NCCC215 Breeding and Genetics Technical Committee Meeting

December 6-7, 2021

Chair: Dave Douches; Vice-chair Josh Parsons; Secretary: Susie Thompson

Administrative Advisor: Ray Hammerschmidt

Agenda

Schedule: Monday 1PM CST

Monday, December 6

1. Welcome and Introductions
2. Approve minutes, new business, announcements
3. Administrative Advisor report
4. Research presentations (12-15 minutes each)

Tuesday, December 7

1. Continue Research presentations
2. Breeder presentations (20 minutes each)
3. Discussion on diploid breeding patent
4. Scheduling 2022 meeting, officer elections
5. Adjourn meeting

**Minutes 2021 Meeting**

The 2021 NCCC215 meeting (Hybrid) was called to order at 1 p.m., December 6, 2021 by Committee Chair Dr. Dave Douches.

Attendees in person and via Zoom introduced themselves (attendance attached).

Dr. Laura Shannon moved to approve the 2020 meeting minutes (second by Dr. Jeff Endelman). The motion passed by a show of hands.

Dave Douches asked if there were any additions or corrections to the agenda. Hearing none, he mentioned that the discussion of the diploid breeding patents may be moved to earlier on the agenda to accommodate the presence of some attendees.

Dr. Ray Hammerschmidt, Administrative Advisor of the NCCC215, provided an update. A new proposal was crafted and submitted in 2021 by Dave Douches and Dr. Susie Thompson. Ray Hammerschmidt indicated some items that are important for including in our report, including Accomplishments, Impacts and Outreach activities and provided several examples.

Dave indicated that details of the registration costs (to pay conference room costs) will be worked out with the breeding program PIs from MSU, NDSU, UMN and UW.

Potato Genetic presentations:

Peyton Sorenson (UW) reported on ‘Marker Assisted Selection for *RB* and *RYadg* in Diploid Potatoes’. João Normura described his work improving potatoes for heat and drought stress at CIP and with Jeff Endelman’s program. Lin Song shared her research with diploid chipping selections during 2021. Dr. Maria Caraza-Harter, post-doc in the Endelman lab, reported on her work with diploid breeding of red-skinned potato genotypes, including successes with dihaploid extraction, varying pollen donors, presence of *Sli* alleles, and identification of families for the next cycles of selection.

Dr. Thomas Sefaniak, with the UMN potato breeding program, provided an update of traits in the legacy lines moving through their program and the potential for open-source releases. Dr. Xiaoxi Meng detailed activities and updates for Potato 2.0; she explained the Tier 1 Sequencing, challenges with fertility and compatibility with the 4x and 2x lines, and that she has identified very low diversity across market types for genes of interest on Chromosome 10. Michael Miller reported on the TUBAR (image analysis program) Russet Function he has ready for adoption. The package and vignette can be accessed at github.com/shannonlabum/TUBAR. Presently he is planning to leave as 2D so that programs can collect images in their lightboxes. Muyideen Yusef presented ‘Diploid Breeding at University of Minnesota: Process and Prospects’; the presentation detailed the process (see manuscript citation below) for dihaploid extraction, the 2021 field trial results from their Becker, MN, site, and upcoming inbreeding plans. Dr. Paul Collins (USDA-ARS, Maine) provided an important note to be sure that the group is evaluating glycoalkaloid content for materials with M6 has a parent, as many are noting elevated TGA levels.

Members of the MSU breeding program team provided summaries of their genetics research. Thilani Jayakody shared ‘Genome-Wide Evaluation of Off-Targets from Gene Editing Agents in Vegetatively Propagated Crop Species’; her report highlighted activities of the knocking out the polyphenoloxidases in potato tubers. William Behling presented ‘Looking Beyond *Sli* – Male versus Female Side Self-Compatibility and the Potential Impact on the Future of Diploid Potato Breeding’. He found cytoplasmic male sterility in the progeny of interspecific crosses with *S. verrucosum* and polyploids, and that there is little diversity in *S. verrucosum* and discussed the opportunities for improving tuber traits in the 1 EBN species, pre-breeding and novel traits, and 1EBN species possessing Colorado potato beetle resistance. Kaela Panicucci shared ‘Examining the Self-Compatibility Properties of a Diploid Potato Population’; the take-home message of her talk was that *Sli* is not the only factor involved in self-compatibility.

Following the conclusion of the Genetics talks, a brief discussion of some patents filed in Europe and the US by a private company that may impact public and private breeding program’s efforts in diploid potato breeding and research was held until 6 p.m., with dialog and questions posed by public and private researchers from the US and Canada.

The second day of the NCCC215 meeting began at 8 a.m. with Chair Dave Douches calling the group to order. Dr. Jeff Endelman (UW) focused his presentation on potato maturity. Dr. Isabel Vales (TAMU) reported on heat tolerance in potatoes and specifically their screening and cultivar development efforts in breeding heat tolerant cultivars; Reveille Russet and Vanguard Russet are both heat tolerant. Dr. Susie Thompson (NDSU) provided a breeding program update for 2021; Dakota Dawn (ATND99331-2PintoY), a specialty cultivar, was released in May, and research trials and seed production were impacted by the severe drought in the northern plains. Dr.Craig Yencho (NCSU) gave an informative summary of the potato and sweet potato breeding efforts as well as production information in North Carolina; they are focusing on heat tolerance, PVY resistance, and are implementing genomic selection, in addition to having reorganized their breeding schematic. Dr. Laura Shannon (UMN) presented an update on the Minnesota breeding program, providing information on where they are in building the program, locations for trials, and collaboration with the North Central (NC) breeding and genetics programs, in addition to many other programs. She also talked about Breedbase and that the NC breeders would be beginning to populate the database this winter (<https://ncrt.breedbase.org/>). It will require specific definition of phenotypes and that the ontology is based on that of CIP. Dr. Dave Douches (MSU) concluded the breeding talks by providing details of their breeding scheme including approximate numbers of entries at each stage, their work on PVY, common scab and late blight resistance; climate resilience is also a focus of their program. MSU has a new release in 2021, Bonafide (MSV093-1Y). They are seeing an increase in interest in their recent specialty releases Blackberry, Raspberry, Colonial Purple, Ruby Rose, and Spartan Red. He also shared information about their diploid breeding efforts, work with XERICO for drought tolerance, and their USAID projects in helping deploy late blight, PVY, and now bacterial wilt resistant materials in lesser developed countries.

One announcement was made reminding the group of the Polyploid SCRI Workshop to be held January 13 and 14, 2022 in San Diego (hybrid format).

The 2022 NCCC215 meeting will be held December 5 and 6. Dr. Dennis Halterman (USDA, UW) was unanimously elected secretary, while Dr. Josh Parsons (Pepsico) and Dr. Susie Thompson (NDSU) will move up to Chair and Vice Chair, respectively. The meeting adjourned at approximately 12 p.m.

A post-meeting report was provided by Dr. John Bamberg USDA/ARS – US Potato Genebank, as he was not available for the meeting. NRSP6 funding officially ended on October 1, 2021, so the genebank no longer has multistate status like the NCCC215 group. Max Martin (genebank staff) retired, as did Dr. Jiwan Palta (UW). A successful expedition to southern New Mexico and west Texas was conducted. Collaboration with B. Swingle (Cornell) found high levels of *Dickeya* resistance, and with R. Cooper (USDA-WA) found Lso immunity; both traits in *S. microdontum*.

They have *S. jamesii* hybrids with cultivars, they are maintaining their collaborative Peru project with interspecific seedlots sent to Puno and a second cultivar release on the horizon. They have reached S5 generation with the orange-flesh Criolla type materials and have also used a parallel approach (recurrent selection). Work continues improving genebank technology and using DNA markers to better understand the status and dynamics of genetics in the collection which they hope will provide a roadmap to make useful traits in germplasm more easily mined by breeders.

Respectfully submitted,

Susie Thompson, NDSU