

USDA SOYBEAN GERmplasm COLLECTION REPORT -- 2012

February 2013

In 2012, we distributed 33,737 seed lots from 14,157 accessions from the USDA Soybean Germplasm Collection in response to 703 requests from 395 individuals. This is the eleventh year in a row and 15 of the past 18 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 637 domestic requests (91% of the total) with a total of 29,543 seed packets representing 13,239 accessions sent to 339 researchers from 38 states. Domestically, public scientists made 429 requests and scientists with commercial companies made 208 requests. There were 4,203 seed packets of 3,385 accessions in 66 orders sent to 56 scientists in 18 countries. Twenty-three requests were made for 1,515 seed packets of 994 perennial *Glycine* accessions. We also sent backup seeds of 315 accessions to the National Center for Genetic Resources Preservation (NCGRP) and 1,103 accessions for storage in the Svalbard Arctic Seed Vault. We have now sent 10,351 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 1,672 accessions of *G. max* for seed replacement in the Collection. These were planted at two locations: 1333 accessions at Urbana, 339 accessions at Stoneville. Plots for pure lining new accessions were also planted in Urbana, Stoneville.

The second evaluation year of accessions received since 1998 was completed 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 both years due to a summer droughts and produced very few seeds, especially maturity group IV accessions from Vietnam, so the trial will be repeated an additional year.

One new accession from Japan and 17 new *Glycine max* pure line accessions from Vietnam were added to the Collection. We received seeds of 3 domestic cultivars, 4 germplasm releases, one isoline, and 491 private varieties with expired Plant Variety Protection certificates (PVPC). The descriptive data from the PVPC was added to GRIN. In the future, we will receive half of the PVPC sample from NCGRP whenever the PVPC expires. We are not aware that any soybean accessions with expired PVPCs are patented, but because this might be the case in the future, the PVPC number is printed on order packing lists with the following disclaimer.

Intellectual Property Considerations:

This order contains accessions that were originally deposited as a Plant Variety Protection Certificate (PVPC) voucher specimen. These accessions may be protected by intellectual property rights other than the expired PVPC. NPGS suggests that requestors may consult with the variety owner named on the issued PVPC.

There is a two year backlog of maintenance seed which has been harvested but not cleaned and added to the inventory seed boxes. These seeds are being stored under controlled environmental conditions. This backlog has been present and quite consistent since the northern and southern germplasm collections were consolidated in 1991. Beginning this year, we have decided to maintain seeds in storage for 11 years rather than 10 years as long as the quantity of seeds is sufficient. This will reduce the number of accessions grown this summer by about 80% and the plan is apply the extra time to eliminating the backlog of unprocessed seeds. In order to speed up processing seed samples, only 3000 seeds will be cleaned and processed even if

more was harvested. Additional seeds will be processed from some accessions based on the past request record.

Our cold room storage was expanded by 1750 ft³. This will allow all germplasm accessions to be stored in same cold room and provide shelf space for the unprocessed bags of seeds, which were previously stored in large sacks stacked in the aisles or temporarily stored off-site.

Alyson Steines, the technician who worked with new introductions, tropical accessions, wild soybeans, and managed our greenhouse, resigned in August. A request to fill her position has been approved and the hiring process has been initiated.

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

NPGS plans to implement the switch from GRIN to GRIN Global in 2013. The public version of GRIN-Global Release 1.0 is now available at <http://test.grin-global.org/gringlobal>.

Louis Hesler screened 339 accessions for resistance to soybean aphid and defoliation by chewing insects. Glen Hartman screened all 1180 *Glycine soja* accessions and 10,139 of the available *Glycine max* accessions for resistance to SDS and is summarizing the data.

The request we submitted to the South Korean Rural Development Administration for 63 Korean soybean varieties and 1760 *G. soja* accessions based on the information from their web site was not approved. We can obtain wild soybean germplasm from National Agriculture Research Organization Institute of Crop Science in Tsukuba, Japan but the germplasm would come with an MTA that would prevent us from distributing the accessions to third parties. We cannot add accessions to the Collection with this restriction.

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 soon. In the final data set, there will be data for slightly over 42,500 SNPs.

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. A procedure that will allow for foreign requestors to voluntarily pay for the cost of the phytosanitary certificate is being developed.

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As of December 31, 2012, the Collection contained the following entries:

USDA Soybean Germplasm Collection Inventory

Annual subcollection	Entries	Perennial species	Entries
Introduced <i>G. max</i>	17141	<i>G. arenaria</i>	5
<i>G. soja</i>	1180	<i>G. argyrea</i>	14
Germplasm releases	192	<i>G. canescens</i>	123
Modern cultivars	544	<i>G. clandestina</i>	90
Old cultivars	208	<i>G. curvata</i>	9
Private cultivars	562	<i>G. cyrtoloba</i>	48
All isolines	600	<i>G. dolichocarpa</i>	3
Color	47	<i>G. falcata</i>	29
Genetic types	197	<i>G. latifolia</i>	44
Annual subtotal	20671	<i>G. latrobeana</i>	6
		<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	1005
Collection total	21676		

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

Perennial <i>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
Disease	Soybean rust, mixed	437

<i>Glycine max</i>		
Type	Descriptor	accessions screened
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	3315
Insect	Soybean looper	2335
Insect	Velvetbean caterpillar	133
Defoliation	Defoliation by chewing insects	339
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>	7,630	3,055
<i>G. soja</i>	2,051	1,081
Perennial <i>Glycine</i>	3,194	976