Phaseolus Crop Germplasm Committee

Curator Report Presented August 20, 2024

Prepared by Sarah Dohle sarah.dohle@usda.gov

National plant Germplasm System news: A new Strategic Plan for NPGS requested by Congress in the 2018 Farm Bill is now public. The Plan is described in 4 documents, a 2-page infographic that distills the key points, a 29-page synopsis, a 208-page document covering the major plant genetic resource management, programmatic, and budgetary details, and an 87-page supplement with crop specific details. At this time the plan has not been funded. Check out the Phaseolus specific opportunities and consider efforts to move the plan forward.

Plant Germplasm Introduction & Testing Research Unit aka Western Regional Plant Introduction Station, a joint project of USDA and 13 Western Land Grant Universities. We hold a total +100,000 crop accessions in Pullman, WA with five curation projects.

Within the last year we have celebrated the retirements of our plant pathology technician Shari Lupien (Feb. 2024), and cool season food legume curator Dr. Clarice Coyne (March 2004). We hired 4 new full-time staff on our W-6 Multistate Project including seed storage technician Kun Fang (October 2023), horticulture crops technician Sam Charpentier (March 2024), temperate forage legumes technician Adriana Cifuentes (April 2024), and Pullman Farm assistant Griffin Stauffenberg (May 2024). We are in the process of filling our Phaseolus bean technician position, vacant since November 2023.

We plan to host field tours at our Pullman Farm summer 2025, so please reach out if you plan to be in the area.

Phaseolus Plant Genetic Collection Additions News:

The USDA-ARS Plant Exploration Office supported a *Phaseolus* collection trip to New Mexico fall 2023.

- Heat and drought tolerant wild bean relatives were collected by a collaborative team from the Alliance of Bioversity and the International Center for Tropical Agriculture (CIAT), New Mexico State University, and USDA-ARS National Plant Germplasm System. Team members included Daniel Debouck, Sarah Dohle, Marcela Santaella, Luis Santos, Richard Pratt and Milan Urban.
- The exploration resulted in collections of wild bean species (P. acutifolius, P. filiformis, P. grayanus, and P. parvulus) from 14 populations in southern New Mexico. The seeds collected for 10 wild tepary (P. acutifolius) have successfully undergone one cycle of regenerations in greenhouses in Pullman and will soon be available to cooperators (early 2025).
- Fall 2024 will be a 2nd year of exploration in New Mexico (also lead by Drs. Debouck and Pratt), with anticipated increased success because of 2023 scouting and 2024 monsoon rains being plentiful.

Expired PVP

- Calander year 2023 and 2024, added 15 and 7 expired PVP accessions respectively.

Phaseolus Plant Genetic Characterization News:

There is a backlog of characterization data to add to GRIN, including but not limited to information on stem blight, bruchid resistance, anthracnose, BCMNV, root architecture, seedling growth rates, seed size and shape, Fusarium cuneirostrum (root rot), F. oxysporum (wilt), F. acuminatum, F. Brasiliense, seed nutrition traits, growth habit and photoperiod sensitivity.

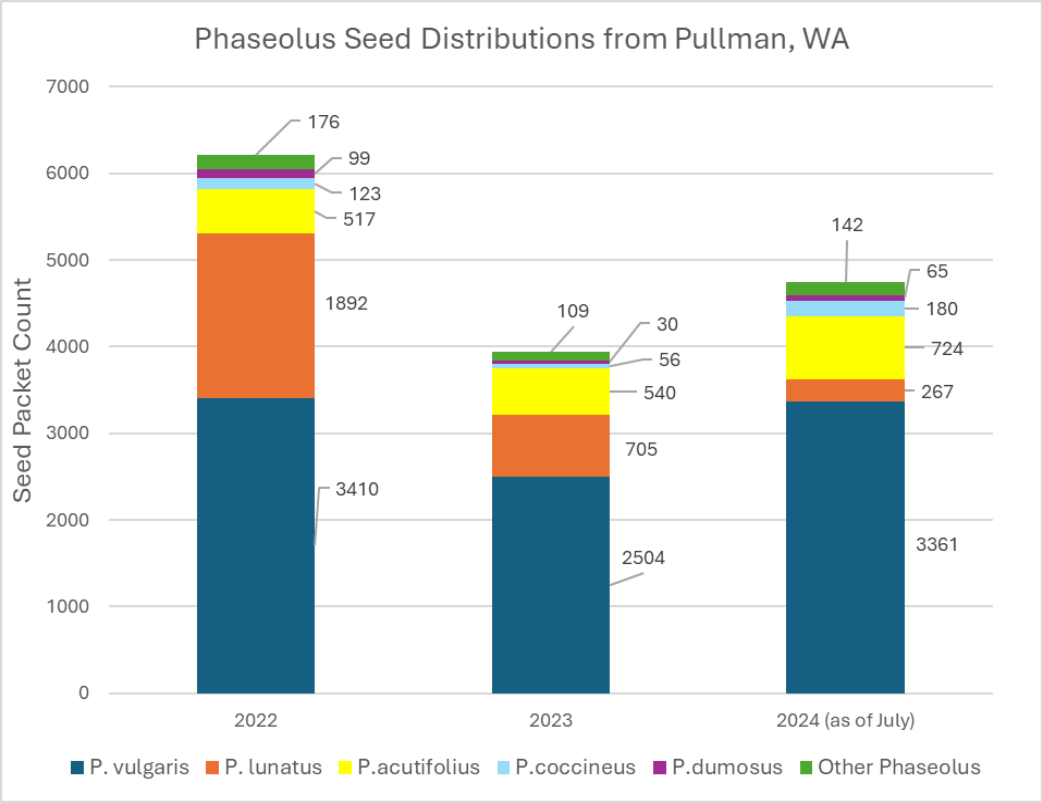
Characterization initiatives

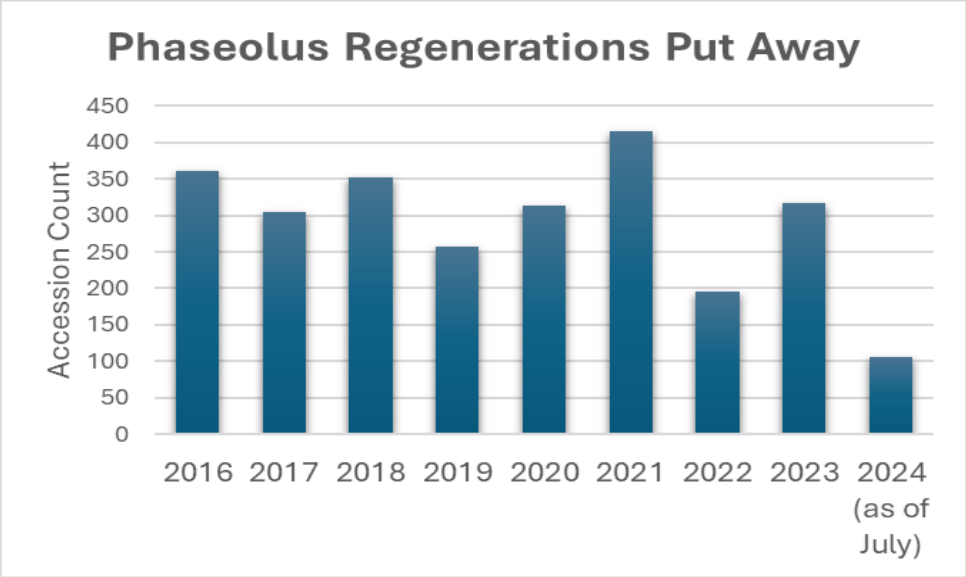
- Summer 2024 tested growing procedures for beans (*P. vulgaris*, *P. lunatus*, *P. acutifolius*) in the field at Pullman, WA to record field traits. Drip irrigation, limited trellising, 2 planting dates (5/22, and 6/6).
- A crowdsource characterization pilot project is utilizing a nationwide network of volunteer growers to evaluate 20 bean accessions. Mid-season results show ~100 individuals reporting agronomic and culinary traits on each accession from 15 locations on average. https://app.seedlinked.com/en-US/trials/2323/registration (Collaboration with Nico Enjalbert from SeedLinked)
- SCRI Lima Beans (year-1 of 4) – Ongoing genotypic and phenotypic analysis of ~700 lima bean accessions, as well as marker development for predicting photoperiod sensitivity.
- SCRI Popping Beans (year-0 of 4) – Greenhouse-based Phenotypic and Agronomic Evaluation: complete USDA nuña collection of diverse genebank accessions (year-1 planned activity)
- Building Better Beans – NIR and hyperspectral scanning of bean seeds to create htp methods of analyzing seed nutrients with Darren Drewry from Ohio State University.

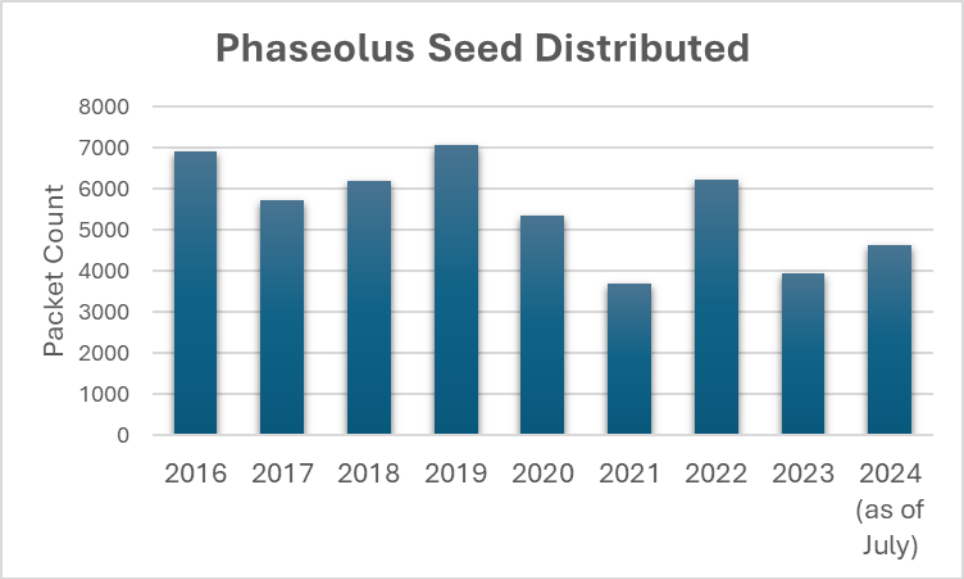
Regeneration initiatives

Phaseolus Collection Status July 2024:

Taxon	Accessions	Backed up at NCGRP		Available	
	Count	Count	Portion	Count	Portion
P. vulgaris	13,774	12,001	87%	12,077	88%
P. lunatus	2,273	686	30%	728	32%
P. acutifolius	483	168	35%	205	42%
P. coccineus	482	198	41%	23	5%
P. dumosus	97	77	79%	47	48%
P. spp. and hybr.	216	65	30%	92	43%
P. 'other'	528	85	16%	153	29%
Total	17,853	13,280	74%	13,325	75%







Challenges & Opportunities

- Regeneration capacity for 380 when all greenhouses are functional, but steam does not work consistantly in the largest greenhouses which holds 150 accessions, which makes winter photoperiod sensitive regenerations extra challenging.
- Greenhouse regenerations lack oportunity for characterization.
- Non-vulgaris species are less backed up and available, but very much in demand.

Input from Phaseolus CGC Wanted

Crop trait ontology
Thoughts on priorities for germplasm collection
Germination testing
BCMV testing
Regenerations
Characterizations
Other
Timeline for next Phaseolus Germplasm Vulnerability and Resilience statement