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Development of Improved Varieties of Soybeans Supporting Cultural and Marketing Practices for Production in the Tropics and Information Delivery Systems

July 1, 1984 - March 31, 1985

IPR-85-1

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Annual Report of
Cooperative Agreement No. DAN-0560-A-00-4050-00
July 1, 1984 - March 31, 1985

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The U.S. Agency for International Development
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by
The University of Illinois at Urbana-Champaign
College of Agriculture
International Soybean Program, INTSOY
IPR-85-1

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PREFACE

1984 continued as a transition year for INTSOY. The bridging cooperative agreement covering the period July 1, 1984 through March 31, 1985 permitted a gradual shift of research emphasis from production in the old program, to processing and utilization in the new seven year cooperative agreement expected to take effect April 1, 1985.

The utilization program was fortunate to get Professor Emeritus A. I. Nelson to reestablish the INTSOY utilization program. USAID has funded a utilization component within INTSOY from 1973-1978. Since that time, a UNDP/CARE funded program in Sri Lanka permitted some activities to be carried out by INTSOY food scientists. Annual six week processing short courses were also held at UIUC on a self-supporting basis.

During the year, the pilot processing facility was moved from the south wing of the Horticulture Field Laboratory to the Dairy Manufactures Building (DMB) next to the new food science wing of the Agricultural Engineering Building. Although the DMB needs further remodeling, the soybean pilot processing plant has the potential to become a first rate facility.

The ISVEX variety trials, which have been the centerpiece of INTSOY's activities since 1973, will be conducted for the last time in 1985. During the 12 years since inception, scientists in 132 countries have participated in the program by conducting these trials. The International Soybean Observational Trial (ISOT) will also be phased out in 1985.

Since other organizations are increasing their production research in the tropics, decisions were made during the year to phase out the microbiology program in Taiwan (August 20, 1985) and the breeding program in Colombia (early 1986).

During the past year progress has been made in obtaining "buy-ins" to supplement INTSOY activities. Outside funding from USAID/USDA helped INTSOY join with the Sri Lankan government to conduct a successful soybean utilization workshop for 28 people from 12 Asian and African countries in January. A grant from the USAID Mission in Islamabad, Pakistan funded a major share of a soybean technology training course in Islamabad in March. Scientists from AVRDC, IITA, IADS, and NIFTAL also participated. The USAID Mission in Georgetown, Guyana supported an end of project evaluation by the INTSOY agronomist. FAO funded activities for several INTSOY staff members to conduct a training program in Turkey. USAID/Zambia and OICD funded travel for the plant pathologist to visit Zambia and Zimbabwe to undertake collaborative research on the serious African disease Pyrenochaeta. IBPGR continued to fund the development of a world soybean germplasm directory.

STATISTICAL SUMMARY

1. Project Title and Contract Number: Development of Improved Varieties of Soybeans--DAN-0560-A-00-4050-00.

2. Principal Investigator, Contractor, and mailing address:

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3. Contract Period: July 1, 1984-March 31, 1985

4. Period Covered by Report: July 1, 1984-March 31, 1985

5. Total AID Funding of Contract to March 31, 1985: $555,694.02*

6. Total Expenditures for Report Period: $555,694.02*

* Provisional amount as final statement was not complete when this was printed.

NARRATIVE SUMMARY

Improved Soyfoods Processing Techniques. During the period of this Cooperative Agreement the food utilization section reestablished activities which were suspended eight years ago when funding for utilization work was eliminated from the contract.

The new program objectives are directed towards developing soy products in the following four areas:

1. Soy beverages
2. Extrusion cooking
3. Simple oil extraction process
4. Village and home level processing

In spite of a major share of the time spent in moving the pilot processing plant laboratory to a new location, significant progress was made on the development of an improved soymilk process and extrusion cooking. Insta-Pro International of Des Moines, Iowa donated an Insta-Pro Model 2000R extruder to INTSOY for the research on extruded soyfoods.

INTSOY Food Science staff continued to receive many inquiries about establishing soybean processing activities in less developed countries. The soybean utilization workshop sponsored jointly with the Government of Sri Lanka was highly successful. Scientists from 12 countries in Asia and Africa participated. Progress was also made in developing a collaborative program with the International Institute of Tropical Agriculture in joint research and development activities in Africa.

Improved Genetic Materials. From INTSOY headquarters at UIUC in 1984, 210 ISVEX 1984 trials were distributed. One hundred and ten were Group A sent to 58 tropical countries, 61 were Group B sent to 38 subtropical countries, and 39 were Group C sent to 21 temperate countries.

The International Soybean Observational Trial (ISOT) was initiated in 1984. Ninety tropical trials were dispatched to 50 countries and 42 temperate trials were sent to 25 countries.

The germplasm enhancement program conducted in Colombia in coordination with scientists at the ICA station in Palmira expanded its volume of tropical breeding material. Lines in the early and advanced generations were evaluated for a number of characteristics important to the tropics. A number of the breeding lines developed in Colombia will be entering the ISOT trial in 1985. The expanded hybridization work at Colombia served to speed up the combining of a number of traits essential for tropical adaptation. The program also filled special requests for segregating populations from cooperators in other countries.

A test was continued on seed longevity where seed was stored at a higher elevation-lower humidity area and at a coastal-high humidity area in Colombia. Seed stored at the high elevation maintained good viability after 11 months. In the coastal region only five varieties maintained some viability at the end of the sixth month.

Improved Rhizobium japonicum Technology for the Tropics. Progress was made in developing an inexpensive production method for small to medium quantities of legume inoculants by using 2 1/2 litre acid bottles. Enough inoculant was produced in each bottle to inoculate seed to plant .4 hectares.

Studies were continued on the effectiveness of fast-growing Rhizobium japonicum strains isolated from nodules collected in Vietnam. These results and cooperative studies with North Carolina State University indicated that the organisms were not "typical fast growers" similar to those found in the People's Republic of China. Research continued on the effect of the interaction between Rhizobium japonicum strains and Azobacter on soybean growth and on nodulation. Results indicate that the combinations of several strains of the Rhizobium and Azobacter significantly increased the number of nodules.

Improved Disease and Insect Control. The 1984 growing season culminated a three year cooperative epidemiological study in five states designed to determine tolerable rates of seed transmission due to soybean mosaic virus and to predict yield loss. The model correctly predicted early season disease buildup in 1983 and 1984 in Louisiana. However, for Georgia and Illinois, the model underestimated the number of source plants becoming available as the season progressed. Yield losses, in general, were not as high as predicted by the model in 1983; seed transmission rates, by contrast, fit well within the 95% confidence interval of the values predicted by the model in 1983. For all the states in 1984, the model predicted less than 1% seed transmission and between 1% and 5% yield loss. Now that the model has been thoroughly tested in three regions of the U.S., it is ready for testing in countries such as China, where the aphids colonize on soybeans.

Studies continued on the effect of pubescent quality on aphid probing behavior and subsequent transmission of SMV. In field experiments, varieties with pubescent type leaves tended to have lower virus infection early in the season, but due to very heavy insect migration, the resistance was quickly overcome. The probing time was longer for aphid species on varieties with highly dense hair.

Research continued on diseased seed and seed quality and the assessment of factors influencing them. Pathohistological studies further elucidated the host parasite relationship of four major fungal pathogens in soybean seed tissue. Several species of Colletotrichum were shown to be involved in soybean anthracnose.

In Zambia, studies on pyrenocheata leaf spot indicated that spread and yield loss estimates ranged from 13% to 23%. Progress was made on identifying control measures through chemical control, but no commercial cultivars were found with a high level of resistance.

A number of experiments on the improved control of seedborne pathogens were pursued. Dipping of the basal soybean stem in the dessicant herbicide Paraquat induced the expression of latent infection by Macrophomina phaseolina. Corn, palm, soybean, and sunflower oils heated to a temperature of approximately 90° significantly reduced the recovery of the seedborne pathogen Phomopsis. Germination was not affected if treatment lasted less than 2.5 minutes.

REPORT OF PROGRESS

GOALS

The goals of the project are to improve soybean research and to increase utilization of soybeans for food use by rural and urban poor in tropical and subtropical LDCs so small-scale producers and consumers can benefit.

APPROACH

The work under this contract will continue the multi-disciplinary interinstitutional INTSOY approach. Work will be conducted at the UIUC, Centro Internacional de Agricultura Tropical (CIAT) in Colombia and the Asian Vegetable Research and Development Center (AVRDC) in Taiwan and coordinated through regional networks cooperatively with AVRDC, the International Institute of Tropical Agriculture (IITA) and the International Rice Research Institute (IRRI).

OBJECTIVES

The four major objectives, or outputs, are:

1. Develop and refine methods to process a range of soy products and assist regional and national programs to develop soyfood research and development programs.
2. Develop and test improved genetic materials for use in LDCs and assist them in strengthening national soybean improvement programs.
3. Develop improved technology for *Rhizobium japonicum* production and management under tropical conditions.
4. Conduct research on biology, ecology and epidemiology of selected disease organisms and insects to help develop improved integrated control measures.

RESEARCH RESULTS: DEVELOP AND REFINE METHODS TO PROCESS A RANGE OF SOYBEAN PRODUCTS

BACKGROUND

The University of Illinois' involvement in commercial utilization of whole soybean foods was started in a very limited manner in 1970.

Research and development activities on the use of whole soybeans in final products in the U.S. was also very limited. Utilization research of whole soybean foods was restricted towards the development of liquid soy milk or beverage at Cornell University and a dry (powdered) soy beverage at the Northern Regional Laboratory (USDA) at Peoria, Illinois.

A small but determined number of University of Illinois staff were keenly interested in developing an international soybean program in the late 1960's. This group was convinced that a whole soybean utilization component was critically needed. The Department of Food Science first tried processing soybeans in a manner similar to that used for other seeds and for garden beans (Phaseolus) Although this approach worked well, it required careful control of the following three activities:

1. Inactiviation of lipoxygenase enzyme (with heat) before it is allowed to develop off-flavor and off-odor.
2. Destruction of all anti-nutritional agents (with heat) during processing of whole (raw) soybeans.
3. Tenderization of soybean tissue to the extent required for the specific human products.

Focus of the New INTSOY Utilization Program. INTSOY is mounting a three phase soybean utilization program. First, research is being undertaken at UIUC to develop new soy products and processes. In the second phase, simple "how-to" manuals and equipment lists for LDC entrepreneurs interested in investing in production of soy products will be prepared; and thirdly, INTSOY will undertake limited on-site technical assistance in soybean utilization for governments and private firms.

The product development work at UIUC is focusing on five products:

1. A simple, relatively low cost process to produce a high quality soy milk which has no patent restrictions. The aim is both to develop an acceptable product and to refine and spell out the details of making that product competitively in an LDC situation. This includes specifying equipment needs, and installation and operating procedures.

2. A combination of soybean/grain, soybean/vegetable, or soybean/fruit products, with and without nutritional additives, produced by extrusion cooking. This can be processed foods, such as weaning or breakfast foods, soups, or products such as soy flour which can be sold in bulk and used as additives in breads or other commonly consumed items.

3. A low-cost village or town level oil extraction process using a continuous expeller which will allow farmers to partially remove oil from their soybeans, thus creating a higher market value product. It is hoped that

about one half of the oil can be removed by a continually operated expeller with little or no damage to the expeller cake. The cake can then be used equally as well as whole soybeans in soy/grain products produced by extrusion cooking as described above. This procedure, if successful, will enhance the total economic value of soybeans in LDCs.

4. To continue to refine village and home level processes for preparing soybean dishes for home consumption. These concepts include: (a) short cooking periods to conserve fuel and save householders' time; (b) inactivation of the lipoxygenase enzyme in the soybean before the enzyme is able to produce an "off-flavor", (c) inactivation of all anti-nutritional factors; and (d) proper tenderization of soy tissue by the addition of low concentrations of sodium biocarbonate in the blanch or cooking water. These aims can be achieved relatively simply by breaking dry soybeans into bits before cooking and by quickly applying high heat; by dropping the broken beans into boiling water containing low concentrations of sodium biocarbonate. This procedure produces a bland, rich tasting soy product that can be blended with essentially all national or local foods so that while the nutritional content of the local dish is enhanced the product retains its accepted local flavor.

5. To combine work by UIUC food and animal scientists to develop simple processes for converting soybean residues with other ingredients into animal feed. Almost without exception, processing agricultural products for human foods yields co-products with substantial value as feedstuffs for livestock. Unfortunately, co-products are seldom fully utilized unless an effort is made first, to establish their nutrient content; and second, to demonstrate the most effective approach for incorporating these materials into animal diets. The soybean extrusion component of this project (item 2 above) will yield co-products which have not been evaluated either by laboratory analysis or animal growth trials.

As products are developed, INTSOY will give increasing attention to their extension into countries overseas. INTSOY will work closely with the utilization expert at IITA who will begin to tailor INTSOY and other soy products to specific African situations. In addition to responding to correspondence, INTSOY food scientists will be available for consulting with missions, host governments, and private entrepreneurs on establishing soyfood producing operations and utilization programs in developing countries. These types of programs can range from a single operation (e.g. a businessman who wants to establish a soy milk or weaning food plant) to a broad country program to promote the use of soybeans at several levels such as Sri Lanka has been engaged in since 1978.

RESEARCH RESULTS: DEVELOPMENT OF IMPROVED GENETIC MATERIALS

J. A. Jackobs, Luis Camacho

The INTSOY soybean cultivar improvement program continues to focus on two complementary operations - cultivar testing and germplasm enhancement. Cultivar screening and breeding work is conducted at a tropical site. From 1973-1983 this site was at the Isabela Sub-Experiment Station in Puerto Rico in cooperation with the University of Puerto Rico, Mayaguez Campus. In 1983, the breeding work was moved to Cali, Colombia, to the Insitutuo Colombiano Agropecuario (ICA). Cultivar evaluation work is accomplished through a series of international cultivar trials in cooperation with soybean workers in approximately 117 countries. These trials are coordinated from the Department of Agronomy at the University of Illinois at Urbana-Champaign. In 1984, seed increases are being made in Texas and Colombia.

Cultivar Testing The genetic improvement program is directed to the development of cultivars demonstrating adaptation to tropical and subtropical environments. Scientists from various national and international programs nominate their best varieties and breeding materials to the cultivar trials. Such cultivars must exhibit high, stable yields, satisfactory photoperiod responses, broad ecological adaptability,and resistance or tolerance to disease pathogens, insect pests, and problem soils. Scientists affiliated with international, national, and private research organizations then utilize this advanced soybean germplasm for their research or cultivar production programs.

INTSOY has two main research trials: the International Soybean Observation Trial (ISOT) and the International Soybean Variety Evaluation Experiment (ISVEX). The methodology involved and the research objectives inherent to ISOT and ISVEX have been detailed elsewhere. The 1984 cooperators are listed in Appendix I.

ISOT. Cultivars developed by various international programs have improved performance in the trials as cultivar development programs in the tropics and subtropics continue to expand.

In 1984, one hundred and forty-two observational ISOT trials were distributed to 75 countries (Appendix I). Forty-seven soybean breeders from 18 countries contributed 264 cultivars for these trials. The results from these trials are just being received, but it is evident that certain lines are being selected for further testing. For example, Dr. Ramli Bin Mohd Noor, Head, Field Crops Branch, Mardi, Malaysia, said that he appreciated the opportunity to select lines for his trials rather than to have INTSOY select them in trials conducted elsewhere in the world.

ISVEX. Large scale evaluation and cultivar distribution are accomplished through the ISVEX program according to the classification shown in Table 1. Two hundred and ten ISVEX 1984 trials were distributed to 117 countries. One hundred and ten were group A sent to 58 tropical countries, 61 were group B sent to 38 subtropical countries and 39 were group C sent to 21 temperate countries. A summary of the ISVEX composition from 1973 through 1983 is given in Table 2.

ISVEX 1983 results have been analyzed and the report is about to be printed. Individual analyses have been returned to the cooperating scientists.

Table 1. ISVEX Zones and Groups

	Latitude							
	0-10°		10-20°		20-30°		30-40°	
	Zone	Group	Zone	Group	Zone	Group	Zone	Group
0-500 m	I	A	IV	A	VII	B	X	B
5,000-1,000 m	II	A	V	B	VIII	B	XI	C
1,000-2,000 m	III	B	VI	B	IX	B	XII	C
2,000 m	XII	C	XII	C	XII	C	XII	C

Tropical Group A cultivars includes cultivars of maturity group classification VI through X or greater. Subtropical Group B cultivars includes cultivars of maturity group classification IV through VII. Group C cultivars includes cultivars of maturity group classification 00 through V. ISOT trials.

Table 2. ISVEX Composition from 1973 to 1984

Item	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Trials	90	136	359	292	179	177	151	166	183	179	150	210
Countries	28	40	67	65	71	81	67	71	75	82	74	11
New Countries	28	20	28	13	8	10	5	4	6	2	7	4
Cooperators	49	68	106	105	94	118	101	110	155	124	112	14
Cultivars	20	15	25	26	28	36	38	47	38	39	51	42
New Cultivars	---	3	13	6	4	18	2	26	5	10	18	18

Total of 131 countries have evaluated ISVEX.

ISVEX 1982 was analyzed and published in December 1984. Of the 180 trials dispatched to 81 countries, results of 77 trials from 47 countries were returned and analyzed. These locations were from 18 countries in Africa, 9 in Asia, 6 in South America, 5 in Meso America, 9 in Europe, the Middle East, North America and Oceania.

Table 3 summarizes the performance characteristics of the 39 cultivars which were included in 8 or more trials.

The top three yielders in the various groups are as follows:

Group A -	1)	Siatsa 194	2,040 kg/ha
	2)	ICA L-124	1,976 kg/ha
	3)	UFV-1	1,974 kg/ha
Group B -	1)	Davis	1,875 kg/ha
	2)	PK-73-94	1,827 kg/ha
	3)	Essex	1,790 kg/ha
Group C -	1)	Essex	3,162 kg/ha
	2)	Amcor	2,648 kg/ha
	3)	Kent	2,642 kg/ha

IITA/INTSOY Promiscuous Nodulation Experiment. A promiscuous nodulation experiment was initiated in 1983 collaboratively with IITA to study the efficiency of nodulation of selected soybean cultivars with indigenous strains. Seed of nine lines supplied by IITA was increased in Puerto Rico in the winter of 1982-83. Seed for 29 promiscuous nodulation trials was sent to 21 countries throughout the world. Results are still being received and will be analyzed in 1985.

Table 3. PERFORMANCE CHARACTERISTICS[a] OF ISVEX SOYBEAN CULTIVARS - 1982

Cultivar	Group[b]	Yield (kg/ha)	Days to maturity	Plant height (cm)	Pod height (cm)	Weight per 100 seeds (g)	Percent germ.
ICA L-125	A	1,615	118.1	85.4	14.3	12.9	71.3
IGH 24	A	1,712	116.7	73.5	14.6	14.4	70.8
IGH 23	A	1,608	114.3	72.4	15.7	16.0	87.3
ICA L-109	A	1,682	113.1	69.8	12.1	11.4	72.0
Jupiter	A	1,761	111.3	66.4	13.6	16.5	67.5
Jupiter	B	1,318	139.7	94.0	16.0	15.9	65.9
71-38	A	1,741	108.9	43.8	9.4	11.7	89.7
SIATSA 194	A	2,009	108.7	84.6	15.7	18.4	73.8
SIATSA 194	B	1,342	138.1	113.6	15.2	17.3	75.6
Alamo	A	1,812	108.4	54.4	11.2	14.4	74.1
Alamo	B	1,406	137.1	73.5	13.6	14.1	68.9
ISRA/IRAT 44A/73	A	1,744	107.4	60.1	11.7	13.0	109.0
UFV-1	A	1,965	107.1	45.8	9.7	15.0	85.6
Ecuador 2	A	1,875	107.1	54.9	11.9	15.6	66.3
ICA L-124	A	1,940	104.2	54.0	11.2	18.9	70.5
ICA L-124	B	1,681	127.7	72.1	11.0	18.8	81.5
Improved Pelican	A	1,805	101.2	72.9	12.4	13.6	77.3
Davis	A	1,885	98.7	34.8	6.7	16.9	63.6
Davis	B	1,971	118.1	53.4	9.0	17.1	75.1
Bossier	A	1,649	98.7	34.8	6.7	16.9	63.6
Bossier	B	1,621	118.0	45.3	8.2	17.2	82.7
Foster	A	1,511	92.5	33.2	7.3	15.5	63.1
Foster	B	1,739	116.2	47.4	9.2	15.5	70.2
Williams 82	A	1,732	91.0	44.0	8.2	18.4	66.6
Williams 82	B	1,870	104.3	51.4	7.9	17.4	67.3
Williams 82	C	2,604	112.8	85.5	12.2	17.8	84.6
G 2120	B	1,186	135.8	114.5	15.3	8.5	76.8
Ecuador 1	B	1,541	134.5	79.5	12.9	16.8	68.5
HM-1	B	1,813	128.0	67.6	12.3	18.5	76.1
PK-73-94	B	1,984	123.1	55.5	10.2	15.4	74.3

Table 3. PERFORMANCE CHARACTERISTICS[a] OF ISVEX SOYBEAN CULTIVARS 1982 (cont'd)

Cultivar	Group[b]	Yield (kg/ha)	Days to maturity	Plant height (cm)	Pod height (cm)	Weight per 100 seeds (g)	Percent germ.
PK-73-86	B	2,100	122.4	61.6	11.5	15.3	85.8
CEP 7717	B	1,882	118.8	64.5	11.6	14.0	86.1
Braxton	B	1,649	118.7	52.6	9.6	18.7	74.7
Essex	B	1,906	115.2	44.6	8.6	15.7	68.0
Essex	C	3,162	128.7	90.7	16.0	16.2	91.4
Crawford	B	1,907	107.1	58.2	8.1	16.6	68.2C
Crawford	C	2,620	119.2	100.9	15.5	17.2	91.3
Kent	C	2,642	118.2	92.5	14.9	18.7	88.9
Sparks	C	2,530	117.0	96.5	14.1	18.3	79.5
Pixie	C	2,426	115.1	53.7	10.0	17.9	95.3
Pella	C	2,558	112.4	83.9	13.0	19.8	77.1
Fayette	C	2,618	112.2	91.2	13.1	17.1	82.4
Century	C	2,485	109.6	75.6	12.4	17.7	81.2
AMCOR	C	2,648	108.3	79.0	11.2	17.3	83.0
Corsoy 79	C	2,408	108.0	72.1	10.1	16.4	79.3
Hardin	C	2,251	106.7	70.6	10.1	16.2	74.1
Lakota	C	2,430	103.0	81.7	11.1	15.9	71.5
Hodgson 78	C	1,972	102.4	66.7	9.9	17.1	77.0
Evans	C	2,021	99.5	57.8	9.5	15.6	68.2
Clay	C	1,820	98.4	49.0	8.8	16.7	64.5

[a] Performance characteristic values given are the mean of adjusted values (y where: y = observed value x (mean of checks over all locations/mean of checks at given location)

[b] Group A was sent to tropical, B to semitropical, and C to temperate zones. Comparisons should be made only within each group.

Agronomic and Seed Longevity Evaluations of International Germplasm.
SIEVE, SPOT and ISVEX For several years the ICA grain legume program has cooperated with INTSOY in the evaluation of soybean germplasm. Data on one SIEVE trial with 50 entries were assembled in Palmira at the end of the first growing season of 1984. The germplasm studied in this trial came from from 14 countries which included Australia, Bangladesh, Brazil, Colombia, India, Mexico, Nigeria, Spain, Taiwan, Thailand, USA, Venezuela, Vietnam, and Zimbabwe. The experiment was planted in single row plots with two replications and data were recorded on flowering date, plant maturity, plant height, lodging, and yield. Table 4 shows the minimum, maximum and average values for each of the traits measured in the cultivars of this experiment.

Table 4. Variability Range of Agronomic Traits of SIEVE Cultivars in Palmira During the First Growing Season of 1984

Characteristic	Minimum	Maximum	Average
Days to flower	28	47	34
Days to maturity	84	103	91
Plant height, cm	13	61	36
Lodging score L	1	5	1.5
Yield, Kg/ha	434	2450	1680

L 1 = all plants erect; 5 = most plants lodged

As expected in any SIEVE trial, the amount of genetic variation in this one was considerably large; any soybean breeding program in the tropics or subtropics could profitably use this variation. The earliest maturing genotypes came from Spain and the more late maturing ones came from Nigeria, Colombia, and Brazil. Plant height in some cultivars from Brazil, Mexico, and U.S. was extremely short.

A new SIEVE experiment was planted in two environments in Colombia during the second growing season of 1984. One of the locations was Palmira at elevation of 1080 m and latitude of 30°30'N; the other location was Motilonia at elevation of 130 m and latitude of 10°2'N. Plots had not been harvested at the time of preparing this report; therefore results will be reported at a later date. The number of entries included in this SIEVE was 175 with nominations from INTSOY, IITA, AVRDC, Australia, Bangladesh, Colombia, Brazil, India, Mexico, Nigeria, Spain, Thailand, Uganda, USA, Vietnam, and Zimbabwe. The main contributors in terms of number of entries were INTSOY with 36% of the entries, USA programs with 17%, AVRDC with 13%, and IITA with 11% of the entries.

The SPOT experiment was also planted in collaboration with the ICA grain legume program at two locations. Palmira at latitude of 3°30'N and evaluation of 1080 m and Nataima at latitude of 4°12'N and elevation of 481 m. Although the trials were harvested in January, 1984 the data became available to INTSOY after July of the same year, hence the reason for including the information on this report. There were 24 entries originated in Colombia, Brazil, Mexico, India, Senegal, Sri Lanka, USA, INTSOY, and AVRDC. Information on agronomic traits and yield performance at each location is presented in Table 5. Differences in yield among entries were significant at each location, but on the average the entries yielded 40 percent more in Natima. The high yielders at this location were also good yielders in Palmira. This tendency was expressed in all the INTSOY lines, which indicates the potential of these materials for adaptation in different environments. Other materials

Table 5. Agronomic Traits of SPOT Materials at Two Environments in Colombia: Nataima (4°12'N, 481m), and Palmira (3°30'N, 1080m)

Cultivar or line	Origin	NATAIMA Maturity (days)	NATAIMA Height (cm)	NATAIMA Yield (kg/ha)	PALMIRA Maturity (days)	PALMIRA Height (cm)	PALMIRA Yield (kg/ha)
Supreme USA	USA	105	39	4625	92	43	2583
PR 142 (3)	INTSOY	101	46	4115	91	44	2354
PR 21 (339)	INTSOY	98	50	4025	92	52	2160
PR (309)	INTSOY	109	43	3907	97	58	2292
ISRA IRAT 26/72	Senegal	105	49	3879	94	45	2222
ICAL-131	Colombia	88	69	3815	89	51	2354
Jupiter R	USA	100	45	3808	98	61	2528
PR 141 (9)	INTSOY	99	46	3744	91	50	2396
Jupiter	USA	108	51	3559	98	59	2035
PR 13 (114)	INTSOY	93	66	3456	92	56	2451
PM-78-2-5-25	Sri Lanka	97	41	3421	90	36	2146
UFV-1	Brazil	89	28	3274	90	27	2375
KHSB-2	India	95	32	3233	93	41	2014
PM-78-8-5-19	Sri Lanka	92	78	3149	89	49	2090
Davis	USA	84	22	2697	87	24	1986
ICA L-132	Colombia	88	55	2659	91	50	2257
Sanalona 77	Mexico	85	26	2515	90	25	1778
Crawford	USA	83	39	2187	85	37	1827
Santa Rosa R	Brazil	104	30	2180	89	27	2098
IPB 204-77	Brazil	82	26	2079	88	32	2104
AGS-162	AVRDC	101	38	2074	90	43	2035
AGS-154	AVRDC	86	42	2018	88	48	2347
Braxton	USA	87	26	1715	90	23	1416
269/5/3/2	Bangladesh	84	25	1459	94	31	1889
Mean		94	42	3066	91	42	2148
C.V.%		8	19	17	1	10	15
LSD. 0.05		12	14	851	1	7	515

showing good stability, although not high yield, were the on coming from Brazil and from AVRDC. Plant height on the average was similar at both locations although tall varieties at Nataima did not grow as tall at Palmira. Plant maturity was slightly longer but more variable in Nataima than in Palmira. A correlation between the two locations on plant height, plant maturity, and yield gave coefficients of 0.05, 0.75 and 0.69, respectively, indicating that if environmental differences remain constant between the two locations, research results on plant growth in one location could be applied in the other.

The ISVEX trial was also planted in Palmira during the first growing season of 1984. The germplasm studied in this experiment originated in soybean progams of Brazil, Colombia, Panama, Peru, Taiwan, USA, and Zimbabwe. Table 6 shows cultivar identification, origin, and some agronomic traits of the materials of this trial.

Results of the ISVEX trial show that high yields can be obtained in tropical environments with selected genotypes of intermediate maturity and intermediate plant height. Late and tall maturing cultivars like Baru may express high yield in environments with optimum moisture conditions, but in areas of short duration rains, the yield of this variety may not be as high as the more early and short varieties. Some of these cultivars, including Baru, have been selected as parents for the hybridization program being carried by INTSOY at the ICA station in Palmira.

Table 6. Origin and Average Values of Some Agronomic Traits of the ISVEX Cultivars Studied in Palmira During the First Season of 1984

Cultivar or Line	Origin	Maturity (days)	Plant Height (cm)	Yield kg/ha
UFV-1	Brazil	94	46	3920
ICA-L-129	Colombia	96	75	3590
Jupiter R	USA	102	82	3549
IAC-73-5115	Brazil	103	77	3423
Duocrop	USA	93	63	3382
IAC-6	Brazil	110	74	3257
Tulumayo-2	Peru	95	69	3127
AGS-8	AVRDC	91	69	3123
Sable	Zimbabwe	89	62	3014
I. Pelican	USA	89	71	2768
F-75-9207	USA	103	40	2684
EGSY-91-7	Philippines	82	46	2376
Baru	Panama	116	124	2338
SH 1274	USA	84	62	1929
Braxton	USA	80	30	1687
Kirby		80	25	1390
Mean		93	63	2847
C.V. %		1	10	15
LSD 0.05		1	8	515

In addition to receiving germplasm for evaluation and distribution, INTSOY also cooperates in the testing programs of other institutions. During the past three years, INTSOY has collaborated with the University of Florida where Dr. Kuell Hinson

conducts research activities on tropical soybeans. During the second growing season of 1984, a replicated trial of 20 lines and four checks from Florida was planted at the ICA research station in Palmira. Agronomic data were not available at the time of preparing this report, but this material will be sent to both INTSOY and the University of Florida at the end of the growing season.

Evaluation of Seed Longevity. This experiment was initiated in Puerto Rico in 1983 and continued in Colombia in 1984 (see INTSOY report January 1, 1983 - June 30, 1984). Seeds of 49 entries for this experiment arrived in Palmira in February 1984 and were immediately placed on storage under ambient conditions. Plans were developed with ICA to conduct the seed storage experiment at Palmira and at Turipana; this latter location is on the northern coastal region of Colombia, and is more humid than Palmira. Consequently, half of the seed of each entry, including five entries nominated by ICA, was placed under ambient storage at each location. The germination test started in Palmira in March, 1984 and continued at intervals of two months, with seed still available at present for one or two more germination tests. At Turipana the germination tests started in May, 1984 and continued at one month intervals till November, 1984 when seed viability for all cultivars dropped to zero. The average germination percentages for all cultivars at each location is shown in Table 7.

As shown in Table 7, seed viability began to decline in Palmira after the fifth month of storage but still maintained good viability after 11 months of storage. At Turipana all entries maintained good seed viability during the first two months of storage but completely lost it after the sixth month of storage. Since the seed source was the same and the technique of the germination test was similar in both

Table 7. Average Percentage of Germination of 45 Soybean Entries and Average Temperature and Relative Humidity During the Testing Period at Two Environments

	Germination %		Average Temperature C		Relative Humidity %	
Month	Palmira	Turipana	Palmira	Turipana	Palmira	Turipana
March/84	97.6	-	23.4	-	75	-
April/84	-	-	22.9	-	80	-
May/84	97.5	94.3	22.7	26.8	79	82
June/84	-	94.4	22.8	27.0	78	83
July/84	94.2	86.6	22.6	24.7	76	86
August/84	-	66.1	23.4	24.5	75	84
September/84	91.4	15.9	22.5	26.8	77	84
October/84	-	11.2	22.4	26.6	79	82
November/84	89.8	0.0	22.0	26.4	76	90
December/84	-	-	23.3	-	76	-
January/85	79.1	-	-	-	-	-

locations (paper towels were used) the seed viability differences can be attributed to difference in temperature and relative humidity between the two sites. In spite of the fast decline in germination power at Turipana, a group of five cultivars retained some viability at the end of the sixth month; the average germination obtained in October (11.2) is given by the average of the surviving cultivars MTD-10 (19%), TGM 737 (18%), PR 83 (7%), OM-78-6-5-13 (5%) and TGX-252-71-C (7%). At Palmira, after 11 months of storage these cultivars show a range germination between

81 and 96 percent but other cultivars are about equal or better at this location. A more complete report of the results in Palmira together with statistical interpretations will be provided at the end of the experimental cycle. One can conclude from this experiment that (a) high soybean seed viability can be achieved and maintained if seed lots can be harvested at the proper plant maturity; (b) initial high seed viability can be maintained at least during two growing seasons in the tropics if the seed is stored in environments similar to the one found in Palmira (Table 4); (c) at high temperatures and high relative humidity, as in Turipana, soybean seeds should not be stored for more than three months; and (d) some cultivars or lines may be found with superior seed storability.

Hybridization and Germplasm Improvement. Breeding materials in the F2, F3, F4, and F5 generations were brought from Puerto Rico and planted at the ICA research station in Palmira, Colombia in March, 1984. All these materials were advanced one generation during the March-July growing season and again during the October/84--January/85 growing season. From Puerto Rico we also brought and planted in Palmira a group of advanced generation lines developed by INTSOY at Isabela, and a sample of breeding lines donated by the North American Plant Breeders (NAPB) seed company. Lines in the F5 and advanced generations were evaluated in regard to flowering, maturity, plant height, phenotypic score (comparison with a check), and disease reaction (bacterial pustule, bacterial blight, downy mildew, cercospora leaf spot, and soybean mosaic virus), and a group of 183 of them were selected at the end of the first season to be tested in replicated trials during the second growing season (Oct. 84-Jan. 85). Harvesting and data analysis on these and other breeding lines will be completed at the end of January/85 and therefore yield performance and agronomic characteristics cannot be included in this report. It is anticipated, however, that a large number of these lines will enter the new ISOT trial in 1985 and thus will be distributed among INTSOY cooperators in other countries.

In addition to the Puerto Rican materials, the project also developed new breeding populations through hybridizations accomplished during the reporting period. Table 8 gives details on the new breeding work and the handling of segregating and other breeding materials introduced from Puerto Rico.

Table 8. Breeding Materials Developed and/or Tested by INTSOY in Collaboratin with ICA and CIAT in the Period March '84 to January '85.

Generation	No. of Materials Advanced or Tested in Each Season			
	March-June	July-Sept.	Oct.-Jan. '85	Total
F1 crosses	72	15	92	179
F2 populations	67	56	15	138
F3 populations	27	-	115	142
F4 populations	83	-	27	110
F5 single rows	780	-	1516	2296
Lines in yield tests	-	-	183	183
Other lines in single rows	313	-	57	370
NABP lines (Brazil)	429	-	-	429

The new hybridization work was undertaken with the purpose of combining traits to develop lines with tropical adaptation, and to fill special requests for segregating populations from cooperators in other countries. One crossing plan attempts to combine the high yield potential found in temperate varieties with otner traits found in tropical varieties, in order to develop lines with intermediate plant maturity and high yield in tropical environments; a second plan is to hybridize elite materials from the ICA program with lines and cultivars selected from the international breeding nurseries of INTSOY, in order to develop new lines with wide adaptation. Breeding materials for these two plans are presently in the F2 and F3 generations. A third crossing plan was accomplished in Palmira to fill a request from colleagues in Turkey to provide hybrid populations from crosses among U.S. varieties adapted to northern latitudes. For this plan, a group of 13 varieties was chosen, and F2 seeds of 16 different crosses were obtained and sent to the Regional Agricultural Research Institute in Atalya, Turkey.

Seed Increases for International Trials. Being in the tropics and having two growing seasons, Palmira is an appropriate place to advance generations of breeding materials and to increase seeds of any cultivars for testing in cooperating countries. About one kg of seed of 60 to 100 INTSOY lines will be prepared and shipped to Illinois for the 1985 ISOT experiment. A total of 56 lines nominated by Florida and Brazil for ISOT are also being increased and will be available for shipping in February, 1985. Initial seed increases for the 1986 ISVEX entries are being harvested in Palmira in January, 1985. In total, about 200 kg of seed will be produced and shipped to Illinois at the end of the second growing season from the ICA research station in Palmira.

Development of Linkages and Supply of Breeding Nurseries. Since the start of the INTSOY breeding project in Colombia in collaboration with ICA and CIAT, several soybean researchers and institutions from the region and outside the region have requested information or expressed interest in opportunities for training or cooperative research. Likewise the project has provided special seed nurseries requested for specific production environments. The INTSOY breeder traveled to Vietnam sponsored by FAO to advise on the development of a soybean research program; he also traveled to El Salvador to advise on a basic grains production project. Information on soybean was provided to Guatemala, Costa Rica, Hondura, Peru, Venezuela, and Colombia.

The following seed nurseries were provided by the INTSOY project during the reporting period:

Honduras:	13 breeding lines and one cultivar
Venezuela:	77 breeding lines of intermediate and late maturity
Peru:	100 breeding lines of different plant maturity
Vietnam:	104 breeding lines of early maturity
St. Lucia:	13 breeding lines and three cultivars
P.R. of China:	4 cultivars
Turkey:	16 F2 populations
Colombia:	Nataima station: 6 F2 populations and 27 F4 populations
	Turipana station: 6 F2 populations, 27 F4 populations 103 F5 populations, 45 cultivators
	Motilonia station: 6 F2 populations, 12 F3 populations, 27 F4 populations, 58 F5 populations, and the 1984 M SIEVE experiment
	La Libertad Station: 421 NAPB lines, 177 populations in F3, F4, and F5, 10 promiscuous lines

RESEARCH RESULTS: SOIL MICROBIOLOGY

W. C. Stearn, Chen Lee-Ju

Addition of a Composting Component to the AVRDC Garden Program. The addition of organic matter to the soil has long been recognized as an essential component of any cropping system in order to maintain good soil tilth, release plant nutrients over the growing season, maximize yield, retain moisture, etc.

Realizing the importance of maintaining organic matter, especially in the tropics, a composting component was initiated in the Garden Program 3 years ago. It was eventually dropped primarily due to the amount of labor involved in turning the piles.

A modified sheet composting method was designed to eliminate the intensive labor requirement usually associated with more traditional composting methods. The compost/growing beds are constructed once and then maintained with the addition of household organic waste materials.

The objective of this project was to determine the feasibility, cost, water requirements and area of application of this type of sheet composting within the Home Garden Project Objectives.

The sheet compost/planting bed was designed as shown in the general model (Figure 1) with a specific carbon to nitrogen ratio (C:N) for each layer. The C:N ratio was formulated at 30, 14, and 60 to 1 for the bottom, middle and top layers, respectively.

Plant refuse was gathered from various disposal sites around the AVRDC facility. Chicken manure and rice hulls were purchased locally. Peanut hulls were gathered from local farmers. A listing of the gathered materials, amounts used, analysis of each material, carbon to nitrogen ration (C:N) by layers as well as a cost estimate are shown in Table 9.

Four 1.2 to 2 meter plots were marked off, hand tilled and raised beds formed. Normal fertility practices used by the garden project were applied to 2 diagonal plots (approxiamtely 5.5 kg of bagasse/plot) while the compost piles were layered as indicated in Table 9 and watered. An anlysis of the soil and bagasse amendment is shown in Table 10.

Tomato plants were planted in the ends of each plot followed by Chinese cabbage.

One of the main advantages of this type of planting bed is the fact that the nutrient status of the soil is not a critical factor. This type of bed also allows tremendous root penetration and proliferation thus allowing optimal nutrient feeding.

The compost/planting beds are providing all of the nutrients required for vigorous growth of both the tomato and Chinese cabbage plants. The check plots are showing nutrient deficiencies in tomato with less than optimal growth. There also appears to be more insect damage on tomato fruits from the control plots as compared to those harvested from the compost/planting bed plots.

Figure 1. General Model for Construction of Permanent Sheet Composting/Growing Bed Layers

General Plan for a Permanent Growing Bed

	Compost Covering Material
6" - 9"	Rice Hulls, Nut Shells, Seaweed/Seagrass, Leaf Mold, Cocoa Beans, Dry Straw (No Weeds), Bark Chips, Sawdust, Other Locally Available Materials.
	Short Term Decomposition
	Horse Stable Straw, Poultry Manure + Straw. Seaweed/ Seagrass, Leaf Mold, Leaves, Grass Clippings (No Weeds) Anything That Decomposes Rapidly.
	Long Term Decomposition
Cover Area	Cardboard, Wallboard, Newspaper, Old Cloth (Cotton), Thin Wood, Rotted Wood, Underfelt, Thin Carpet (Cotton or Wool). Any Organic Material That Decomposes Slowly.
	Nutrient Source Layer
Thin Layer	Chicken, Pig, Rabbit, or Cow Manure. Food Scraps, Coffee Grounds, Tea Leaves, Dolomite (Mg/Ca), Rock Phosphate, Blood and Bone Meal or Other Sources of Organic Nitrogen.

Table 9. Analysis of Raw Materials, C:N Ratio by Layer and Cost Estimate of Permanent Compost/Planting Bed Plots

Material	(kg)	Dry Wt. (%)	Nitrogen (%)	Phosphorus (%)	Potassium (%)	O.M.C:N Ratio
Bottom Layer						
Rock Phosphate	0.60	0.01	0.001	0.002	0.30	7250.00
Palm Leaves	3.06	0.79	0.27	0.29	75.00	73.70
Chicken Manure	6.84	2.69	7.18	2.22	35.71	21.56
Paper	0.04	0.04	0.01	0.02	82.79	1567.57
Cardboard	0.27	0.27	0.01	0.21	80.40	214.02
Straw	1.65	0.57	0.31	1.89	64.20	101.58
Subtotal	13.07			Layer C:N ratio		18.43
Middle Layer						
Straw	1.51	0.57	0.31	1.89	64.20	101.58
Dry Leaves	1.80	1.40	0.25	0.42	57.90	41.46
Chicken Manure	9.00	2.69	7.18	2.22	35.71	21.56
Mushroom Compost	12.85	0.67	0.40	0.53	16.50	86.05
Peanut Hulls	2.90	0.87	0.13	0.42	54.60	66.97
Subtotal	28.06			Layer C:N ratio		13.37
Top Layer						
Peanut Hulls	2.90	0.87	0.13	0.42	54.60	66.97
Soybean Trash	1.80	0.82	0.25	0.93	64.20	71.17
Rice Hulls	6.75	0.40	0.11	0.23	59.10	143.56
Subtotal		11.45		Layer C:N ratio		58.56
TOTAL		52.58				

Cost per 1.2 meter by 2 meter plot 90 NTD (2.25 USD).

Table 10. Soil Analysis of Control Garden Plot and Bagasse Amendment

	pH	% Ash	% O.M.	% N	% P	% K
Soil	7.54	96.65	1.36	0.71	0.01	0.01
Bagasse	7.58	69.48	20.70	1.26	1.38	0.65

Presently, we have stopped watering all plots and will determine the water holding capacity of the composting beds as compared to the check plots and their ability to supply water over a long period of time without watering.

Additional crops of sweet potato and vegetable soybean will be planted in the beds to maintain consistency with the Garden Projects crop rotation.

The concept of this type of growing bed is scientifically sound. Potential problem areas that will arise in trying to transfer this technology are seen in availability of enough organic material to build the initial growing beds and in providing enough water initially to have good breakdown of the organic material to form humus.

Another potential problem area is analysis of raw material. There is little information in the literature and few reference manuals with analysis of organic materials that can be used in any type of composting. Consequently, analysis of raw materials within a particular country would have to be done in order to determine meaningful carbon to nitrogen ratios.

The composting/planting bed concept, with reduced labor input, potentially reduce watering requirement due to the high organic matter content and the ability to plant high density crops year round appears to have tremendous potential in the Home Garden Program. The evaluation of this type of growing bed is in the early stages and overall conclusions cannot be made at this time.

Develop an Inexpensive Production Method for Producing Small to Medium Quantities of Legume Inoculant. Legume inoculants, in LDC's, are usually imported from Australia or the United States at 2-3 times their normal selling price. Some LDC's have initiated small pilot inoculant production plants, but in most cases the output and quality control are inadequate and storage facilities and distribution systems poor. If small to medium quantities of inoculant could be produced in legume growing regions and distributed for immediate use, many of the above mentioned problems would be solved as well as reducing the cost tremendously.

Empty laboratory acid type bottles (2-1/2 liters) were collected and cleaned. Two liters of liquid mannitol, yeast extract media was distributed in each of 6 bottles and sterilized.

Five ml of an actively growing culture of Rhizobium japonicum was inoculated in each of the 6 bottles. Two of the bottles were placed on a rotary shaker at 120 r.p.m. (standard), two were shaken 3 times per day and the last two remained stationary. All bottles were incubated at 28-30 degrees C. Estimates of the number of Rhizobium japonicum cells were determined by the plate count method 1, 3, 5, 7, and 9 days after the start of the experiment.

The first experiment became contaminated but it was obvious from the results that shaking 3 times per day did not provide adequate oxygen for rapid growth of Rhizobium japonicum cells.

The experiment was repeated with shaking 9 times per day. As can be seen in Figure 2, shaking 9 times per day still did not provide adequate oxygen for maximal growth.

The experiment was repeated twice more using an oxygen probe to determine the ideal oxygen potential. In both cases the experiment became contaminated due to the inability to adequately sterilize the probe.

A standard air pump, used for aeration of fish tanks, was purchased. Holes were drilled in a rubber stopper for glass tubing for incoming air to bubble through the media as well as exhaust from the bottle. A glass tube packed with cotton was placed between the air pump and the glass jars and on the exhaust tube

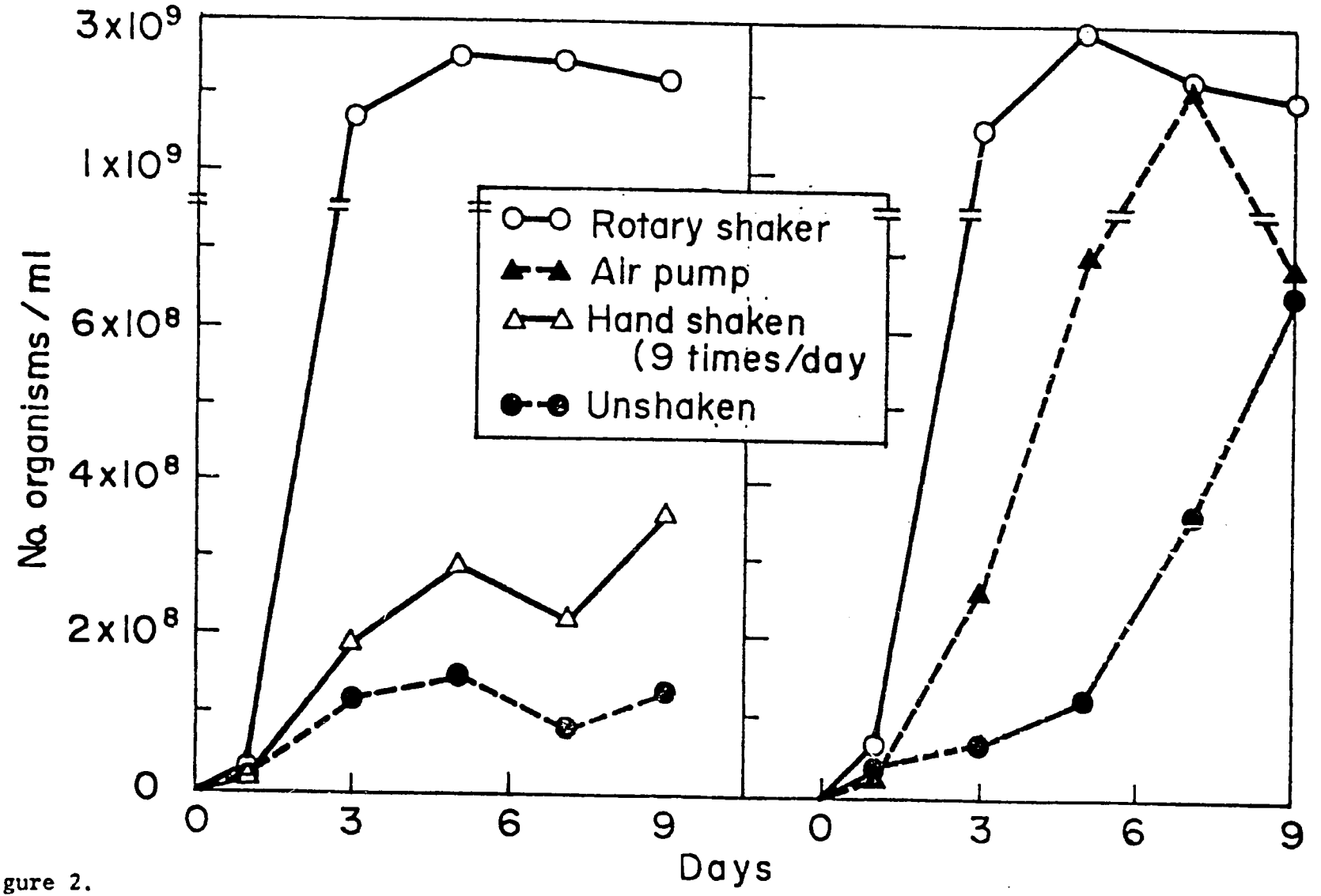


Figure 2.
Plate counts of Rhizobium Japonicum grown in liquid culture with various methods of aeration.

side to prevent contamination. The experiment was run again and the results presented in the second graph in Figure 2.

The Rhizobium japonicum growth curve was much better than hand shaking. The maximum number of cells was quite good but occurred 2 days after the control standard.

Part of the problem was the restriction of the cotton filter between the pump and the glass bottle. Further experiments are planned to reduce the restriction and increase the volume of air bubbling through the liquid media.

This method is viable for producing small to medium quantitites of inoculant. Considering the standard rate of application of inoculant to seed, the 2 liter volume would inoculate enough soybean seed to plant 0.4 hectare. Considering the dilution method proposed by NifTAL (Somasegaran and Halliday) the 2 liters could be diluted a thousand fold and inoculated into sterilized peat to produce enough inoculant to inoculate soybean seed for 384 hectares.

Most laboratories usually have a good supply of empty 2-1/2 liter glass bottles. The cost of the air pump was 120 NDT or approximately 3.00 USD. It appears that the necessary materials are not a problem. The methodology, however, needs refinement to the point where non-sterile conditions and non-technical personnel could produce a consistent, relatively pure culture of Rhizobium japonicum inoculant.

To Determine the Effectiveness of Fast Growing Rhizobium japonicum Strains Isolated from Nodules Collected in Vietnam. Fast growing Rhizobium japonicum have only been reported from the People's Republic of China (PRC). It has been reported that these strains will inoculate only soybean varieties indigenous to the PRC, e.g. variety Peking. Nodules were collected by Dr. Joseph A. Jackobs, INTSOY Agronomist, during a trip to Vietnam in 1982. Isolates of Rhizobium japonicum were made from these nodules and they appeared to be of the fast growing variety.

Pouch studies were conducted to determine the ability of the Vietnam isolates to nodulate with various varieties of soybean. Pouches are made with standard boilable plastic bags that are heat sealed on three sides. Paper wicks are made from paper towels and inserted into the bag. The pouches are placed in a wire rack half filled with 25 ml of a minus nitrogen nutrient solution and sterilized in an autoclave.

Seeds of the desired varieties are sterilized and sprouted on moistened filter paper.

Rhizobium japonicum strains are grown in liquid mannitol yeast extract media.

The sprouted seeds are placed in the sterilized pouches and then inoculated with 0.5 - 1.0 ml of the appropriate Rhizobium strain. The rack is then placed under fluorscent and incandescent lamps. The pouches are watered alternately with half-strength minus nitrogen solution or sterile water throughout the experiment.

The experiment usually lasts for 3-4 weeks, at which time the plants are harvested and the nodules counted. Re-isolation of the organisms can be made from these nodules.

Table 11 summarizes several pouch experiments looking at the soybean variety X *Rhizobium* strain interaction.

Table 11. Fast Growing Isolates of *Rhizobium japonicum* (ISP), Isolated from Nodules Collected in Vietnam and their Ability to Form Effective Nodules on Different Varieties of Soybean

ISP#	Cultivars* #1	#2	#3	#4	#5	#6	#7**	ISP#	Cultivars* #1	#2	#3	#4	#5	#6	#7**
11						r	c	29						r	c
12						r	c	30	x						
13						r		31	x					r	
14		x				r	c	32						r	
15							c	33	x		x				c
16		x				r	c	34							
17		x					c	35					x	r	
19		x				r	c	38				x		r	
20		x				r	c	39	x				x	r	
21	x						c	40	x				x	r	
22								41				x		r	
23	x							42	x			x		r	
24	x							43						r	
25								44	x		x			r	
26	x							45				x		r	
27	x		x					46		x				r	

*Cultivars: #1 = Peking (G4142) #3 = Alamo #5 = Jupiter
#2 + Peking (G4336) #4 = Hill #6 = Caribe

**Experiment done at North Carolina State University using Siratro.

x = Fast growing *Rhizobium* re-isolated from nodules.
r = Fast growing *Rhizobium* isolation from nodules being repeated.
c = Confirmed by NCSU but considered not similar to isolates from PRC.

Twelve percent of the strains tested only nodulated the variety Peking. Twelve percent of the strains showed no nodulation with any of the varieties tested. Thirty-six percent of the strains nodulated 2 varieties of soybean and 12% nodulated 3 varieties.

North Carolina State University also tested the Vietnam isolates using the pouch method and found that 33% effectively nodulated Siratro. They felt that the organisms were not similar to those found in the PRC and felt that they were not the "typical" fast growers. They are presently running growth chamber studies with different varieties of soybean.

Re-isolation of the organisms from nodules and plating on solid media showed good growth in 2 days which is typical of fast growing *Rhizobium* strains.

Further discussions with North Carolina State University as well as additional tests will be conducted to determine the status of the Vietnam isolates.

To Investigate the Affect of the Interaction Between Rhizobium japonicum Strains and Azotobacter spp. on Soybean Growth and Nodulation. Previous work has been done on the interaction of Rhizobium japonicum strains with Azotobacter spp. The work gave clear indications that with proper selection of Azotobacter spp., enhanced nodule number and plant growth could be realized under laboratory conditions.

Rhizobium japonicum strain 184 (R.J. 184) has shown good heat tolerance in greenhouse studies at North Carolina State University and would be a good strain to test under actual tropical conditions. It was therefore decided initially to test this strain against strains of Azotobacter that would enhance nodulation and plant growth as has been previously shown.

Pouch studies, as previously described, were conducted using 3 strains of Azotobacter alone and in combination with R. J. 184. Four cultivars of soybean (Alamo, Hill, Caribe, and Jupiter) were used to ascertain if variety was a factor in enhancing nodulation and plant growth.

Overall, there appeared to be problems of nodulation using the pouch technique. It was obvious from the elongation of the stems that light was also limiting considering the density of soybean plants. There were cases where one replication would be nodulated and another not.

There were some indications, however, that the combination of R. J. 184 and A. Beijerinckia in the presence of Alamo and Hill provided 3 times as many nodules as R. J. 184 alone. There appeared to be an increase in both dry shoot weight and root weight for both Hill and Alamo (31% and 36%, 47%, and 54%, respectively) above R. J. 184 alone. There appeared to be very little difference between nodule mass wet or dry.

It is felt that the pouch technique is not the best for this type of study, and that greenhouse studies utilizing Leonard jars would be much more satisfactory. Greenhouse space at AVRDC is very hard to obtain and in most cases contain large amounts of soil that would contaminate this type of experiment.

The results of this experiment are felt to be too variable to draw any valid conclusions. The indication of positive as well as negative influence of the interaction of Rhizobium x Azotobacter x Cultivar appear to be there but the methodology at present is not satisfactory.

RESEARCH RESULTS: IMPROVED DISEASE AND INSECT CONTROL: INSECTS

Michael E. Irwin, Gail E. Kampmeier, and U. B. Gunasinghe

Cooperative Studies on the Epidemiology of Soybean Mosaic Virus. The 1984 growing season culminated a three-year cooperative epidemiological study designed to determine tolerable rates of seed transmission due to soybean mosaic virus (SMV) and to predict yield loss. Both parameters are affected by initial infection rate, local vector species, timings and abundances. Georgia, Illinois and Louisiana remained in the project through the third year. Details of the justification and experimental design of this project appeared in IPR-84-1.

The "simple" model used in predicting the 1982 disease progress curves for each state was modified for the 1983 and 1984 seasons in an attempt to gain a better explanation of the variation observed in 1982. This "complex" model (Figures 4, 6, and 8) add biological information based on an hypothesis formulated from the 1982 Illinois Essex data, assuming a value, N, for the number of moves an aphid makes within a plot. When tested on the 1983 data, the model predicted early season disease build up well but overestimated late season disease incidence. This trend continued in 1984 in Louisiana. For Georgia and Illinois, however, the model underestimated the number of source plants becoming available as the season progressed.

Vector intensity (Figures 3, 5, and 7) (product of the number of aphid species groups landing per m2 on a given day and a coefficient particular to that species group), in Illinois (1983 and 1984) and Virginia (1983), was only about a tenth of that calculated in 1982. Georgia and Louisiana remained at about the same intensity throughout the project.

Yield loss estimates for 1983 were generally not as high as predicted by the model (Figure 7a). Observed seed transmission rates (Figure 7b), by contrast, fit well within the 95% confidence interval of the values predicted by the model in 1983, although observed values never exceeded those predicted. For all states in 1984, the model predicts less than one percent seed transmission and between about one and five percent yield loss in the 2.5% inoculated plots. Seed transmission in plots replanted from the previous year's seed was reduced to zero in all states by the third year of the project.

The model has been thoroughly tested in three areas of the United States. It is now ready to test in selected countries around the world. We would like to see the effect on the model of spread in an area where the vectors colonize the crop (E. Asia) and where wild soybean species can act as natural reservoirs of the virus. Thus, we hope to initiate two trials in China and perhaps a couple more in S. Asia, Africa, and Latin America. Plans are now underway to initiate this trial series.

Effect of Pubescence Quality on Aphid Probing Behavior and Subsequent Spread of SMV. As stated in IPR-84-1, the probing behavior of aphids appears to be influenced by plant pubescent type. Both laboratory and field experiments were conducted in 1984 to further investigate this phenomenon.

A field experiment similar to the one conducted in 1983 was set out in central Illinois in 1984. Soybean (Clark) isolines (dense, semi-sparse, appressed, glabrous and Clark normal) differed somewhat from those planted the previous year due to availability of seed. Total aphid landing rates were similar throughout the season for all isolines. But unfortunately, only the

1983 SMV MULTISTATE 2.5% INOCULATED
Complex Inoculation Model

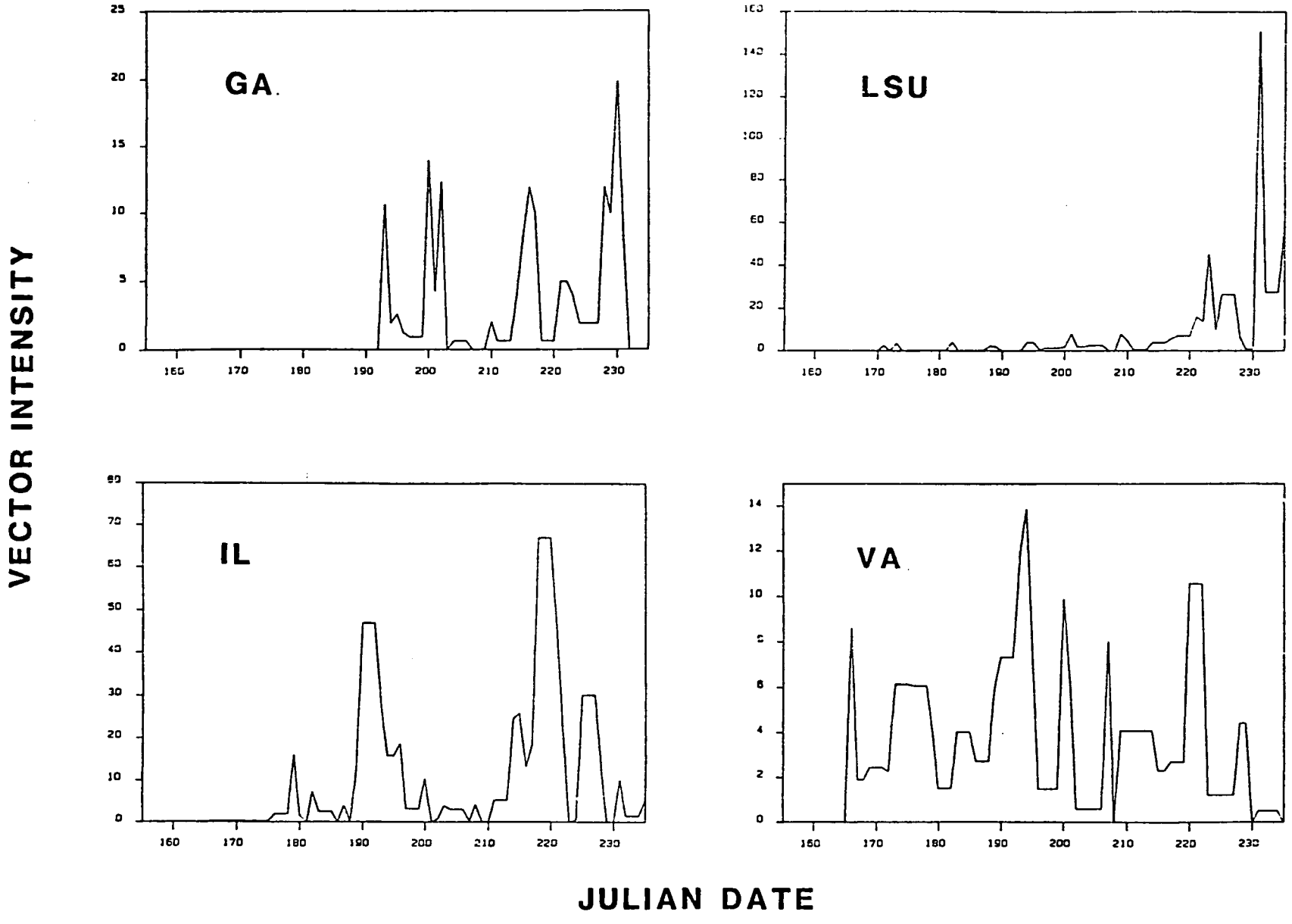


FIGURE 3

1983 SMV MULTISTATE 2.5% INOCULATED
Complex Inoculation Model

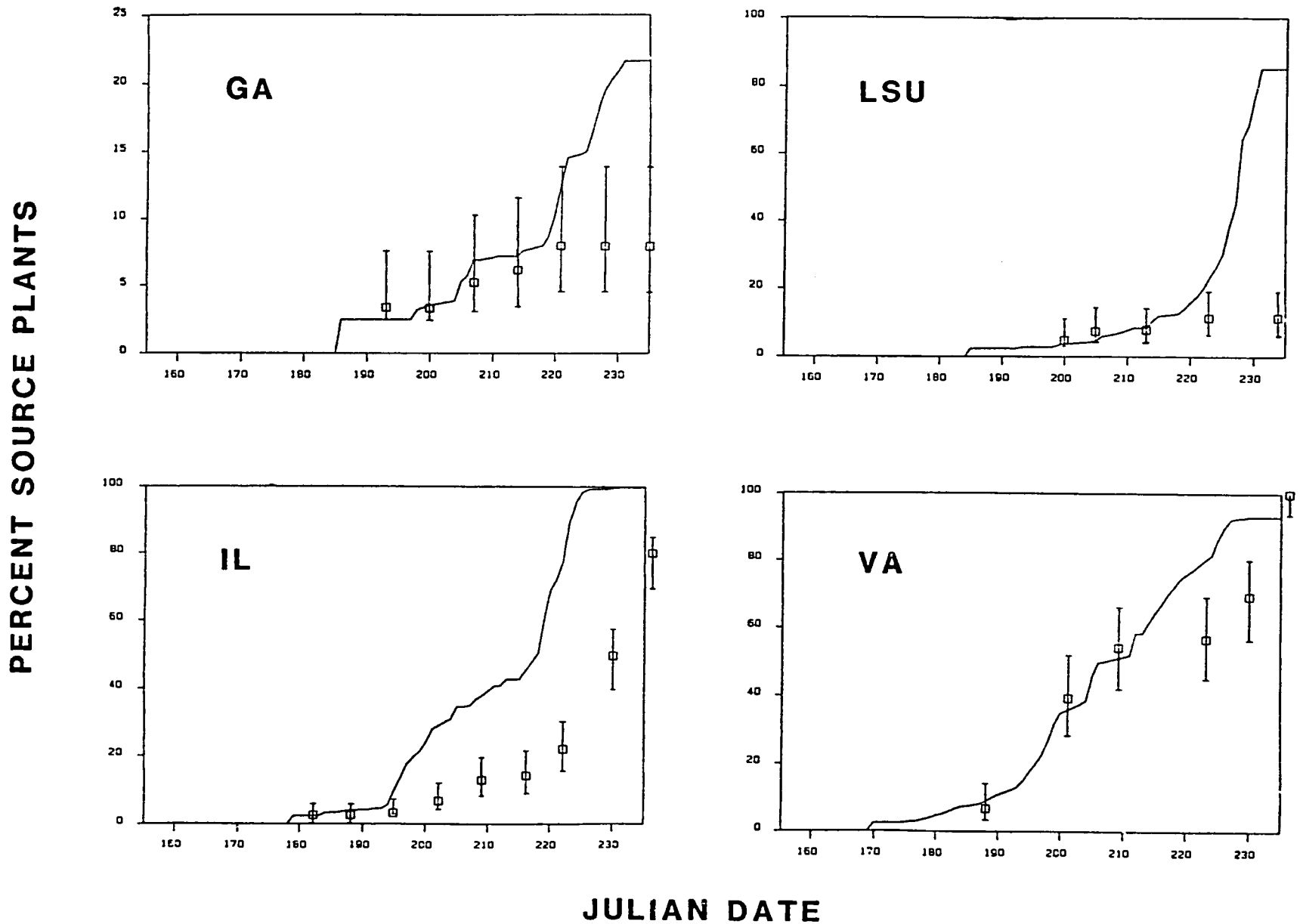


FIGURE 4

1983 SMV MULTISTATE 1982 2.5% INOCULATED
Complex Inoculation Model

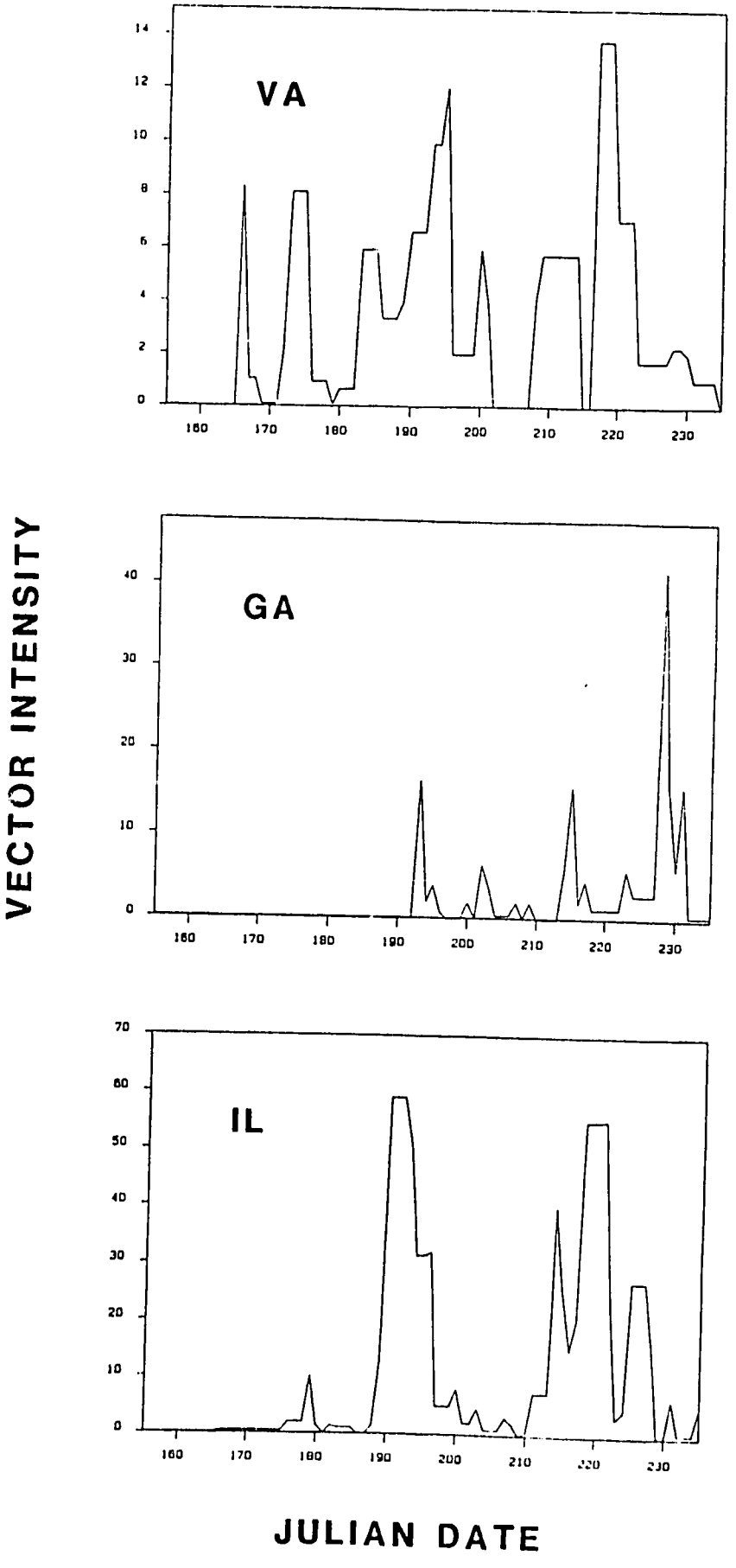


FIGURE 5

1983 SMV MULTISTATE 1982 2.5% INOCULATED
Complex Inoculation Model

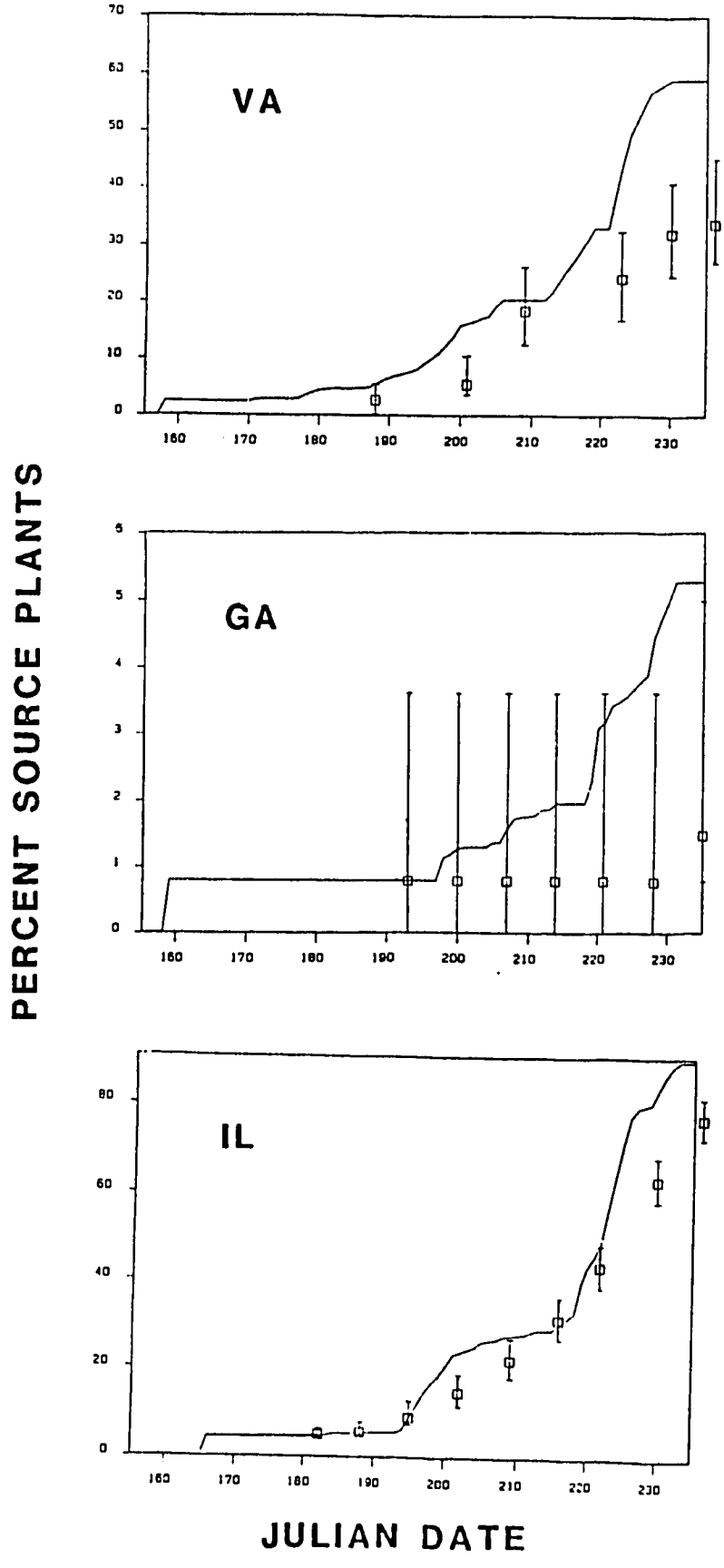


FIGURE 6

1984 SMV MULTISTATE 2.5% INOCULATED
Complex Inoculation Model

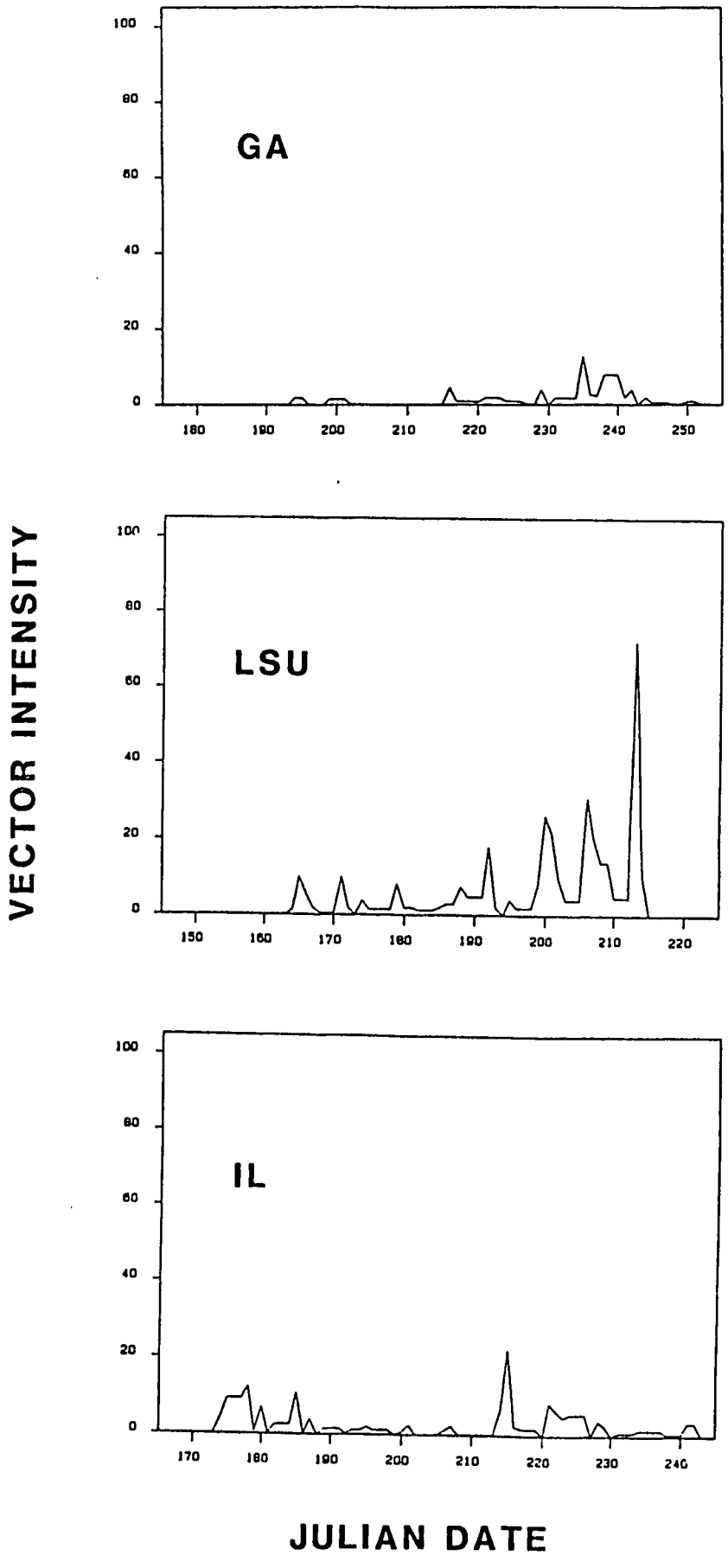


FIGURE 7

1984 SMV MULTISTATE 2.5% INOCULATED
Complex Inoculation Model

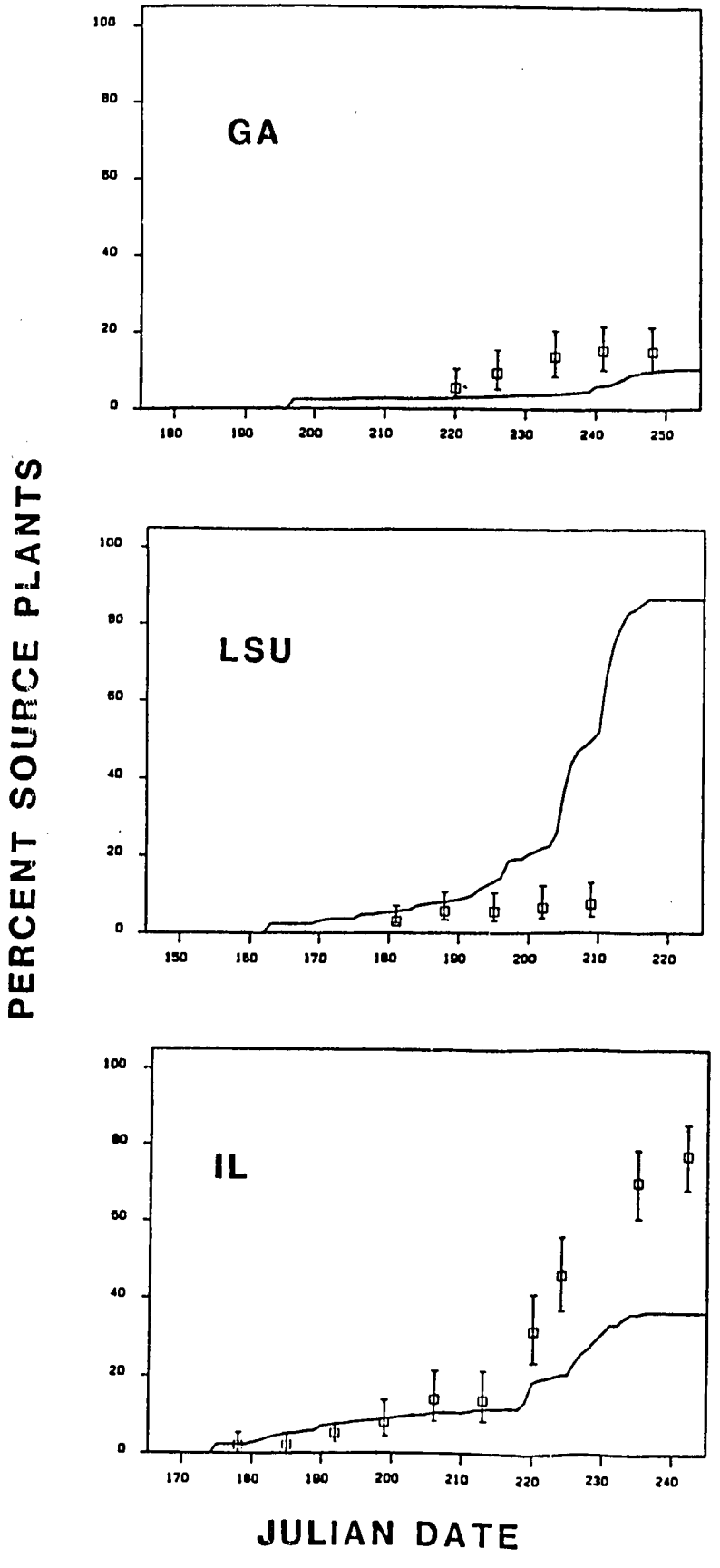
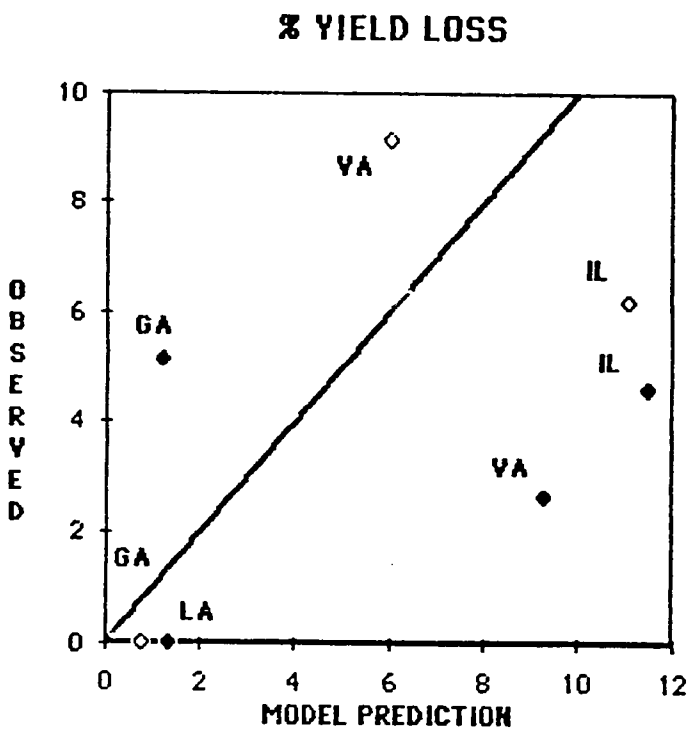
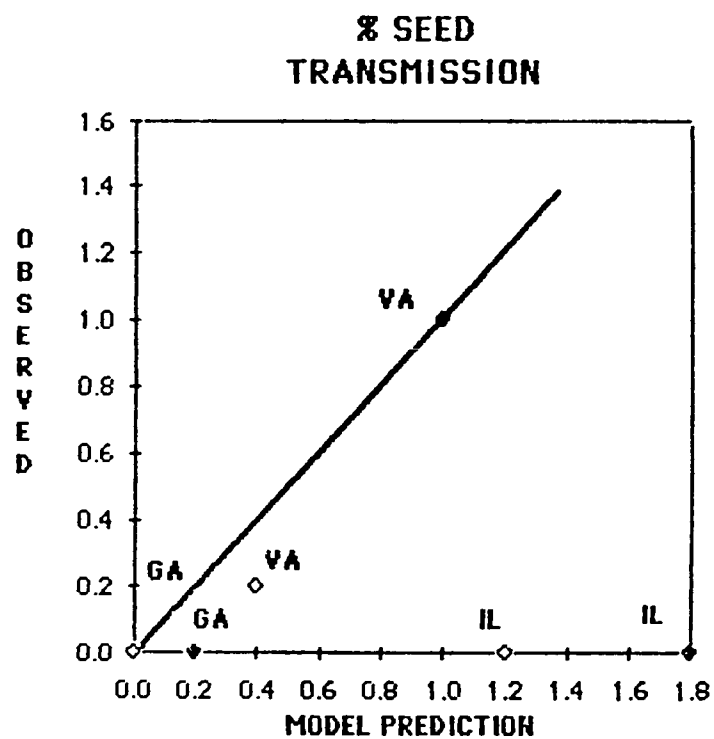


FIGURE 8

FIGURE 9



A



B

◆ = 1983 2.5% inoculated plots

◇ = 1982 replant (1983)

first week's examination for disease incidence showed meaningful difference between the treatments, with SMV-infected glabrous plants numbering significantly more than those of any other isoline. The following weeks climbed quickly towards 100% infection due to a major influx of the excellent vector species, Myzus persicae (Sulz.), which tends to mask discriminatory behavior when present in large numbers.

Laboratory experiments continued, studying the probing responses not only of M. persicae but of Rhopalosiphum maidis (Fitch) and Aphis citricola (van der Goot) to various isolines. These vector species were chosen because they are present in sufficient numbers in the field so as to critically influence the spread of SMV.

In observations of probing behavior under the microscope, both A. citricola and R. maidis spent significantly more time probing the glabrous isoline than the other isolines tested (sparse, semi-sparse, appressed, and dense).

In an experiment with both M. persicae and R. maidis, six isolines were tested for rates of disease transmission. Five (for M. persicae or six (for R. maidis) starved aphids were allowed a one minute access to an SMV infected leaf of a particular isoline. These aphids were then permitted a 24-hour access period to a Clark normal indicator plant. Seven to ten days later, disease symptoms were noted and tabulated for each isoline.

Table 12. Percent SMV-Infected Indicator Plants for Two Aphid Species on Seven Soybean (Clark) Isolines Having Different Pubescent Characteristics

Clark Isoline	M. persicae N = 20	R. maidis N = 15
glabrous	85 a*	27 a
sparse	80 ab	27 a
semi-sparse	65 abc	13 ab
Clark 63	65 abc	13 ab
dense-62	55 bcd	0 b
dense-75	40 cd	0 b
highly dense	35 d	0 b

*Percentages in the same column followed by the same letter are not significantly different from one another at the 5% level.

The results of these experiments indicate the importance of plant pubescence type in altering the rate at which plants may become infected due to the effect on aphid probing behavior. Shifts in timing of infection in the plant life cycle can radically affect yield loss estimates and the amount of seed transmitted progeny.

Aphid Identifications for Past Experiments. Much of the last six months has been spent catching up on the aphid identifications from experiments conducted during the summers of 1981-1984. Aphids have been identified from (a) the final year of the SMV-Multistate experiment (see earlier section); (b) a cooperative experiment

with Dr. David Ferro at the University of Massachusetts at Amherst conducted in 1982 and 1983 comparing aphid landing rates in two types of green traps (see IPR-84-1); (c) an experiment run in 1982 which examined the effect of three planting dates and three row spacings on the landing rates of aphids; (d) a 1981 field study featuring the effect of three different densities of sunflower barriers on aphid landing rates and spread of SMV behind those barriers (85% of these aphids have been identified to date); and (e) the third year of a 3 year experiment measuring aphid landing rates in liquid-filled pan traps of three different areas with aluminum (repellant), yellow (attractive), or one of two types of green (neutral) traps. All the data have been entered into the computer (with the exception of the experiment where the data are yet incomplete) and analyses begun so that the data may be interpreted in the near future. In addition, more than 500 microscope slide mounts of aphids have been made of voucher specimens and of unknown species requiring further identification. This information will be used in a paper regarding species diversity encountered during the course of the SMV Multistate experiment.

RESEARCH RESULTS: DEVELOP IMPROVED PRODUCTION, HARVESTING, HANDLING, AND METHODS FOR SEED AND GRAIN UNDER TROPICAL CONDITIONS

J. B. Sinclair

Diseased Seeds and Seed Quality and Assessment of Factors Influencing Them. Research in this area concentrated on: Pathohistological studies on the host-parasite relationship of four fungal pathogens in soybeans seeds: Cercospopra kikuchii, Cercospora sojina, Colletotrichum truncatum and Phomopsis spp.; the pathogenicity of Glomerella and Colletotrichum spp. from soybeans; charcoal rot; Pyrenochaeta leafspot in Zambia; agronomic factors affecting seed quality in Nepal; the effect of herbicides on seed quality and seedborne pathogens in Brazil; and the effect of harvest and assay methods for detecting seedborne fungal pathogens.

The pathohistological studies further illucidated the host-parasite relationship of C. kikuchii, C. sojina, C. truncatum and Phomopsis spp. and developed techniques to distinguish the major fungal pathogens in soybean seed tissue. We have found that there are several species of Colletotrichum involved in soybean anthracnose and are in the process of sorting these out and studying the taxonomic as well as pathogenic relationship between the various fungi. The mode of overseasoning in seeds and in plant debris is being studied.

In Nepal 1000-seed weights decreased and seed infection by Cercospora spp., C. truncatum and Phomopsis spp. increased with delayed harvest. Seed quality was poor in cultivars of maturity groups 00 to III, good in groups V to VIII and best at later planting dates. Early planting dates enhance maturity.

In Zambia, the occurrence of Pyrenochaeta leaf blotch has spread, and yield loss estimated range from 13 to 23 percent. No commercial cultivar has been found with a high level of resistance.

Herbicides applied at planting in Brazil have the ability to directly or indirectly exert nontarget effects on soybean fungal pathogens and seed quality. The incidence of downy mildew caused by Peronospora manshurica was increased at two locations and the incidence of seedborne Fusarium spp. and Phomopsis spp. decreased at one location from herbicide-treated plots. In the U.S. the recovery of C. kikuchii, C. sojina, and Phomopsis spp. was lower from threshed seeds than seeds aseptically removed from pods. However, the rate of seed transmission of fungi was underestimated when seeds were disinfected. Germination was lowest when the recovery of Phomopsis spp. was highest. Generally, C. kikuchii and C. sojina did not affect germination.

Improved Control of Seedborne Pathogens. Studies on traditional and innovative methods for the control of seedborne soybean pathogens has continued. We have continued to develop methods for the detection of endomycophytes in soybean tissues and the use of hot vegetable oils as well as storage under soybean oil for control of internally seedborne fungi. Biological as well as nonchemical methods and use of fungicide sprays and seed treatment have been studied for the control of seedborne fungi.

Dipping basal soybean stem pieces in the desiccant herbicide paraquat induced the expression of latent infection by Macrophomina phaseolina (charcoal rot) and inhibited the growth of Alternaria spp. to prove a more accurate determination of colonization of soybean stems by the fungus.

Culture filtrates from Glicladium roseum, Trichoderma harzianum, and Trichothecium roseum, fungi that are nonpathogenic to soybeans, inhibited zoosporgenesis of Phtophthora megasperma f. sp. glycinea (Phytophthora root rot) in culture.

Studying culture methods to control soybean diseases, it was found that soybeans in rotation with corn had greater yield, weed control, 1000-seed weight, germination, vigor, and lower recovery of seedborne Phomopsis spp. than soybeans in plots with continuous soybeans. Soybeans in 25 cm rows had better weed control and lower levels of seedborne Alternaria spp. than 76 cm rows.

Hot corn, palm, soybean and sunflower oils at 90±2° significantly (P=0,.05) reduced the recovery of seedborne Phomopsis spp. with no effect on germination in the laboratory. However, at 2.5 and 5 minutes at 90±2°C emergence was significantly reduced in the greenhouse, but had no effect on yield in the field.

The use of preharvest fungicide sprays to control internally seedborne fungi as determined by bioassay can be used in soybean and other large seeded legumes (bean, cowpea, pigeon peas), sorghum and wheat control species of Cercospora, Cladosporium, Colletotrichum, Fusarium, Lasidopidlodia, Phomopsis, Rhizoctonia, and Septoria.

In 1983 only the use of Captan fungicide controlled seedborne fungi and increased field emergence. In 1984, Apron, Captan, and Arasan significantly (P=0.05) increased field emergence. No seed treated with a biological control agent provided control better or equal to that provided by fungicides.

The Epidemiology of Pyrenochaeta Glycine on Soybeans. The effect of Pyrenochaeta leaf blotch of soybeans caused by Pyrenochaeta glycines Stewart, on yield and 300-seed weight was studied in a 2 x 6 factorial experiment. Main plots consisted of given weekly applications of fentin acetate sprays and unsprayed treatments. Subplots consisted of six soybean cultivars. Disease severity, Phyrenochaeta leaf blotch vertical progress and area under the disease progress curve for unsprayed cultivars ranged from 16.4 to 30.5%, 90 to 100% and 653.9 to 1322.5, respectively. The severity of Pyrenochaeta leaf blotch was not affected by maturity group.

Studies were initiated to determine if Neonotonia wightii is an alternative host for Pyrenochaeta glycines and if Dactuliophora glycines area a sclerotial state of P. glycines. Red, circular to irregular lesions, typical of Pyrenochaeta leaf blotch, developed on all soybean leaves inoculated with either D. glycines or P. glycines but not on the controls. Pycnidia of P. glycines developed from colonies initiated from sclerotia of D. glycines. These cultural and pathogenicity studies demonstrate that N. wightii is an alternate host of P. glycines, and D. glycines is a sclerotial state in the life cycle of P. glycines.

AUXILIARY ACTIVITIES: SOYBEAN INSECT RESEARCH INFORMATION CENTER (SIRIC)

Jenny Kogan

Most of the Soybean Research Insect Research Information Center (SIRIC) special activities in 1984 centered around preparations toward our participation in the World Soybean Research Conference III. Because these conferences are held only once every five years, they provide a rare forum for sharing concerns, trends, research needs and results with the international community of soybean specialists. We feel that such events are useful to promote the SIRIC concept and make the community aware of its capabilities.

In preparation for the conference, SIRIC targeted 1984 as the year for completion of the soybean entomology literature compilation and for publication of an International Directory of Soybean Entomologists.

A major effort was made to obtain copies of documents published prior to 1984 and to process them into the SIRIC bibliographic data base. A bibliographic analysis of the world literature of soybean entomology provided interesting correlations and was the topic of a contributed paper presented at the conference. The following is a summary of our findings.

> A comprehensive world wide survey of the literature of soybean entomology is in its final stages of preparation. Publication of this bibliography is expected within the near future. The bibliogrpahy will include over 4,000 references. About 70 percent of this literature has been published in the past 20 years. The publication trends, reflecting research effort, have followed very closely oscillations of the economic importance of soybean in the various regions of the world. Analysis of this bibliography provides an indirect index of the economic importance of major pests in each region and major directions in research. The extensive coverage of the literature from China, Japan, Korea, Indonesia, and Asian USSR provides a valuable historical resource.

SIRIC also participated in the poster display presentations which generated considerable interest. A summary of the message conveyed in this display follows:

> The Soybean Insect Research Information (SIRIC), established in 1969 probably was one of the first bibliographic data bases in agricultural entomology to undertake computerization of its storage and retrieval operations. The backbone of the system is a thesaurus of Hierarchical Code Descriptors (HCD) that has grown to include more than 8,700 descriptors organized in 4 hierarchical levels. The HDC structure allows retrieval of a superordinate category to include documents indexed by any of its subcategories. SIRIC's bibliographic records and HCD data bases are searched, changed, and increased by running specialized FORTRAN IV program designed specifically for these files. Most of these programs run as batch jobs from a timesharing terminal. Initial data entry is handled through an interactive program combined with corrections to the entry file using the system line editor. With rapid changes in computer technology specialized programs quickly become obsolete and inefficient. We are currently exploring the use of

commercially available general purpose data base management software as a method of providing improved and expanded capabilities without a very large investment of resources. One feature expected to be developed for the system is the capability to produce bibliographies such as the World Soybean Entomological Literature in copy-ready format for ease of publication and updating.

The International Directory of Soybean Entomologists was published in time for distribution at the Conference. It contains names, addresses and areas of speciality for one hundred and eighty-three entomologists organized geographically by countries with a subdivision by states for U.S. entomologists. A questionnaire page was inserted to provide additional names or possible corrections to the already listed names. Preparation of the manuscript was done using an A.B. Dick word processor with the assistance and supervision of Dr. Edward Armbrust, Section of Economic Entomology, Illinois Natural History Survey. It is hoped that this Directory can be easily updated in the future.

Other Accomplishments in 1984: In 1983 SIRIC was asked to host a visiting scholar from the People's Republic of China interested in training in modern bibliographic research methods and management of scientific information. Mrs. Yalian Qu from the Institute of Information of Agricultural Science and Technology of the Chinese Academy of Agricultural Sciences spent a year training and working at SIRIC. As a result of this traineeship, a bibliography of three pod borers was compiled and published for distribution. Expanding the usefulness of the International Soybean Directory, we anticipate sending copies of publications such as the pod borers' bibliography to all researchers listed in it.

During the summer season two groups of crop protection specialists representing many countries visited SIRIC. Two presentations were made to participants of the Soybean Production Short Course and to members of the International Crop Protection Course offered at Purdue University. Participants of the latter toured the University of Illinois with emphasis on the soybean entomology program. They were lectured on the diverse components of this program.

In the period from July 1, 1984 to January 31, 1985, we provided services to individuals in 34 countries answering different kinds of requests (see Appendix II). Requests came from the following countries: Argentina, Bolivia, Brazil, Burma, Cape Verde, Colombia, Costa Rica, Cuba, Egypt, El Salvador, France, India, Indonesia, Italy, Japan, Madagascar, Mexico, Nepal, Nigeria, Pakistan, Panama, People's Republic of China, Philippines, Portugal, Sierra Leone, Sri Lanka, Taiwan, Tanzania, Thailand. United States of America, Vietnam, Yemen, Zambia, and Zimbabwe. Of a total of 512 requests, 66% (338) came from countries other than the United States (see Tables 13 and 14).

Professional Meetings Attended:

World Soybean Research Conference III, 12-17 August, 1984, Iowa State University, Ames, Iowa.

Entomological Society of America Annual Meetings, 9-13 December, 1984, San Antonio, Texas.

Table 13. Summary by Country of Services Rendered by SIRIC 7/1/84 - 3/31/85.

Country	Number of Requests	Type of Request
Argentina	11	SD
Bolivia	4	CB
Brazil	50	CB,CD,CS,SD
Burma	8	CB,CS,SB
Cape Verde	4	CB,CS,SB
Colombia	4	CS,SD
Costa Rica	10	CB,SB
Cuba	3	CB,CS
Egypt	7	CB,CS,SB
El Salvador	5	CB
France	5	CB,CS,SD
India	4	SB,SD
Indonesia	90	CB,CD,CS,SB
Italy	1	SB
Japan	46	CB,SB,SD
Madagascar	8	CB,SB
Mexico	15	CB
Nepal	6	CB,SD
Nigeria	1	SD
Pakistan	4	CB,SB
Panama	6	CB,SB
People's Republic of China	20	CB,CS,SB,SD
Philippines	2	SD
Portugal	1	CD
Sierra Leone	4	CB,SB
Sri Lanka	6	CB,SB
Taiwan	1	SD
Tanzania	5	CB,SB,SD
Thailand	5	CB,SB,SD
USA	198	CB,CD,CS,SB,SD
Venezuela	5	CB,CS
Vietnam	2	CB
Yemen	6	CB,SB
Zambia	10	CB,CS,SB
Zimbabwe	9	CB
TOTAL	566	

CB = Copies of bibliographies, CD = Copies of documents, CS = Computer searches, SB = Soybean insects' bulletin, SD = Soybean entomologists' directory

Table 14. Monthly Services Provided to Individuals and Institutions, July 1984-March 1985

Month	Bibliographies Total	Bibliographies Foreign	Soy Bulletin Total	Soy Bulletin Foreign	Copies of Documents Total	Copies of Documents Foreign	Computer Searches Total	Computer Searches Foreign	Ent Soy Directory Total	Ent Soy Directory Foreign	Total Services Total	Total Services Foreign
July	97	(80)[a]	31	(26)	1	(0)	11	(7)			140	(113)
August	44	(30)	2	(2)	66	(66)					112	(98)
September	3	(0)					7	(4)			10	(4)
October			2	(1)	13	(1)	12	(2)	180	(97)	207	(101)
November	6	(0)			15	(11)	4	(2)	2	(0)	27	(13)
December							2	(0)			2	(0)
January	7	(4)					5	(4)	2	(1)	14	(9)
February	18	(12)		3			4	(2)	3	(3)	28	(17)
March	16	(11)					8	(4)	2	(2)	26	(17)
TOTAL	191	(137)	35	(29)	98	(78)	53	(25)	189	(103)	566	(372)

[a] Numbers in parentheses refer to requests originating outside the continental U.S.

INTSOY NEWSLETTER AND MAILING LISTS

Bonnie J. Irwin

The INTSOY Newsletter was issued in August 1984 in English, French, and Spanish. There are approximately 2,000 entries on the mailing list. Nearly two-thirds are mailed overseas. All mailings are by bulk rate or surface mail.

INTSOY PUBLICATION SERIES

Bonnie J. Irwin

One item was issued in the INTSOY Publication Series:

Number 27 - International Soybean Variety Experiment, Ninth Report of Results, 1982 by J. A. Jackobs, C. A. Smyth, and D. R. Erickson. 1984.

Demand for INTSOY publications continues (Table 15). INTSOY Publication Number 1 is out of print. From July 1, 1984 through March 31, 1985, INTSOY mailed out 1,021 items to 49 countries (Table 16). Fifty-five percent of the items went to developing countries (Table 17). Other distribution statistics are shown in Tables 18 through 20.

Four items were issued in the INTSOY Staff Report Series (Table 17).

Thirteen journal or conference articles were published by INTSOY staff (Appendix III).

Table 15. List of INTSOY Publications

Number	Title and Author(s)
1	Selected Literature of Soybean Entomology, G. L. Godfrey, ed. 1974.
2	Proceedings of the Workshop on Soybeans for Tropical and Subtropical Conditions. 1974.
3	A Case Study of Expeller Production of Soybean Flour in India, S. W. Williams and R. L. Rathod. 1974.
4	Soybean Processing in India: A Location Study on an Industry to Come, Mattias von Oppen. 1974.
5	Potential Production of Soybeans in North Central India, S. W. Williams, W. E. Hendrix, and M. K. von Oppen. 1974.
6	Soybean Production, Protection, and Utilization: Proceedings of a Conference for Scientists of Africa, the Middle East, and South Asia, D. K. Whigham, ed. 1975.
7	An Annotated Bibliography of Soybean Diseases, J. B. Sinclair and O. D. Dhingra. 1975.
8	International Soybean Variety Experiment, First Report of Results, D. K. Whigham. 1975.
9	Soybean Cultivars Released in the United States and Canada: Morphological Descriptions and Responses to Selected Foliar, Stem and Root Diseases, T. Hymowitz, S. G. Carmer, and C. A. Newell, comp. 1976.
10	Expanding the Use of Soybean: Proceedings of a Conference for Asia and Oceania, R. M. Goodman, ed. 1976.
11	International Soybean Variety Experiment, Second Report of Results, D. K. Whigham. 1976.
12	Rust of Soybeans: The Problem and Research Needs, Report of a Workshop held in Manila, Philippines, February 28-March 4, 1977, R. E. Ford and J. B. Sinclair, eds. 1977.
13	Pedigrees of Soybean Cultivars Released in the United States and Canada, T. Hymowitz, C. A. Newell, and S. G. Carmer. 1977.
14	Whole Soybean Foods for Home and Village Use, A. I. Nelson, M. P. Steinberg, and L. S. Wei. 1978.
15	International Soybean Variety Experiment, Third Report of Results, D. K. Whigham and W. H. Judy. 1978.
16	International Soybean Variety Experiment, Fourth Report of Results, W. H. Judy and D. K. Whigham 1978.
17	The Literature of Arthropods Associated with Soybean. V. A. Bibliography of *Heliothis zea* (Boddie) and *H. Virescens*, (F.) (Lepidoptera: Noctuidae), J. Kogan, D. K. Sell, R. E. Stinner, J. R. Bradley, Jr., and M. Kogan. 1978.
18	Sources of Resistance to Selected Fungal, Bacterial, Viral and Nematode Diseases of Soybeans, O. Tisselli, T. Hymowitz, and J. B. Sinclair. 1979.
19	International Soybean Variety Experiment, Fifth Report of Results, 1977, W. H. Judy and H. J. Hill. 1979.
20	Irrigated Soybean Production in Arid and Semi-Arid Regions, W. H. Judy and J. A. Jackobs, eds. 1981.
21	International Soybean Variety Experiment, Sixth Report of Results, 1978, W. H. Judy, J. A. Jackobs, and E. A. Engelbrecht Wiggans. 1981.

Table 15. (Continued)

Number	Title and Author(s)
22	Soybean Seed Quality and Stand Establishment; Proceedings of a Conference of Scientists for Asia, J. B. Sinclair and J. A. Jackobs, eds. 1982.
23	International Inoculant Shipping Evaluation, R. S. Smith, W. H. Judy, and W. C. Stearn. 1983.
24	International Soybean Variety Experiment, Seventh Report of Results, 1979. J. A. Jackobs, M. D. Staggs, and D. R. Erickson. 1983.
25	Soybean Research in China and the United States. Proceedings of the First China/USA Soybean Symposium and Working Group Meeting. B. J. Irwin, J. B. Sinclair, and Wang Jin-ling, eds. 1983.

Table 16. Distribution of INTSOY Publications by Publication Number and Geographical Region, July 1, 1984 - March 31, 1985

Argentina	55	France	3	Philippines	44
Australia	19	Germany	4	Puerto Rico	2
Brazil	8	Ghana	14	South Africa	7
Burma	8	India	71	Sri Lanka	14
Canada	5	Indonesia	82	Thailand	22
China	44	Ivory Coast	4	Turkey	1
Colombia	149	Jamaica	11	USA	191
Costa Rica	3	Kenya	4	USSR	1
Cuba	20	Korea	4	Venezuela	2
Czechoslovakia	1	Laos	7	Vietnam	16
Dominican Republic	41	Madagascar	25	West Indies	7
Ecuador	1	Malawi	6	Western Samoa	23
Egypt	29	Mexico	7	Yugoslavia	5
El Salvador	12	Nigeria	20	Zaire	1
England	4	Pakistan	2	Zimbabwe	6
Ethiopia	3	Panama	1		
Fiji	5	Peru	7	Total	1,021

1,021 publications to 49 countries

Table 17. INTSOY Publications Sent to Developed and Developing Countries

Area	Number	Percentage
Developing Countries	565	55
Developed Countries	456	45
Total	1,021	100

Table 18. Distribution of INTSOY Publications by Publication Number and Geographical Region, July 1, 1984 - March 31, 1985

Publication Number	U.S. & Canada	Latin America	Asia, Middle-East, Australia	Europe	Africa	Total
2	5	13	17	0	5	40
3	6	12	8	0	2	28
4	8	10	9	0	3	30
5	5	9	7	0	1	22
6	12	12	24	0	6	54
7	9	15	17	0	7	48
8	3	9	7	0	3	22
9	5	13	16	0	8	42
10	13	15	18	0	5	51
11	3	10	10	0	3	26
12	6	12	0	0	6	46
13	7	12	12	0	3	34
14	10	15	14	0	7	46
15	2	8	8	0	3	21
16	3	9	8	0	3	23
17	7	12	11	0	5	35
18	14	15	20	0	7	56
19	2	8	10	0	3	23
20	6	13	19	1	6	45
21	2	9	10	0	3	24
22	14	17	24	2	6	63
23	6	16	16	1	5	44
24	7	15	9	1	4	36
25	16	17	18	2	5	58
26	15	20	21	8	5	69
27	10	10	6	4	5	35
Total	196	326	361	19	119	1,021

Table 19. Distribution of INTSOY Publications by Regions, July 1, 1984-March 31, 1985

Region	Number	Percentage
Asia, Middle East, and Australia	361	35
Latin America, Caribbean	326	32
U.S. and Canada	196	19
Africa	119	12
Europe	19	2
Total	1,021	100

Table 20. Distribution of INTSOY Publications by Subjects, July 1, 1984-March 31, 1985

Subject and Publications Numbers	Number	Percentage
Conferences (2,6,10,20,22,25)	311	30
ISVEX (8,11,15,16,19,21,24,26,27)	279	27
Crop Protection (7,12,17,18)	185	18
Utilization (3,4,5,14)	126	13
Germplasm, Inoculum (9,13,23)	120	12
Total	1,021	100

Table 21. INTSOY Staff Reports, July 1, 1984-March 31, 1985

Publication Number	Title	Date	Author
ISR-84-2	Upland Crops Monitoring Tour, Indonesia	8/16-22/84	H.E. Kauffman
ISR-84-3	Trip to India, Pakistan, & China	8/26-9/7/84	H.E. Kauffman
ISR-84-4	Trip to Washington, D.C.	11/5-7/84	H.E. Kauffman
ISR-85-1	Administrative Visit to India, Sri Lanka, Thailand, Philippines	1/9-25/85	H.E. Kauffman
ISR-85-2	Administrative Visit to Zimbabwe, Zambia, Pakistan	3/7-22/84	H.E. Kauffman

TRAINING ACTIVITIES

John W. Santas

Training, while not a specific objective of the research contract, involves the INTSOY staff and contributes to the overall goal of the project by imparting knowledge to soybean workers that can be translated into action programs in LDCs. INTSOY training has concentrated on short courses offered on the UIUC campus and abroad, as well as specialized programs arranged for individuals and groups coming to campus as short-term visitors.

During the period, July 1, 1984 to March 31, 1985, the following major training activities were completed.

1. Sixteen persons from eleven countries attended the 12-week campus-based course on "Technical and Economic Aspects of Soybean Production" which was conducted during the period May 28 to August 17, 1984. A total of 119 scientists from 47 countries have participated in this course since its inception in 1975.

2. Eleven persons from nine countries attended the UIUC-based 7 week course on "Soybean Processing for Food Uses" which was held during the period May 14 to June 29, 1984. A total of 86 people from 38 countries have participated in this course since its inception in 1975.

3. During the reporting period, individualized programs were arranged for at least 70 visitors from throughout the world who came to the University of Illinois for the specific purpose of consulting with INTSOY staff.

4. Soybean production training was provided in Turkey, using the facilities at the Agricultural Research Institute in Antalya, for nearly 40 extension staff of the "Second Crop Project". This training was conducted by INTSOY staff in two phases. Cultural practices were covered early in the growing season during the period May 13-19 and the crop protection aspects were covered later in the season during the period September 14-24. This training effort was funded by FAO. A large supply of instructional materials was left at the Institute for use in future training programs.

5. The "Soybean Utilization Workshop for Asia" was held in Peradeniya, Sri Lanka in cooperation with the Sri Lanka Department of Agriculture during the period January 14 to 25, 1985. Twenty-eight persons from 13 countries registered for the workshop. Participants learned how to prepare a wide variety of soyfoods and were involved in a case study of the Sri Lanka Soybean Project which was developed by INTSOY during the period 1977-82.

6. A Soybean Technology Training Program was conducted in Islamabad, Pakistan during the period March 18-28, 1985. This training session was held at the National Agricultural Research Centre and 42 Pakistani Research and Extension Advisors attended. INTSOY staff had primary responsibility for instruction, but worked with representatives of AVRDC, IRRI, IITA, and the Pakistan Agricultural Research Council (PARC). This training activity was funded by the USAID Mission to Pakistan.

CONFERENCES AND TRAVEL ACTIVITIES

Conferences: During the course of this contract, INTSOY sponsored the following conferences or training workshops jointly with other organizations:

(1) Asian Soybean Improvement Workshop in Indonesia (Jointly with IRRI, AVRDC, IITA and FAO). Scientists for 10 Asian countries discussed ways to implement the Asian Soybean Improvement Network.

(2) Turkey - Soybean Technology Training Program - May and September 1984 (Jointly with FAO and the Turkish Ministry of Agriculture). Professor Jackobs (Agron-omist) and Professor Sinclair (Pathologist) participated in lectures and field activities with extension workers and research scientists.

(3) Soybean Utilization Workshop - Sri Lanka - June 14-25, 1985 (Jointly with the Sri Lanka Governnment and OICD). Twenty-eight participants from 12 Asian and African countries attended.

(4) Pakistan Soybean Technology Training Course (Jointly with the Pakistan Agriculture Research Council, AVRDC, IITA, NifTAL, and IADS). Forty-two extension and research workers from three provinces attended.

Travel: During the year, INTSOY scientists visited the following countries: China, Colombia, India, Indonesia, Pakistan, Philippines, Taiwan, and Turkey.

ADMINISTRATION AND BUDGET

EXPENDITURES AND PROJECT STAFF

PROGRAM OF EXPENDITURES

	Contract Period 7/1/84-3/31/85*	Report Period 7/1/84-3/31/85*	Total Expenditures 7/1/85-3/31/85*
1. Salary and Wages	274,396.34	274,396.34	274,396.34
2. Fringe Benefits	32,396.92	32,396.92	32,396.92
3. Indirect Costs	150,833.44	150,833.44	150,833.44
4. Travel and Transportation	26,789.95	26,789.95	26,789.95
5. Other Direct Costs	63,192.94	63,192.94	63,192.94
6. Equipment and Supplies	8,084.43	8,084.43	8,084.43
TOTAL	555,694.02	555,694.02	555,694.02

*Provisional amount as final statement was not complete when this was printed.

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
1.	Algeria	Mr. Souissi	IDCI	83528C, 84637
		Directeur	Station Regionale, IDCI	84205A, 84885
2.	Angola	Mr. Oscar Azancot de M.	Nacional Ministerio da Agricultura	84819
3.	Antigua	Dr. Laxman Singh	CARDI	84435B
		Director	PLENTY-Canada	84184A
4.	Argentina	Mr. Roland Kaser		84301, 84316
		Dr. Roque Fernando Caro	E.E.A.O.C.	84836, 84427B
		Ing. Enzo A. Battu	Union Agricola de Avellaneda Cooperativo LTDA.	84439B, 84855
		Ing. Agr. Ricardo R. Siciliano	Compania Continental S. A.	84441B, 84525C, 84627
		Ing. Agr. Daniel E. Arnalda	Criadero y Semillero "Cultivar"	84317
		Ing. Agr. Juan Carlos Suarez	INTA	84528C, 84630
		Direccion de Agricultura	Min. de Agr. y Ganaderia	84495B
		Ing. Agr. Carlos Remussi	Catedra de Cultivos Industriales	84534C, 84635
5.	Australia	Ms. Moira Fulton	Western Australian Dept. of Agr.	84302
		Dr. J. L. Rose	Department of Primary Industries	84303
6.	Bangladesh	Dr. Gordon A. Zook	Mennonite Central Committee	84160A, 84430B
7.	Belize	Dr. B. K. Rai	CARDI	84824, 84197A
8.	Bolivia	Ing. Agr. Humberto Vasquez	Corp. Gestora del Proyecto "ABAPO-IZOZOG"	84181A, 84853
		Ing. Herbert Zurita O. y Ing. Alejandro Tejerina	Est. Exp. Agr. de Saavedra, CIAT	84866, 84868
		Ing. Roberto Delgadillo	Est. Exp. "Gran Chaco", IBTA	84182A, 84865, 84413B, 84812, 84204A, 84453B, 84884
9.	Brazil	Mr. Willem Henri van der Vliet	F. T. Pesquisa e Sementes	84318

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
		Dr. Nelson S. Fonseca Jr. and Dr. Ivo Marcos Carraro Mr. Carson Geld	 Programa de Pesquisa, OCEPAR Instituto Pesquisas IRI	 84168A, 84429B, 84842 84200A
10.	Burma	Project Director Mr. Lee Eklund	Ministry of Agriculture and Forests Manring Corporation	84173A, 84438B, 84854 84304
11.	Cameroon	Dr. Patrick Salez Dr. Goma Hadi	IRA Service Experimentation	84113A, 84808 84103A, 84879
12.	Canada	Mr. M. Jeyabalan	PLENTY -Canada	84530C, 84631
13.	Chile	Dr. Patricio C. Parodi	Catholic University of Chile	84524C
14.	China	Prof. Wong Xiuying Mr. C. C. Liu Prof. Pu Mu Hua	Academy of Agricultural Sciences Yunnan Academy of Agricultural Science Central Academy Agricultural Sciences	84505C, 84644 84617, 84523C 84888, 84645
15.	China (Taiwan)	Dr. S. Shanmugasundaram	AVRDC	84404B
16.	Colombia	Dr. Luis H. Camacho Ing. Gilberto Bastidas Ramos	INTSOY/ICA/CIAT ICA, Programa Leguminosas	84826, 84305 84104A, 84105A, 84706, 84843
17.	Congo	Dr. Desire Dzaba	Centre de Recherches Agron. de Loudima	84136A, 84822
18.	Costa Rica	Dr. Enrique Villalobos R. Ing. Allen G. Moreira V. Ing. Rafael Angel Montero R. Ing. German Quesada H. Ing. Eduardo Mata Montero Mr. William Emerine	CIGRAS, Universidad de Costa Rica Consejo Nacional de Produccion Central Regional Univer. de Costa Rica Ministerio de Agr. y Ganaderia CARE, Costa Rica Costa Rican Project	84414B, 84813 84201A 84153, 84154, 84834 84163A, 84838 84167A, 84166A, 84841 84319

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
19.	Cuba	Dr. Fernando Fuenes Ing. Lorenzo Barreiro Arbelo	FAO-Ministerio de la Agricultura Estacion Experimental El Tomequin	84434B, 84171A 84190A
20.	Cyprus	Dr. Andreas Hadjichristodoulou	Min. of Agr. and Natural Resources	84306, 84876, 84533C
21.	Czechoslovakia	Ing. Teodor Sinsky and Ing. L. Pastucha	Vyskumny ustav rastlinnej vyroby	84511C
22.	Dominica	Director	PLENTY-Canada,	84183A
23.	Dominican Republic	Mr. Kevin N. Smith Ms. Claire Bowen	Peace Corps Peace Corps	84102A, 84407B, 84804 84307
24.	Ecuador	Ing. Agron. T. Gorky Diaz C. Ing. Eduardo Maldonado A.	Estacion Experimental Pichilingue, INIAP INIAP	84124A, 84810, 84705 84818, 84134A, 84133A
25.	Egypt	Dr. Kenneth Cassman	EMCIP - NMSU	84902
26.	El Salvador	Agr. Nelson Rolando Vasques F. Mr. Thomas King	Centro de Tecnologia Agricola (CENTA) USAID/ San Salvador	84158A, 84428B, 84837 84161A, 84162A
27.	Ethiopia	Dr. Ato Amare Belay Dr. Boris Anisimoff	Institute of Agricultural Research Ministry of Agriculture	84420B, 84141A, 84829 84308
28.	France	Dr. J. Vavassori-Fesquet Mr. Philippe Godon	UCAAB Semences IRAT	84618 84122A
29.	Gabon	Dr. Carlo Carli	Projet FAO/CIAM	84111A, 84877, 84641
30.	Ghana	Mr. Elmo Schmidt Mr. Charles Oti-Boateng Mr. Hector Mercer-Quarshie	Agro-Industries MIM, Ltd. University of Ghana Nyankpala Agr. Experiment Station	84119A, 84805 84116A, 84127A 84132A

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
31.	Greece	Dr. George Skaracis	Hellenic Sugar Industry	84609
32.	Guatemala	Ing. Danilo A. Gonzalez A.	ICTA	84181A, 84840, 84164A
		Ing. Carlos Madrazo	Agro-Pacific, S.A.	84214A and 84215A
		Ing. Francisco Viteri A.	Iowa State University	84374, 84199
33.	Guinea	Dr. R. Vandevenne	IRAT	84309
34.	Guyana	Dr. Mike Granger	Central Agricultural Station	84194A, 84195A, 84707, 84299A, 84873
35.	Honduras	Dr. Jorge Chang	Escuela Agricola Panamerican (ZAMORANO)	84123A, 84143A
		Dr. Simon E. Malo	Escuela Agricola Panamericana	84702
		Ing. Jose Ramon Ramirez	Secretaria de Recursos Naturales	84149A, 84148, 84825
36.	India	Dr. R. K. Arora	Nat. Bureau of Plant Genetic Resources	84310
37.	Indonesia	Dr. Sumarno	Central Research Inst. for Food Crops	84110A, 84887
		Ir. B. O. P. Tampubolon	Dept. Agronomi Fakultas Pertanian USU	84109A
		Dr. J. S. Siemonsma	Malang Research Institute for Food Crops	84207A, 84459B
38.	Iran	Mr. Heshmattollah Pourdavai	Seed and Plant Improvement Institute	84406B
		Dr. Abd-Mishani	University of Tehran	84514C, 84606
		Dr. G. Noor-Mohammadi and Dr. B. Ehdaie	Jundi Shapur University	84532C, 84632
39.	Iraq	Dr. Ahmad Mahdi Ali	Agricultural Research Center	84801
40.	Italy	Sig. Giovanni Porreca	ENEA DIP FARE DIV. BIOAGR	84522C
		Mr. Daniele Raccone	Institute di Agronomia	84518C
		Dr. Eugenio Sgaravatti	FAO of the UN	84311
41.	Ivory Coast	Ing. Yaganabe Yeo	Projet Soja	84146A, 84821

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
42.	Jamaica	Mr. David Dixon Director	PLENTY for Canada Miller Machine Company	84121A, 84802 84444B, 84849
43.	Kenya	Dr. George W. Otieno	Department of Agriculture	84206A
44.	Korea	Dr. Eun Hi Hong	Office of Rural Development	84498B, 84513C, 84605
45.	Laos	Resident Representative	UNDP Vientiane	83192A, 84111B, 84144A
46.	Liberia	Mr. Jolobah Cisco Wesseh Mr. Filmore Hney	Ministry of Agriculture	84155A, 84835 84154A
47.	Madagascar	Arsene Randriamamonjy and Harilalanoromanana	Enterprise MAMISOA	84189A, 84452B
48.	Malaysia	Dr. Ramli Bin Mohdnoor	MARDI	84114A, 84809
49.	Mali	Dr. Sadio Traore	S.R.C.V.O.-Sotuba	84140A, 84832
50.	Mauritius	Dr. A. L. Owadally	Ministry of Agriculture, Fisheries, and Natural Resources	84159
51.	Mexico	Ing. Alfonso De Luna J. Ms. Lucy Morren Dr. Ponciano Perez-Garcia Comunidad Los Horcones Ing. Alberto Soliz	Comision Nac. de las Zonas Aridas CARJUA SARH-INIA Sociedad Cooperativa de Produccion, SCL I.O.C.E.	84512C, 84412B, 84807 84101A 84703 84639 84436B
52.	Morocco	Dr. Nadah Driss	Direction de la Production Vegetale	84137A, 84421B
53.	Mozambique	Dr. Wilson Sichmann and Mr. Luis Bayona	United Nations Development Programme	84188A, 84458B 84870
54.	Nepal	Dr. R. P. Chaudhary	Grain Legume Improvement Program	84145A, 84426B, 84614

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
55.	New Caledonia	Director	Recherche Agronomique, CREA	84425B
56.	Pakistan	Dr. Zar Quresh	Agricultural Resesearch Station (North)	84607, 84515C
		Dr. Tila Mohammad	Nuclear Institute for Food and Agr.	84418B, 84820, 84610, 84509C
		Dr. Mir Hatam	N.W.F.P. Agricultural University	84312, 84446B, 84871, 84627
		Dr. Akhtar Beg	Agricultural Research Council	84501C, 84502C, 84503C 84409B, 84636
		Dr. Zahoor Ahmad	National Agricultural Research Center	83530C, 84108A, 84405B, 84880
		Dr. Altaf Hussain Chaudhry	Agricultural Research Institute	84423B, 84611, 84450B, 84881, 84646
		Dr. Sulyman Khan	Malakan Agency Development Project	84529C, 84634
		Mr. J. R. Lockman	Technical Services Assn. Agr. Project	84900, 84901, 83527C 84419B, 84322
57.	Paraguay	Dr. Lu Dee Wang	Mision Tecnica Agricola de China	84169A, 84844, 84496B, 84616
		Ing. Oscar Aguilera and Ing. Roberto Casaccia	Instituto Agronomico Nacional	84437B, 84848
58.	Peru	Dr. Dale Bandy	USAID/Lima/Peru	84619, 84621,84622, 84623 ,84177A, 84179A, 84859, 84860, 84440B, 84857, 84175A, 84180A, 84858 84861, 84858, 84176A, 84432B, 84862, 84850, 84433B, 84863

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
		Dr. Hugo Soplin	Universidad Nacional Agraria	84193A
		Mr. Jack Rosholt	USAID/Lima	84196A
59.	Philippines	Mr. Antonio C. Mercado, Jr.	Pioneer Overseas Corporation	84120A, 84806
		Mr. E. N. Sison and Dr. R. M. Lantican	Institute of Plant Breeding	84828
		Ms. Emily A. Lorion	Botanique Philippines, Inc.	84174A
		Mr. Benjamin M. Legaspi	Bureau of Plant Industry	84847, 84178A
		Dr. R. K. Pandey	IRRI	84185A, 84443B, 84626, 84851, 84526C
60.	Portugal	Eng. Abilio Mendes Gaspar	Estacao Agronomica Nacional	84510C
61.	Rwanda	Dr. Pierre Nyabyenda	ISAR	84886, 84454B, 84531C
62.	Saudi Arabia	Mr. Zaid Al-Jowairah	Ministry of Agriculture and Water	84816, 84416B, 84516C
		Dr. Ibrahim Y. Trabulsi	King Saud University	84402B, 84403B, 84640
		Dr. Allyn A. Cook	USREP/JECOR/AGWAT	84401B
		Dr. Y. A. Al-Saheal	King Saud University	84455B, 84633
63.	Somalia	Dr. Salad G. Osscble	Ministry of Agriculture	84117A, 84118A
		Mr. Bernard Kolp	University of Wyoming, for Somalia	84147A, 84320
64.	South Africa	Embassy of South Africa	South Africa	84135A, 84422B, 84517C
65.	Sri Lanka	Mr. Cecil P. Dharmasena	C.A.R.I.	84115A, 84803
66.	St. Lucia	Mr. Michael Sligh	PLENTY	84313
		Mr. David Dixon	PLENTY-Canada	84187A
		Mr. Peter Kampidoo	PLENTY-International	84314
67.	St. Vincent	Mr. David Dixon	PLENTY-Canada	84186A
68.	Sudan	Dr. M. O. H. El-Karouri	Arab Authority for Agricultural Investment and Development	84128A, 84130A, 84323

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
		Director	Western Sudan Agr. Research Project	84321
		Dr. Osman A. A. Ageeb	Gezira Research Station	84126A, 84415B, 84814
		Dr. Mohamed Ali El Hassan	Regional Min. of Agr. and Nat. Res.	84417B
		Dr. George Ghobrial	USAID/Khartoum/Sudan	84138A, 84139A, 84823
		Dr. Mukhtar Kanani	Kadugli Research Station	84497B, 84831
69.	Swaziland	Mr. John Pali-Shikulu	Malkern Research Station	84533C, 84527C, 84456B, 84198A, 84643, 84875
70.	Syria	Dr. M. Sadik El Mott	Min. of Agr. and Agrarian Reform	84608
71.	Tanzania	Mr. H. B. Purohit	National Agr. and Food Corporation	84112A
		Dr. A. J. Carpenter	FAO	84815, 84129A
		Dr. A. L. Doto	Sokione University of Agriculture	84202A, 84451B, 84882
72.	Thailand	Mr. Sawing Nattribhop	Chiang Mai Field Crop Research Center (Mae Jo)	84106A, 84107A, 84638, 84877
73.	Turkey	Dr. Attila Altunay	Regional Agr. Research Institute	84519C, 84520C, 84521C 84612, 84613
74.	U.S.A.	Dr. Richard A. Creelman	Texas A. and M. Univ.	84172A, 84442B, 84846
		Dr. Glenn R. Bowers, Jr.	Texas Agr. Experiment Station	84125A, 84811
		Dr. Martin L. Price	ECHO	84315
		Mr. Andrew Scott, Jr.	Rio Farms, Inc.	84704
		Dr. Virgil Luedders	University of Missouri	84325
		Dr. Michael Irwin and Ms. Gail Kampmeier	INTSOY	84864, 84624
75.	Uganda	Prof. J. K. Mukiibi	Makerere University	84817, 84131A
		Mr. J. M. Ssebuliba	Makerere University	84203A, 84883

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

No.	Country	Cooperator	Organization	Research Trial Numbers*
76.	Upper Volta	Director	CERCI	84150A, 84830
		Director	IRHO/HV	84216A
77.	Venezuela	Ing. Raul Nino	Fundacion Servico Para El Agricultor	84701, 84326
		Dr. Rosa A. Lovera	Fundacion Servico Para El Agricultor	84165A, 84839
78.	Vietnam	Ing. B. Hlava	University of Agriculture, Prague	84142A, 84424B, 84833
79.	Yemen	Mr. Ali E. Kambal	UNDP - Ministry of Agriculture	84408B
		Dr. A. I. Kheiralla	UNDP/FAO	84508C, 84110B, 84643
80.	Yugoslavia	Dr. Nikola Gacesa	University of Sarajevo	84506C, 84601
		Dr. Vitomir Bekric	Institut za Kukuraz "Zemun Polje"	84504C, 84603
		Prof. Dr. Bogdan Belic	Institute of Field and Vegetable Crops	84507C, 84602, 83529C
81.	Zaire	Director	Agriculture Project, ECZ/CBFZ Ntondo par Mbandaka	84322
		Mr. Michael Cote		84499B
		Dr. Quyen H. Nguyen	Programme National Legumineuses (PNL)	84431B, 84170A, 84845 84615
		Mr. Ngalisame M. Bieme	Cooperative du Plateau de Bateke (COPLABAT)	84856
82.	Zambia	Dr. Jagmohan Joshi	Mt. Makulu Research Station	84868, 84869, 84628, 84629
		Dr. Jagmohan Joshi	USAID Zamare Project	84191A, 84192A, 84449B, 84970
83.	Zimbabwe	Dr. J. R. Tattersfield	Seed Co-Op Company of Zimbabwe, Ltd.	84445B, 84852
		Mr. J. S. Tichagwa	Crop Breeding Institute	84872, 84448B

APPENDIX I: 1984 COOPERATORS IN INTSOY TRIALS

58 Countries received 110 Tropical Research Trials (ISVEX A).
- 11 Universities participated.
- 49 National Organizations participated.
- 23 International and Private Organizations participated.

38 Countries received 61 Subtropical Research Trials (ISVEX B)
- 7 Universities participated
- 29 National Organizations participated.
- 19 International and Private Organizations participated.

21 Countries received 39 Temperate Research Trials (ISVEX C)
- 6 Universities participated.
- 20 National Organizations participated.
- 5 International and Private Organizations participated.

50 Countries received 90 Tropical Observational Trials (MSIEVE I).
- 9 Universities participated.
- 47 National Organizations participated.
- 20 International and Private Organizations participated.

25 Countries received 42 Temperate Observational Trials (MSIEVE II).
- 9 Universities participated.
- 14 National Organizations participated
- 11 International and Private Organizations participated.

20 Countries made 28 requests for Seeds and Research Materials.
- 2 Universities participated
- 8 National Organizations participated.
- 13 International and Private Organizations participated.

9 Countries received 11 Special Research Trials.
- 2 Universities participated.
- 5 National Organizations participated.
- 3 International Organizations participated.

APPENDIX I: COOPERATORS IN 1984 TRIALS

In summation, 23 Universities, 60 National Organizations, and 70 International/Private Organizations from 83 Countries received 381 Research Trials and/or germplasm/research materials. A total of 75 countries received 210 ISVEX Research Trials. Sixty countries received 132 MSIEVE Observational Research Trials.

*84100 and 84200 numbers indicate Tropical Research Trials, ISVEX A.
84300 numbers indicate Germplasm and Research Materials requests.
84400 numbers indicate Subtropical Research Trials, ISVEX B.
84600 numbers indicate Temperate Observational Trials, MSIEVE II.
84700 AND 84900 numbers indicate Special Research Trials.
84800 numbers indicate Tropical Observational Trials, MSIEVE I.

APPENDIX II: SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING JULY, 1984-JANUARY, 1985

MONTH	COUNTRY	INSTITUTION	NAME	NUMBER OF BIBLIO-GRAPHIES	NUMBER OF SOY BULLETIN	NUMBER OF DOCUMENTS	NUMBER OF COMPUTER SEARCHES	NUMBER OF SOY ENT DIRECTORIES
JULY								
	USA	Ill. Nat. Hist. Survey, Section Econ. Entomol.	Kogan, M.				1	
	USA	Ill. Nat. Hist. Survey, Section Econ. Entomol.	Kuhlman, D.				1	
	INDIA	ICAR Research Complex for NEH Region - Division of Entomol.	Pathok, K.A.		1			
	BURMA	Food Legumes Division Agricultural Research Insitute	Smellie, S.	2	1		1	
	INDONESIA	Maros Research Institute For Food Crops	Suharto, H.	2	1		2	
	USA	Environmental Studies Center, Bowling Green State University	Tarimo, T.C.	2	1		1	
	CAPE VERDE	M.D.R./D.P.P.V.	Delgado, F.X.	2	1		1	
	ZAMBIA	National Irrigation Research Station	Mingochi, D.S.	4	1		2	
	EGYPT	Agrarian Reform Organization	Gayed, Y.S.	2	1		1	

APPENDIX II: SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING JULY, 1984-JANUARY, 1985

MONTH	COUNTRY	INSTITUTION	NAME	NUMBER OF BIBLIO-GRAPHIES	NUMBER OF SOY BULLETIN	NUMBER OF DOCUMENTS	NUMBER OF COMPUTER SEARCHES	NUMBER OF SOY ENT DIRECTORIES
JULY								
	ZAMBIA	Regional Research Station	Nkumbula, S.	1	1			
	JAPAN	Japan International Co-operation Agency	Kawakami, T.	1	1			
	COSTA RICA	CARE/Costa Rica	Mata, E.M.	4	1			
	INDONESIA	Macang Research Institute for Food Crops	Adisarwanto, T.	2	1			
	BURMA	Central Farm Agriculture Corporation	Wai, D.N.N.	1	1			
	MEXICO	Instituto Technologico de Estudios Superiores de Monterrey	Monasterio, I.O.	5				
	MADAGASCAR	Mamisoa Enterprise	Rakotoalivao, D.	2	1			
	PEOPLE'S REPUBLIC OF CHINA	Heilongjiang Academy of Agricultural Sciences	Zhihong, H.	4	1			
	PAKISTAN	NWFP Agricultural University	Hatam, M.	3	1			
	MADAGASCAR	Mamisoa Enterprise	Randriamamonjy, A.	4	1			

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JULY								
	BURMA	Agriculture Corporation	Thein, U.T.	1	1			
	INDONESIA	Directorate of Estate Crop Protection Directorate of Estate, Dept. of Agriculture	Riyaldi	1	1			
	USA	San Jose, California	Linn, L.A.	5	1			
	INDONESIA	Directorate of Food Crop Protection	Jasis	4	1			
	PANAMA	Anton Prov.-Cocle	Von Chong, K.	5	1			
	SRI LANKA	Dept. of Agriculture	Senanayake, E.	5	1			
	SIERRA LEONE	W.A.R.D.A.	Fannah, S.	3	1			
	YEMEN A.R.	SANA	Nashir, A.F.A.H.	5	1			
	TANZANIA	Univ. Dar es Salam	Tarimo, F.	2	1			
	USA	Canyon, Texas	Bouo, K.K.	5	1			
	USA	International Program-Oklahoma State University	Sadio, Diarra	5	1			

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JULY								
	USA	Dept. of Entomol. Purdue Univ.	Kudagamage, C.	5	1			
	INDONESIA	Maros Research Institute for Food groups	Akib, W.	3	1			
	BRAZIL	EMBRAPA/UEPAES	Biblioteca Central	1				
	THAILAND	Crop Promotion Division Dept. of Agricultural Ext.	Thanooruk, S.	2	1			
	COSTA RICA	Moravia	Quiros U., L.R.	4	1			
	USA	Ill. Nat. Hist., Section Econ. Entomol.	Soybean Entomol. Project				1	
	USA	Dupont Chem	Meade, H.			1		
AUGUST								
	USA	Insect Pathologist Dept. of Entomol. Mississippi State	Sikorowski, P.P.	1				
	USA	Iowa State Univ.	Ruiz-Vega, J.	5				

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AUGUST								
	USA	Genetics and Development Univ. of Ill.	Narde, J.	1				
	ZIMBABWE	Dept. of Crop Sciences University of Zimbabwe	Collett, W.E.	2				
	EL SALVADOR	Centro de Technologia Agricola	Vasquez F., N.R.	5				
	MEXICO	Cuautilan Mexico	Marquez Berber, S.R.	2				
	BOLIVIA	Santa Cruz, Bolivia	Zurita O., H.	4				
	VIETNAM	University of Cantho	Tuan, Thuong Tran	2				
	BRAZIL	Ponta Grossa	van der Viliet, W.H.	3				
	ZIMBABWE	Dept. of Crop Science Univ. of Zimbabwe	Levy, C.	2				
	ITALY	Univ. Degli Studi di Perugia Instituto di Entomologia Agraria	Bin, F.		1			
	ZAMBIA	Msekera Regional Research Station Grain Legume Research Team	Sohati, P.H.		1			

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AUGUST								
	USA	Ring Around Seed Research	Phelps, N.	5				
	USA	Funk Seeds International	Laible, C.	2				
	ZIMBABWE	Harare Zimbabwe	Collett, W.E.	5				
	INDONESIA	Maros Research Institute for Food Crops	Akib, Wafiah	5		66		
SEPTEMBER								
	USA	Entomol. Dept. Clemson University	Rogers, J.	3				
	PEOPLE'S REPUBLIC OF CHINA	Institute of Information of Agr. Science and Tech. The Chinese Academy of Agr. Sciences	Qu, Y.				2	
	USA	Univ. of Georgia	Ross, D.C.				2	
	COLOMBIA	CIAT	Hallman, G.				2	
	USA	Soyfoods Center	Shurtleff, B.				1	

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OCTOBER								
	ARGENTINA	Instituto Nacional de Technologia Agropecuaria	Aragon, J.R.					1
	ARGENTINA	Estacion Experimental Agricola San Pedro	Bimboni, Hugo C.					1
	ARGENTINA	Faculdad de Ciencias Exactas Fisicas y Naturales	Brewer, M.M.					1
	ARGENTINA	Estacion Experimental Agricola Oliveros	Diez, S.M.					1
	ARGENTINA	Estacion Exp. Agr. Pergamino, Instit. Nac. de Tech. Agropecuaria	Iannone, N.					1
	ARGENTINA	Estacion Exp. Agr. San Pedro, Instit. Nac. de Tech. Agropecuaria	Mitidieri, A.					1
	ARGENTINA	Estacion Exp. Agr. Oliveros - Inst. Nac. de Tech. Agropecuaria	Molinari, A.M.					1
	ARGENTINA	Estac. Exp. Agr. Pergamino - Inst. Nac. de Tech. Agropecuaria	Parisi, R.A.					1
	ARGENTINA	Inst. Nac. de Tech. Agropecuaria Plant Protection Dept.	Rizzo, H.F.					1

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OCTOBER								
	ARGENTINA	Estac. Exp. Agr. Reconquista Inst. Nac. de Tech. Agropecuaria	Sosa, M.A.					1
	ARGENTINA	Estac. Exp. Regional Agr. Parana Inst. Nac. de Tech. Agropecuaria	Vincentini, R.					1
	BRAZIL	Unidade de Execuca de Pesquisa de Ambito Estadual de Pelotas - EMBRAPA	Bertels, A.M.					1
	BRAZIL	Fecotrigo	Borgo, A.					1
	BRAZIL	Centro Nac. de Pesquisa de Soja EMBRAPA	Correa Ferreira, B.S.					1
	BRAZIL	Faculdade de Agronomia Univ. Federal do Rio Grande do Sul	Corseuil, E.					1
	BRAZIL	Centro Nac. de Pesquisa de Soja EMBRAPA	Corso, I.C.					1
	BRAZIL	Dept. de Ficotecnia-Univ. Federal de Santa Maria	Costa, E.C.					1

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OCTOBER								
	BRAZIL	Dept. of Fitotecnia-Univ. Federal de Santa Maria	Estefanel, V.					1
	BRAZIL	Centro Nac. de Pesquisa de Arroz e Feijao EMBRAPA	Ferreira, E.					1
	BRAZIL	Dept. de Zoologia-Univ. Federal do Parana	Foerster, L.A.					1
	BRAZIL	Fundacao Zoobotnica do Rio Grande do Sul	Galileo, M.H.					1
	BRAZIL	Faculdade de Agronomia-Univ. do Rio Grande do Sul	Gassen, D.N.					1
	BRAZIL	Unidade de Execucao de Pesquisa de Ambito Estadual de Dourados-EMBRAPA	Gazzoni, D.L.					1
	BRAZIL	Unidade de Execucao de Pesquisa de Ambito Estadual de Dourados-EMBRAPA	Gomez, Sergio A.					1

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OCTOBER								
	BRAZIL	Dept. de Zoologia-Inst. de Biologia, Univ. de Campinas	Grazia, J.					1
	BRAZIL	Falcuadade de Medicina Veterinaria e Agronomia de Jaboticabal	Lara, F.M.					1
	BRAZIL	Dept. de Fitotecnia-Univ. Fed. de Santa Maria	Link, D.					1
	BRAZIL	Inst. de Pesquisa Agropecuaria Secretaria de Agricultura do Rio Grande do Sul	Lorenzato, D.					1
	BRAZIL	Secao de Entomologia Inst. Agronomico	Lourencao, A.L.					1
	BRAZIL	Inst. Biologico-Estacao Experimental de Campinas	Massariol, A.A.					1
	BRAZIL	Inst. de Pesquisa Agropecuaria - Secretaria de Agricultura do Rio Grande do Sul	Morosini, S.					1

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OCTOBER								
	BRAZIL	Centro Nac. de Pesquisa de Soja - EMBRAPA	Moscardi, F.R.					1
	BRAZIL	Dept. de Entomol.- Escola Superior de Agronomia Luis de Queiroz	Nakano, O.					1
	BRAZIL	Centro Nacional de Pesquisa de Soja EMBRAPA	Panizzi, A.R.					1
	BRAZIL	Inst. Biologico - Estacao Exp. de Campinas	Ramiro, Z.A.					1
	BRAZIL	Secao de Entomol. Inst. Agronomico	Rossetto, C.J.					1
	BRAZIL	Unidade de Execucao de Pesquisa de Ambito Estadual de Dourados-EMBRAPA	Salvadori, J.R.					1
	BRAZIL	Dept. de Zoologia- Univ. Fed. de Parana	Santos, B.B.					1
	BRAZIL	Unidade de Execucao de pesquisa de Ambito Estadual de Dourados EMBRAPA	Silva, J.C.C.					1

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OCTOBER								
	BRAZIL	Falcudade de Agronomia Univ. Fed. do Rio Grande do Sul	Silva, R.P.					1
	BRAZIL	Centro Nac. de Pesquisa de Soja EMBRAPA	Villas Boas, G.L.					1
	COLOMBIA	Inst. Colombiano Agropecuaria	Garcia Roa, E.					1
	COLOMBIA	Inst. Colombiano Agropecuaria	Saldarriaga, A.					1
	INDIA	Dept. of Entomol. G.B. Pant Univ. Agr. and Tech.	Bhattacharya, A.K.					1
	INDIA	Div. of Entomol.- Indian Agr. Research Inst.	Bhattacherjee, N.S.					1
	INDIA	Dept. of Entomol.- Coll. of Agr., J.N. Agr. Univ.	Singh, O.P.					1
	JAPAN	Kyushu Nat. Agr. Exp. Sta.	Endo, Shozo					1

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OCTOBER								
	JAPAN	Nat. Inst. Agr. Sci.	Fukuhara, N.					1
	JAPAN	Nat. Inst. Agr. Sci.	Hamada, R.					1
	JAPAN	Hokuriku Nat. Agr. Exp. Stn.	Hattori, M.					1
	JAPAN	Hiroshima Agr. Exp. Stn.	Hayashi, H.					1
	JAPAN	Tohoku Nat. Agr. Exp. Stn.	Hirai, K.					1
	JAPAN	Tohoku Nat. Agr. Exp. Stn.	Honda, K.					1
	JAPAN	Upland Farming Div.., Hokkaido Nat. Agr. Exp. Stn.	Honma, K.					1
	JAPAN	Kagoshima Agr. Exp. Stn.	Horikiri, M.					1
	JAPAN	Faculity of Agr., Kagoshima Univ.	Ikenaga, H.					1
	JAPAN	Hokkaido Central Agr. Exp. Stn.	Kanehira, O.					1
	JAPAN	Prefectural Instit. Agr. and Forest Sci.	Kawahara, S.					1

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OCTOBER								
	JAPAN	Nat. Instit. of Agr. Sci.	Kiritani, K.					1
	JAPAN	Nat. Instit. of Agr. Sci.	Kishino, K.					1
	JAPAN	Kyushu Nat. Agr. Exp. Stn.	Kitamuia, C.					1
	JAPAN	Nagano Agr. Exp. Stn.	Kogayashi, S.					1
	JAPAN	Tohoku Nat. Agr. Exp. Stn.	Kobayashi, T.					1
	JAPAN	Hyogo Prefecture Agr. Cen. Exp. and Education	Kono, S.					1
	JAPAN	Kyushu Nat. Agr. Exp. Stn.	Koyama, J.					1
	JAPAN	Nagano Agr. Exp. Stn.	Kureha, Y.					1
	JAPAN	Akita Agr. Exp. Stn.	Masahiko, S.					1
	JAPAN	Kyushu Nat. Agr. Exp. Stn.	Masuda, T.					1

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OCTOBER								
	JAPAN	Tohoku Nat. Agr. Exp. Stn.	Miyahara, Y.					1
	JAPAN	Nat. Instit. of Agr. Sci.	Miyai, S.					1
	JAPAN	Nat. Insti. of Agr. Sci.	Miyazaki, M.					1
	JAPAN	Okayama Prefecture Ag. Exp. Stn.	Naggi, K.					1
	JAPAN	Nagasaki Prefectural Fruit Tree Exp. Stn.	Nagano, M.					1
	JAPAN	Nat. Instit. of Agr. Sciences	Noda, T.					1
	JAPAN	Tohoku Nat. Agr. Exp. Stn.	Oku, T.					1
	JAPAN	Nat. Grassland Research Instit.	Ouchi, Y.					1
	JAPAN	Yamagata Prefectural Agr. Exp. Stn.	Saito, T.					1
	JAPAN	Chiba-Ken Agr. Exp. Stn.	Sawada, M.					1
	JAPAN	Kochi Prefectural Instit. of Agr. and Forest Science	Shimato, R.					1

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OCTOBER								
	JAPAN	Nakamura Plant Protection Office	Takai, M.					1
	JAPAN	Nagasaki Agr. and Forestry Exp. Stn.	Toshikatu, N.					1
	JAPAN	Akita Agr. Exp. Stn.	Tsuruta, R.					1
	JAPAN	Upland Farming Div. Hokkaido Nat. Exp. Stn.	Tsutsui, H.					1
	JAPAN	Ehime Agr. Exp. Stn.	Yamasaki, Y.					1
	JAPAN	Nagano Agr. Exp. Stn.	Yanagi, T.					1
	JAPAN	Nat. Instit. of Agr. Sciences	Yasuda, S.					1
	JAPAN	Ehime Agr. Exp. Stn.	Yoshioka, K.					1
	JAPAN	Entomol. Lab., Kagoshima Univ.	Yukawa, J.					1
	NIGERIA	Int. Instit. of Tropical Agr.	Jackai, L. E.					1
	PEOPLE'S REPUBLIC OF CHINA	Ag. College, Nanjing	Xia, J.					1

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OCTOBER								
	PHILIPPINES	Cropping Sys. Prog. Int. Rice Res. Instit. Entomology Dept.	Litsinger, J.					1
	PHILIPPINES	Dept. of Entomol. Univ. of Philippines	Rejesus, R. S.					1
	TAIWAN	Asian Veg. Res. and Devel. Cen.	Talekar, N. S.					1
	TANZANIA	Dept. Crop Science, Univ. of Daresslaam	Doto, A. L.					1
	TANZANIA	Dept. Crop Science, Univ. of Daresslaam	Karel, A.K.O.					1
	THAILAND	Dept. of Agr., Entomol. and Zoology Div.	Arunin, A.					1
	THAILAND	Nat. Biol. Res. Cen (NBCRC)	Napompeth, B.					1
	USA	Dept. of Zoology/ Entomology, Auburn Univ.	Harper, J.D.					1
	USA	Dept. Zoology/ Entomol., Auburn Univ.	Mack, T. P.					1
	USA	Univ. of Arkansas	Burleigh, J.G.					1

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OCTOBER								
	USA	Dept. of Entomol. Univ. of Arkansas	Luttrell, R. G.					1
	USA	Dept. of Entomol. Univ. of Arkansas	Mueller, A. J.					1
	USA	Dept. of Entomol. Univ. of Arkansas	Tugwell, N.P.					1
	USA	Dept. of Entomol. Univ. of Arkansas	Yearian, W. C.					1
	USA	Dept. of Entomol. Univ. of Arkansas	Young, S.Y.					1
	USA	Dept. of Entomol. Univ. of California	Carlson, E.C.					1
	USA	Dept. of Ent./Nemat. Univ. of Florida	Barfield, L.					1
	USA	Dept. of Entomol. Univ. of Florida	Boote, K.J.					1
	USA	Dept. of Entomol. Univ. of Florida	Boucias, D.					1
	USA	Agr. Res. and Education Center, Univ. of Florida	Herzog, D.C.					1

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OCTOBER								
	USA	Agr. Engineer., Univ. of Florida	Jones, J.W.					1
	USA	Dept. of Entomol. Univ. of Florida	Oneil, R.J.					1
	USA	Dept. of Entomol. Univ. of Florida	Stimac, J.L.					1
	USA	Dept. of Entomol. Univ. of Georgia	Bass, M. H.					1
	USA	Extension Entomol. Univ. of Georgia	Horton, D.L.					1
	USA	Coastal Plain Exp. Stn., Univ. of Georgia	Isenhour, D.J.					1
	USA	Coastal Plain Exp. Stn., Univ. of Georgia	Reed, T.D.					1
	USA	Coastal Plain Exp. Stn., Univ. of Georgia	Todd, J. W.					1
	USA	Dept. of Entomol. Iowa State Univ.	Pedigo, L.P.					1
	USA	Univ. of Idaho	Bechinski, E.K.					1
	USA	Funk Seeds Int.	Beland, G.L.					1

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OCTOBER								
	USA	Sec. of Econ. Entomol. Il. Nat. Hist. Survey	Bouseman, J.K.					1
	USA	Sec. of Econ. Entomol. Il. Nat. Hist. Survey	Helm, C.G.					1
	USA	Il. Nat. Hist. Survey	Irwin, M.E.					1
	USA	Il. Nat. Hist. Survey	Kampmeier, G.E.					1
	USA	Sec. of Econ. Entomol. Il. Nat. Hist. Survey	Kogan, M.					1
	USA	Sec. of Econ. Entomol. Il. Nat. Hist. Survey	Ruesink, W.G.					1
	USA	Dept. of Entomol. Purdue Univ.	Bledsoe, L.W.					1
	USA	Dept. of Entomol. Purdue Univ.	Edwards, C.R.					1
	USA	Dept. of Entomol. Purdue Univ.	Flanders, R.V.					1
	USA	Kansas St. Univ.	Higgins, R.A.					1
	USA	Res. and Education Univ. of Kentucky	Johnson, D.W.					1
	USA	Dept. of Entomol. Univ. of Kentucky	Yeargan, K.V.					1

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OCTOBER								
	USA	Coop. Ext. Service Louisiana St. Univ.	Bagent, J.					1
	USA	Dept. of Entomol. Louisiana St. Univ.	Boethel, D.J.					1
	USA	Jensen Agr. Consultants, Inc.	Jensen, R.L.					1
	USA	Dept. of Entomol. Louisiana St. Univ.	Mitchell, P.L.					1
	USA	Dept. of Entomol. Louisiana St. Univ.	Newsom, L.D.					1
	USA	Dept. of Entomol. Louisiana St. Univ.	Smith, C.M.					1
	USA	Coop. Ext. Service Louisiana St. Univ.	Tynes, J.S.					1
	USA	Dept. of Entomol. Univ. of Maryland	Dively, G.P.					1
	USA	USDA, ARS, Field Crops Lab.	Elden, T.C.					1
	USA	Univ. of Maryland	Joshi, J.M.					1
	USA	Soybean Res. Agr. Dept. Univ. of Maryland	Wells, P.W.					1

APPENDIX II: SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING JULY, 1984-JANUARY, 1985

MONTH	COUNTRY	INSTITUTION	NAME	NUMBER OF BIBLIO-GRAPHIES	NUMBER OF SOY BULLETIN	NUMBER OF DOCUMENTS	NUMBER OF COMPUTER SEARCHES	NUMBER OF SOY ENT DIRECTORIES
OCTOBER								
	USA	Univ. of Minn.	Ragsdale, D.W.					1
	USA	USDA, ARS	Ignoffo, C.M.					1
	USA	Biological Control of Insects Res. Lab.	Marston, N.L.					1
	USA	USDA-ARS, Biol. Control of Insects Lab.	Puttler, B.					1
	USA	Miss. St. Univ.	Andrews, G.L.					1
	USA	Miss. St. Univ.	Hamer, J.S.					1
	USA	USDA, ARS Delta Sts. Res. Cen.	Jones, W.A.					1
	USA	AR-SEA-USDA Soybean Prod. Research Delta Branch Exp. Stn.	Kilen, T.C.					1
	USA	USDA, ARS, Delta Sts. Res. Center	Lambert, L.					1
	USA	USDA, ARS, Delta Sts. Res. Center	McWilliams, J.M.					1
	USA	Miss. St. Univ.	Pitre, H.N.					1
	USA	USDA, ARS, Delta Sts. Res. Center	Powell, J.E.					1

APPENDIX II: SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING JULY, 1984-JANUARY, 1985

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OCTOBER								
	USA	Dept. of Entomol. N. Carolina St. Univ.	Bacheler, J.					1
	USA	Dept. of Entomol. N. Carolina St. Univ.	Bradley, J.R.					1
	USA	Dept. of Entomol. N. Carolina St. Univ.	Campbell, W.V.					1
	USA	Dept. of Entomol. N. Carolina St. Univ.	Gould, F.					1
	USA	Dept. of Crop Science N. Carolina St. Univ.	Hart, S.V.					1
	USA	Dept. of Entomol. N. Carolina St. Univ.	House, G.					1
	USA	Dept. of Entomol. N. Carolina St. Univ.	Stimer, R.E.					1
	USA	Edenton, N. Carolina	Van Duyn, J.W.					1
	USA	North Platte Stn. Univ. of Nebraska	Campbell, J.B.					1
	USA	Ohio Agr. Res. and Dev. Center	Hammond, R.B.					1
	USA	Dept. of Entomol, Fisheries, and Wildlife, Clemson Univ.	Carner, G.R.					1

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OCTOBER								
	USA	Dept. of Entomol, Edisto Exp. Stn. Clemson Univ.	Chapin, J.W.					1
	USA	Dept. of Entomol, Fisheries, and Wildlife, Clemson Univ.	Culin, J.D.					1
	USA	Dept. of Entomol, Fisheries, and Wildlife, Clemson Univ.	Grant, J.F.					1
	USA	Carolina Agr. Res. Service	McCarty, M.T.					1
	USA	Dept. of Entomol, Edisto Exp. Stn. Clemson Univ.	McCutcheon, G.S.					1
	USA	Dept. of Entomol. Clemson Univ.	Shepard, B.M.					1
	USA	Dept. of Entomol, Edisto Exp. Stn. Clemson Univ.	Sullivan, M.J.					1
	USA	Dept. of Entomol, Edisto Exp. Stn. Clemson Univ.	Turnipseed, S.G.					

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OCTOBER								
	USA	W. Tenn. Exp. Stn. Univ. of Tenn.	Lentz, G.L.					1
	USA	Texas A&M Univ.	Bowers, G.					1
	USA	Texas Agr. Ext. Serv.	Drees, B.M.					1
	USA	Texas A&M Univ.	Way, M.O.					1
	USA	Eastern Vir. Res. Stn. Virginia Poly. Instit.	McPherson, R.M.					1
	USA	Virginia Poly. Instit. Tidewater Res. Cen.	Smith, J.C.					1
	EGYPT	Food Legume Res. Field	Nassib, A.M.		1		2	
	USA	Purdue Univ.	Van Holbert				2	
	USA	Sec. of Econ. Entomol. Ill. Nat. Hist. Survey	Soybean Proj.				1	
	USA	Dept. of Entomol. Univ. of Ill.	Schroeder, A.			8	5	
	USA	Dept. of Entomol. Univ. of Ill.	Metcalf, R.L.			3		
	PORTUGAL	Algueirao Portugal	Luna de Carvalho, E.A.			1		
	USA	Dept. of Crop Science N. Carolina St. Univ.	Patterson, R.P.		1	1		

APPENDIX II: SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING JULY, 1984-JANUARY, 1985

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OCTOBER								
	USA	Dept. of Entomol. Univ. of Georgia	Roger, D.C.				2	
NOVEMBER								
	USA	USDA, Univ. Missouri	Steiner, W.W.M.	1				
	USA	Dept. of Entomol. Purdue Univ.	O'Neil, R.J.				1	
	USA	The Furrow John Deere Co.	Henkes, R.	5		4		1
	USA	Dept. of Agronomy Univ. of Ill.	Vaughan, D.				1	
	USA	Dept. of Agronomy Univ. of Ill.	Barwak, U.					1
	BRAZIL	EMBRAPA/CNP soja Documentation Cen.	Alves de Lima, A.B.			11	2	
DECEMBER								
	USA	Sec. of Econ. Ent. Ill. Nat. Hist. Survey	Kogan, M.				1	
	USA	Sec. of Econ. Ent. Ill. Nat. Hist. Survey	Levine, E.				1	

APPENDIX II: SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING JULY, 1984-JANUARY, 1985

MONTH	COUNTRY	INSTITUTION	NAME	NUMBER OF BIBLIO-GRAPHIES	NUMBER OF SOY BULLETIN	NUMBER OF DOCUMENTS	NUMBER OF COMPUTER SEARCHES	NUMBER OF SOY ENT DIRECTORIES
JANUARY								
	USA	Sec. of Econ. Ent. Ill. Nat. Hist. Survey	Kogan, M.				1	
	CUBA	Sec. of Biol. Control Dept. of Plant Prot. Sancti Spiritus	Ayala, J.L.	1			2	
	BRAZIL	EMBRAPA/CNP Soja	Villas Boas, G.L.				1	
	FRANCE	Roussel UCLAL	LeRumeur, D.C.				1	
	NEPAL	Int. Agr. Devel. Serv.	Hittle, C.N.	1				1
	USA	Univ. of Missouri	Higdon, M.	1				
	USA	Dept. of Agronomy Univ. of Ill.	Barwak, U.	1				1
	MEXICO	Cardenas Mexico	Ruiz-Rosado, O.	3				
TOTALS	512 Service Units			157	35	95	41	184

APPENDIX II. SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING FEBRUARY- MARCH 31, 1985

MONTH	COUNTRY	INSTITUTION	NAME	NUMBER OF BIBLIO-GRAPHIES	NUMBER OF SOY BULLETIN	NUMBER OF DOCUMENTS	NUMBER OF COMPUTER SEARCHES	NUMBER OF SOY ENT DIRECTOR
FEBRUARY								
	USA	Dept. Agron. Univ. Missouri	Higdon, M.	1				
	People's Rep. China	Dept. Plant Protection Nanjing Agr. College	Xia, J.K.	5				1
	People's Rep. China	Dept. Plant Protection Nanjing Agr. College	Gai, J.N.	5				1
	USA	Dept. Computer Science Louisiana State Univ.	Rudd, W.G.				1	
	USA	Dept. Entomology Univ. Florida	Gregory, B., Jr.			3		
	France	Roussel UCLAF Corp.	LeRumeur, C.	1			2	1
	USA	Jacob Hartz Seed Co. Stuttgart, Arkansas	McCall, L.	4				
	Brazil	Dept. Entomology ESALQ, Peracicaba	Bleichner, E.	1				
	USA	Dept. Zoology Univ. Georgia	Crim, J.W.	1			1	
MARCH								
	Japan	Agr. Res. Center Tsukuba	Naito, A.				2	

APPENDIX SUMMARY BY MONTH, COUNTRY, AND INSTITUTIONS OF SERVICES RENDERED BY SIRIC DURING FEBRUARY - MARCH 31, 1985

MONTH	COUNTRY	INSTITUTION	NAME	NUMBER OF BIBLIO-GRAPHIES	NUMBER OF SOY BULLETIN	NUMBER OF DOCUMENTS	NUMBER OF COMPUTER SEARCHES	NUMBER OF SOY ENT DIRECTORI
March Continued--								
	Nepal	Dept. Agr. Entomol. Div. Khumaltar, Kathmandu	Gyawali, B.K.	1				1
	Nepal	Plant Prot. Dept., Inst. Agr. Animal Science, Central Campus, Ramur	Neupane, F.P.	1				1
	Mexico	A. P. 88 Cualiacan, Senaloa	Gamboa, A.V.	5				
	USA	Dept. Entomol. Univ. Illinois	Simms, L.	5			4	
	Venezuela	Fac. Agronomia Univ. Central Venezuela Maracay	Yepez Gil, G.	4			1	
	Brazil	EMBRAPA UEPAE Dourados Mato Grosso do Sul	Gazzoni, D.L.				1	

APPENDIX III: LIST OF PUBLICATIONS BY INTSOY STAFF APPEARING OR SUBMITTED, JULY 1984-MARCH 1985

Al-Heeti, M.B., and J. B. Sinclair. 1984. Inhibition of Phytophthora megasperma f. sp. glycinea zoosporogenesis by Gliocladium roseum, Trichoderma lharzianum, and Trichothecium roseum culture filtrates. (Abs.) Phytopathology 74: 807.

Bowman, J. E., G. L. Hartman, R. D. McClary, J. B. Sinclair, J. W. Hummel, L. M. Wai 1984. Effect of crop history, tillage, row-spacing and herbicide on soybean seed quality. (Abs.) Phytopathology 74: 795.

Bowman, J. E., J. T. Yorinori, and J. B. Sinclair. 1983.Efeitos de aplicacao de herbicidas para soja sobre fungos patogenicos e qualidade de semente da soja (Nontarget effects of herbicides on soybean fungal pathogens and seed quality). (Abs.) Proc. XVI Brasilian Cong. Phytopathology: 153.

Datnoff, L. E., M. A. Cubeta, V. S. Bisht, P. N. Thapliyal, and J. B. Sinclair. 1983. Soybean (Glycine max 'Wells') pre- and postemergence damping off, seed and soilborne microorganisms. Fungicide Nematicide Tests 31: 32.

Halbert, S. E., Zhang Guang-Xue, and Pu Zu-Qin. Comparison of active and passive sampling for alate aphids and speculations about transmission of soybean mosaic virus in Nanjing, China. Ann. Appl. Biol. (submitted).

Hartman, G. L., J. B. Manandhar, C. C. Machado, and J. B. Sinclair. 1984. Soybean seed treatments, 1983. Fungicide and Nematicide Tests 39: 159.

Irwin, M. E. and W. G. Ruesink. 1984. Predicting the impact of soybean mosaic virus in soybean. Poster #108. Presented by G. Kampmeier. World Soybean Research Conference III, 12-17 August, Ames, IA.

Irwin, M. E. and W. G. Ruesink. 1985. Vector intensity: A product of propensity and activity. Ch. 2 in G. D. McLean, R. G. Garrett and W. G. Ruesink, eds., Plant Virus Epidemics: monitoring, modelling and predicting outbreaks. Sydney: Academic Press (in press).

Kogan, J. 1984. International Directory of Soybean Entomologists 1984. Soybean Insect Research Information Center, Illinois Natural History Survey and College of Agricul-ture, International Soybean Program, University of Illinois at Urbana/Champaign 45 p.

Kunwar, I., T. Singh, and J. B. Sinclair. 1984. Histopathology of mixed infections by Colletotrichum truncatum and Phomopsis spp. in soybean seeds. (Abs.) Phytopathology 74:795.

Machado, C. C., G. L. Hartman, J. B. Manandhar, and J. B. Sinclair. 1984. Detection of Macrophomina phaseolina in soybean stems. Prog. & Abstrs. World Soybean Research Conf. III: 46. Ames, Iowa.

APPENDIX III: LIST OF PUBLICATIONS BY INTSOY STAFF APPEARING OR SUBMITTED, JULY, 1984-MARCH 1985

Steiner, W. W. M., D. J. Voegtlin, M. E. Irwin, and G. E. Kampmeier. 1985. Electrophoretic comparison of aphid species: detecting differences based on taxonomic status and host plant. Comp. Biochem. Physiol. (in press).

Yorinori, J. T., and J. B. Sinclair. 1983. Harvest and assay methods for seedborne fungi in soybeans and their pathogenicity. Intern. J. Trop. Plant Diseases 1: 53-59.

APPENDIX IV: INTSOY PROJECT STAFF ASSIGNED TO RESEARCH CONTRACT AID/TA/C 1984 July 1, 1984-March 31, 1985

Name	Rank/Title	Department	FTE
Professional Staff			
Camacho, Luis H.	Research Agronomist	Agronomy (from 9/21/78)	1.00
Erickson, D. R.	Asst. Agronomist	Agronomy (from 10/8/80)	1.00
Irwin, M. E.	Assoc. Professor	Ag. Entomology (from 10/28/74)	1.00
Jackobs, J. A.	Professor	Agronomy (from 8/21/78 to 6/30/80)	.50
		(from 8/21/81)	.75
Kauffman, H. E.	Director	INTSOY Administration (from 12/21/81)	1.00
Nelson, A. I.	Professor	Food Science (from 8/20/84)	.50
Shettel, Nancy	Ass. Plant Pathologist	Plant Pathology (from 3/19/84 to 3/30/85)	1.00
Sinclair, J. B.	Professor	Plant Pathology (from 8/21/81)	.25
			.50
Stearn, W. C.	Asst. Professor	Agronomy (From 3/21/80)	1.00
Wei, L. S.	Professor	Food Science (from 10/21/77)	.25
Yeh, Sing-Wood	Research Associate	Food Science (from 7/1/84)	1.00
Support Staff			
Creswell, Jean	Clerk Typist III	Agronomy (from 3/10/81)	1.00
Hansens Judy A.	Secretary	INTSOY Administration (from 4/24/82)	1.00

APPENDIX IV: INTSOY PROJECT STAFF ASSIGNED TO RESEARCH CONTRACT AID/TA/C-1294 July 1, 1984-March 31, 1985 (cont'd)

Support Staff (cont'd)

Irvin, Gloria	Clerk Typist III	Food Science (from 6/2/81)	.50
Kampmeier, Gail	Res. Technician	Ag. Entomology (from 10/19/83)	1.00
King, Phylis	Clerk Typist III	Plant Pathology (from 10/19/83)	.50
Kogan, Jenny	Research Associate	Ag. Entomology (from 1/21/77)	.75
		(from 2/1/84)	.50
Smyth, Charles A.	Statistician	Agronomy (from 8/21/83)	.50
Wijeratne, Wilmot	Research Assistant	Food Science	.50