

Phaseolus Crop Germplasm Committee Meeting Minutes
Cityscapes Ballroom, Radisson Hotel, Fargo, ND

November 6, 2019

Participants:

- Avican, Omer (omer.avican@may.com.tr) – May Seed, Turkey
- Baetsen-young, Amy (amy.baetsen-young@syngenta.com) – Syngenta Seeds
- Beebe, Steve (s.beebe@cgiar.org) – CIAT, Colombia
- Cichy, Karen (Karen.cichy@ars.usda.gov) – USDA-ARS, East Lansing, MI
- Emmalea, Ernest (emmalea@udel.edu) – University of Delaware
- Gang, David (gangd@wsu.edu) – Washington State University
- Glahn, Ray (Raymond.glahn@usda.gov) – USDA-ARS
- Gomez, Francisco (gomez225@umn.edu) – University of Minnesota
- Goncalvez Vidigal, Maria C. (megvidigal@gmail.com) – UEM, Brazil
- Grusak, Mike (mike.grusak@ars.usda.gov) – USDA-ARS, Fargo, ND
- Haus, Miranda (hausmi@msu.edu) – Michigan State University
- Heitholt, Jim (Jim.Heithlot@uwyo.edu) – University of Wyoming
- Hellier, Barbara (Barbara.heliler@usda.gov) – USDA-ARS, Pullman, WA
- Hoyos-Villegas, Valerio (Valerio.hoyos-villegas@mcgill.ca) – McGill University
- Hou, Anfu (anfu.hon@canada.ca) – Ag-Canada
- Humann, Jodi (jhumman@wsu.edu) – Washington State University- pulsedd.org
- Hyten, David (David.hyten@unl.edu) – University of Nebraska
- Kelly, Jim (kellyj@msu.edu) – Michigan State University
- Mazourek, Michael (mm284@cornell.edu) – Cornell University
- McClean, Phillip (Phillip.mcclean@ndsu.edu) – North Dakota State University
- Munoz-Amatriain, Maria (maria.munoz_amatriain@colostate.edu) – Colorado State University
- Miklas, Phil (phil.miklas@ars.usda.gov) – USDA-ARS, Prosser, WA
- Osorno, Juan (juan.osorno@ndsu.edu) – North Dakota State University
- Porch, Tim (timothy.porch@ars.usda.gov) – USDA-ARS, TARS, Mayaguez, PR
- Pastor-Corrales, Talo (talo.pastor-corrales@ars.usda.gov) – USDA-ARS, Beltsville, MD
- Raatz, Bodo (b.raatz@cgiar.org) – CIAT, Colombia
- Trapp, Jennifer (jtrapp@senecafoods.com) – Seneca Foods
- Safe, Jeff (jeff@critessed.com) – Crites Seed, Inc.
- Saha, Gopesh (gopesh.saha@brothertonseed.com) – Brotherton Seed Co.
- Scholz, Todd (tscholz@usapulses.org) – American Pulse Association
- Shi, Ainong (ashi@uark.edu) – University of Arkansas
- Souza, Thiago (Thiago.souza@embrapa.br) – EMBRAPA, Brazil
- Uebersax, Mark (uebersax@msu.edu) – Michigan State University (retired)
- Vidigal Filho, Pedro (vidigal.filhop@gmail.com) – UEM, Brazil
- Urrea, Carlos (currea2@unl.edu) – University of Nebraska
- Vaz Bisneta, Mariana (marianavazbisneta@hotmail.com) – UEM, Brazil
- Wahlquist, Dan (dan.wahlquist@syngenta.com) Syngenta Seeds
- Wiesinger, Jason (Jason.wiesinger@usda.gov) – USDA-ARS

- Woolf-Weibye, Andy (bean@bean.idaho.gov) – Idaho Bean Commission

Tim Porch called the meeting to order at 10:20 A.M.

1) Introduction of Members and Guests

2) Approval of minutes of last meeting

Minutes from the last meeting, held at the University of California–Davis (July 26, 2018) were distributed, reviewed, and approved. Phil Miklas motioned for approval and Juan Osorno seconded.

3) Update of CGC funded projects:

a. 2016. Characterizing the Resistance of Diverse Lima Bean Lines to Agronomically Important Diseases in the Mid-Atlantic Region of the United States. T. Mhora, N. Donofrio, T. Evans, E. Ernest. University of Delaware, Newark, DE

A diversity panel of 256 lima bean accessions was characterized for resistance to races E and F of downy mildew (*Phytophthora phaseoli*) in the field and dew chamber screens over two years. This project was initiated to identify new sources of resistance to race F, the predominant race present in the Mid-Atlantic region, and to identify genotypes with resistance to both races. Currently available resistance genes for E and F are either allelic or tightly linked in repulsion. In field screens, plants were inoculated at the pin pod stage and the disease developed on pods and vining shoot tips. In dew chamber screens, plants were inoculated at emergence and hypocotyls became infected. An attempt was made to screen the diversity panel for resistance to *Phytophthora capsici*, another problematic disease of lima bean. However, an effective greenhouse or dew chamber screening method for this disease in lima bean has not been developed and the attempted field screen proved unreliable due to a mixed infection with downy mildew.

Three accessions from Costa Rica were resistant to both races E and F in all screens: PI 256417, PI 256419 and PI 256420. An additional accession from Ecuador, PI 355839, was resistant to both races for all screens performed, but was not screened at the hypocotyl stage for race F. Several previously unknown sources of resistance to race F were also identified (Table 1). Several resistant accessions have since been used to create populations to characterize the new resistance gene or genes and move them into a photoperiod insensitive background.

Table 1. Ratings of all accessions which were resistant to either race E, F, or both after field (F) and dew chamber (DC) screening.

Accession	Origin	PI	Race E		Race F		
			Newark (F-2017)	DC (2017)	Newark (F-2016)	Georgetown (F-2017)	DC (2016)
173	Costa Rica	PI 256417	R	R	R	R	R
174	Costa Rica	PI 256419	R	R	R	R	R
175	Costa Rica	PI 256420	R	R	R	R	R
17	USA	(PI 549521)	R	S	R	R	R
20	El Salvador	PI 256389	R	S	R	R	R
72	USA	PI 549512	S	S	R	R	R
108	Guatemala	PI 195342	S	S	R	R	R
164	El Salvador	PI 200919	S	S	R	R	R
166	Guatemala	PI 200924	S	S	R	R	R
167	Mexico	PI 201287	S	S	R	R	R
177	Ecuador	PI 256816	S	S	R	R	R
192	Mexico	PI 257548	R	S	R	R	R
203	Guatemala	PI 310627	S	S	R	R	R
219	Ecuador	PI 355837	S	R	R	R	R
226	Mexico	PI 433928	S	S	R	R	R
170	Mexico	PI 224713	R	R	R	R	S
220	Ecuador	PI 355839	R	R	R	R	NA
233	Guatemala	PI 451925	R	R	R	S	R

In reference to photos of the seed of some of the resistant accessions Jim Kelly asked if the differing seed coat colors within some of the accessions was an indication of heterozygosity. Emmalea explained that like pinto and cranberry beans, certain lima beans have a dark on light speckled pattern that sometimes occurs in reverse. The lines in question are inbred.

b. 2018. Evaluation and Association Analysis of Soybean Cyst Nematode Resistance in USDA Common Bean (*Phaseolus vulgaris*) Germplasm. Ainong Shi, and Jun Qin, University of Arkansas, and Senyu Chen, University of Minnesota.

1. Evaluate USDA common bean accessions for their resistance to SCN: So far, 1,116 USDA germplasm accessions have been tested for reaction to SCN race 3 HG Type 0. Preliminary results indicate that there was large variation in SCN resistance in common bean germplasm accessions. Fifty accessions were resistant to SCN HG Type 0 with female index values <10. Three hundred fifty-five of the 1,116 accessions, originally collected from 30 countries, were further evaluated with the HG Type 0 The phenotypic data for SCN reaction using female index values were used for the genome-wide association study (GWAS).

2. Conduct genome-wide association study of SCN resistance in USDA common bean germplasm: So far, whole genome resequencing (WGR) has been done on 355 USDA GRIN dry bean accessions with 10x coverage (about 7 Gb sequencing data for each sample). A total of 24.4 M SNPs across 355 dry bean accessions were identified on 11 chromosomes, ranging from 1.47 M SNPs on chromosome 6 to 2.93 M SNPs on chromosome 8. After filtering with minor allele frequency >5% and missing allele <2%, 0.7 million SNPs were used for the genome-wide

association study of SCN resistance. Our preliminary results from the GWAS using BLINK showed that five large QTLs are located on chromosomes (chr) 2, 3, 5, 6, and 7, respectively, with LOD (-LOG(P-value)) values greater than 20 for resistance to SCN HG Type 7.

Phil McClean pointed out the need for data sharing. Juan Osorno asked about the SCN race being used. Ainong Shi said that it was race 3, but with a different nomenclature. Talo Pastor-Corrales mentioned that SCN is a major problem in North Dakota, Minnesota, and Michigan and a pathogen diversity study needs to be carried out.

Barbara Hellier asked for the data, if available. She pointed out that it is the responsibility of the CGC to send the data to her to be entered into GRIN.

c. 2019. Wild bean (*Phaseolus vulgaris* L.) disease resistance and adaptive root traits. Karen Cichy, ARS-East Lansing, MI (newly funded).

Miranda Haus mentioned that the project started this year. Two hundred forty-nine accessions, mainly from the USA, will be tested for resistance to anthracnose, bean common mosaic virus, root rots, and for root architecture.

4) ARS-NGRL Update Peter Bretting (via Skype). Peter Bretting presented a PowerPoint presentation entitled ‘The National Plant Germplasm System: 2019 Status, Prospects, and Challenges.’

There are 22 Gene Banks, located mostly in crop growing areas. There is an effort to incorporate wild relatives into each collection. About 250,000 accessions were distributed in 2019. Numbers are steady. On average, $\frac{2}{3}$ to $\frac{3}{4}$ were distributed in the USA, mainly to faculty/students and ARS personnel. ARS National Plant Germplasm Systems have a budget of \$44.5 million/year. The key challenges for the NPGS are: expanding capacity infrastructure, loss of manpower, applying cryopreservation and/or in vitro techniques, managing GxE traits, and acquiring and conserving additional germplasm, mainly wild relatives. Genetic resources management priorities are acquisition, maintenance, regeneration, documentation and data management, and distribution. Research encompasses all of these areas.

Peter talked about Ted Kisha’s retirement and Barbara Hellier as the new interim *Phaseolus* Curator until a new curator is hired. The funding level in FY20 will be identical to FY19. Budget for enhancing the collection was increased mainly for coffee, citrus, and industrial hemp genetic resources.

5) Status of the *Phaseolus* Germplasm Collection, Barbara Hellier (Interim *Phaseolus* Curator)

The largest bean collection is maintained at Pullman, WA (17,591 accessions). Of these, 13,107 are available. There are 13,177 accessions, mostly *P. vulgaris*, backed up in Fort Collins, CO. In 2019, 10,085 packets were distributed in response to 435 seed requests, 6 of them from foreign countries. Currently, Barbara is regenerating 551 accessions (523 *vulgaris*, 2 *acutifolius*, 8 *coccineus*, 8 *lunnatus*, and 2 other spp.). Barbara is also growing 38 *P. polytschyus*. Two new

greenhouses in Pullman, WA are being dedicated to Phaseolus. This will allow regeneration of 100-200 accessions/year.

Maria Munoz-Amatriain asked about the Caribbean bean collection. Tim Porch, Juan Carlos Rosas, and Jim Beaver will be working on the list for potential addition to the GRIN. The collection is large.

6) New business

a. Change of Committee Officers, Membership

Maria Munoz-Amatriain, CSU, Valerio Hoyos-Villegas, McGill University, and Bodo Raatz, CIAT, Colombia were added to the PCGC list.

Carlos Urrea and Valerio Hoyos-Villegas were elected as the new Chairman and Secretary, respectively. Carlos Urrea was nominated by Tim Porch and Juan Osorno seconded. Valerio Hoyos-Villegas was nominated by Juan Osorno and Maria Munoz-Amatriain seconded.

b. Exploration proposals

No exploration proposals are currently being funded.

c. Next meeting

The next meeting will be in Scottsbluff, NE on August 21, 2020, after the National Association of Plant Breeders (NAPB) meeting in Lincoln, NE from August 16-19, 2020.

8) Adjourn

The meeting was adjourned at 11:30 A.M.

Respectfully Submitted:

Secretary

Carlos A. Urrea