State of Oregon Annual Report for Calendar Year 2020
W-6 Technical Committee
Compiled by Shawn A. Mehlenbacher

Oregonians continue to use the PI system extensively. Users include state and federal researchers as well as private seed companies and private individuals. Oregon is a major user in the western region, along with California and Washington.

Progress Reports:

1. Shawn A. Mehlenbacher, Dept. of Horticulture, Oregon State Univ., Corvallis, OR 97331.

Two graduate students (Merve Şekerli and Golnaz Komaei Koma) developed and characterized new simple sequence repeat (SSR) markers in eastern filbert blight (EFB) resistance regions, and assigned them to linkage groups (LGs): 20 on LG6, 24 on LG2, and 12 on LG7. An additional 22 SSR markers were on LG1. The new and previously-developed SSR markers were used to study new sources of EFB resistance. Correlation of SSR marker and disease scores allowed assignment of resistance sources to a LG, and then linkage maps were constructed for each progeny using SSR markers. Resistance from selection OSU 1187.101 (Holmskij, Russia) was on LG2. Ten resistance sources were on LG6: Moscow #23 and #26 from the Russian Research Institute of Forestry and Mechanization, four selections from Holmskij, Russia (H3R04P23, H3R04P28, H3R04P30 and H3R13P40), selection OSU 1185.126 from Crimea, selection OSU 533.129 from Michigan, *Corylus heterophylla* 'Ogyoo' from the Republic of Korea, and the interspecific hybrid 'Estrella #1'. Four resistance sources were placed on LG7: Moscow #2 and #27, OSU 1166.123 (from Sochi, Russia) and H3R12P62 (from Crimea). Resistance from five other sources was not correlated with markers on LG6 or LG2 or LG7 and merit further investigation: Moscow #37, selection H3R07P11 from Crimea, hybrid selection OSU 401.014, *C. americana* 'Winkler' and *C. americana* OSU 366.060. These new resistance sources and SSR markers should be useful in breeding new cultivars. Resistance on different linkage groups will be especially useful for R-gene pyramiding, aided by the SSR markers. These results were published in two articles, one in the Journal of the American Society for Horticultural Science and the other in Frontiers in Plant Science.

New sources of EFB resistance continue to be investigated. Resistant accessions are crossed with susceptible selections, and the resulting seedlings exposed to EFB under a structure topped with diseased branches. The results showed that Dickum Hybrid OSU 1044.086 (presumably *C. americana* x *C. avellana*) and five selections (OSU 1229.082, 1233.007, 1233.145, 1240.131, and 1242.146) from seeds collected in Giresun, Turkey transmit resistance to about half of their offspring. These new sources of resistance will be assigned to a LG in the future.

The OSU hazelnut breeding program has also identified a diverse set of 78 selections with a level of quantitative resistance similar to the check 'Tonda di Giffoni'. These develop a few small cankers following structure exposure. Testing is being repeated to better document the resistance.

Selections of hybrid hazelnuts [from crosses of the American hazel (*Corylus americana*) and the European hazel (*C. avellana*)] were also exposed under the structure. Of the 48 selections, 23 had more disease than the check 'Sacajawea', 16 had less disease than 'Sacajawea', and an additional 9 had no cankers. It appears that the American hazel transmits quantitative as well as major gene resistance. Selections from the F_1 generation and seedlings of the F_2 generation (from pairwise crosses of unrelated F_1 selections) are being shared with partners in the Hybrid Hazelnut Consortium (OSU, Rutgers Univ., Univ. of Nebraska-Lincoln, and Arbor Day Foundation).

2. **Alec Kowalewski and Clint Mattox,** Dept. of Horticulture, Oregon State University, Corvallis, OR 97331.

The OSU turfgrass program requested 34 accessions of *Agrostis castellana* and one of *Agrostis capillaris* for evaluation and potential initiation of a breeding project for Highland bentgrass for home lawns in cool-humid regions west of the Cascade mountain range. The seeds are being stored at -4 °C with the goal of sowing them in a greenhouse and later transferring them to the field for evaluation. A grant proposal was written and the project will be initiated with funding is obtained

3. **Adam Heesacker and Bob Zemetra**, Dept. of Crop and Soil Science, Oregon State University, Corvallis, OR 97331.

Three wheat accessions were positive controls for the septoria resistance project of grad student David Cobertera. Bulgaria 88 and ND735 are controls for *Stb*1 and Tadinia is the control for *Stb*4. The resistance QTLs found in OSU germplasm didn't have the same marker profile as those coming from Stb1 or Stb4 and thus are novel. The other requested line OK05312 was used in the breeding program to introduce a gene for resistance to wheat curl mite.

4. **Joy Waite-Cusic,** Associate Professor of Food Safety Systems, Dept of Food Science and Technology, Oregon State University, Corvallis, OR 97331.

Dr. Waite-Cusic is the Statewide Specialist for the Food Preservation Program. She obtained fruit of 13 accessions of elderberry (7 *Sambucus canadensis* and 6 *Sambucus nigra*) from the Corvallis repository in August 2020 for a research project on food safety, specifically growth of *Clostridium botulinum*. Consumers are very interested in preserving a variety of products containing elderberries. Previous studies have reported that the pH of elderberries can be >4.6 – a critical pH for preventing the growth of *Clostridium botulinum*. Her goal was to verify the pH of a large variety of elderberries and evaluate recipes that could be used to safely preserve a variety of recipes. The pH of the varieties was measured and a few recipes were trialed. Many of the berries collected from the germplasm center remain frozen for additional work later this summer. These berries and the progress on the recipes were shared during a remote training of the Master Food Preserver Program at OSU in April 2021. She intends to produce an extension publication when the work is complete. "The germplasm system is such a great resource! I wish I had more to report."

5. **Sam Leiboff**, Dept of Botany and Plant Pathology, Oregon State Univ., Corvallis, OR 97331.

His research group started at OSU in May 2020 and the germplasm resources provided by the USDA have been critical in collecting preliminary data. This germplasm supported four invited posters at the annual Maize Genetics Conference (held virtually) and one invited talk at the International Conference for Arabidopsis Research (on sorghum vascular trait diversity; held virtually). Preliminary data generated from this germplasm has been used in funding proposals to the Foundation for the Future of Agricultural Research (FFAR), USDA AFRI, and NSF. These materials currently support the research of two PhD students and one postdoctoral researcher. Recent findings: 1. There is significant variation among sorghum accessions in adult leaf vein density and this density is not correlated between leaf blade and sheath, 2. Using a synthetic fluorescent gibberellic acid sensor called GPS2, Golden Promise barley (PI 343079) displays a reduced cellular sensitivity to GA in leaf tissue compared to panicle tissue, a trend that is reversed in Kronos wheat (PI 576168), 3. The SC 1426 sorghum (PI 656079) inflorescence is highly sensitive to artificial cytokinin treatment and responds to high cytokinin conditions by producing an elongated panicle with a reduced number of primary branches; this response is reversed in SAP-347 sorghum (PI 576386). In the next year, he hopes to determine some of the genetic molecular factors

which underlie these preliminary results and explore the developmental pathways that determine these complex responses.

6. Ruijun Qin, Hermiston Agricultural Research & Extension Center, 2121 South 1st Street, Hermiston, OR 97838

Dr. Qin requested 135 accessions of adzuki bean (*Vigna angularis*) for inclusion in his project "Developing dry beans in irrigated fields of Columbia Basin" funded for three years by Washington Specialty Crop Block Grant Program. Potatoes and onions are the major high-value crops in the Columbia Basin, which can only be planted once every 3 years in the rotation. Rotational crops with these high-value crops are mainly wheat and/or corn, which have had low commodity prices for the past several years, thus growers' profits are marginal. Some producers have chosen to fallow the land, which is undesirable for both soil health and profitability. Therefore, there is a need to increase the rotational crop choices, especially with higher value crops to increase grower profits. Pulse crops, especially adzuki bean, were tested and found to be a promising crop based on preliminary tests. Adzuki bean has a very promising overseas market and good price. To explore the potential of this crop, he is ***determining the most suitable adzuki bean cultivars for the region***. For most accessions, the seed number was 10 or less. Around 80 accessions are red beans while the rest are with other colors, such as white, dark, grey, etc. The seeds were manually planted 2-3 inches apart on May 4, 2020 and germination was observed from May 24 to May 29. Nearly 130 varieties germinated, of which nearly 80 had excellent germination rate and the rest had moderate or poor level in germination. No fertilizer was used in the test plot. No disease or insect problems were found, but the crops were impacted by weeds which were removed manually. On Oct. 1 and Oct. 30, the varieties that had matured were hand harvested. The plant number, plant height, biomass, and pod number were recorded. Many accessions had not matured by October 30. 19 accessions with red color can produce beans successfully in the Columbia Basin and half of these varieties are early maturing of which #19 (PI 291366), #34 (PI 360707), and #4 (PI 157625) are most promising.

Another 11 with other seed colors can produce beans successfully in the Columbia Basin, of which #21 (PI 322571) and #23 (PI 322573) are extremely productive and have white seeds. Nine varieties cannot produce seeds in the Columbia Basin but might be useful as cover crops because of their good biomass production if a seed source for them can be secured. Variety #20 (PI318469) might be a candidate for vegetable bean production because it produced green beans although dry beans were not harvested. All seeds harvested in 2020 will be planted and evaluated again in 2021. A report that includes four tables with details on each accession can be obtained from Dr. Qin.

7. Ryan Graebner, Extension Cereal Variety Program, OSU Columbia Basin Agricultural Research Center, 48037 Tubbs Ranch Road, Adams, OR 97810

Dr. Graebner ordered three accessions of hard spring wheat in an effort focusing on high end-use quality. 'Red Fife' (PI 348919 and CItr 6196) was not agronomically suitable when grown under dryland conditions in Pendleton. 'Edison' (PI 676252) performed well and will be used in crosses this winter. He ordered 19 hulless barley accessions for evaluation under dryland conditions in Pendleton. The accessions were chosen based on available yield, protein content, lipid content, and seed size data. From these, three accessions (PI 331861, PI 328621, and PI 327993) were selected as most promising on the basis of yield and seed appearance and are currently being grown in 5' x 20' plots. After harvest, he will assess whether these accessions have characteristics that would be desirable in a specialty food barley variety. "Some of the barley varieties had nice looking grain! It will be interesting to see how they taste."

8. Neil Bell, Community Horticulturist, OSU Extension Service - Marion and Polk Counties, 1320 Capitol Street NE #110, Salem, OR 97301

Cuttings of 24 olive cultivars received in July, 2019 were stuck in the greenhouse at the North Willamette Research and Extension Center (NWREC) in Aurora, OR, and the rooted cuttings were potted in February and March 2020. A total of about 100 cultivars are being grown on in 1-gallon pots at the North Willamette Research and Extension Center (NWREC) in Aurora, OR. A replicated planting of these cultivars will be planted at NWREC in June 2021. The evaluation plot will consist of 12 rows spaced 10' apart with plants 10' apart in the row. Weed mat will be used to control weeds in the row and microsprinklers will provide irrigation. The field evaluation will continue indefinitely in order to collect data on cold hardiness, plant growth, flowering and fruit.

9. Bob Martin (retired), Michael Hardigan and Chad Finn (deceased), USDA Horticultural Crops Research Unit, 3420 NW Orchard Avenue, Corvallis, OR 97330

The berry breeding and berry virology research programs at the USDA-ARS Horticultural Crops Research Unit make use of germplasm from the USDA-ARS NCGR in Corvallis, Oregon. The breeding program accesses material at the NCGR as sources of specific traits in cultivar development, i.e. such as thornlessness, winter hardiness, fruit quality characteristics etc. In May 2021, Dr. Michael Hardigan assumed responsibility for the breeding of blackberry, red raspberry, and black raspberry, continuing the work of Dr. Chad Finn. These crops, and trailing blackberry in particular, contain an array of different Rubus species in their genetic backgrounds, span multiple ploidy levels, and draw from geographically widespread regions. The Rubus germplasm maintained by USDA-ARS-NCGR continues to play an important role for mining untapped diversity, and screening for novel sources of resistance to current and emerging pathogen threats. In recent years, the breeding program has begun developing semi-erect and erect primocane blackberry varieties using blackberry germplasm derived from the eastern U.S. and John Clark's program at the University of Arkansas, which are geared to the fresh market and derived from different species than the trailing blackberry cultivars grown in Oregon. Release notices of several cultivars were published in HortScience.

The virology program has accessed the material at NCGR with known virus infections in a study to compare High Throughput Sequencing with bioassays and PCR for detection. The program also uses material in the NCGR to study virus diversity in developing reliable diagnostic assasys for certification and quarantine programs.

10. Henning, John, USDA-ARS National Forage Seed Production Research Center, 3450 SW Campus Way, Corvallis, OR 97331

Dr. Henning ordered 56 accessions of Humulus lupulus to re-stock and re-new the USDA-ARS hop breeding program's collection. Some had died in the field and others were suspected off-types that had taken over the hills (e.g. a male plant was present in the place of a female cultivar).

11. Virginia Lehman, Blue Moon Farm LLC, 33754 Tennessee Road, Lebanon, OR

Dr. Lehman continues to use accessions from the NPGS for evaluation and breeding. Requested accessions in 2020 were 47 of *Festuca spp*., 2 of *Lolium multiflorum*, 8 of *L. perenne*, 15 of *Poa pratensis*, 5 of *P. trivialis*, 14 of *Vicia villosa* and 16 of *Trifolium wormskioldii*. She used the turfgrass accessions for the objective measurements for Plant Variety Protection or certification and so forth. She used some of the clovers to survey the germplasm for salinity tolerance. The accessions of hairy vetch (Vicia villosa) are being evaluated for vigor and use in breeding for a new cover crop. "We are appreciative to receive the germplasm from the PI system. The PI system is providing a appreciated resource as we develop improved plant materials."

12. Robin Lamp, Forage breeder, Barenbrug USA, 33477 Highway 99E, PO Box 239, Tangent OR 97389

Barenbrug continues to use NPGS materials in research and breeding. In 2020, two accessions of *Sorghum bicolor* were ordered for a greenhouse grow-out. Their current turf breeder was a sorghum breeder in his previous career. No breeding or selection was done with these. The three accessions of meadow fescue (*Festuca pratensis*) were used as checks in a morphology trial for plant variety protection. The one accession of orchardgrass ('Palestine') is being used for a seed increase in fall 2021, and subsequently will be tested for drought tolerance in trials.

13. Jerry Hall, Grassland Oregon (GO seeds), 4455 60th Ave NE, Salem, OR 97305

Seeds of two accessions reported to be high in DIMBOA (X *Triticosecale spp*. CIxt 107 and *Secale cereale* PI 534942) were requested and are being used in cover crop research and breeding. 24 accessions of common vetch (*Vicia sativa*) and one accession of hairy vetch (*Vicia villosa*) are being evaluated for multiple traits and possible incorporation into the breeding program.

14. Blake Bell, OreGro Seeds, 34847 Bond Road, Lebanon, OR 97355

Six accessions of potato (*Solanum tuberosum*), four of squash (*Cucurbita pepo)* and 3 of maize (*Zea mays*) were requested. The intent was to trial varieties in the Willamette Valley and to improve upon the existing varieties. However, due to COVID and related issues, the project has been put on hold for now.

15. Yongjian Chang, North American Plants, Inc., 9375 SE Warmington Road, McMinnville, OR 97128

In response to a request from a grower, 'Royalty' raspberry (PI 652958) was requested and used as the mother plant for initiation of an in vitro culture. "We greatly appreciate the support from National Germplasm Network System."

16. Harold Frazier, 5122 Imperial Street, Eugene, OR 97405

Six accessions of *Fragaria moschata* were requested 2/27/20 and received about 10/20/20. the goal was to establish a breeding population for development of productive, high fruit quality selections. He shared these notes on 6/1/2021.

PI 664346 - *F. moschata* 658 - was dead on arrival.

PI 551750 - *F. moschata* Germany fruited after late fall transplant, with ripe fruit May 2021. Fruit size of pinky finger. Pleasant aroma and moderately sweet.

PI 664327 - *F. moschata* Nr. 4 'Oberau 3' Seed started February 2021 and transplanted April. Attractive ground cover with prolific runners that have short internodes. No sign of flowers yet.

PI 551550 - *F. moschata* L-10 Very vigorous and appears to be quite hardy; runners with long internodes. Not flowering by May 2021.

PI 551549 - Profumata di Tortona Only one plant; similar to Capron in appearance but this plant did not flower.

PI 551528 -Capron Medium vigor plant, fruited after late fall transplant with maturity time May 2021, similar to PI 551750. Fruit size of pinky finger. Pleasant aroma, more tart than PI551750.

17. Kathe Welch, Frog Eagle Farms, PO Box 1008, Gaston, OR 97119

Plants or cuttings of 13 accessions of olive (*Olea europaea*) were requested for evaluation of cold hardness at different elevations. The shipment she received was badly damaged in shipping and none survived. She asked for another set for this year.

18. Dr. Layla Schubert Corner of The Eye, 5026 NE 17th Ave, Portland, OR

She requested 20 accessions of *Fragaria* representing seven species (*X ananassa, bucharica, chiloensis, moschata, orientalis, vesca, virginiana*) 13 accessions of *Rubus* representing six species (*caesius, coreanus, ellipticus, glaucus, pedatus, roseus*).

She is working on varietal breeding, mainly strawberry, *Rubus*, and pomegranate. Her aims with strawberry breeding are twofold: hypoallergenic, de-pigmented cultivars, and high-anthocyanin cultivars. She has a white fruited *F. virginiana* called "Christina" that she hopes to cross with pale fruited *F. chiloensis* cultivars to breed high-quality de-pigmented *F. x ananassa* cultivars. She is also trying to acquire pale fruited *F. nilgerensis* and *F. orientalis* cultivars. In addition, she is working on novel crosses for interesting flavor profiles. She said that the 'Little Scarlet' she received last year appears to be a white-fruited *F. virginiana*. For strawberry, she is also going in the opposite direction, trying to breed higher anthocyanin berries. 'Kama' is a cultivar she hopes will be useful to this end. She is trying to track down other dark-fruited cultivars, but the ones mentioned by Darrow are proving elusive.

For *Rubus*, she is trying to breed improved cultivars with novel flavor profiles and ornamental value. She believes that R. roseus and R. pedatus could be useful parents but there are no commercial sources so she requested from the Corvallis repository. She won't have any results until next year at the earliest, but will happily share them. I forwarded this information to Dr. Kim Hummer at the Corvallis repository.

19. Adam Tedeschi, Pipsqueak Orchard, 24325 NW Reeder Road, Portland, OR 97231

He received 14 accessions of *Pyrus communis*, 2 of *P. pyrifolia*, 2 of *P. sinkinagensis*, and 23 of Malus domestica He will be sampling fruits from his grafts beginning this fall. Two standouts so far are 'Richelien' and 'Padley's Pippin'. The scions were grafted to M111 rootstocks last spring, grew to 5 feet in his nursery beds last year, and were planted in the orchard this winter. All of the trees set a sizeable fruit load this spring while also continuing to vigorously grow without any N applications other than what's available naturally.

20. Jasper Smith, 3957 N. Concord Avenue, Portland, OR 97227

He requested scions of nine apple accessions. He owns a cidery focused on producing Basque style cider and is interested in seeing how Spanish cider apple varieties fared at two different orchard sites in Oregon - one in the Willamette Valley and one in the Parkdale area. He hopes to determine which varieties thrive in our climate/region, and to evaluate their usefulness at commercial scale for cider production. I encouraged him to contact OSU Orchard Crops Extension Specialist Nik Wiman who has trials of cider apple cultivars.

21. Peter Cersovski, 635 Crimson Way, Harrisburg, OR 97446

He requested five accessions of maize (*Zea mays*) for use in breeding. He requested LH244 (PI 612589) and LH283 (PI 596553) as relatively modern germplasm for both his sweet and exotic breeding programs. He notes that LH283 is very susceptible to aphids, the most susceptible variety he has seen. DE3 (PI 638551) and W604s (Ames 30556) are older Germplasm Enhancement of Maize (GEM) lines; both will be crossed to other inbreds and then dropped from his program because of poor seed set (in contrast to the other inbreds with good seed set last year). W604S was developed for silage. DE3 is relatively high in vitamin A and will be used to cross with Cato Sulino flint (open pollinated orange corn) from Southern Exposure Seed Exchange. The Arizona Maize for saline environments (PI 508270) was not tested last year but this year he plans to test its susceptibility to salt water.

22. Lucia Monge, 0520 SW Palatine Hill Road, Portland, OR 97219

Five accessions of true potato seeds were used in an art & science project by artists Xin Liu and Lucia Monge (NYC and Portland, OR respectively). Half of the seeds were sent to lower earth orbit and stayed on the International Space Station for a month (March 2020). When the seeds returned from space she planted them next to a control group that remained on Earth to see the potential impacts of their time under varying gravities. She was not able to identify any morphological differences between the potato groups. She kept the tubers that grew from last summer's plants and this year is replanting the space potatoes to have a second generation. This art project received the support from the MIT Space Exploration Initiative, International Potato Center, and Lewis & Clark College. As part of the project she developed a "Space Potato Academy" with a local public school (Dr. MLK Jr.) and is now planning an exhibition in China. More information on the project can be found here: https://www.unearthingfutures.org

23. Tim Ford, Pineview Farms, LLC, 35632 Cold Springs Road, Lebanon, OR 97355

Dr. Ford requested and received open-pollinated seeds of pear (*Pyrus communis*) cultivars 'Bartlett' and 'Reimer Red', but none germinated.

Publications:

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