

USDA SOYBEAN GERmplasm COLLECTION REPORT -- 2011

February 2012

In 2012, we distributed 26,785 seed lots from 15,196 accessions from the USDA Soybean Germplasm Collection in response to 594 requests from 336 individuals. This is the tenth year in a row and 14 of the past 17 years in which we have distributed more seed lots than total accessions in the Collection. We are the only collection in the National Plant Germplasm System (NPGS) with a distribution number to collection size ratio that is over 1. There were 538 domestic requests (91% of the total) with a total of 24,499 seed packets representing 14,768 accessions sent to 292 researchers from 39 states and Puerto Rico. Domestically, public scientists made 388 requests and scientists with commercial companies made 150 requests. There were 2,286 seed packets of 2,076 accessions in 56 orders sent to 44 scientists in 15 countries. Twenty-three requests were made for 607 seed packets of 431 perennial *Glycine* accessions. We also sent backup seeds of 386 accessions to the National Center for Genetic Resources Preservation and 1,186 accessions for storage in the Svalbard Arctic Seed Vault. We have now sent 9,248 accessions to Svalbard. A sample for Svalbard is packaged each time new seeds are added to the Collection so over a period of 10 years all annual accessions will have been sent.

We planted 1,423 accessions of *G. max* for seed replacement in the Collection. These were planted at three locations: 861 accessions at Urbana, 330 accessions at Stoneville, and 232 accessions in Costa Rica. Plots for pure lining new accessions were planted in Urbana, Stoneville, and Costa Rica. One new accession from Brazil and 96 new *Glycine max* pure line accessions from Vietnam were added to the Collection.

We received seeds of 15 domestic cultivars and 4 germplasm releases.

Two-year evaluations of accessions received since 1998 were started in Stoneville, MS (665 accessions, maturity groups V – VIII); Urbana, IL (459 accessions, maturity groups I – IV); and Rosemont, MN (90 accessions, maturity groups 000 – I). For each accession grown at Urbana, pictures of a leaf, leaf surface showing pubescence orientation, pulvinus, mature plants, pods, and seeds were recorded and have been added to GRIN. Many of the plants in Urbana grew poorly due to a summer drought and produced very few seeds, especially maturity group IV accessions from Vietnam, so the trial may have to be repeated an additional year.

In cooperation with Marcelo Oliveira of Embrapa, all of the soybean accessions in maturity groups IX and X will be evaluated in northern Brazil this year.

NPGS plans to implement the switch from GRIN to GRIN Global in late 2012 or early 2013. Training sessions for site users have been scheduled for this spring. The public version of GRIN-Global Release 1.0 is now available at <http://test.grin-global.org/gringlobal>.

Prakash Arelli screened 280 accessions for resistance to soybean cyst nematode, race 1, and Bibiana Ferrari de Novoa (Don Mario Semillas, Argentina) screened 109 accessions for resistance to frogeye leaf spot, race 11. Glen Hartman screened all 10,139 of the available *Glycine max* accessions not yet tested for resistance to SDS and is summarizing the data. He will screen 1180 *Glycine soja* accessions for SDS resistance this year.

Glen Hartman screened all of the available perennial *Glycine* accessions not yet tested for resistance to *Sclerotinia* stem rot (221) and SDS (250) and is in the process of summarizing the data

The South Korean Rural Development Administration has agreed to make available some of the germplasm in their genebank to the NPGS pending approval of an MTA agreeable to both countries. We have

submitted a request for 63 Korean soybean varieties and 1760 *G. soja* accessions based on the information from their web site. With the help of Kelly Whiting from USB, possible germplasm exchanges with Ukraine and Kazakhstan are being explored. We are also talking with scientists at National Agriculture Research Organization Institute of Crop Science in Tsukuba, Japan about possible exchanges of wild soybean.

The SNP genotyping of all of the annual accessions in Collection that is being done with Perry Cregan's laboratory is scheduled to be completed this summer. There are 52,041 SNPs on SoySNP50K iSelect SNP beadchip. Validation of the SoySNP50K chip with 96 soybean accessions, 96 U.S. cultivars and 101 wild soybean accessions showed that 47,446 SNPs were polymorphic and 86% had minor allele frequencies $\geq 10\%$. It is likely that more SNPs will be polymorphic when the data set is complete.

The cost of phytosanitary certificates remains a problem for the NPGS. APHIS must support the phytosanitary certificate operation with user fees and those fees have risen from \$23 in 2008 to \$61 in 2012. These costs have now outstripped the available funds from the Plant Exchange Office (PEO). Last fiscal year sites that use this service, such as our Collection, contributed funds to offset the cost to the PEO. This fiscal year the PEO is getting some certificates from the Maryland Department of Agriculture at a much reduced cost compared to APHIS. This has already saved the System nearly \$8,500. ARS is continuing to work with APHIS to try to reach a sustainable solution for both agencies.

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As of December 31, 2010, the Collection contained the following entries:

USDA Soybean Germplasm Collection Inventory

Annual subcollection	Entries	Perennial species	Entries
Introduced <i>G. max</i>	17135	<i>G. arenaria</i>	5
<i>G. soja</i>	1180	<i>G. argyrea</i>	14
Germplasm releases	188	<i>G. canescens</i>	123
Modern cultivars	538	<i>G. clandestina</i>	90
Old cultivars	208	<i>G. curvata</i>	9
Private cultivars	75	<i>G. cyrtoloba</i>	48
All isolines	599	<i>G. dolichocarpa</i>	3
Color	47	<i>G. falcata</i>	29
<u>Genetic types</u>	<u>197</u>	<i>G. latifolia</i>	44
Annual subtotal	20167	<i>G. latrobeana</i>	7
		<i>G. microphylla</i>	32
		<i>G. peratosa</i>	7
		<i>G. pescadrensis</i>	68
		<i>G. pindanica</i>	4
		<i>G. rubiginosa</i>	38
		<i>G. stenophita</i>	27
		<i>G. syndetika</i>	5
		<i>G. tabacina</i>	143
		<i>G. tomentella</i>	310
		Perennial subtotal	1006
Collection total	21173		

Number of accessions screened for which data is entered in GRIN:

<i>Perennial Glycine</i>		
Type	Descriptor	Accessions screened
	Core subset	116
	Image	958
CHEMICAL	Bowman-Birk Inhibitor	553
CYTOLOGIC	Chromosome number	766
DISEASE	Sclerotinia stem rot	777
DISEASE	Sudden death syndrome	758
MORPHOLOGY	Adventitious roots	330
MORPHOLOGY	Leaflet arrangement	299
MORPHOLOGY	Upper pubescence type	299
MORPHOLOGY	Upper terminal leaflet length	271
MORPHOLOGY	Upper terminal leaflet shape	299
MORPHOLOGY	Upper terminal leaflet width	299
NEMATODE	Soybean cyst nematode, race 3	493

<i>Glycine max</i>		
Type	Descriptor	accessions screened
	Core Subset	1685
Chemical	Arginine	5530
Chemical	Cysteine	5530
Chemical	human allergen P34	13267
Chemical	Iodine number	2817
Chemical	Isoleucine	5530
Chemical	Leucine	5530
Chemical	Linoleic	16521
Chemical	Linolenic	16520
Chemical	Lysine	5530
Chemical	Methionine	7069
Chemical	Oil	16625
Chemical	Oleic	15803
Chemical	Other fatty acid composition	5720
Chemical	Palmitic	15803
Chemical	Petiole ureide	2499
Chemical	Protein	16625
Chemical	Stachyose	5522
Chemical	Stearic	15803
Chemical	Sucrose	5483
Chemical	Threonine	5530
Chemical	Tryptophan	5530
Chemical	Valine	5530
Disease	Bacterial pustule	3438
Disease	Bean pod mottle virus	424
Disease	Brown stem rot	4027
Disease	Frogeye C-32 isolate	1688
Disease	Frogeye race 2	2665
Disease	Frogeye race 11	109
Disease	Frogeye, unspecified race	115
Disease	Northern stem canker	1489
Disease	Peanut mottle virus	2150
Disease	Phytophthora rot, race 1	9988
Disease	Phytophthora rot, race 10	629
Disease	Phytophthora rot, race 12	646
Disease	Phytophthora rot, race 17	2235
Disease	Phytophthora rot, race 2	433
Disease	Phytophthora rot, race 20	659
Disease	Phytophthora rot, race 25	2844
Disease	Phytophthora rot, race 3	2826
Disease	Phytophthora rot, race 30	115
Disease	Phytophthora rot, race 30T	263
Disease	Phytophthora rot, race 31	145
Disease	Phytophthora rot, race 33	113
Disease	Phytophthora rot, race 38	65
Disease	Phytophthora rot, race 4	1478
Disease	Phytophthora rot, race 5	798
Disease	Phytophthora rot, race 6	139
Disease	Phytophthora rot, race 7	2980
Disease	Phytophthora rot, race 8	149
Disease	Phytophthora rot, race 9	96
Disease	Pythium ultimum	1290
Disease	Southern stem canker	120
Disease	Soybean mosaic virus	15

<i>Glycine max</i>		
Type	Descriptor	accessions screened
Disease	Soybean rust, mixed	437
Disease	Soybean rust, red-brown	103
Disease	Soybean rust, tan	3099
Disease	Soybean sudden death syndrome	6859
Growth	Height	16195
Growth	Stem termination type	17441
Insect	Beet armyworm	5
Insect	Corn ear worm	27
Insect	Leaf hopper injury	784
Insect	Mexican bean beetle damage	5049
Insect	Soybean aphid resistance	2600
Insect	Soybean looper	2335
Insect	Velvetbean caterpillar	133
Morphology	Branching	2151
Morphology	Early shattering score	14779
Morphology	Flower color	17570
Morphology	Hilum color	17588
Morphology	Image	2033
Morphology	Late shattering score	12243
Morphology	Lodging	16040
Morphology	Lower leaflet ration	15
Morphology	Mottling score	13016
Morphology	Other leaf traits	969
Morphology	Other plant traits	257
Morphology	Other seed traits	3473
Morphology	Pod color	17559
Morphology	Pod length	15
Morphology	Pubescence color	17711
Morphology	Pubescence density	17654
Morphology	Pubescence form	17196
Morphology	Seed coat color	17746
Morphology	Seed coat luster	17410
Morphology	Seed quality	16198
Morphology	Seed shape of <i>Glycine max</i>	8159
Morphology	Seed weight	16202
Morphology	Stem termination score	11145
Morphology	Upper leaflet length	15
Morphology	Upper leaflet shape	15
Nematode	Cyst nematode, race 1	496
Nematode	Cyst nematode, race 14	2493
Nematode	Cyst nematode, race 2	214
Nematode	Cyst nematode, race 3	12097
Nematode	Cyst nematode, race 4	7379
Nematode	Cyst nematode, race 5	11227
Phenology	Flowering	16204
Phenology	Maturity date	16378
Phenology	Maturity group	17760
Phenology	Twining date	14
Production	Yield	16021
Root	Root fluorescence	796
Stress	Chlorosis score	1974
Stress	High temperature	520
Stress	Salt reaction	564

<i>Glycine soja</i>		
Type	Descriptor	Accessions screened
Chemical	Human allergen P34	1116
Chemical	Linoleic	1075
Chemical	Linolenic	1075
Chemical	Oil	1075
Chemical	Oleic	1075
Chemical	Other fatty acid composition	182
Chemical	Palmitic	1075
Chemical	Protein	1075
Chemical	Stearic	1075
Disease	Bean pod mottle virus	116
Disease	Phytophthora rot, race 3	448
Disease	Soybean mosaic virus	182
Disease	Height	182
Disease	Stem termination type	258
Insect	Beet armyworm	425
Insect	Soybean looper	379
Insect	Velvetbean caterpillar	408
Morphology	Flower color	1008
Morphology	Hilum color	1037
Morphology	Image	1073
Morphology	Leaflet shape	1060
Morphology	Leaflet size	1060
Morphology	Lower leaflet area	1041
Morphology	Lower leaflet aspect	1049

<i>Glycine soja</i>		
Type	Descriptor	Accessions screened
Morphology	Lower leaflet ratio	182
Morphology	Other leaf traits	38
Morphology	Other plant traits	3
Morphology	Other seed traits	300
Morphology	Pod color	1005
Morphology	Pod length	182
Morphology	Pubescence color	1003
Morphology	Pubescence density	1002
Morphology	Pubescence form	450
Morphology	Seed coat color	1041
Morphology	Seed coat luster	572
Morphology	Seed shape	185
Morphology	Seed weight	182
Morphology	Upper leaflet length	182
Morphology	Upper leaflet shape	182
Nematode	Cyst nematode, race 1	1078
Nematode	Cyst nematode, race 3	545
Nematode	Cyst nematode, race 4	1
Nematode	Cyst nematode, race 5	547
Phenology	Flowering	1076
Phenology	Maturity date	1076
Phenology	Maturity group	1007
Phenology	Twining date	182
Stress	Chlorosis score	19

Photos stored in GRIN:

	Number of Photos	Number of Accessions
<i>G. max</i>	7,190	3,023
<i>G. soja</i>	2,051	1,081
Perennial <i>Glycine</i>	3,106	969