

Phaseolus Germplasm Conservation for the USDA, ARS, National Plant Germplasm System R. M. Hannan  
 USDA, ARS, Western Regional Plant Introduction Station (WRPIS), Pullman, WA 99164-6402

The Western Regional Plant Introduction Station (WRPIS) is responsible for the maintenance and distribution of germplasm collections of 284 crop genera. These genera include over 62,000 accessions in nearly 1,900 species of germplasm with either food or ornamental potential. The Phaseolus collection is the largest collection maintained at WRPIS, and includes over 13,000 accessions in 36 species. The mission of the station is to acquire, maintain, evaluate, document and distribute the information and germplasm, as well as to conduct scientific research in areas related to germplasm preservation, seed physiology, genetics, etc.

Phaseolus germplasm is acquired by either foreign or domestic collecting trips, or from donors, foreign or domestic, and from national programs, institutions, or private collections. Seeds are received at WRPIS, logged into the NPGS computer database, and put into cold storage until they are grown for the initial increase and evaluation. Rarely do we receive enough seed to begin distribution from the original sample.

Maintenance of germplasm includes increase of the seed and storage under conditions which are conducive to the utilization of a working collection. The seed storage facility is located on the campus of Washington State University, and seed is stored in metal containers at 4C and 28-30% RH. Each increase is carried out so that the maximum genetic diversity of the original sample is preserved, and careful steps are taken to maintain genetic integrity between samples.

Bean increases are done almost exclusively under greenhouse conditions. Over 20% of the Phaseolus accessions must be handled in special ways due to unique pollination or daylength requirements. Hand manipulation (tripping or use of a brush) of the flowers is necessary for some species. The greenhouse is continuously cropped throughout the year. Accessions are selected for planting according to availability, viability, and photoperiodism. Continuous efforts are made to maintain vigorous and disease free plants.

Pest control in the greenhouses is managed under an Integrated Pest Management program. Sanitation, environmental control, insect growth regulators, insecticidal soap and the introduction of biological predators in addition to chemical pesticides are used to control pest populations. A low threshold level of pests is tolerated to sustain biologicals, but there is zero tolerance for the presence of aphids. The goal of the IPM program is to produce the quantity and quality of germplasm desired by the Plant Introduction Program using a minimum amount of pesticides. This goal has been adopted as an environmentally responsible method of operation, and helps ensure the health of greenhouse personnel. Insecticides, miticides and fungicides are available for use as they become necessary. *Frankliniella occidentalis*, the Western flower thrip, *Trialeurodes vaporariorum*, the greenhouse whitefly; and *Tetranychus urticae*, the two-spotted spider mite are the major insect pests of concern. Insect monitoring is done by visual inspection while harvesting or trimming, or as a separate task. White flies have been controlled using the parasitic wasp, *Encarsia formosa*, in combination with greenhouse sanitation and spraying adults with either insecticidal soap or an insect growth regulator. Thrips are controlled with insect growth regulators and the release of *Amblyseius cucumeris*, a predatory mite. For mites we use two predatory mites, *Phytoseiulus persimilis* and *Iphiseius degenerans*, as well as hand-picking of badly infested foliage and greenhouse environment control. If found, the bean aphid, *Aphis fabae*, is rapidly eliminated from the greenhouse environment with insecticides, because they can vector viruses.

A program has been established to eliminate seed borne viruses, particularly bean common mosaic virus (BCMV), from the Phaseolus germplasm collection. Using a commercial potyvirus antiserum, the enzyme-linked immunosorbent assay (ELISA) is conducted during the seed increase process. The protocol for the ELISA follows the 'indirect' procedure. All plants of each accession are tested at both the first trifoliate stage and at bloom stage. Where accessions have less than a ten percent level of infection, the infected plants are discarded and the remainder are grown to harvest. If the level of infection is greater than ten percent within an accession, then all infected plants are moved to a different greenhouse, grown through to harvest, and seed from a virus free plant is obtained from the progeny of the subsequent generation. In this way we achieve seed production from the targeted fifty plants per accession and maintain the broadest genetic diversity within an accession.

Adequate plant and seed evaluation and documentation of the evaluation and passport data are essential for effective management and utilization of plant genetic resources. A set of 27 plant character descriptors, with associated codes, has been developed for the Phaseolus collection. Data is collected at WRPIS or other evaluation sites and is entered into the NPGS Germplasm Resources Information Network (GRIN) database. Both the descriptor set and the associated data are available from GRIN either via the World Wide Web (home page = <http://www.ars-grin.gov>) or as PC-GRIN from the Data Base Management team in Beltsville, MD.

Distribution of NPGS germplasm and information is provided, free of charge, to domestic and foreign research scientists. The normal distribution is 30-50 seeds per accession, with the only limits being availability of seed. Requests can be made by post, electronic mail, telephone and fax. All seed requests are responded to as quickly as possible. All that we ask in return is a report on how the germplasm performs in the scientists' tests.

A *P. vulgaris* Genetic Stocks Collection was started several years ago in close coordination and collaboration with the Bean Genetic Stocks Committee of the Bean Improvement Cooperative. There are currently 33 accessions in the 'official' Genetic Stocks Collection and these lines are maintained the same as the larger collection. Recently, there has been more activity in the identification of accessions to be included into this special collection. A special GRIN data set is being developed to handle the unique information associated with these accessions.

Two core sub-sets for *Phaseolus vulgaris* have been selected in order to test the efficiency of certain core selection criteria when compared to a randomly selected core. One is from Mexico, and the other is from nine Central American and South American countries. This research will be a State and Federal collaborative effort to compare these subsets using morphological and molecular markers.

Germplasm and information requests can be addressed to:

Richard Hannan, USDA, ARS, Western Regional Plant Introduction Station, Rm. 59 Johnson Hall, WSU, Pullman, WA 99124-6402, Tel. 509-335-3763, Fax 509-335-6654.  
Email <[w6rh@ars-grin.gov](mailto:w6rh@ars-grin.gov)> or <[hannan@wsunix.wsu.edu](mailto:hannan@wsunix.wsu.edu)>

Table 1. Status of the Phaseolus collection at W-6.

species	total no. of accessions	number acc. available	acc. w. W6=s
acutifolius	182	91 (64%)	27
angustissimus	3	2 (66%)	0
atropurpureus	0	0	1
brevilobus	0	0	1
coccineus	453	345 (76%)	40
filiformis	19	12 (63%)	1
floribundus	1	0	0
formosus	0	0	15
glabellus	1	0	1
grayanus	1	0	0
griseus	0	0	5
hybrid	79	79 (100%)	0
jaliscanus	3	0	0
leptostachyus	26	21 (81%)	17
lignosus	1	0	0
lunatus	1029	990 (96%)	16
macrolepis	1	0	0
maculatus	2	1	0
micranthus	1	0	0
microcarpus	15	4 (27%)	0
nipponensis	0	0	1
obovalatus	0	0	2
oligospermus	1	0	0
parvifolius	0	0	1
parvulus	2	0	0
pedicellatus	1	0	0
pluriflorus	2	0	0
polystachios	6	5 (83%)	0
ritensis	6	1	0
salicifolius	1	0	0
species	169	27	147
speciosus	0	0	1
stenolobus	4	0	4
trilobus	0	0	1
vulgaris	63	20 (32%)	12
var. aborigineus			
vulgaris	10962	9769 (98%)	1048
xanthotrichus	3	0	2
TOTAL(36 species)	13040	11371 (87%)	1345