MINUTES

Potato Crop Germplasm Committee meeting 2019

Potato Association of American annual meeting 2019 at Winnipeg --- 6:30 AM, July 30th, 2019

Present: Anglin, Bamberg (Chair), Bretting (call in), Bizimungu, Coombs, DeJong, del Rio, Douches, Endelman, French, Jansky, Manrique, Munyaneza, Novy, Parsons, Schmitz-Carley, Shannon, Vales, Whitworth

Agenda (attached) had been distributed earlier. Notes presented here in order of presentation, numbered as in Agenda.

1. Munyaneza gave updates as USDA/ARS Root and Tuber NPL. Bretting (call in) gave updates on USDA/ARS NPGS NPL. We also had received an update from the USDA/ARS NGLR by RL Gary Kinard. These reports available at USPG website.

2. Bamberg gave the usual brief history of the national CGC program, particulars of how it applies to potato, how it relates to the US Potato Genebank (USPG) project and administration, and the role of PCGC committee members.

5. GMO best management practices for potato. Bretting and Bamberg have been working on a document [post-meeting update: See final version attached. Also, statement prepared by Bamberg on threat of transgene escape in the USA is attached]. Consensus of group was that any GMO potato storage should be physically separate and clearly labeled. USPG should not keep *regulated* clones.

5. Vulnerability Statement update: Sathuvalli leads a sub-committee to revise the 2014 version. A draft has been circulated for comment, update and finalize [post meeting update: Final version now posted on USPG website].

6. Quarantine. Ron French gave status report. Addressed requests for greatly increased throughput brought up last year. Options include certifying outside labs or lobby for more funds to expand capacity of PPQ. TSP quota for next cycle is filled, but send in requests because expected imports are sometimes canceled.

1. Munyaneza further reported with description of NPC potato evaluation grant program. It is a Fed-State partnership funding about 50 proposals with NIFA funds, and selected by growers.

FOLLOWING TOPICS were not addressed due to insufficient time...

3. CGC-sponsored grants, subpart c: We scouted, selected, and submitted a 2019 grant proposal on screening for *in vitro* speed of carb digestion by Brad Bolling at UWisc, but it was rejected by NPS. Bamberg had previously distributed WSJ article (attached) on how progress in reducing cardiovascular disease mortality has been reversed by interaction with surging metabolic syndrome (WSJ June 22-23, 2019 p. A11). Need strategy of better communication for future grants [post meeting update: Bamberg pre-cleared idea of finding genetic and metabolic markers for *Dickeya* and Zebra chip resistance with Bretting for 2020. Another failsafe would be to send in two or three ranked proposals].

4. Big data mgt issue.

7. Fate of NRSP6, the SAES-funded part of USPG for the upcoming 5-year renewal FY21-25.

Adjourned at 8:00 AM.
Respectfully submitted,
John Bamberg

POTATO CGC 2019

As is typical, the Potato CGC annual meeting for 2019 will be held during the Potato Association of America (PAA) meeting-- this year at Winnipeg

6:30 AM breakfast on Tuesday July 30th
St. Boniface Room

AGENDA

1. NPL report – Munyaneza

2. Review of CGC mission, history, documentation -- Bamberg

3. Update on most recent grants

    a. *Dickeya* (2017) – Charkowski, Swingle, Bamberg
    b. *Zebra Chip* (2016) – Levy, Bamberg, Cooper
    c. *Failed FY2019 grant proposal*

4. Big data management status – Shannon and others

5. Vulnerability report updates – Sathuvalli and sub-committee (including GMO monitoring policy documentation).

6. Quarantine status – French

7. Related issues from NRSP6 TAC meeting in March at Denver – Bamberg

    a. Outlook for new project FY21-25

8. Other business

Draft GMO BMP for potato

Potato

- The domesticated potato (*Solanum tuberosum* L.) has a mixed reproductive system. It can reproduce sexually by seeds which result usually from insect-mediated “vibratile” pollination, and also clonally by tubers. Regardless of whether they are seed or clonally propagated, plants of domesticated potatoes do not successfully compete with other flora in non-cultivated environments and consequently do not persist outside of cultivated fields in the U. S. (Love, 1994).

- Domesticated potatoes in the field in the U. S. will cross-pollinate via insects, but infrequently and locally (Love, 1994). Many potato cultivars are male sterile, thereby also limiting opportunities for cross-pollination. Movement of domesticated potato pollen farther than 20 m from the source plant is considered unlikely (Halterman et al., 2016). Some potato wild relatives (especially diploids) are primarily outcrossing, whereas others (especially tetraploids) are primarily self-pollinating. The potato wild relatives found in the U. S. have not been reported to hybridize with domesticated potato (Love, 1994; Halterman et al. 2016). The crop wild relative that would be most likely to cross-pollinate with domesticated potato occurs in regions of the southwestern U. S. where no/or limited acres of potatoes are grown commercially, so the probability of cross-hybridization is very low. Gene flow between potatoes and wild relatives have not been reported to date in areas of the U. S. where potatoes have been cultivated.

- In the case of cultivated fields of potatoes, long rotations with different crops together with herbicide applications in rotations can reduce the proliferation of volunteer plants (including possible hybrid plants). Uncultivated areas in much of the U. S. potato-growing areas are generally “rain-fed” and experience extended periods without precipitation. If segments of tubers (“seed pieces”) from cultivated potatoes were accidentally dropped from farm equipment, it would be difficult for any volunteers to survive in those uncultivated areas because potato plants demand much water for growth and reproduction.

- Some potato cultivars with genetically-engineered (GE) insect resistance were cultivated commercially in the U. S. between about 1995-2002. No potato cultivars with GE traits were cultivated in the U. S. between about 2002-2014 primarily because of consumer non-preference. Starting in 2014-2015, potato cultivars genetically-engineered for tuber quality traits of interest to consumers began to be grown and marketed in the U. S. (Halterman et al., 2016) The second generation of these cultivars, which also incorporates resistance to late blight and improved cold storage characteristics, is currently undergoing regulatory review.

- The U. S. Potato Genebank (USPG) of the USDA/ARS NPGS is located at the University of Wisconsin’s Peninsular Agricultural Research Station (PARS) in Sturgeon Bay, Wisconsin, miles from the nearest commercial potato production fields. The USPG collection comprises accessions of domesticated potato and potato wild relatives. The potato cultivars are maintained clonally, whereas potato crop wild relatives or traditional domesticated potato landraces are maintained as seeds from controlled self-or cross-pollinations.

- USPG clonal accessions of domesticated potatoes are maintained, propagated and distributed almost exclusively in the form of sterile tissue culture. Rigorous procedures are followed to prevent cross contamination and/or mislabeling of those cultures. Because of the clonal propagation, the threats of adventitious presence (AP) of GE traits from cross-pollination or seed admixture are very low.

- Most of the accessions of potato crop wild relatives are maintained and propagated by seed. Hand pollinations are conducted in screened greenhouses, usually during months when no insect pollinators are inactive, and domesticated potatoes are not flowering. Furthermore, domesticated potatoes are not present in those greenhouses. For nearly all species of potato crop wild relatives, seed set does not occur without deliberate hand or insect pollination. An added precaution against inadvertent cross-pollination involves locating accessions with interspecific hybridization barriers adjacently. Consequently, the risk of any inadvertent geneflow between accessions in the USPG genebank is studiously avoided.

- Some cultivars in the USPG collection are maintained as seeds and previously were open-pollinated in the field at PARS for seed increase. Very few (only 20) of these cultivars were acquired after 1995, when potatoes with GE traits were first grown commercially in the U. S. Those 20 cultivars were increased by open-pollination with 110 others and constitute 130 of 1117 cultivated stocks (12% of the total USPG cultivated stocks) which possibly could have been exposed to inadvertent geneflow. As mentioned earlier, no commercial potato fields are located within many miles of PARS, and other USPG potato plots or home gardens containing potatoes are located farther than ½ mile, making geneflow by pollinating insects very unlikely. Breeding lines from the USDA/ARS's and University of Wisconsin's potato breeding and genetic programs are also grown during the summer in the fields at PARS**,** but those are clonally-propagated, consequently inadvertent cross-pollination among breeding stocks and USPG accessions is not an issue. No accessions are currently increased by open-pollination at PARS.

- The USPG currently collects new accessions of crop wild relatives of potato which are found in the southwestern U. S. Those wild species do not interhybridize with domesticated potato because of numerous reproductive barriers (Love, 1994). As mentioned earlier, these crop wild relatives are located many miles distant from any commercial potato production.

- At present, the USPG collection does not include any potato varieties incorporating GE traits. Approximately 52% of the USPG's accessions were received after 1995 when potatoes with GE traits were first grown commercially in the U. S. The remainder of the USPG's accessions were acquired before then, when potatoes with GE traits were not grown commercially in the U. S.

- USPG does not anticipate receiving cultivars or breeding stocks with GE traits in the near future because currently germplasm users typically receive this proprietary germplasm, and authorizations to use the former, directly from the owner/developer. If the intellectual property rights status for those materials changes and the USPG could incorporate into its collection accessions with GE traits, USPG would simply adopt a policy of not including such germplasm into any on-site research. Those materials would be propagated and distributed solely *in vitro*, thus avoiding significant risks of AP of GE traits in other USPG accessions.

- For USDA/ARS potato breeding programs, the risk of AP during seed regeneration from geneflow of GE traits from production fields or from feral plants is low, with program hybridizations typically conducted in greenhouses during the winter months when the outside risk of pollen contamination and AP would be unlikely. Furthermore, potato breeding stocks, following their generation by hybridization of parents, are subsequently propagated clonally, consequently inadvertent cross-pollination is not an issue.

- To date, AP of GE traits has not been detected in USPG accessions or in USDA/ARS breeding lines. The greatest risk of AP to USPG germplasm accessions and to USDA/ARS potato breeding stocks is from incoming materials from the private-sector or public-sector. Strict adherence to established BMPs, including testing for AP of GE traits when warranted, should minimize the risk of AP in USDA/ARS potato germplasm accessions and breeding stocks.

- Genotyping with the potato SNP array (Endelman et al. 2017) can identify inadvertent seed admixtures in USPG germplasm accessions and USDA/ARS potato breeding stocks.

- To summarize, the risk of AP of GE traits in USPG potato germplasm accessions and USDA/ARS breeding stocks as they are currently managed is currently very low. Notable but relatively low risk factors for AP in USPG potato germplasm accessions and breeding stocks include:

- Failure to adhere to BMPs;
- Incorporation of new sources of germplasm, especially from non-ARS public-sector or private-sector breeding programs, with AP of GE traits into the genebank collection or breeding program;
- Inadequate testing for AP.

Endelman, J. B., C. A. Schmitz Carley, D. S. Douches, J. J. Coombs, B. Bizimungu, W. S. De Jong, K. G. Haynes et al. 2017. Pedigree Reconstruction with Genome-Wide Markers in Potato. American Journal of Potato Research 94,184-190.

Halterman, D., J. Guenthner, S. Collinge, N. Butler, and D. Douches. 2016. Biotech potatoes in the 21st Century; 20 years since the first biotech potato. Amer. J. Pot. Res. 93:1-20.

Love, S. L. 1994. Ecological risk of growing transgenic potatoes in the United States and Canada. Amer. Pot. J. 71: 647-658.