intervals had the best yields. [EMS]

*0206 REP.SB-244
Cheng, A.S. Evaluation effect of fungicides on uredospore of *Phakopsora pachyrhizi* by a detached-leaf technique. Shanhua, Tainan, AVRDC, Taiwan, ROC. 12 leaves, 1976. [En] (AVRDC Summer Trainees' Report)

All seven fungicides inhibit the development of rust pustules on detached soybean leaves at the concentration of 2,000 ppm. Dithane M-45 is most effective, followed by Plantvax, and Difolatan 4. Dithane M-45, Bavistin C65 and Difolatan 4-flowable are most effective in inhibiting uredospore germination of *Phakopsora pachyrhizi*. Addition of Tween 80 to the spore suspension stimulates uredospore germination. [PLH/EMS]

*0207 REP.SB-772
Chu, H.T. ; Chuang, Y.C. Investigation on soybean diseases. TAIWAN SUGAR RESEARCH INSTITUTE, REPORT v.25:11-25, 1961. [Ch] [En Ch Abst]

The most prevalent diseases found on soybean in the cane-soybean interplanting field include rosette, leaf crinkle and mosaic, bacterial pustule, downy mildew, anthracnose, rust, Sclerotial blight, brown spot, purple speck, Fusarium pod rot and root-knot nematode. Rosette and bacterial pustule, rust, anthracnose and root-knot nematode may be considered the most serious. An increase of 9.9-36.0% in seed yield may be obtained by spraying Dithane Z-78 four times, once every 10 days starting at 20 days after sowing. A 13.3-47.1% yield increase may be obtained by spraying Dithane Z-78 + Endrine, especially in the autumn planting period. Spraying 0.1% Agrosan GN5, 6% wettable sulfur powder or 0.1% Orthocide 50 in the early growing stage may give some yield increase, but it is not as significant as spraying Dithane Z-78. [EMS]

*0208 REP.SB-664
Ebuenga, M.D. ; Ilag, L.L. ; Mendoza, E.M.T. Inhibition of pathogens of field legumes by mimosine. PHILIPPINE PHYTOPATHOLOGY v.15(1):58-61, 1979. [En] [En Abst]

The effects of three mimosine concentrations (0.1%, 0.2%, and 0.3%) incorporated in various culture media on the growth of nine pathogens of peanut, mungbean and soybean were studied. Mimosine inhibited mycelial growth of *Colletotrichum lindemuthianum* (Sacc. and Magn.) Bri. and Cav., *Sclerotium rolfsii* Sacc., *Cercospora canescens* Ell. and Mart., *Diplodia natalensis* P. Evans., and an *Alternaria* sp. pathogenic on soybean. The compound also inhibited conidial germination of *Cercospora personata* (Berk and Court.) Ell. and Everh. and uredospore germination of *Phakopsora pachyrhizi* Syd. and *Puccinia arachidis* Speg. The formation of sclerotial bodies of *S. rolfsii* was completely inhibited in all treatments with mimosine. Some reduction in the multiplication of cells of *Xanthomonas phaseoli* (E. F. Smith) var. *sojense* (Hedges) Starr. and Burk. was observed in the presence of mimosine. [AS]

*0209 REP.SB-731
Hu, L. F. ; Chen, C. H. ; Yang, C. Y. Fungicide trials for soybean rust (abst). PLANT PROTECTION BULLETIN (R.O.C.) v.17(4s):9, 1975 [CH Abst]

MEETING: Annual meeting of the Plant Protection Society of China, Taichung, Taiwan, ROC, Dec 6-7, 1975

The investigation was conducted to determine a suitable fungicide and treatment schedule for control of soybean rust. The results indicated that Dithane M-45 was an effective fungicide and Saprol was the best curative fungicide. [NMC/EMS]

*0210 REP.SB-721
Hung, C.H. ; Liu, K.C. Soybean spraying experiment for rust disease control. AGRICULTURAL RESEARCH v.10(1):35-40, 1961. [Ch] [En Abst]

Among the tested fungicides, Dithane M-22 showed the best rust control, while Dithane Z-78, Dithane Z-78 plus wettable sulfur, and Bordeaux mixture followed. 0-3818-B, a new fungicide, at the rate of 200 g/100 l showed phytotoxicity. For the best control of soybean rust, it is suggested to apply either Dithane M-22 or Dithane Z-78 at the rate of 300 g/100 l water. For the spring crop, the first spraying should be initiated at the middle of the growth period, but it is advisable to initiate the spraying program at the late period for both summer and fall crops. Yields were markedly increased, except for the fall crop. [EMS]

*0211 A:PS
Jan, C.R. ; Wu, L.C. Chemical control of soybean rust. NATIONAL TAIWAN UNIVERSITY, COLLEGE OF AGRICULTURE, MEMOIRS v.12(1):173-190, 1971. [Ch] [En Abst]

An experiment employing CCC, 2,4-D, IAA, NAA, Benlate, Sankyo Bordeaux, DCMOD, Plantvax 75W, Dithane M-45, MBAA, and BAS 3050F was conducted to study the effects on soybean rust development. The data of foliage application indicated that all growth regulators increased the 1000 seed weight from infected soybeans except that of 1500 ppm a.i. CCC. One ppm 2,4-D significantly decreased defoliation of highly infected plants. Efficacy of growth regulators reached maximum on the third day after application, then gradually decreased. Chemical injury was observed in the soybean plants treated with 1,500 ppm a.i. CCC, 100 ppm NAA, 10 ppm 2,4-D or 1,000 ppm a.i. MBAA. All the fungicides tested, i.e. Benlate, Sankyo Bordeaux, Plantvax 75W, Dithane M-45, MBAA, not only decreased the disease incidence and defoliation but also increased 1000-seed weight. The least disease incidence was obtained by applying either Dithane M-45 or Benlate. [AS/EMS]

*0212 REP,SB-843
Jan, C.R. ; Wu, L.C. [Infection procedure and chemical control of soybean rust (abst)]. PLANT PROTECTION BULLETIN (R.O.C.) v.12(4):193, 1970. [Ch Abst]

MEETING: Annual Meeting of the Plant Protection Society of China, Taipei, Taiwan, ROC, Dec 6, 1970

The infection procedure for *Phakopsora pachyrhizi* was described. Growth regulators 2,4-D (1 ppm and 10 ppm), IAA (1 ppm, 10 ppm, 50 ppm, and 100 ppm), CCC (1 ppm, 10 ppm, 100 ppm, 250 ppm, 500 ppm, 1000 ppm, and 1500 ppm), were applied on rusted plants. The infection percentage did not differ between 2,4-D (1 ppm) and the check (CK); however, the defoliation percentage was decreased from 73.8% (CK) to 33%. The 1000-seed weight (143 g) of the 2,4-D (1 ppm) treatment was higher than that of the check (128.6 g). The same results were obtained with NAA 1 ppm and CCC 100 ppm. In the spring crop season, a total of 6 applications every 10 days, starting 20 days after planting, of B.W. 400x, Benlate 100 ppm, DM-45 200x, and DM-45 400x effectively controlled rust. [PLH]

*0213 REP,SB-732
Jan, C.R. ; Wu, L.C. Chemical control of soybean rust. NATIONAL TAIWAN UNIVERSITY, COLLEGE OF AGRICULTURE, MEMOIRS v.12(1):173-190, 1971. [Ch] [En Ch Abst]

This experiment was conducted to determine the efficacy of fungicides and plant hormones on the germination percentage of uredospores. The materials used included

CCC, IAA, NAA, benomyl, Sankyo Bordeaux, Plantvax, Dithane M-45, MBAA, BAS 3050F, and 2,4-D. The results indicated that all growth regulators increased the 1000-seed weight from infected soybeans. One ppm 2,4-D significantly decreased defoliation of infected plants. All the fungicides tested, i.e. Benlate, Sankyo Bordeaux, Plantvax 75W, Dithane M-45 and MBAA, not only decreased the disease incidence and defoliation but also increased 1,000-seed weight. The least disease incidence was obtained by applying either Dithane M-45 or Benlate. With regard to the yield, 100 ppm a.i. Benlate and 200-fold or 400-fold dilution of Dithane M-45 were recommended for rust control. Sankyo Bordeaux was as effective as the other fungicides, but it contained phenylmercuric acetate which was not permitted to use on this island. [EMS]

*0214 SB-326
Kitani, K. ; Inoue, Y. ; Natsume, T. Studies on the soybean rust and its control measure. 1. Studies on the soybean rust. 2. Studies on the control measure on the soybean rust. SHIKOKU AGRICULTURAL EXPERIMENT STATION, BULLETIN v.5:319-358, 1960. [Ja] [En Ja Abst]

Summer- and autumn-grown soybeans tend to be affected more by soybean rust as a result of earlier sowing dates. Aso No. 1 and Iyo soy were resistant, whereas Tamanishiki and Shirodaizu (white soybean) and related cultivars were susceptible. Four fungicides were evaluated for soybean rust control. Mercurials and Zineb were ineffective. Lime sulphur diluted to forty times was proved highly effective. Bordeaux mixture, though slightly less effective than lime sulphur, caused less defoliation and tended to increase the yield slightly. [EMS]

*0215 REP.SB-647
Kitani, K. ; Inoue, Y. ; Natsume, T. Ecological studies on the mobilization of lime sulphur spraying efficacy to the wheat brown rust and the soybean rust. SHIKOKU AGRICULTURAL EXPERIMENT STATION, BULLETIN v.5:225-306, 1960. [Ja] [En Abst]

Mobilization of the efficacy of lime sulphur and Bordeaux mixture against the wheat brown rust and the soybean rust was investigated ecologically in Japan. Lime sulphur is very powerful in its sterilizing effect for a while after spraying, but the efficacy declines rapidly with the elapse of time. The fungicidal quality of Bordeaux mixture is weak as compared to lime sulphur. When spraying, the fungicidal action is stronger in the vertical direction and better in a wet, high temperature environment. The lowering of fungi toxicity due to the weathering process tended to be delayed as the spraying rate increased and concentration became high. The addition of polyethylene polysulphide greatly increased the lime sulphur efficacy. The density of uredospores on the leaves is influenced by leaf arrangement, deposition of fungicide, amount of dew formed and the rate of deposit. Therefore, the improvements in spraying technique are important for disease control. [NMC]

*0216 REP.SB-657
Kitani, K. ; Inoue, Y. ; Natsume, T. Studies on effectiveness of lime sulphur spraying on the wheat brown rust and the soybean rust. SHIKOKU AGRICULTURAL EXPERIMENT STATION, BULLETIN v.5:307-318, 1960. [Ja] [En Abst]

The present report deals with the results of experiments conducted to know the controlling effect of lime sulphur spraying on the wheat brown rust and the soybean

rust. 1) As for the relation of spraying concentration to controlling effect, it was found that disease development was less and controlling effect was high within the range of concentration from eighty to twenty-fold dilution. Though disease development tended to be less as the interval becomes short, interval of spraying did not matter so much within the range of three, five and seven days interval. As for the frequency of spraying, a distinct difference in effect was observed between sprayings of once and twice, but no distinct difference between twice and thrice. 2) Concerning the relation between the spraying amount and development of the disease, it was found that the more in spraying amount and frequency, and the shorter the interval, the greater the effect. 3) As for the effect of spreader and addition of metal salts, variation was noticed according to the kind and the date of experiments. It is considered that, for practical purposes, there remain many problems to be solved. 4) The effect of addition of polyethylene polysulphide increased with the amount added, resulting in suppression of development. [AS/JWS]

*0217 A:PS
Lapis, D.B. ; Neypes, M.V.T. Fungicide foliar sprays for soybean rust control (abst). PHILIPPINE PHYTOPATHOLOGY v.19(1-2):7, 1983. [En] [En Abst]

MEETING: Annual Meeting of the Philippine Phytopathological Society, 19th, Baguio City, Philippines, May 5-8, 1982

The effectiveness of Bayleton 25% WP at concentrations of 0.05, 0.10 and 0.15; Baycor 30% EC at 0.06, 0.12 and 0.18; and Dithane M-45 at 0.6 percentages of the formulated products was evaluated against soybean rust. All fungicide treatments provided effective control of soybean rust compared with the unsprayed checks. As concentrations of Bayleton and Baycor were increased, the severity of the disease correspondingly decreased. However, the number of pods and weights of seed of the different treatments did not increase with rates although they were much more than the check. The effects of Bayleton and Baycor on disease control and yield were comparable with the standard fungicide, Dithane M 45. [AS]

*0218 A:PS
Maiti, S. ; Dhar V. ; Verma, R.N. Bio-efficacy of fungicides for controlling soybean rust in India. SOYBEAN RUST NEWSLETTER v.5(1):16-17, 1982. [En]

Eight fungicidal formulations were tested against soybean rust. Saprol, Delan, Macuprax, and Dithane M-45 effectively reduced the spread of the disease, but without any statistical difference among them. Kilex and Difolatan were moderately effective, while Bavistin and RH 124 were ineffective to control this disease. Delan and Seprol gave an almost 3-fold increase in grain yield. Yield increase in case of Kilex, Macuprax, and Dithane M 45, however, was not that remarkable. [PLH/EMS]

*0219 REP.SB-733
Osathaphant, P. ; Pupipat, U. ; Nuntapun, M. Evaluation of five fungicides against soybean rust (abst). IN: The second Southeast Asian symposium on plant diseases in the tropics: program and abstracts. p. 106, 1980. [En Abst]

MEETING: Southeast Asian Symposium on Plant Diseases in the Tropics, 2nd, Bangkok, Thailand, Oct 20-26, 1980

Laboratory and field experiments were conducted to evaluate five fungicides for the control of soybean rust fungus (*Phakopsora pachyrhizi* Syd.) in Thailand. Results from

field tests revealed that among the five chemicals tested (Bayleton, Manzate-D, Saprol, Plantvax and Sicarol), the most effective chemical for protecting soybean against rust disease was two weekly applications of Bayleton 25 WP at a concentration of 125 ppm starting at mid-bloom stage (40 days). Soybean plants receiving such applications gave 2,091 kg/ha seed yield, whereas the nontreated plants gave only 1,026 kg/ha. The decreasing order of effectiveness of the four other chemicals was Manzate-D at 2,000 ppm (five applications), Saprol at 200 ppm (three applications), Plantvax at 300 ppm (three applications), and Sicarol at 500 ppm (three applications). [AS]

*0220 A:PS
Piamonte, A.L. ; Quebral, F.C. The influence of rust control on the yield of soybean. PHILIPPINE PHYTOPATHOLOGY v.16(1-2):38-41, 1980. [En] [En Abst]

A paired plot spraying experiment using the combination of Dithane M-45 and Plantvax 75W was conducted at the UPLB Central Experiment Station to determine the influence of rust on the yield of soybean. Observations on the incidence of rust infection showed that TK No. 5 was infected earlier than Clark 63, indicating that the former is more susceptible to rust infection than the latter. Based on the International Working Group on Soybean Rust rating system, the mean disease rating of the protected plots of both varieties was 123 for the bottom third leaves, while 311 or no pustules nor lesions on the upper third. The unprotected plots had an average rating of 142 and 333 for the bottom third leaves and upper third leaves, respectively. The protected plots gave a significantly higher yield compared to the unprotected. TK No. 5 yielded 503 kg while Clark 63 had 748 kg over the unprotected. A significant increase of 47% for TK No. 5 and 30% for Clark 63 was obtained in the protected over the unprotected. Yield reduction was due to lower number of pods/plant, number of seeds/pod and seed weight. [AS]

*0221 REP.SB-753
Piccio, V.L. ; Franje, N.S. Rust incidence in soybean (*Glycine max* (L.) Merr.) as affected by varying levels of NPK applied alone and in combination. SOYBEAN RUST NEWSLETTER v.3(1):18-22, 1980. [En] NOTE: The abstract was presented at the 'Philippine Phytopathology' v.15:105-106, 1979

All treatments which received the higher amount of nitrogen and phosphorous, though continuously infected with rust gave more seeds per pod. Nitrogen, when applied in higher amount, prolonged the vegetative growth of the plant, and, hence, delayed defoliation due to disease. Rust severity was least on plants treated with complete fertilizer at the rate of 30 kg/ha. Further increasing the application subjected the plants to higher infection by rust, though the yield was not much affected. [EMS]

*0222 SB608.S7F6
Quebral, F.C. Chemical control of soybean rust in the Philippines. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 81-83, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

The effectiveness of five fungicides was evaluated for soybean rust control of soybean cultivars Clark 63 and T.K. 5. The fungicides were: Benlate, Dithane M-45, HOE 6052

50 WP, HOE 13764 and Plantvax 75 W. Dithane M-45 was the most effective in reducing rust infection with significant yield increases of 64 and 24% in TK 5 and Clark 63, respectively. [PLH]

*0223 REP.SB-823
Sangawongse, P. A preliminary report of study on soybean rust. THAI JOURNAL OF AGRICULTURAL SCIENCE v.6(2):165-169, 1973. [En] [En Abst]

Soybean rust caused by *Phakopsora pachyrhizi* Syd. was found in several soybean growing areas during the rainy season of 1971, with damage and losses in yield ranging from 10-30% in local varieties and complete loss of yield in some imported varieties. No resistant variety was found among 57 varieties and hybrids tested at Mae Cho, Chiang Mai, but two hybrids, 64-104 and 0-38 were tolerant. Of 7 fungicides and fungicide mixtures tested, only Plantvax and Plantvax plus Benlate reduced defoliation significantly, but Benlate had no appreciable effect when used alone. No fungicide increased yields. Use of fungicides in farmers' fields will not be recommended until further tests have been made. [AS]

*0224 REP.SB-784
Sangawongse, P. ; Kittisin, S. ; Nunthapun, M. Chemical control of soybean rust in Thailand. THAI JOURNAL OF AGRICULTURAL SCIENCE v.10(1):1-8, 1977. [En] [En Abst]

Soybean rust caused by *Phakopsora pachyrhizi* Syd. was found to be the most serious disease in Thailand. The damage and losses in yield ranged from 10-15% in the dry season and complete loss of yield was observed on some imported varieties and also on local varieties in the rainy season. A number of fungicides were screen tested and selected for the controlling of this disease. Piperazin W. 524, oxycarboxin, Mn^{++} Zn^{++} bisdithiocarbamate ion and manganese ethylene bisdithiocarbamate can be used effectively for the controlling of soybean rust at the rate of 1,500 ml, 1.0 lb, 1.5 lb and 1.0 lb per acre, respectively, if applied 5 sprays with 5-day intervals. The first sprays should be done 30 days after germination of the seed. No synergistic effects were observed on manganese ethylene bisdithiocarbamate combined with tested systemic fungicides. [AS]

*0225 SB608.S7V3
Sinclair, J.B. Chemical control of the soybean rust. IN: Vakili, N.G. Workshop on soybean rust in the Western Hemisphere; Proceedings of. Washington, D.C., United States Department of Agriculture, USA. p. 30-34, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

The following chemicals have been reported to control soybean rust: benomyl, Brestonal, Bordeaux mixture or copper, captafol, maneb + wettable sulfur, mancozeb, zineb, zineb + wettable sulfur, dinocap, lime-sulfur, dichlone, oxycarboxin, and a few unspecified others. Benomyl and oxycarboxin were reported to be used for seed treatment; however, work at Urbana showed benomyl to be phytotoxic. In the absence of resistant cultivars, chemical control may be used, together with other measures mentioned in the text. [EMS]

*0226 REP.SB-672
Singh, K.P. ; Thapliyal, P.N. Interaction of some adjuvants with the fungicides effective against soybean rust, *Phakopsora pachyrhizi* Syd.. PANTNAGAR JOURNAL OF RESEARCH v.3(1):65-68, 1978. [En] [En Abst]

The interactions of 5 adjuvants with 7 selected fungicides were studied *in vitro*. Sandovit was compatible with all, whereas Tenac was not compatible with any of the fungicides used. The remaining 3 adjuvants showed differential interactions with the test fungicides. [AS]

*0227 REP.SB-868
Thapliyal, P.N. ; Singh, K.P. Soybean (*Glycine max*) rust; *Phakopsora pachyrhizi*. FUNGICIDE AND NEMATICIDE TESTS v.29:94, 1973. [En]

Efficacy of several fungicides, as a combination of seed and spray treatment, was tested in a split-plot design with four replications. Among the four fungicides used as sprays, Dithane M-45 and Dithane Z-78 were the best followed by benomyl. Plantvax was found to be ineffective at the rate used in this trial. Plantvax and benomyl as seed treatments both were found to be effective. In another trial effectiveness of three fungicides was tested in a randomized block design with three replications. Dithane M-45 was most effective followed by Brestanol and Difolatan. A thousand-grain weight analysis proved to be nonsignificant. [AS/EMS]

*0228 A:PS
Tin, C. H. Recent findings on how to control rust disease (*Phakopsora pachyrhizi* Syd.) in soybean (*Glycine max* (L.) Merrill). SOYBEAN RUST NEWSLETTER v.5(1):3-5, 1982. [En]

Soybean rust reduces chlorophyll content in the leaf. By using soybean seeds treated with Ceresan 0.1% and mercury chloride ($HgCl_2$) 0.10%, the resulting soybean plants were free of rust disease for the first fifteen days. Hot water (52°C) or salt solution (5%) both can be used to control rust disease, especially in late growth stages. [EMS]

*0229 REP.SB-726
Torres, C.Q. ; Quebral, F.C. Comparative effectiveness of five fungicides against soybean rust. TROPICAL GRAIN LEGUME BULLETIN no.6:20-21, 1976. [En]

Two field trials were conducted during the wet season and dry season of 1974-75. Plants treated with fungicides had less disease symptoms and gave a significant increase in yield. Dithane M-45 was the most effective in controlling soybean rust. HOE 6052 caused phytotoxicity. [EMS]

*0230 REP.SB-704
Wang, C.S. Chemical control of soybean rust. AGRICULTURAL ASSOCIATION OF CHINA, JOURNAL (NEW SERIES) v.35:51-54, 1961. [Ch] [Ch En Abst]

Soybean rust (*Phakopsora pachyrhizi* Syd.) is a prevalent disease in Taiwan. Out of eight fungicides evaluated for control of soybean rust, Dithane Z-78 was the most effective. [EMS]

*0231 REP.SB-705
Yeh, C.C. ; Chen, C.H. ; Yang, C.Y. [A simple method for forecasting soybean rust]. HARVEST FARM MAGAZINE [TW] v.25(18):28, 1975. [Ch]

A simple method for forecasting soybean rust was suggested to allow farmers to spray fungicide at the right time. Starting from 3 weeks after sowing, leaves from the lower portion of soybean plants were continuously harvested, cleaned and enclosed in clear polyethylene bags stored under shade. Sprays should start as soon as disease symptoms appear on leaves. [EMS]

Disease Management - Biological Control

*0232 REP.SB-667
Naidu, R. Parasitism of *Darluca filum* (Biv) Cast. on cardamom. JOURNAL OF PLANTATION CROPS v.6(1):46, 1978. [En] [En Abst]

Cardamom rust, incited by *Phakopsora elettariae* (Racib.) Cummins, was found to be parasitized by *Darluca filum*. The hyperparasite developed only during the advanced stage of rust development. [NMC/EMS]

*0233 REP.SB-864
Pothidee, K. ; Manoch, L. ; Pupipat, U. *Tuberculina* spp., hyperparasites of *Phakopsora pachyrhizi* Syd. the incitant of soybean rust (abst). IN: The second Southeast Asian symposium on plant diseases in the tropics: program and abstracts. p. 75, 1980. [En]

MEETING: Southeast Asian Symposium on Plant Diseases in the Tropics, 2nd, Bangkok, Thailand, Oct 20-26, 1980

The parasitic fungi, *Tuberculina* spp., was incidently found in the uredia of soybean rust fungi. When infected uredia were incubated at 20-22°C for 7 days in the dark, sporulation of more than 80% was obtained on the uredia. Spore masses appeared as whitish or creamy vigorous galls. The parasites were classified and designated into two slightly different morphological groups. The parasite was able to grow on artificial media. The optimum temperature for development was 20-25°C and pH 4-10. Sporulation decreased upon subculturing. Poor germination was observed from conidia produced under both natural and artificial conditions. Histopathological studies of this fungus, parasitic on soybean rust, revealed that *Tuberculina* spp. affected only the rust fungus, not the host plant tissue. Thus, this parasite should be called a hyperparasite. [AS/EMS]

*0234 REP.SB-633
Sutton, D.C. ; Deverall, B.J. Liberation of antifungal activity during the extraction of soybean leaves. PHYSIOLOGICAL PLANT PATHOLOGY v.20(3): 365-377, 1982. [En] [En Abst]

Uninoculated soybean leaves from plants less than 31 days old released antifungal substances when leached for 24 h under benzene. Similar substances were produced when macerates of leaves in water were incubated for a period. Experiments indicated

that the unknown substances, which were not the isomers of glyceollin known as soybean phytoalexins, were released by the action of an enzyme on precursors. These findings provide a caution about detection of antifungal compounds created as an artifact of an extraction procedure, which can, under different conditions, yield compounds such as the glyceollins. [AS]

Disease Management - Host Resistance

*0235 S542.A8p 1982
The Asian Vegetable Research and Development Center Soybean. ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER, PROGRESS REPORT 1982:171-254, 1984. [En]

Results are reported from studies in plant breeding, plant pathology, entomology, and plant physiology in the soybean program at AVRDC during 1982. Over 3000 advanced pedigree lines were evaluated for rust resistance under natural infection and 931 lines were selected for further screening in 1983. A number of rust isolates collected from various soybean accessions at AVRDC were shown to belong to a single race - Bromfield's race PDRL 4. Two advanced breeding lines, SRE-Z-11B (AGS 182) and SRE-Z-15A, had a higher level of rate-reducing resistance than the check cultivar, Shih-Shih, in both spring and fall seasons. There appears to be an interaction between the level of rate - reducing resistance and environment. Two soybean populations were evaluated for the extent of yield loss under stress from a severe rust epidemic. The percentage of yield loss in most of the resistant germplasm accessions was similar to or less than that of the check cultivar, and in four accessions was significantly less. [PLH/EMS]

*0236 SB608.S7V3
Bernard, R.L. Sources of resistance to soybean rust. IN: Vakili, N.G. Workshop on soybean rust in the Western Hemisphere; Proceedings of. Washington, D.C., United States Department of Agriculture, USA. p. 24-25, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

The entire U.S. soybean germplasm collection was screened in Taiwan by TARI and a few resistant accessions were identified, including PI 200492. This accession is from southern Japan's Shikoko Island, where it is named Komata. It is no longer resistant in Taiwan, but is still highly resistant to Australian isolates. Rust is not a serious problem in temperate areas such as northern Japan, Korea, and northern China. The U.S. soybean germplasm collection comprises the northern collection maintained at Urbana, Illinois, and the southern collection at Stoneville, Mississipi. [EMS]

*0237 REP.SB-763
Bromfield, K.R. ; Hartwig, E.E. Resistance to soybean rust and mode of inheritance. CROP SCIENCE v.20(2):254-255, 1980. [En] [En Abst]

A study was conducted in containment facilities to determine the reaction to *Phakopsora pachyrhizi* Syd. isolates from widely separated geographic areas on seven soybean

(*Glycine max* (L.) Merr.) strains rated moderately resistant in field planting in Taiwan. Additional studies were conducted to determine the mode of inheritance of resistance to several rust isolates. Soybean strains PI 230970 and PI 230971 were resistant when inoculated with *P. pachyrhizi* isolates Australia-72-1, India-73-1, Philippines-77-1, and Taiwan-72-1. The other five soybean strains, although rated moderately resistant in field planting in Taiwan, were rated susceptible in these studies. All were rated resistant to an isolate with low virulence from Puerto Rico. Individual trifoliolate leaves of soybean plants of an F_2 population of Centennial x PI 230970 were inoculated with rust isolates from three different geographic areas. Plants rated as resistant to one isolate were resistant to all isolates. Similarly, plants rated susceptible to one isolate were susceptible to all isolates. A ratio of 92 resistant to 31 susceptible was obtained. Twenty-five F_3 plants from the cross D75-10169 x PI 230971 gave 19 resistant and six susceptible plants after inoculation with the Taiwan isolate. The results suggest a single dominant gene for resistance to soybean rust. [AS]

*0238 PEP,SB-738
Bromfield, K.R. ; Melching, J.S. Sources of specific resistance to soybean rust. PHYTOPATHOLOGY v.72(6):706, 1982. [En Abst] NOTE: Abstracts also issued in 'Soybean Rust Newsletter' v.5(1), 1982

Each of the three soybean accessions PI 200492, PI 230970, and PI 462312 (Ankur) carries a dominant gene governing specific resistance to *Phakopsora pachyrhizi*, the cause of soybean rust. These genes are at a different locus in each accession and not in an allelomorphic series. Additional sources of specific resistance recently identified are soybean accessions PI 459024 and PI 459025, both from southern China, and *Glycine soja* accession PI 339871 from Korea. The genetic basis for rust resistance in these latter accessions is currently being investigated. The resistance of PI 459025 and PI 339871 is of special interest because it is effective against *P. pachyrhizi* isolate Taiwan-80-2, which is capable of attacking the genes for specific resistance in PI 200492, PI 230970, and PI 462312. [AS]

*0239 A:PS
Brown, A.H.D. ; Grant, J.E. ; Burdon, J.J. ; Grace, J.P. Wild perennial *Glycine* species as genetic resources for soybean improvement. SOYBEAN GENETICS NEWSLETTER v.11:17-19, 1984. [En]

The soybean genus *Glycine* is now divided into 2 subgenera - *Glycine* and *Soja*. The subgenus *Soja* includes soybean (*G. max*) and its wild ancestor (*G. soja*) with which soybean can be readily crossed. The subgenus *Glycine* contains at least 7 perennial wild species, all of which occur in Australia: *G. latifolia*, *G. latrobeana*, *G. canescens*, *G. clandestina*, *G. falcata*, *G. tabacina*, and *G. tomentella*. The first five species - all of them diploid - occur only in Australia whereas the two others are more widespread. Because of continent - wide distribution of the subgenus and its presence in a wide array of habitats, these species possess many valuable characteristics which could be transferred to soybean, such as drought and cold tolerance, day-length insensitivity, and disease resistance, especially to rust. Crosses between these wild species and cultivated soybean have so far been hampered by incompatibility mechanisms. Attempts are being made to overcome these barriers. Surveys of wild *Glycine* species have demonstrated a considerable diversity for rust resistance. Six pathotypes of the rust fungus have been identified using a differential set of *Glycine* accessions which can be used as standard set in future research. [EMS]

*0240 SB205.S7W6 1985
Brown, A.H.D. ; Grant, J.E. ; Burdon, J.J. ; Grace, J.P. ; Pullen, R. Collection and utilization of wild perennial *Glycine*. IN: Shibles, R. World soybean research conference III; Proceedings Boulder, CO, Westview Press, USA. p. 345-352, 1985. [En]

MEETING: World Soybean Research Conference, 3rd, Ames, IA, USA, Aug 12-17, 1984

The description and geographic distribution of the soybean genus, *Glycine*, were presented. Hybridization between soybean and perennial *Glycine* was conducted. Cited were several specific attributes of the perennial *Glycine*, of potential use in soybean improvement. These included tolerance of adverse environments, pest and disease resistance, improved seed protein and oil quality, daylight insensitivity, and reduced floral shedding. Surveys of perennial *Glycine* accessions for resistance to soybean rust have shown them to be a rich source of resistance genes. Six virulent rust races have been recognized. In turn, several sets of differential hosts were identified. Future prospects for use of wild germplasm were proposed. [PLH]

*0241 REP.SB-740
Burdon, J.J. ; Marshall, D.R.Evaluation of Australian native species of *Glycine* for resistance to soybean rust. PLANT DISEASE v.65(1):44-45, 1981. [En] [En Abst]

Extensive screening of six Australian native species of *Glycine* uncovered variation in reaction to *Phakopsora pachyrhizi*, the causal agent of leaf rust of soybeans. Some of these native species represent a potentially valuable source of resistance genes for soybean rust resistance breeding programs. [AS]

*0242 REP.SB-443
Burdon, J.J. ; Marshall, D.R. Inter- and intra-specific diversity in the disease response of *Glycine* species to the leaf rust fungus *Phakopsora pachyrhizi*. JOURNAL OF ECOLOGY v.69(2):381-390, 1981. [En] [En Abst]

The occurrence of qualitative and quantitative resistance to leaf rust caused by *Phakopsora pachyrhizi* was documented in four native Australian species of *Glycine* (Leguminosae): *G. canescens*, *G. clandestina*, *G. tabacina* and *G. tomentella*. Considerable variation occurred within species in a number of disease characteristics both between and within populations. Similar differences in epidemiologically important disease characteristics also occurred between the different *Glycine* species. A distribution map of populations possessing qualitative resistance showed no clear geographic patterns in the occurrence of this form of resistance. The importance of both qualitative and quantitative resistance as a means of protecting plant populations against pathogen attack is discussed. [AS]

*0243 REP.SB-836
Burdon, J.J. The potential of Australian native *Glycine* species as sources of resistance to soybean leaf rust (*Phakopsora pachyrhizi*). IN: Napompeth, B. ; Subhadrabandhu, S. New frontiers in breeding researches; Proceedings of. Bangkok, Kasetsart Univ., Thailand. p. 823-832, 1986. [En] [En Abst]

MEETING: International Congress Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), 5th, Bangkok, Thailand, Nov 25-29, 1985

Australia is a major center of genetic diversity within the genus *Glycine*. Nine described perennial species occur in a wide range of ecological habitats. In many of these, they are subject to attack by *Phakopsora pachyrhizi*. Extensive testing of four native species and more limited evaluation of three others with a number of distinct races of *P. pachyrhizi* has shown that these species represent a rich source of resistance to this important pathogen. Both race non-specific and race-specific resistance are present. Extensive variation has been detected in epidemiologically significant features like latent period and the number and size of pustules produced. Evidence for race-specific resistance has been obtained in five species (*Glycine argyrea*, *G. canescens*, *G. clandestina*, *G. tabacina* and *G. tomentella*). This resistance is manifest as one of three infection type responses: (i) dark brown or purple necrotic flecks with no sporulation, (ii) light brown flecks with occasional sporulation, and (iii) small pustules surrounded by chlorotic or necrotic regions. The genetic basis of the inheritance of representative examples of these infection type responses have all shown F_2 segregation patterns consistent with resistance being due to single, dominant genes. Genetic studies of a number of diverse accessions of *G. canescens* currently being used in a differential set to identify races of *P. pachyrhizi* have found seven different resistance genes or alleles. Similar detailed analysis of a single natural population of this species has shown the presence of at least six resistance genes. All members of the population had at least one resistance gene while several carried three resistance genes. *G. canescens* lines carrying one of these resistance genes have been used in the production of a hybrid with soybean. This hybrid is resistant to *P. pachyrhizi*. Currently this hybrid is sterile but steps are being taken to restore its fertility. [AS]

*0244 SB608.S7F6
Chan, K.L. Soybean rust in Taiwan. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 51, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Excised leaves have great potential as a new approach to rust research for the purpose of maintaining *P. pachyrhizi*. There are several advantages of such a technique: (i) large numbers can be handled, (ii) this technique can be done throughout the year if a growth chamber is available, and (iii) it reduces labor and other costs. Control of *P. pachyrhizi* through host resistance has been emphasized for more than twenty years throughout the soybean breeding sections in several government agricultural research organizations. It led to the release of three moderately rust-resistant cultivars, Kaohsiung No.3 (KS 3), Tainung No.3 (TN 3) and Tainung No.4 (TN 4), and in recent years by the use of PI 200492 as the resistant parent. PI 200492 was a selection from the soybean germplasm introduced from the U.S. Regional Soybean Laboratory, Urbana, Illinois, and maintained by the Taiwan Agricultural Research Institute. Since PI 200492 is not highly rust resistant, the rust problem cannot be solved solely by breeding until a more highly resistant or immune cultivar is available. [AS]

*0245 A:PS
Chan, K.L. Notes on soybean rust research in Taiwan, R.O.C.. SOYBEAN RUST NEWSLETTER v.1(1):18, 1977. [En]

Breeding for resistance has been emphasized over the past twenty years in soybean breeding sections of several government agricultural research organizations. This has led to the release of three moderately rust resistant varieties: Tainung No. 3 (TN 3),

Tainung No. 4 (TN 4), and Kaohsiung No. 3 (KS 3). Of these varieties PI 200492 was the resistant parent. PI 200492 was a selection from soybean germplasm introduced from U.S. Regional Soybean Laboratory and maintained by Taiwan Agricultural Research Institute. However, PI 200492 is not a highly rust-resistant variety; therefore, the rust problem cannot be solved through breeding until varieties with a greater degree of resistance are available. Excised leaves with petioles immersed in water in small tubes may provide convenient substrates for rust development in many research situations. The use of detached leaves has several advantages: (1) a single plant can provide many leaves for separate inoculations, (2) research can be carried out year-round if a growth chamber or suitable lighting in a laboratory is available, and (3) major reductions in cost, labor, and space requirements can be realized. [PLH]

*0246 REP.SB 8-47
Chan, K.L. [Studies on artificial inoculation and heredity in soybean rust (abst)]. IN: Research reports' abstracts, 1969-1972. Taipei, Taiwan, ROC. p. 138-139, 1974. [Ch Abst]

F_2 plants from 2 crosses between susceptible and resistant soybean cultivars were artificially inoculated with soybean rust fungus. Results show that resistance is controlled by a single dominant gene. In the 1972 spring crop, the occurrence of natural infection being severe, the more tolerant variety 200492 was rated as R2 and 200490 and Hr 2217 were R3-4. [PLH/EMS]

*0247 REP.SB 7-02
Chan, K.L.; Tsaur, W.L.; Huang, M.S. Breeding of disease-resistant and high-yielding soybean varieties. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT Ser. 15:121-143, 1973. [Ch] [En Abst]

Three commercial varieties (Tainung 4, Kaohsiung 3 and Shih-Shih), two bacterial pustule-resistant varieties (CNS and Clark 63), two bacterial blight-resistant varieties (Hawkeye and Hambean) and one rust resistant variety (PI 200492) were used as parents to produce 13 cross combinations. Two hundred and six hybrid seeds were harvested from these crosses. Preliminary, intermediate and advanced yield trials revealed lines which significantly outyielded the check. [NMC/EMS]

*0248 REP.SB-70
Chan, K.L.; Cheng, Y.B.; Chen, S.H. The breeding of 'Tainung 4' soybean. JOURNAL OF TAIWAN AGRICULTURAL RESEARCH v.20(2):56-60, 1971. [Ch] [En Abst]

'Tainung 4' soybean (*Glycine max* (L) Merr.) originated as an F_6 plant selection from the cross Nung shih H-11 x PI 200492 in 1964. Hybridization and selection was made at Taiwan Agricultural Research Institute. It was evaluated in regional uniform tests beginning in 1966 by the Kaohsiung District Agricultural Station and agricultural stations in Taipei, Hsinchu, Tainan, Taitung and Hualian. Before release, it was designated Nung-shih 64-104. It has purple flowers, brown pubescence, yellow seed with light brown hila and large seed (190-206 g/1000 seeds). It is resistant to lodging and is determinate with upright and breeder habit. Tainung 4 was developed because of its high yield and rust resistance. It yields 59.9% more than Taita-Kaohsiung 5 in the spring crop, and 8% more in the summer crop. In the winter crop, it yielded equal to or above Taita-Kaohsiung 5 in the southern area, which is the main production area in Taiwan. The greater the severity of rust, the greater the difference in yield. [NMC/EMS]

*0249 REP.SB-831
Chan, K.L. ; Cheng, Y.B. Collection and investigation of local soybean strains for rust resistance. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT Ser.9:172-175, 1968. [Ch]

The objective of this study was to search for rust-resistant soybean germplasm. Plants with early maturity, flat stem, and modified chloroplast, were obtained following neutron treatment, but no rust-resistant mutants. Wu douh from Ilen district presented moderate resistance in the spring collection during 1966. The lesions on Ilen district's Wu douh were large, almost white in color, with no boundary. It indicated rust resistance required further studies. Wu douh plants from Ping Tung district were infected seriously, rated 4 to 5 grade of resistance. However, a rating of 2 had been found in the collection of 1966. [PLH/EMS]

*0250 REP.SB-844
Cheng, Y.W. ; Chan, K.L. ; Cheng, Y.B. [Collection of breeding materials for soybean]. TAIWAN AGRICULTURAL RESEARCH INSTITUTE, ANNUAL REPORT p. 22, 1967. [Ch]

Searches were made in three directions: A) Reinvestigation of moderately resistant or slightly susceptible introduced soybean lines. Two hundred out of 500 lines were rated 2 to 3 grade of resistance. B) Induced mutation with neutron treatment: A total of 477 plants with 1 to 3 grade of resistance was selected from the progeny of line 64-104. C) Search for rust-resistant materials from local soybean varieties: Individual plants with apparent resistance were selected from soybean yields in various areas of Taiwan and will be further tested in the field and greenhouse. [EMS]

*0251 REP.SB-709
Cheng, Y.W. ; Chan K.L. The breeding of rust resistance soybean 'Tainung 3'. JOURNAL OF TAIWAN AGRICULTURAL RESEARCH v.17(2):30-34, 1968. [Ch] [En Abst]

Tainung 3 (*Glycine max* (L.) merr.) was selected from F_2 plants of the cross Nung-shih H-11 x PI 200492 in 1963. Tainung 3 was identified as Nung-shih 63-11 previously. It is adapted to the whole island in the spring and winter crops. Tainung 3 has purple flowers, brown pubescence, large seed size (18-20 g/100 seeds), yellow seed coats and brown hila. It outyielded Taita-Kaohsiung 5 (Check variety) by 17-52% in the winter crop and 15-178% in the spring crop. The more severe the rust disease, the bigger the difference was in yield. Maturity is similar to Taita-Kaohsiung 5, but it is resistant to lodging and soybean rust (*Phakopsora pachyrhizi* Syd.). It is susceptible to seed coat cracking. [NMC/EMS]

*0252 SB608.S7C49
Chotiyarnwong, A. Inheritance of resistance to soybean rust (*Phakopsora pachyrhizi* Syd.). Bangkok, Kasetsart Univ., Thailand. 62p., tables, 1978. [Th] [En Abst] (Thesis - M.Sc.) NOTE: The abstract also issued in 'Soybean Rust Newsletter' v.2(1):7, 1979

Soybean rust resistance was found to be recessive. Rust resistance heritability values ranged from 3.17 to 53.15% (broad sense) and from 2.44 to 48.08% (narrow sense). Inheritance of a number of other morphological and physiological characteristics is described. [EMS]

*0253 A:PS
Chou, W.M. ; Lu, Y.C. The effect of chemical mutagen (ethyl methanesulfonate) in two soybean cultivars. NATIONAL SCIENCE COUNCIL MONTHLY v.9(11): 995-1002, 1981. [Ch] [En Abst]

In order to investigate the effect of chemical mutagen (EMS) in two soybean cultivars, treatments of the five EMS concentrations (0.0125, 0.025, 0.05, 0.075, 0.10 M) with three soaking times (4, 8, 12 hr.) were used. The data of M_1 and M_2 on several agrononic traits were measured. The effects of different mutagens were summarized as follows: (1) Increasing the EMS combination (dosage and time) treatments greatly reduced germination rate. The rates of plant and leaf growth were more vigorous at low EMS concentrations. (2) By increasing the dose of treatments, reduced the M_2 progeny seed yield and lengthened the days to the phenotype maturity. (3) Variability of all treatments in the M_2 was greater than the control. (4) Some mutants resistant to rust were found in the M_2 population. [AS]

*0254 A:PS
Craigmiles, J.P. ; Hartwig, E.E. ; Sij, J.W. ; Paschal, E.H. Dowling, a moderately rust-resistant soybean release. SOYBEAN RUST NEWSLETTER v.2(1):8, 1979. [En]

Dowling, a late-maturing Group VIII soybean cultivar developed by the Texas Agricultural Research and Extension Center at Beaumont, was released in March 1978. Dowling is a selection from a cross invclving PI 200492, the source of rust resistance, and Semmes. Dowling is moderately resistant to Taiwan strain of soybean rust. It is, furthermore, resistant to *Phytophtora megasperma* var. *sojae*, *Xanthomonas phaseoli* var. *sojensis*, *Pseudomonas tabaci*, and *Corynespora cassiicola*, butis susceptible to the two root-knot nematodes *Meloidogyne incognita* and *M. arenaria* and to the cyst nematode *Heterodera glycines*. [PLH/EMS]

*0255 A:PS
Craigmiles, J.P. ; Hartwig, E.E. ; Sij, J.W. Dowling, a late maturing, high yielding soybean variety developed for the gulf coast region. SOYBEAN RUST NEWSLETTER v.3(1):4-7, 1980. [En] [En Abst]

Dowling, a newly released late-maturing soybean variety developed at the Texas A & M University Agricultural Research and Extension Center, has the potential to produce high yields over a wide range of conditions and is especially tolerant of excess soil moisture. It compares favorably with Hutton, Coker 338, and Cobb in quality and has satisfactory resistance to lodging. Seed holding ability is very good. Dowling has field resistance to the Taiwan strain of rust. It is susceptible to nematodes. The seed contain 40.1 percent protein and 20.7 percent oil. Dowling has a good level of tolerance to the herbicide Metribuzin but is sensitive to propanil. [AS/EMS]

*0256 REP.SB-710
Craigmiles, J.P. ; Hartwig, E.E. ; Sij, J.W. Registration of dowling soybeans. CROP SCIENCE v.18:1094, 1978. [En]

Dowling soybeans (*Glycine max* (L.) Merr.) originated as an F_4 line developed from a bulk population of Semmes x PI 200492. The cross was made at Stoneville, Mississippi. Dowling has white flowers, grey pubescence, and tan pod walls. It is classified as group VIII maturity. Seeds are dull yellow with buff hila and an average 14 g/100 seeds. It

is resistant to Phytophthora rot (*Phytophthora megasperma* Drechs. var. *sojae*), bacterial pustule [*Xanthomonas phaseoli* (E.F. Smith) Dows. var. *sojensis* (Hedges)], wildfire [*Pseudomonas tabaci* (Wolf & Foster)], target spot [*Corynespora cassiicola* (Berk. & Curt.)] and moderately resistant to the Taiwan strain of soybean rust. Dowling is susceptible to the two root-knot nematode species [*Meloidogyne incognita* (Kofoid & White) Chitwood and *M. arenaria*], and to the soybean cyst nematode (*Heterodera glycines* Ichinohe). Shatter resistance is excellent. Dowling was tested in the regional preliminary group VIII nursery in 1974 and in the regional uniform group VIII nursery in 1975-1977. At Beaumont, it averaged 7.5% higher in seed yield than the average of the three check varieties Cobb, Hardee and Coker 338. [AS/EMS]

*0257 A:PS
do Vale, F.X.R. ; Zambolim, L. ; Chaves, G.M. Reaction of soybean cultivars to *Phakopsora pachyrhizi* Sydow. SOYBEAN RUST NEWSLETTER v.7:10-13, 1985. [En]

In greenhouse screening tests involving 34 Brazilian soybean cultivars and 33 lines, no accession was immune from rust infection but cultivars Mineira, Vila Rica, FT-1, IVAI, IAC-4, BR 4 and Uniao were rated resistant. Cultivar Santa Rosa, though rated moderately resistant, rusted very slowly under field conditions. Several of the 33 lines were rated resistant. [EMS]

*0258 A.PS
do Vale, F.X.R. ; Zambolim, L. ; Chaves, G.M. Disease gradient of soybean rust. SOYBEAN RUST NEWSLETTER v.7:14-16, 1985. [En]

Studies on the dispersion gradient of *Phakopsora pachyrhizi* on the resistant soybean cultivar Santa Rosa and the susceptible Parana confirmed glasshouse tests in which Santa Rosa showed a longer latent period and fewer uredia/lesions. [PBA 56-7358]

*0259 REP.SB 877
do Vale, F.X.R. ; Chaves, G.M. ; Martins, M.C.D.P. ; Junqueira, N.T.V. Evaluation of the infection by *Phakopsora pachyrhizi* of different soybean varieties. FITOPATOLOGIA BRASILEIRA v.5(3):443, 1980. [Pt Abst] NOTE: Text in Portuguese, translated by 'EMBRAPA'

Soybean cultivars 'Santa Rosa', 'UFV-1', 'Vicosa', 'UFV-2', and 'Parana', grown under greenhouse conditions at the Federal University of Viçosa, were inoculated with a suspension of *P. pachyrhizi* uredospores. Spraying on the lower faces of the first and second trifoliate leaves was done 30 days after planting, using a suspension of 2 x 10^4 uredospores/ml in water + wetting agent Triton X 114 at 0.005%. After inoculation, the plants were placed in a fog chamber for 24 h (15 h of darkness and 9 h of light) at ± 21°C and about ± 98% relative humidity. After this period, the plants were maintained under greenhouse conditions. Fourteen days after the inoculation, the number of lesions/unit of foliar area was evaluated as were the medium number of uredia/lesion and percentage of sporulated uredia. The results, when analyzed statistically, showed that there was no significant difference, at the 5% probability level, for number of lesions/unit of leaf area. In relation to the medium number of uredia/lesion and percentage of sporulating uredia, highly significant differences were found at the 1% probability level. The cultivar 'Santa Rosa' presented the smallest medium number of uredia/lesion and the smallest percentage of sporulating uredia, proving to be the least susceptible to this isolate of the pathogen. [AS/EMS]

*0260 SB204.R4 1979
Guhardja, E. ; Somaatmadja, S. ; Kartoprawiro, M.I. Improvement of soybean, peanut and mungbean by the use of nuclear techniques. IN: Induced mutations for improvement of grain legume production; Report of. Vienna, IAEA, Austria. p. 33-39, 1980. [En] [En Abst]

MEETING: Research Co-ordinating Meeting on the Use of Induced Mutations for Improvement Grain Legume Production, 1st, Kuala Lumpur, Malaysia, May 28-Jun 1, 1979

Pulses are an important part of the diet in Indonesia. Their production is insufficient. Rust disease is one of the obstacles towards higher yields. Seeds of two soybean varieties, one peanut variety and two mungbean varieties were irradiated with doses causing 15-30% seedling height reduction. M_1 and M_2 generation of irradiated soybean were screened for soybean rust (*Phakopsora pachyrhizi*) resistance and it appears that irradiated populations contain a few more plants with a resistant or moderately resistant reaction. Irradiation of mungbeans with doses of 45-72 krad was rather unsuccessful in terms of obtaining useful mutations. Therefore M_3 seeds were irradiated again with similar doses. [AS]

*0261 SB608.S7V3
Hartwig, E.E. Breeding soybeans for rust resistance. IN: Vakili, N.G. Workshop on soybean rust in the Western Hemisphere; Proceedings of. Washington, D.C., United States Department of Agriculture, USA. p. 26-29, 1978. [En]

MEETING: Workshop on Soybean Rust in the Western Hemisphere, Mayaguez, Puerto Rico, Nov 14-17, 1976

The entire U.S. soybean germplasm collection was screened in Taiwan and 2 resistant accessions were identified: PI 200490 and 200492. The southern collection was also screened in Taiwan - at AVRDC - and about 20 resistant accessions were identified, with PI 230970, PI 230971, and PI 60273 having the highest level of resistance. Some of these resistant lines were used as parents to initiate a bulk population from which highly resistant lines were selected at Pantnagar in India. A moderately resistant variety, Orba, has been released by the Indonesian soybean improvement program. In view of the high level of rust resistance available, prospects seem good for developing productive, highly resistant soybean cultivars. [EMS]

*0262 REP.SB-754
Hartwig, E.E. ; Bromfield, K.R. Relationships among three genes conferring specific resistance to rust in soybeans. CROP SCIENCE v.23:237-239, 1983. [En] [En Abst]

This study was conducted in containment facilities to further elucidate the genetic basis of specific resistance to *Phakopsora pachyrhizi* Syd. (incitant of soybean rust) among three soybean (*Glycine max* (L.) Merr. lines previously reported to each have a single dominant gene conferring resistance. F_2 lines, D79-9690 and D79-9697, each having rust resistance derived from PI 230970, were crossed with PI 462312 ('Ankur') and PI 200492, respectively. The cross PI 462312 x PI 200492 was also made. F_2 populations and selected F_3 lines were evaluated for their reactions to two soybean rust isolates, Taiwan-72-1 and India-73-1. For each plant tested, a leaflet of a single trifoliolate leaf was inoculated with the Taiwan rust isolate and another leaflet was inoculated with the India isolate. PI 230970 and the two breeding lines D79-9690

and D79-9697 gave a resistant reaction to both isolates. PI 462312 gave a resistant reaction to the India isolate and PI 200492 an immune reaction to that isolate, but both were susceptible to the isolate from Taiwan. Our results confirmed previously published reports that each soybean line carried a single dominant gene for resistance and demonstrated that each gene was at a different locus. The genotypes for rust reaction assigned to the three parental types were: PI 200492, *rpp*$_1$ *rpp*$_1$ *rpp*$_2$ *rpp*$_2$ *rpp*$_3$ *rpp*$_3$; PI 230970, *rpp*$_1$ *rpp*$_1$ *rpp*$_2$ *rpp*$_2$ *rpp*3 ; and PI 462312, *rpp*$_1$ *rpp*$_1$ *rpp*$_2$ *rpp*$_2$ *rpp*$_4$ *rpp*$_4$. [AS]

*0263 A:PS
Hartwig, E.E. Identification of a fourth major gene conferring resistance to soybean rust. CROP SCIENCE v.26(6):1135-1136, 1986. [En] [En Abst]

Studies were conducted in containment facilities at Frederick, MD to determine the genetic basis of resistance to *Phakopsora pachyrhizi* Syd. (incitant of soybean rust) carried by the soybean (*Glycine max* (L.) Merr.) line PI 459025. Previous studies showed that soybean genotypes PI 200492, PI 230970, and PI 462312 each carried a single dominant gene conferring resistance to a specific soybean rust isolate. Genotype PI 200492 gave a near-immune reaction to rust isolate India 73-1 and a susceptible reaction to Taiwan 72-1. Genotype PI 462312 gave a resistant reaction to the India rust isolate and a susceptible reaction to the Taiwan isolate. Genotype PI 230970 and F_2 lines having PI 230970 as a parent gave resistant reactions to both rust isolates. Genotype PI 200492, PI 230970, and PI 462312 gave a susceptible reaction when inoculated with rust isolate Taiwan 80-2. Line PI 459025 was identified as resistant to Taiwan 80-2 as well as Taiwan 72-1 and India 73-1. Line PI 459025 was crossed with each of the three previously identified sources of resistance. The F_1 plants, F_2 populations, and selected F_3 lines were inoculated with each of the three rust isolates to determine their reaction. For each plant evaluated, a leaflet of a single trifoliolate leaf was inoculated with a different rust isolate. The results showed that PI 459025 carried a single dominant gene for resistance to all three rust isolates and that this gene was at a different locus from the three previously identified genes conferring resistance to specific rust isolates. The genotype assigned for rust resistance of PI 459025 is *rpp*$_1$ *rpp*$_1$ *rpp*$_2$ *rpp*$_2$ *rpp*$_3$ *rpp*$_3$ *rpp*$_4$ *rpp*$_4$. [AS/PLH]

*0264 A:PS
Hidayat, O.O. ; Somaatmadja, S. Screening of soybean breeding lines for resistance to soybean rust (*Phakopsora pachyrhizi* Sydow). SOYBEAN RUST NEWSLETTER v.2(1):9-22, 1979. [En]

Three hundred and ten soybean breeding lines from AVRDC were tested for rust infection during the rainy season of 1977/78 and during the dry season of 1978. None of the lines tested was free of rust. In the rainy season most lines showed severe infection at flowering time. One line (30094-1-2) could be classified as resistant. Fifteen lines showed moderate resistance. [PLH/EMS]

*0265 A:PS
Hidayat, O.O. ; Somaatmadja, S. Reaction of soybean breeding lines to rust (*Phakopsora pachyrhizi*). SOYBEAN RUST NEWSLETTER v.3(1):12-14, 1980. [En]

This report discusses the screening of breeding material received from the Delta Branch Experiment Station, Stoneville, MS, USA, under field conditions, supplemented by

spraying with the causal organism to secure disease. Results indicate that most of the 20 lines identified as resistant in the dry season were susceptible in the wet season except Gm 2316, Gm 2323, and Gm 2597, which continued to exhibit moderate resistance to the fungus. [PLH/EMS]

*0266 REP.SB-835
Hoppe, H.H. ; Koch, E. Expression of host and nonhost resistance against two races of the soybean rust fungus. IN: Napompeth, B. ; Subhadrabandhu, S. New frontiers in breeding researches; Proceedings of. Bangkok, Kasetsart Univ., Thailand. p. 833-840, 1986. [En] [En Abst]

MEETING: International Congress Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), 5th, Bangkok, Thailand, Nov 25-29, 1985

The response of a wide range of soybean cultivars and other host species to infection by six single spore lines of the soybean rust fungus (*Phakopsora pachyrhizi*) was analyzed. Uredospores were collected in Thailand (4 lines) or Australia (2 lines). Variation in the reaction pattern of the differential set were high enough to detect three different races among the six spore lines. The races found in the spore collection from Thailand were used to analyze the resistance reactions of soybean lines developed and used at the Kasetsart University, Bangkok in breeding programs. In these studies, symptom development, spore production, and fungal growth in the host tissue were determined. One soybean line showed races specific resistance leading to complete suppression of sporulation in incompatible interactions. On other soybean lines, resistance had a more quantitative, nonspecific character resulting in delayed development of symptoms and spore production. [AS]

*0267 A:PS
Joshi, S. Incidence of soybean rust in Nepal in 1984. SOYBEAN RUST NEWSLETTER v.7:21, 1985. [En]

Soybean rust was first observed in Nepal in 1981 and since then has been endemic in the country. Out of 175 exotic and local soybean cultivars screened for rust resistance in 1984, only 2 (Tainung 3 and Tainung 4) were resistant to *Phakopsora pachyrhizi*. In Nepal the rust survives on other hosts, as yet unknown. The telial stage was not observed. [EMS]

*0268 SB608.S7F6
Lantican, R.M. Observations and theories on cultivar resistance of soybeans to rust. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 54-57, 1977. [En] (INTSOY Series No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Original sources of resistance to soybean rust, PI 200451, PI 200490, and PI 200492 originate from Japan's Shikoku Island where they carried the cultivar names Amakusa Daizu, Kiwami, and Komata, respectively. PI 200492 was the main source of resistance used by TARI in Taiwan to develop resistant cultivars Kaohsiung 3, Tainung 3, and Tainung 4. These cultivars, especially Tainung 4, were later used as sources of resistance in Thailand and the Phillippines. Cultivars reported as highly resistant in

Australia and India were found susceptible in the Philippines. Cultivars which did show resistance when first introduced into the Philippines, such as TK-5, Wayne, Kaohsiung 3, Tainung 3, Tainung 4 and the PI series, have all gradually lost their resistance. On the other hand, cultivars formerly highly susceptible such as Clark 63 and Lincoln, have improved their tolerance to rust. Fifty-four crosses were made involving rust- and bacterial pustule-resistant parents and the 21 families which survived from the progeny are being further intercrossed in an attempt to recover higher degrees of resistance. Screening is done under natural infection. Inheritance of rust resistance appears to be simple and dominant. Our long-term objective is to breed rust-resistant soybean cultivars by pyramiding as many genes for resistance as possible into a line or 'multi-line' to constitute a broad-spectrum and stable type of resistance. [EMS]

*0269 REP.SB-794
Leppik, E.E. Gene centers of plants as sources of disease resistance. ANNUAL REVIEW OF PHYTOPATHOLOGY v.8:323-344, 1970. [En] [En Abst]

Gene centers of cultivated plants and their wild progenitors serve as the main source of genotypic resistance to disease, insect pests, and nematodes. In these centers plants have long been exposed to the selective pressure of local pathogens and insect pests, and developed resistance. Systematic exploration of primary and secondary gene centers of particular plants may provide additional gene pools for resistance breeding. The gene center of the genus *Glycine* is in Central Africa; but the domestication of G. *max* (L.) Merr.(2n = 38,40) took place in Central East Asia. Several foreign pathogens, such as the very destructive soybean rust, *Phakopsora pachyrhizi* Syd., from the Far East, have not yet reached the United States. [AS/PLH]

*0270 REP.SB-845
Lu, Y.C. [Breeding for soybean rust resistance (abst)]. IN: Research reports' abstracts 1969-1972. Taipei, Taiwan, ROC. p. 45, 1974. [Ch Abst]

Cultivars CH 1, CH 2, and CH 3 were developed; they have high yield combined with insensitivity to photoperiod and temperature, but a low level of rust resistance. No variety was found free from rust infection, however Ching reen wu douh (8) (418) and 200492 (R 8) (R 10) showed a fair level of tolerance. In general, the yields in the spring crop season were low. The yield of the tolerant variety was higher than that of the less tolerant one. Several pedigrees from various cross combinations were selected with rust resistance and high yield. [PLH/EMS]

*0271 REP.SB-839
Lu, Y.C. ; Tsai, K.H. ; Yen, H. ; Tou, K.T. [Breeding for soybean rust resistance and adaptability for fall crop (abst)]. IN: Research reports' abstracts 1969-1972. Taipei, Taiwan, ROC. p. 46-47, 1974. [Ch Abst]

A total of 27 accessions were grown in the spring, summer, and fall seasons for a yield trial and rust resistance test. Rust-resistant varieties had higher yields than rust-susceptible varieties in the spring crop season. No rust occurred in the summer and fall crop seasons. No variety was completely resistant to rust, but some were moderately resistant, such as 0-125, R 10, Pi 200492 x Ch 1, PI 200492 x CH 3, and 8 induced mutation lines. [PLH/EMS]

*0272 A:PS
Manandhar, J.B. ; Joshi, S. Soybean rust in Nepal. PHYTOPATHOLOGY v.73(5):843, 1983. [En]

MEETING: Annual Meeting of the American Phytopathological Society, 1983, Ames, IA, USA, Jun 26-30, 1983

Soybean rust, caused by *Phakopsora pachyrhizi*, was first observed in mid-August, 1981 on several cultivars of soybeans in Khumaltar. The disease appeared in 1982 during the first week of September following 3 to 4 days of continuous rain. Soybean rust disease surveys in 1981 and 1982 showed that the disease is endemic in Nepal. Severity of the disease is high in the late-maturing cultivars Bragg, Cobb, Hardee, P-28 and P-32. Most of the early-maturing cultivars, including all indigenous ones, are susceptible when planting is delayed. Tainung 3, Tainung 4 and PI 200492 are resistant; and yam bean (*Pachyrhizus* sp.) and cowpea (*Vigna unguiculata*) are susceptible. However, several cultivars of pigeon pea (*Cajanus cajan*) and other cultivated summer legumes are not affected. The telial stage of the fungus was not observed. [AS]

*0273 REP.SB-767
Marshall, D.R. ; Broue, P. The wild relatives of crop plants indigenous to Australia and their use in plant breeding. AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE, JOURNAL v.47:149-154, 1981. [En] [En Abst]

The purpose of this review is to highlight the potential use of the wild relatives of crops indigenous to Australia in plant improvement programs and to summarize the available information on the taxonomy, species characteristics and cytogenetic relationships among them. The following genera are addressed: *Nicotiana*, *Glycine*, *Grossypium*, *Oryza*, and *Sorghum*. Of the currently recognized perennial species of the subgenus *Glycine* Willd., five are found only in Australia - *G. clandestina*, *G. falcata*, *G. latifolia*, *G. latrobeana*, and *G. canescens* - while two, *G. tabacina* and *G. tomentella*, occur both in Australia and elsewhere in the western Pacific. High levels of both qualitative and quantitative resistance to soybean rust are found in four of these species: *G. canescens*, *G. clandestina*, *G. tabacina*, and *G. tomentella*. In the first two, resistance was shown to be controlled by single dominant genes. [EMS]

*0274 SB608.S7F6
McLean, R.J. ; Byth, D.E. Resistance of soybeans to rust in Australia. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean: the problem and research needs; Report of. Urbana-Champaign, IL, University of Illinois, USA. p. 58-61, 1977. [En] (INTSOY Series No. 12) NOTE: Also issued in 'Aust. Plant Pathol. Soc. Newsletter' v.5:34-36, 1976

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Rust resistance was found, in particular, in accession PI 200492 and the cultivars derived from it (Tainung 3 and Tainung 4) and in accessions PI 227268, PI 227287 and Hy 2217. Estimated yield losses of up to 80% have been reported from Taiwan, 40% in Japan and 30% in Thailand. In Australia, soybean rust was first recognized in 1970 and is now present in all major soybean growing areas except the Narrabri region. All Australian soybean cultivars are susceptible as well as a large collection of accessions. The 3 accessions PI 200492, Tainung 3 and Tainung 4 gave an immune reaction in Australia and were crossed in various combinations with local cultivars Gilbert, Ogden and Ross. Progenies segregated for the 3 infection types I (immunity), R (resistance: necrotic lesions sporulation), S (susceptibility: necrotic sporulating lesions). Out of 21 other reportedly resistant accessions of soybean and of a related

species (*G. ussuriensis*), six accessions were found either immune or resistant and are thus of immediate interest in soybean rust investigations: PI 200490, PI 200653, PI 224268, PI 227687, PI 229358, and HY 2217. Late in the 1975-76 season a new race appeared which is capable of attacking PI 200492. This showed that there are now at least 2 races of the soybean rust fungus in Australia. [EMS]

*0275 REP.SB-742
McLean, R.J. Research into genetic/pathology aspects of resistance to soybean rust. 9p., 1978. [En] NOTE: Unpublished report

Yield losses were 60-70% in the most severely rusted field plots, and up to 95% in the glasshouse. Yield reductions were associated with reductions in the number of filled pods, number of filled seeds, seed weight, and seed yield/plant. Seed oil, but not protein content was reduced. The extent of damage was dependent on the growth stage of the plant. In both field and glasshouse, rust infection hastened defoliation, but the effect on maturity was conflicting. A new host, *Desmodium triflorum*, was identified. At least two races occur in Australia. Tainung 4 is still immune to both of them. Penetration of the host plant is direct; stomatal penetration occurs very seldom. Early infection is similar on the immune, resistant, and susceptible hosts; however, a hypersensitive response occurred early in the immune host. Immunity of PI 200492 appears to be determined by a single dominant gene. Other resistance inheritance studies are under way. Twenty-seven introductions were screened, 5 of which were immune - PI 200492, Tainung 3, Tainung 4, PI 224268, PI 227687 - and one resistant - H.Y. 2217. Glasshouse and field screenings were in good agreement. Glasshouse screening is quicker and simpler. Conclusive field trials could only be carried out in 1976 as there was no rust in 1977 or 1978. Advanced breeding lines were screened for both agronomic traits and rust resistance. A few immune lines were field tested in 7 locations scattered through Queensland and New South Wales. They were confirmed immune in all locations except Walkamin, suggesting the occurrence of a different race (A) in that location. At present, soybean rust is not considered a serious disease in Australia and only occurs regularly and severely in restricted areas of northern Australia. [EMS]

*0276 REP.SB-714
McLean, R.J. ; Byth, D.E. Inheritance of resistance to rust (*Phakopsora pachyrhizi*) in soybeans. AUSTRALIAN JOURNAL OF AGRICULTURAL RESEARCH v.31(5):951-956, 1980. [En] [En Abst]

A study was conducted to determine the inheritance of resistance to soybean rust in three soybean accessions - PI 200492, Tainung 3 and Tainung 4. The results suggest that PI 200492 and Tainung 3 contain the same single dominant gene for resistance, and that Tainung 4 contains two dominant genes for resistance, one of which is identical with that in PI 200492 and Tainung 3. [AS]

*0277 REP.SB-739
McLean, R.J. ; Byth, D.E. Inheritance of resistance to soybean rust. SOYBEAN RUST NEWSLETTER v.3(1):15-17, 1980. [En]

Studies of inheritance of resistance in 3 soybean accessions (PI 200492, Tainung 3, and Tainung 4) suggested that all 3 resistant accessions have a common dominant gene for resistance. Tainung 4, a sister line of Tainung 3, possesses a second dominant gene for resistance. [EMS]

*0278 REP.SB-785
McLean, R.J. ; Byth, D.E. ; Langdon, R.F.N. ; Ogle, H.J. Investigations of differential host reaction to soybean rust (*Phakopsora pachyrhizi*). IN: Australian Oil Seeds and Protein Grains Research Conferences. Queensland, University of Queensland, 2 leaves, 1981. [En]

MEETING: Conference on Australian Oil Seeds and Protein Grains Research, Toowoomba, Queensland, Australia, 1976

Three reportedly resistant accessions, PI 200492, Tainung 3 and Tainung 4 were introduced and crossed in various combinations with local susceptible cultivars. The original introductions and the F_2, F_3 and F_4 progeny of the crosses showed reactions ranging from immunity to susceptibility. Histological examinations and genetic studies are reported. Other potential sources of resistance have been introduced and assessed. These are: Q 15728 (PI 219653), Q 15729 (PI 224268), Q 15730 (PI 227687), Q 15731 (PI 229358), and Q 15991 (HY 2217). Q 15729 showed an immune reaction, Q 15730 and Q 15991 developed nonsporulating lesions, and Q 15728 and Q 15730 produced a low density of sporulating lesions with slow uredial development and low uredospore production. [PLH/EMS]

*0279 A:PS
Na Lampang, A. Breeding soybean resistant to major diseases. SOYBEAN RUST NEWSLETTER v.4(1):17-21, 1981. [En]

Soybean rust is a serious disease, especially during late rainy seasons due to heavy rain, high relative humidity, and cool nights. Yield reduction ranges from 10 to 100% depending on degree of infection. The breeding program at Mae Jo Experiment Station has resulted in the releasing of S.J.4, a rust resistant selection, in 1976. In addition to S.J.4, a new breeding line (7024-2) appears promising and will be released as S.J.5. This cultivar has moderate resistance to rust and anthracnose, and has a high degree of tolerance to soybean mosaic virus. To date, the three lines received from AVRDC, PI 230970, PI 230971, and accession 101 are still resistant to rust under Thai conditions. The paper also addresses other diseases of soybean in Thailand. [PLH/EMS]

*0280 REP.SB-711
Na Lampang, A. Breeding soybean resistant to major diseases (abst). IN: The second Southeast Asian symposium on plant diseases in the tropics; program and abstracts. p. 96, 1980. [En]

MEETING: Southeast Asian Symposium on Plant Diseases in the Tropics, 2nd, Bangkok, Thailand, Oct 20-26, 1980

Projects to breed resistant soybean cultivars started in 1970. The newly released cultivars possess moderate resistance to rust (*Phakopsora pachyrhizi* Syd.), downy mildew (*Peronospora manshurica* Syd.) and soybean mosaic virus (SMV). Work is in progress to control anthracnose (*Colletotrichum dematium* var. *truncata*), bud and stem blight, purple seed stain (*Cercospora kikuchii*), bacterial pustule (*Xanthomonas phaseoli*), bacterial blight (*Pseudomonas glycinea*) and other soybean diseases. [NMC/EMS]

*0281 A:PS
Nundhapun, M. ; Surin, P. Soybean reactions to rust caused by *Phakopsora pachyrhizi* at Mae-Joe Experiment Station. SOYBEAN RUST NEWSLETTER v.1(1):11-12, 1977. [En]

Twenty-seven entries of the International Soybean Rust Nursery Program received from AVRDC were tested for their reaction to soybean rust under greenhouse conditions. All soybean entries tested were susceptible to the Mae-Joe isolate of soybean rust used for artificial inoculation. However, the leaves of soybean accessions BM 52, BM 53, BM 54, G 8586, and G 8587 remained green at pod setting stage. [PLH/EMS]

*0282 A:PS
Shanmugasundaram, S. ; Toung, T.S. Breeding for soybean rust resistance in soybean. SOYBEAN RUST NEWSLETTER v.2(1):27-28, 1979. [En]

The F_2 populations from 39 different cross combinations of rust-resistant AVRDC accessions G 8586 and G 8587 were planted in the field, together with 190 pedigrees from various crosses. Single plants were selected from the F_2 population for rust resistance. Seven pedigrees were found to have outstanding resistance. [PLH/EMS]

*0283 A:S
Shanmugasundaram, S. ; Toung, T.S. Field screening for soybean rust resistance. SOYBEAN RUST NEWSLETTER v.5(1):27-30, 1982. [En]

A total of 2,842 pedigrees from F_3 to F_7 generations was evaluated during the 1981 autumn season at AVRDC. Among the 2,842 pedigrees evaluated, 791 pedigrees, derived from 158 cross combinations were moderately resistant to rust compared to the check cultivars. One hundred and ten out of 158 had previously reported soybean rust-resistant germplasm as one parent. The remaining 48 combinations had an early maturity or photoperiod insensitive accession as one parent. [PLH/EMS]

*0284 A:PS
Shanmugasundaram, S. ; Yen, C.R. ; Toung, T.S. Soybean rust symptoms expression in two locations. SOYBEAN RUST NEWSLETTER v.4(1):24-27, 1981. [En]

Ninety F_6 pedigrees from 5 crosses were evaluated for their reaction to soybean rust at AVRDC and Hualien. Eleven pedigrees in Hualien and 9 pedigrees at AVRDC were rated as moderately resistant. Three were moderately resistant at both locations. Large differences in lesion type between the two locations were observed. [EMS]

*0285 A:PS
Shanmugasundaram, S. ; Yen, C. R. ; Toung, T. S. Preliminary yield test of soybean rust resistant selections at AVRDC. SOYBEAN RUST NEWSLETTER V.4(1):22-23, 1981. [En]

Forty-eight pedigrees from three crosses in the F_7 generation were evaluated in preliminary yield trials during spring, summer, and autumn seasons of 1980 at AVRDC. In the spring, only one pedigree, GC 60037-1-38-9, showed very few rust lesions. Eight other pedigrees had acceptable levels of rust resistance and the grain yields were also either equal to or better than the 3 check cultivars. In the summer, soybean rust was not severe even in the susceptible checks, whereas in the autumn, the plant stands of the pedigrees in general were poor which resulted in poor yield performance. [PLH/EMS]

*0286 A:PS
Shanmugasundaram, S. ; Tourg, T.S. Photoperiodic response of soybean rust tolerant soybeans. SOYBEAN RUST NEWSLETTER v.5(1):31-33, 1982. [En]

Six accessions and three advanced selections reported to have moderate levels of general resistance to soybean rust were used to determine their photoperiodic responses. The results suggested that among the 9 entries evaluated, G 5525, G 5554, and G 6154 are insensitive to photoperiod whereas G 5422, G 5524, and SRE-Z-13 can be considered relatively less sensitive to photoperiod. These entries can therefore be used in crosses aimed at combining photoperiod insensitivity and rust resistance. [PLH/EMS]

*0287 A:PS
Shanmugasundaram, S. ; Chen, L.F. Selection for field resistance to soybean rust. SOYBEAN RUST NEWSLETTER v.6(1):25-27, 1983. [En]

A total of about 7000 advanced pedigree lines was evaluated under conditions of natural infection for field resistance to soybean rust. Some pedigrees with promising resistance were selected. Nine hundred and thirty-one breeding lines were selected for further screening in 1983. [EMS]

*0288 REP.SB-764
Shanmugasundaram, S. A screening technique for and inheritance of soybean rust infection types. SOYBEAN RUST NEWSLETTER v.3(1):27-28, 1980. [En]

Moderately rust resistant soybeans G 8586 and G 8587 were crossed with susceptible soybean lines G 9673 and G 882, respectively. Seedlings of parents, F_1 and F_2 of crosses G 9673 x G 8586 and G 882 x G 8587 were reared in the greenhouse and inoculated with small sections of infected tissue of a susceptible cultivar kept in place with a thin piece of moist cotton. The data suggests that RB TAN lesion type (a mixture of RB and TAN types) is controlled by a single dominant gene. However, it is possible that two distinct races were used as inoculum. [EMS]

*0289 A:PS
Singh, B.B. Inheritance of resistance to soybean rust. SOYBEAN RUST NEWSLETTER v.1(1):17, 1977. [En]

Genetic data on segregation for resistant and susceptible plants was obtained in 1971 from F_2 populations from three crosses which involved resistant and susceptible parents. The data fit the 3:1 ratio in only one population. In the other two populations, the data was closer to a mongenic ratio than a digenic ratio. [PLH]

*0290 SB205.S7W6 1979a
Singh, B.B. ; Thapliyal, P.N. Breeding for resistance to yellow mosaic and rust diseases of soybean (abst). IN: Caldwell, B.E. ; Corbin, F.T. World soybean research conference II: abstracts, 1979. Boulder, CO, Westview Press, USA. p. 42, 1980. [En Abst]

Yellow mosaic is one of the most serious diseases of soybean in India, Bangladesh, Sri Lanka, and Pakistan. Soybean rust is a major disease in the whole of Southeast Asia. Therefore, the major emphasis in soybean breeding programs at Pantnagar has been on the development of resistant varieties to these diseases. Through systematic

screening of the world soybean germplasm, two lines resistant to yellow mosaic, PI 171443 and *Glycine formosana* (a variant of *G. soja*) and nineteen lines resistant to moderately resistant to rust were identified. Genetic studies have revealed that resistance to yellow mosaic is controlled by two pairs of recessive genes and the resistance to rust by one dominant gene. *G. formosana* appears to have a single dominant gene for resistance to yellow mosaic. The advanced breeding lines derived from segregating populations involving these resistant sources have exhibited high yield potential and resistance to yellow mosaic, rust and other foliar diseases. The details of these will be presented in the paper. [AS]

*0291 A:PS
Singh, B.B. Breeding for resistance to soybean rust in India. SOYBEAN RUST NEWSLETTER v.1(1):15-16, 1977. [En]

Rust is considered to be one of the most devastating diseases of soybean in northern India. Over 3300 lines were screened for rust resistance in the field. The lines were classified into the following 3 groups: resistant: PI 200465, PI 200466, PI 200477, PI 200490, PI 200492, and PI 224268; moderately resistant: E.C. 11695, E.C. 50081, PI 88816-S, PI 181567, PI 200455, PI 200474, PI 200476, PI 200270, PI 200487, PI 285089, PI 341352, E.C. 22694, E.C. 36956, Ankur, and PK-71-39; susceptible: all remaining lines, except for the very early ones which escaped infection. A number of high-yielding rust-resistant breeding lines (PK-73-84, PK-73-94, PK-73-109, PK-73-148, and PK-73-156) were developed from crosses of some of the identified resistant lines with high-yielding but susceptible varieties. [PLH/EMS]

*0292 REP.SB-752
Singh, B.B. ; Gupta, S.C. ; Singh, B.D. Sources of field resistance to rust and yellow mosaic diseases of soybean. INDIAN JOURNAL OF GENETICS AND PLANT BREEDING v.34(3):400-404, 1974. [En]
[En Abst]

A total of 4066 lines of soybean including 5 wild species were screened for resistance to rust and yellow mosaic diseases. Six lines, PI 200465, PI 200466, PI 200477, PI 200490, PI 200492 and PI 224268 were found to be free from rust. Thirteen lines developed pink spots on leaves at the point of contact with the rust spores inhibiting further sporulation. These were rated as moderately resistant. These lines are PI 88816-S, PI 181567, PI 200456, PI 200474, PI 200476, PI 224270, PI 200487, PI 285089, PI 341352, E.C. 11695, E.C. 50081, E.C. 26694, and E.C. 36956. Only one line viz. PI 171443 was found to be completely resistant to yellow mosaic. Of the 5 wild species *G. ussuriensis* was susceptible to rust as well as yellow mosaic. *G. formosana* was susceptible to rust but completely resistant to yellow mosaic. *G. tabacina*, *G. tomentella* and *G. wightii* were resistant to both rust and yellow mosaic. Successful crosses were achieved between *G. max* and *G. ussuriensis* and *G. formosana*. [AS]

*0293 A:PS
Smutkupt, S. ; Wongpiyasatid, A. ; Lamseejan, S. A second report on induced mutations for soybean rust resistance. SOYBEAN GENETICS NEWSLETTER v.9:103-107, 1982. [En]

Eighty-eight selections from single plants derived from M_3 and M_4 progenies were evaluated for rust resistance in the rainy season. Most of these lines reached the

disease level 343 (IWGSR scale) 86 days after planting. Six lines derived from G 8586 only reached 333 and one plant with a score of 323 from Taichung N was selected. [EMS]

*0294 A:PS
Smutkupt, S. ; Wongpiyasatid, A. ; Lamseejan, S. A report on induced mutations for soybean rust resistance. SOYBEAN GENETICS NEWSLETTER v.8:122-125, 1981. [En] [En Abst]

Approximately 10,000-23,000 seeds, from each of 11 cultivars, were irradiated with 15 and 30 krad. Two plants were identified in an M_3 row derived from Taichung N, which appear to have some resistance. [EMS]

*0295 A:PS
Smutkupt, S. A review of soybean radiation experiments in Thailand. THAI JOURNAL OF AGRICULTURAL SCIENCE v.13:157-162, 1980. [En]

A soybean mutation breeding program has been conducted in Thailand since 1970. Variability has been induced in such characters as: outcrossing, morphological characteristics, protein content and oil content. Four sublines could be isolated which were infected with nonsporulating lesions. It is, however, still premature to say whether these sublines are truly resistant mutants. [EMS]

*0296 A:PS
Smutkupt, S. ; Vipasrinimit, S. ; Pupipat, U. Field observation on rust reaction in M_4 soybean lines. SOYBEAN GENETICS NEWSLETTER v.5:96-97 1978. [En]

Ninety-three lines were irradiated with gamma rays in an induced mutation breeding experiment. Out of 174 M_4 sublines tested for reaction to soybean rust under natural infection, four sublines exhibited a hypersensitive reaction to the fungus. Further testing is suggested to determine whether these four sublines are rust-resistant mutants. [EMS]

*0297 SB204.R4 1979
Smutkupt, S. ; Pupipat, U. ; Lamseejan, S. ; Wongpiyasatid, A. ; Naritoom, K. Induced mutations for rust resistance in soybeans. IN: Induced mutations for improvement of grain legume production; Report of. Vienna, IAEA, Austria. p. 27-32, 1980. [En] [En Abst]

MEETING: Research Co-ordination Meeting on the Use of Induced Mutations for Improvement of Grain Legume Production, 1st, Kuala Lumpur, Malaysia, May 28-Jun 1, 1979

Soybean rust is a problem in many countries of Southeast Asia. In Thailand, losses are between 10 and 40%. An International Working Group on Soybean Rust (IWGSR) has been formed with the Asian Vegetable Research and Development Center (AVRDC) at Shanhua, Taiwan, as the coordinating center. Promising soybean lines and varieties were distributed but only two moderately resistant lines persist at present. Since 1974, a soybean improvement project exists at the Kasetsart University, Bangkok and efforts to develop productive soybean lines with rust resistance by induced mutations are included. [AS]

*0298 SB204.R4 1981
Smutkupt, S. ; Pupipat, U. ; Lamseejan, S. ; Wongpiyasatid, A ; Naritoom, K. Induced mutations for rust resistance in soybean. IN: Induced mutations for improvement of grain legume production II; Proceedings of. Vienna, IAEA, Austria. p. 145-146. 1982. [En]

MEETING: Research Co-ordination Meeting on the Use of Induced Mutations for Improvement of Grain Legume Production, 2nd, Chiang Mai, Thailand, Apr 21-May 1, 1981

Eleven soybean cultivars were treated with gamma rays for mutation induction. No selection for rust resistance could be done in the dry season of 1980 as no rust epidemic occurred. Natural infection in the rainy season of 1980 was severe, however, and 121 plants from M_1 and M_2 progenies were selected and threshed separately. Seeds of these selected plants were multiplied for further testing in the rainy season of 1981. [PLH/EMS]

*0299 REP.SB-834
Smutkupt, S. ; Wongpiyasatid, A. ; Lamseejan, S. Induced mutations for rust resistance. IN: Napompeth, B. ; Subhadrabandhu, S. New frontiers in breeding researches; Proceedings of. Bangkok, Kasetsart Univ., Thailand. p. 841-851, 1986. [En] [En Abst]

MEETING: International Congress Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), 5th, Bangkok, Thailand, Nov 25-29, 1985

Experiments for inducing rust resistance in soybeans have been carried out since 1979. Seeds of various cultivars, mutant-and mutation-derived lines were gamma irradiated with doses of 15, 20 and 30 krad. Screenings for resistance in the M_2 and M_3 populations were mainly carried out [illegible]e rainy seasons in Nong Hoi Valley (altitude about 1000 m) in Chiang Mai Provin[illegible] altitude 18°31-19°N). Single plants were selected on the basis of low IWGSR rating notation and/or slow growth of rust on the plant compared with the average highest rating notation (343) of plants within the same row. Good seeds of selected plants were increased on a plant to row basis in a disease free condition. Selected lines were evaluated in single rows for disease tolerance in a rainy season in Nong Hoi Valley. Good seed yield per plant, percentage of shrivelled seeds and weight of 100 seeds were used as criteria for selecting the best lines. Seeds of the best lines were increased and planted in replicated single-row plots of 1.5 m long. Following characteristics of seed yield per plant, per plot, shrivelled seed percentage and seed size were determined. Among them, 8 rust-tolerant lines were further evaluated with and without protection for yield and seed size. The results confirmed that the rust disease developed slowly on plants of rust tolerant lines. The seed size of the mutant line 81-1-038 was less affected than that of its parent S.J.4. The yield of 81-1-038 was slightly lower than that of the S.J.4 but this was not statistically significant. [AS]

*0300 S293.K3 1981
Smutkupt, S. ; Naritoom, K. ; Lamseejan, S. ; Wongpiyasatid, A. The use of radiation in soybean breeding. KASETSART UNIVERSITY, RESEARCH REPORTS p. 4, 1981. [Th] [En]

Eleven soybean cultivars were gamma-irradiated with the dose of 15 and 30 krad in 1979. Based on the IWGSR rating system, 121 soybean plants with low rust ratings

were selected from a total of 31,636 plants of M_4-bulk, M_4-single and M_5-bulk grown at Nong Hoi Valley in the rainy season of 1980. In the dry season of 1981, seeds from 119 selections were increased; only 90 selections were harvested. All 90 selections were screened for rust resistance in the rainy season of 1981; only 88 lines survived for rust evaluation. Based upon average high seed yield per plant with a low percentage of shrivelled seeds, 16 selections derived from Wakashima mutant number 10, Taichung N, S.J.2, S.J.4, G8377, G8586 and G8587 were selected. Their seeds were increased and will be further tested for yield in the rainy season of 1982. [AS]

*0301 SB204.A8 pt.2
Sumarno Soybean breeding program in CRIA, Bogor. IN: The First ASEAN Workshop on Grain Legumes. Bogor, Ministry of Agriculture, Indonesia. 7p., 1974. [En]

MEETING: ASEAN Workshop on Grain Legumes, 1st, Bogor, Indonesia, Jan 15-20, 1974

A collection of more than 400 varieties is being maintained by the Indonesian soybean breeding program. No variety in the collection is resistant to rust. Some introduced varieties which noted rust resistance (Tainung No.3, PI 200451, PI 36830?7, and Wayne) are susceptible to the Indonesian rust strain. The soybean breeding program has so far yielded a promising line No. 1343, which has a maturity of about 85 days, tolerance to rust disease and good seed quality. The limiting factors of both pest and disease have not yet been solved. [EMS]

*0302 SB608.S7F6
Sumarno, R.S. ; Sudjadi, M.S. Breeding for soybean rust resistance in Indonesia. IN: Ford, R.E. ; Sinclair, J.B. Rust of soybean; the problem and research needs, Report of. Urbana-Champaign, IL: University of Illinois, USA. p. 66-70. 1977. [En] (INTSOY Series, No. 12)

MEETING: Workshop on Rust of Soybean: the Problem and Research Needs, Manila, Philippines, Feb 28-Mar 4, 1977

Rust is considered the most serious disease of soybean in Indonesia. All recommended soybean cultivars are susceptible except for the tolerant cultivar Orba. Breeding for rust resistance was begun in 1974. Fifty cultivars were screened in the field and eight varieties were found moderately resistant to rust. They were San Kuo, Arosoy, LS_1D-, Jagus, Bilomi 1, Klungkung, Ohito Okidaizu, and CRIA accession no. 778. In another pot screening trial in Bogor, involving 82 lines, three lines (CRIA accession nos. 835, 986, and 1312) were resistant, 14 were moderately resistant, and 65 were susceptible or highly susceptible. The cultivars were medium to late maturing, while most of the early maturing cultivars were susceptible. Crosses were made between some recommended Indonesian cultivars and resistant accessions nos. 986, 1312 and San Kuo. Preliminary investigations suggest that resistance of accession no. 986 is due to two dominant genes. Cultivars reported resistant in Bangladesh and Taiwan were found susceptible in Indonesia. [EMS]

*0303 REP.SB-841
Taiwan Agriculture Research Institute [Resistance screening for soybean rust]. TAIWAN AGRICULTURAL RESEARCH INSTITUTE, ANNUAL REPORT p. 31, 1978. [Ch]

The reaction of newly developed varieties to rust infection was investigated. Eighty-eight varieties were grown in the field during the spring and summer crop seasons. Infection was only severe in the spring. Infection was more severe in the late growth stage. The infection rates varied between the lines. [EMS]

*0304 REP.SB-846
Tang, W.T. [Breeding for soybean rust resistance (abst)]. IN: Research reports' abstracts, 1969-1972. Taipei, Taiwan, ROC. p. 44-45, 1974. [Ch Abst]

The purpose of this study was to develop new breeding lines with high yields and rust resistance. For the F_2 segregation test, 44 pedigrees from 5 crossing combinations were screened for disease resistance. The results showed that 5 pedigrees were rust resistant, and 19 pedigrees moderately tolerant. [PLH/EMS]

*0305 REP.SB-798
Thapliyal, P.N., Choudhary, N.N. Resistance of some soybean varieties to *Phakopsora pachyrhizi* uredia and uredospore production. INDIAN PHYTOPATHOLOGY v.29(3):343-345, 1976. [En]

Two out of 14 varieties tested, viz., Ankur and PK-71-39, were highly resistant showing hypersensitive flecks with no pustule development. Varietal differences in the average number of pustules per leaf (range: 1.0 to 7.1), and amount of sporulation (3.0 to 94.5 spores/microscope field) were noticed. On the basis of relatively basic infection rates (Rs), UPSM-19 was classified as the most susceptible variety, whereas, PK-73-94, PK-71-21, and PK 73-91 were resistant. [PLH/EMS]

*0306 SB608.S7T5
Tisselli, O., Sinclair, J.B., Hymowitz, T. Soybean rust. IN: Tisselli, O.; Sinclair, J.B.; Hymowitz, T. Sources of resistance to selected fungal, bacterial, viral and nematode diseases of soybeans. Urbana-Champaign, IL, University of Illinois, USA. p. 66-70, 1980. [En] (INTSOY Series No. 18)

The causal pathogen of soybean rust, *Phakopsora pachyrhizi*, its synonym, symptoms, importance, and distribution are discussed. Results of resistance screening from various countries are reported. [EMS]

*0307 REP. SB-775
Tsai, K.H., Lu, Y.C., Oka, H.I. Mutation breeding of soybean for the resistance to rust disease. SABRAO JOURNAL v.6(2):181-191, 1974. [En] [En Abst]

Since no proper parental strain resistant to the rust disease was available, the seeds of six soybean varieties selected for wide adaptability in Taiwan were subjected to mutagenic treatments (gamma ray and EMS). About 240,000 M_2 to M_3 plants grown in bulk and about 5,000 M_3 to M_4 lines derived from seemingly resistant plants were tested under natural infection and selection was repeated. Some of the selected lines showed a moderately high resistance which appeared to be due to induced mutations. In view of continuous variation in susceptibility grade and no remarkable changes in agronomic characters and yield found in most of selected lines, the induced resistance was considered to be due to genic changes with minor effects. [AS]

*0308 REP.SB-840
Tsai, T.W. ; Hsieh, K.S. [Studies on rust resistant varieties of soybean and its chemical control]. Kaohsiung, Kaohsiung District Agricultural Improvement Station, Taiwan, ROC. 12p., 1967. [Ch]

In the fall-crop season of 1965, and the spring-crop season of 1966, a total of 140 accessions was tested for rust resistance. All varieties can be infected by soybean rust, while infection degree varied between lines. Infection of lines 63-11, 64-104, 64-91, and PI 200492 was low which may suggest that these lines possess rust resistance potential. There were differences between chemical-protected and nonchemical-protected plants within one line. Yield and 1000-seed weight also showed significant difference between treatments. [PLH/EMS]

*0309 REP.SB 703
Tsaur, W.L. ; Chan, K.L. Test of rust resistance of new soybean lines. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT Ser.19:118-121, 1978. [Ch] [En Abst]

A total of 89 newly bred lines of soybean released by AVRDC, TARI and Kaohsiung DAIS was tested for rust resistance in the spring and summer crop seasons in the Taichung area. Results showed that in the spring crop season, the six lines 69S-1-3-17, 70F-17-21, 72-025, KS 706, 69S-10-1537, and Tainung No. 3 were resistant to the soybean rust in early growth stages, but resistance decreased at later growth stages. In the summer crop season, the rust lesion of all tested lines was light. [AS]

*0310 A.PS
Tschanz, A.T. ; Sheng, W.S. ; Tsai, B.Y. Development of soybean rust resistance in advanced breeding lines. SOYBEAN RUST NEWSLETTER v.5(1):34-37, 1982. [En]

In this preliminary report, data is presented on the variation in the rate of rust development which clearly shows the existence and potential of rate reducing resistance. A breeding strategy to utilize and increase this resistance is also presented. The data indicates that RR resistance is apparently inherited quantitatively and that variation in levels of rate-reducing resistance exists even in resistant cultivars that are not specifically selected for rate-reducing resistance. [PLH/EMS]

*0311 A.PS
Tschanz, A.T. ; Wang, T.C. ; Cheng, C.H. International screening trials for soybean rust tolerance. SOYBEAN RUST NEWSLETTER v.7:22-25, 1985. [En]

In tests at 2 locations in Taiwan and 1 in Thailand the line GC 60082-8-14-6-7-68 was identified as having a level of tolerance to *Phakopsora pachyrhizi* equal to or higher than that of the check, AGS 181. It also had the highest mean yield across treatments in all 3 trials. [PLH]

*0312 A.PS
Verma, R.N. Reaction of six AVRDC soybean accessions to rust in Shillong, India in 1984. SOYBEAN RUST NEWSLETTER v.7:20, 1985. [En]

The reaction of six AVRDC soybean accessions to rust in Shillong, India was tabulated. [PLH]

*0313 A:PS
Vipasrinimit, S. ; Smutkupt, S. Selection of rust resistance in M_3 soybean lines. SOYBEAN RUST NEWSLETTER v.4(1):35-36, 1981. [En] [En Abst]

Twenty seeds each of 93 soybean lines were irradiated with gamma rays of caseium source at the dose of 15 Krad. Two M$_3$ sublines were identified as moderately resistant, whereas three sublines showed a hypersensitive reaction type. There was no statistically significant difference in seed yield between the soybean lines, while a highly significant difference existed in seed size. [PLH/EMS]

*0314 A:PS
Wilcox, J.R. Breeding soybeans resistant to diseases. PLANT BREEDING REVIEWS v.1 183-235, 1983. [En]

This literature review presents a current account of information pertaining to breeding soybean for resistance to rust and other fungal, bacterial, virus, and nematode diseases. Soybean rust is probably the most serious fungus disease of soybean in the Eastern Hemisphere and has been reported in the eastern USSR, China, Japan, Taiwan, the Philippines, Malaysia, Indonesia, India, equatorial Africa, and Australia. Yield losses of up to 80% have been reported. The disease has also been reported from Brazil, Colombia, Venezuela, Central America, and the Caribbean. It has not been reported in Europe or North America. The entire U.S. soybean germplasm collection was screened in Taiwan and India and the 2 accessions, PI 200490 and PI 200492 were rated resistant in both locations. PI 200492 was used in crosses in Taiwan which produced the cultivars 'Tainung 3', 'Tainung 4' and 'Kaohsiung 3', all of which possess a degree of field resistance. Both PI 200492 and PI 200490 were shown to possess a single dominant gene for rust resistance. PI 230970 and PI 230971, from the southern germplasm collection, were also found resistant in later screenings. Distinct races have been shown to occur in Australia, and cases of breakdown of resistance genes have been reported from Taiwan. Breeding programs for rust resistance are underway in the Philippines, Australia, India, and Indonesia. Disease rating scales are discussed. [EMS]

*0315 A:PS
Yeh, C.C. ; Chan, K.L. ; Tsaur, W.L. Screening soybeans for rust resistance. ANNUAL REPORT OF DRYLAND FOOD CROPS IMPROVEMENT Ser.(24):122-125, 1982. [Ch] [En Ch Abst]

This experiment was conducted to screen soybean [illegible]s with slower progress in rust disease. About 1,500 accessions of soybean germ[illegible]m were tested. Results showed that all the accessions observed had lower rust infection rate (less than 1%) at 47 days after seeding during the young pod stage. However, heavy rust infections (30% or higher) were observed in most of the materials 59 days after seeding when the pods were half filled. Since this program was aimed at screening of slow rusting strains, those showing heavy rust infections 59 days after screening were discarded. Following this method, 151, 86, and 60 accessions were saved at 59, 64, and 72 days after seeding, respectively. The 29 out of the 60 accessions saved at the final observation might be the best slow rusting strains. [AS]

*0316 REP.SB-876
Zambolim, L. ; do Vale, F.X.R. ; Chaves, G.M. Partial resistance of soybean cultivars to *Phakopsora pachyrhizi*. FITOPATOLOGIA BRASILEIRA v.8(1):117-122, 1983. [En] [En Pt Abst]

A study was conducted in greenhouse conditions to determine the reactions of 34 Brazilian soybean cultivars and four plant introductions from Stoneville, Mississippi, to *Phakopsora pachyrhizi* (the soybean rust pathogen). The inoculum consisted of uredospores collected from *Dolichos lablab* L. in the field and increased on soybean plants (cultivar Parana). The assessment of the disease was done six days after inoculation. The soybean plants tested showed different levels of quantitative resistance based on the latent period and the number of uredia per lesion. There were no accessions immune to *P. pachyrhizi*. The reactions showed by almost all the soybean plants corresponded to the RB (reddish brown) lesion. Fifteen accessions were rated 'susceptible' (Wayne, Parana, Lancer, BR-1, and PI 200492 were the most susceptible); fourteen 'moderately resistant' including the cultivars Santa Rosa, Vicoja, Hardee, etc. and the plant introductions PI 230970, PI 230971 and Ankur; seven 'resistant' (Mineira, Vila Rica, FT-1, Ivai, IAC-4, BR-4, and Uniao) based on the latent period and on the number of uredia per lesion. [AS/PLH]

Disease Management - Cultural Control

*0317 A:PS

Dacup, A.V. ; Alovera, R.B. Influence of row orientation and phosphorus fertilization on the occurrence of soybean diseases. CMU JOURNAL OF AGRICULTURE, FOOD AND NUTRITION v.4(3):224-239, 1982. [En] [En Abst]

This study was conducted to find out the influence of the two row orientations and phosphate levels on the incidence of soybean diseases. North to South and East to West row orientations had no significant effect on the incidence of soybean mosaic virus (SMV) and soybean rust, although the prevailing meteorological conditions favored the growth and development of both. Occurrence of SMV was evidently influenced by the different levels of phosphorus. On the other hand, soybean rust infection was not significantly affected by the different phosphorus levels. However, the number of pods per plant, number of seeds per pod and yield per plot varied in all the treatments. [As]

*0318 A:PS

Desborough, P. J. Selection of soybean cultivar and sowing date as a strategy for avoidance of rust (*Phakopsora pachyrhizi* Syd.) losses in coastal New South Wales. AUSTRALIAN JOURNAL OF EXPERIMENTAL AGRICULTURE AND ANIMAL HUSBANDRY v.24(120):433-439, 1984. [En] [En Abst]

Selection of cultivar and sowing date was investigated as a means of reducing rust losses. Seasonal effects on agronomic and phenological performance were determined for five susceptible soybean cultivars (Ruse, Forrest, Bragg, Ransom, and Fitzroy), sown early or late in each of three seasons, with fungicide applications to control rust on half the plots. In unsprayed treatments, rust infestation occurred late in two seasons but reduced yield in only one season, and only in the latest maturing cultivar, Fitzroy, for which yield at both sowing dates was reduced by an average of 19.4%. Seed size was smaller in the sprayed plants of all cultivars in the one season when rust was detected. Rusting had no effect on time to pod maturity in any cultivar. In two seasons, cultivar x sowing date yield responses could be related to the severity and timing of moisture stress. Later sowing dates produced yields greater than or equivalent to those

of early dates when significant moisture stress occurred before mid-February. Seed size was affected by sowing date but the differences were not consistent with yield response. Averaged over the three seasons, later sowings (late December-early January) led to higher yields in the absence of rust, but late maturing cultivars (later than Bragg) would be required to ensure that mature plant heights were adequate to reduce harvesting losses. [AS/PLH]

*0319 A:PS
do Vale, F.X.R. ; Chaves, G.M. ; Zambolim, L. Effect of planting time on the incidence of soybean rust. SOYBEAN RUST NEWSLETTER v.7:4-6, 1985. [En]

Seven soybean cultivars were planted on three different dates and compared for their reaction to rust under natural infection. Cultivars Santa Rosa, Parana and FT-1 reached the R8 stage without developing rust. Santa Rosa and FT-1 showed low disease incidence even when sown later in the season (Dec.). Cristalina, sown in Oct., had 30% incidence at R6 whereas Numbaira, Doko and UFV-1 had 60-100%. Disease incidence was high on these cultivars even in the Dec. sowings. Parana, previously reported as highly susceptible, did not show any symptoms, possibly due to the lack of local inoculum. The long cycle cultivars were always severely diseased, with more than 90% of the leaves infected at R7 and R8. [EMS]

*0320 A:PS
Hidayat, O.O. ; Poerbojo, I. Effect of rice hull ash on rust (*Phakopsora pachyrhizi* S.) incidence and seed yield in soybean (*Glycine max* (L.) Merrill). SOYBEAN RUST NEWSLETTER v.5(1):6-15, 1982. [En]

A two factorial experiment was set up to determine the effect of various levels of rice hull ash and fertilizer applications on soybean rust infection and yield of various soybean cultivars. Rust development showed no difference between the varieties and treatments. The highest yields were obtained from the plots with both fertilizer and ash while the lowest yield was from the unfertilized plot. Yield increased with increasing rates of ash applied. Varietal response to fertilizer and ash was greatest with Shakiti, SC 7301-1308c-0, SC 7301-1136c-0, Taichung, SC 7301-1217c-0, SC 7301-1254-0, and Srogel. [PLH/EMS]

*0321 REP.SB-828
Wang, T.C. ; Tschanz, A.T. [Study on the relationship between sequential planting date of soybean and susceptibility of soybean rust (abst)]. PLANT PROTECTION BULLETIN (R.O.C.) v.22(4):438, 1980. [Ch Abst]

MEETING: Annual Meeting of the Plant Protection Society of the Republic of China, Taipei, Taiwan, ROC, Dec 13-14, 1980

The effect of planting date, growth stage, and environmental conditions on rust development was studied. From Sept. 1979 to Jan. 1980, later planting date showed earlier infection and slow development. During Jan., Feb. and June of 1980, the rust development showed the slowest growth. Under the same condition, the old plants had been infected seriously, while the rust developed slowly on the young ones. It indicated that the growth stage of a plant affected the rust development. Thus, in screening for rust resistance, the same growth stage and environmental conditions were required. [PLH]

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