USDA SOYBEAN GERMPLASM COLLECTION REPORT

February 1994

In 1993, a total of 13,314 seedlots were distributed from the USDA Soybean Germplasm Collection in response to 342 requests from 37 states and 22 foreign countries. There were 295 domestic seed orders for 12,540 seedlots and 47 foreign requests for 889 seedlots. Numerous publications were sent in response to 11 domestic and 6 foreign requests for information about the collection. Additionally, 342 accessions were sent to the National Seed Storage Laboratory at Ft. Collins, Colorado, as back-up samples for the collection.

Of the approximately 13,500 *Glycine max* strains in the collection in 1993, 1600 were grown in 4-row plots at Urbana, Illinois, and 86 were grown in 4-row plots at Stoneville, Mississippi, for seed replacement. Also grown in 4-row plots at Stoneville, for seed increase, were 49 Nepalese accessions, received at Urbana in 1990. Because original seed of these lines, collected in 1984 by an IBPGR-sponsored plant exploration expedition, was mixed, of poor quality and low germination, seed had to be increased before purelineing could begin. It was then necessary to pureline this group in the greenhouse. Seed of these lines will be available for distribution for the first time, once this fall's harvest is processed. An additional 96 group X accessions were planted in 12-foot, single-row plots in Puerto Rico for seed replacement in November 1993. These lines will be harvested in March 1994 and will then be available for distribution.

Of the 3424 pureline and comparison plant rows grown in 1993, 568 were grown at Stoneville and 2856 were grown at Urbana. Comparison plant rows are those of an established strain which is grown alongside the pureline plant rows when no conclusion is reached about the equality of a new accession and an established strain the first year an accession is grown. The total number of *G. max* accessions added to the collection this year was nearly 1000, with purelines added from China, Russia, Nepal, South Korea, Japan and Taiwan. Included in this number are the 737 purelines harvested from the 500 Chinese accessions received in May of 1992. Many of these original seed lots were mixed. The final number of lines added to the collection may be slightly lower after all of this year's seed samples have been compared.

In Puerto Rico, single plants for purelining were harvested in February 1993 from the 153 maturity group IX accessions in the collection plus 194 new accessions from Indonesia and 5 new accessions from China. Seed production was extremely poor for many of these plants. Therefore, seed of 232 of these were planted in November 1993, in 5-foot, single-row plots for seed increase. These lines will be harvested sometime this month and will be planted by the end of March in 8-foot rows, along with the remaining maturity group IX accessions. The purelineing and evaluation of this group will be completed this year, and seed of these lines will again be available for distribution sometime this year. Three year's experience with growing the group IX's and X's indicates that when planted in Puerto Rico, group IX's are best grown in the summer and group X's in the winter.

Accessions grown for the first time in 1993 originated from China, Russia, Vietnam, Argentina and Japan. Of these, 148 *G. max* accessions were grown at Urbana and 81 were grown at Stoneville. The following institutions donated this germplasm: Japanese National Federation of Agriculture Cooperative Association, Tokyo, Japan; Organizacion Ferrarotti para el Campo, Buenos Aires, Argentina; National Scientific Committee, Beijing, China; Institute of Crop Germplasm Resources, Beijing, China; University of Can Tho, Department of Genetics and Plant Breeding, Can Tho, Vietnam. The following people helped to obtain these new accessions, and their assistance is greatly appreciated: R.L. Bernard, University of Illinois; Y. Chen, Institute of Crop Germplasm Resources; J.S. Ferrarotti, Organizacion Ferrarotti para el Campo; K. Naito, Japanese National Federation of Agriculture Cooperative Association; T.T. VanToai, USDA-ARS; T.D. Vuong, University of Can Tho; G. White, USDA-ARS-PSI-NGRL-PIO. We would also like to thank the Illinois Soybean Program Operating Board, Iowa Soybean Promotion Board, Iowa Agriculture and Home Economics Experiment Station, Illinois Agricultural Experiment Station and USDA-ARS for their support of the Chinese germplasm exchange project.

Dr. Qiu Lijuan, the visiting scholar from China currently working with the germplasm project, is characterizing some of the ancestors of the modern Chinese cultivars. She will be comparing them with the ancestors of modern U.S. cultivars, most of which originated in China. Several of the ancestors of the modern Chinese lines were already in our collection, but Dr. Qiu identified 20 that were not. These lines were requested from the Institute of Crop Germplasm Resources, Beijing, China and have been received at Urbana. In addition to the 20 ancestral lines from China which will be planted in 1994, 20 *G. max* accessions have been received Japan, 7 from the Russian Federation and one from India. No new accessions of *G. soja* have been received for planting in 1994.

Sixty-five plots of *G. soja* were grown at Urbana and 9 plots were grown at Stoneville for seed increase in 1993. Four new lines, all from Russia, were added to the wild soybean collection this year, bringing the current inventory of the USDA Wild Soybean Germplasm Collection to 1040 accessions. Grown for the first time this year at Urbana were 22 accessions from eastern Russia, which were donated by the Far Eastern Experiment Station, All-Russian Institute of Plants, Vladivostok, Russia, and the Lenin All-Union Academy of Agricultural Sciences, Far East Department, All-Russian Institute of Plants, Blagoveshchensk, Russia. This germplasm was obtained by T.A. Lumkin, Washington State University.

Unpublished data for accessions in maturity groups less than V which were introduced before 1963 have been submitted for publication in a USDA Technical Bulletin. This information had been available previously as locally produced bulletins but was never released in a formal publication. These data were revised so that the format of this publication would follow that of previously published technical bulletins containing general evaluation data. Pubescence form and density data have been added; reported stem termination codes are based upon the stem termination score; and the country of origin was reviewed and updated, when more current information was available. Once we receive copies, this publication will be distributed to soybean researchers throughout the world. We plan to include updated versions of non-published information about the soybean collection in this mailing. In 1993, the general evaluation of 812 accessions of maturity group VI was completed at Stoneville. These data will be summarized and published in a USDA Technical Bulletin this year. This spring, we will begin the evaluation of approximately 760 accessions of maturity group VII and VIII at Stoneville. Also, about 800 accessions of maturity groups less than V which have been added to the collection since 1987 will undergo the first year of general evaluation at Urbana in 1994.

Data from S.C. Anand's soybean cyst nematode screening study and T.C. Kilen's stem canker study have been received and will be added to the GRIN database with the assistance of members of the Database Management Unit in Beltsville, Maryland. Also to be added to the GRIN database is the information being gathered about the newly added Chinese lines. These data will be entered into the GRIN as soon as possible. The re-designed and updated version of GRIN is scheduled to be up and running in early June of 1994.

The current inventory of the USDA Perennial *Glycine* Germplasm Collection consists of 890 accessions. Thirty-five new accessions were added to the collection this year, as a result of a USDA-sponsored plant collection trip to Western Australia, conducted by T. Hymowitz, University of Illinois, and T. Brown and J. Grace, both with CSIRO, Queensland, Australia. Species represented in this group of new accessions include *G. canescens*, *G. clandestina*, *G. tomentella* and the newly identified species, *Glycine pindanica*. The addition of this new species brings the total of perennial *Glycine* species to sixteen. Fifty seeds of 60 accessions were sent to the National Seed Storage Laboratory, and an additional set containing 10 seeds per packet was sent to the USDA Soybean Germplasm Collection in 1993. Of the collection, 690 accessions currently have sufficient seed for distribution, and backup samples of about 535 accessions are stored at the National Seed Storage Laboratory in Ft. Collins, Colorado. During 1993, 339 seed packets were sent in response to 22 requests from 6 states and 5 foreign countries. Most packets shipped had 5 to 10 seeds per packet. Voucher specimens of all accessions which have been grown successfully have been placed in the Crop Evolution Herbarium. A regime for biological control of pests was established in the greenhouse this year, with encouraging preliminary results. Intensive vegetative propagation by cuttings and by grafting to *G. max* stocks has helped in the multiplication of some perennials which are difficult to multiply by conventional methods. This collection is maintained through a cooperative agreement with Ted Hymowitz, University of Illinois.

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REPORT ON GERMPLASM EXCHANGE FROM CHINA

In May of 1992, we received 500 accessions from nine provinces in central China. Table 1 shows the origin of these lines and the number of accessions previously in the collection from those provinces. In the fall of 1992, we harvested single plants in the pureline process. Because of the interest in this material, we began some evaluation projects with seeds from one plant from each of the original 500 accessions. Seed amounts were very limited, so the projects selected were those that could be initiated with 5 to 10 seeds.

John Imsande and Reid Palmer at Iowa State screened the lines for root fluorescence variants and several isozymes. They have identified isozyme variation not previously known to exist. Cecil Nickell has completed evaluation for resistance to two races of Phytophthora root rot. He found that, depending upon the province of origin, resistance varied greatly and that reaction patterns suggest the possiblity of new genes. We have characterized the diversity in storage protein subunits and believe we may have found a null or greatly reduced subunit not previously reported. Lila Vodkin, working with Yiwu Chen, a visiting scientist from China, compared RAPDs of selected lines from four provinces and Greg Noel is currently evaluating for SCN resistance. Preliminary data indicate that these accessions are different from those currently in our collection and portend additional successes as we initiate new projects.

Dr. Qiu Lijuan, the visiting scholar currently working with the germplasm project, is characterizing some of the ancestors of the modern Chinese cultivars. She will be comparing them with the ancestors of modern U.S. cultivars, most of which originated in China. Several of the ancestors of the modern Chinese lines were already in our collection, but Dr. Qiu identified 20 that were not. All that was required to have these lines delivered to the U.S. embassy for shipment to the U.S. was a letter to Prof. Chang. This is the first time that we have been able to request specific germplasm lines from China and have them sent to us immediately. We may not be able to expect this kind of response in every situation, but it is evidence that our relationship with China concerning germplasm exchange has greatly improved.

Table 2 indicates the number of lines in each maturity group from each province tentatively added to the collection. We harvested 737 purelines this fall. Many of the 500 original seed lots were mixed. The final number added to the collection may be slightly lower after all of the seed samples have been compared. We have reached an agreement for a second exchange of germplasm. It is almost certain that we will receive 500 accessions from southern China this spring. We continue to receive support from the Illinois Soybean Program Operating Board, Iowa Soybean Promotion Board, Iowa Agriculture and Home Economics Experiment Station, Illinois Agricultural Experiment Station and USDA-ARS for the Chinese germplasm exchange project. These funds will be used to support a visiting scholar from China for each of the next two years and to acquire a thermal cycler, an electronic balance and a centrifuge, which will be sent to the germplasm laboratory in Beijing.

Table 1. Number of accessions in the USDA Soybean Germplasm Collection in 1991 and number of new accessions received in 1992 from the 9 Chinese provinces.

Province	Previous Accessions	New Accessions
Anhui	50	2
Gansu	73	0
Hebei	36	70
Henan	76	8
Jiangsu	46	55
Ningxia	17	0
Shaanxi	41	13
Shandong	96	20
Shanxi	65	4
TOTAL	500	172

Table 2. Number of purelines tentatively added to the USDA Soybean Germplasm Collection for the Chinese exchange by maturity group and province.

	0	I	II	III	IV	V	VI	VII	VIII	Total
Anhui					18	48				66
Gansu		1	9	3	44	42	2	2	1	104
Hebei			12	27	10	1				50
Henan				13	86	13				112
Jiangsu			3	10	52	12				77
Ningxia			5	10	8	2				25
Shaanxi				1	11	42	4	8	1	67
Shandong		1	20	41	75	4				141
Shanxi	2	3	18	12	52	8				95
TOTAL	2	5	67	135	386	124	6	10	2	737