**Brief Summary of Minutes of Annual Meeting**

Dr. Torrion opened the meeting, welcomed the participants in-person and via virtual connectivity, and thanked Dr. Welbaum for hosting the meeting. A short introduction by the participants followed.

Dr. Mary Burrows, Associate Dean and Director of Virginia Agricultural Experiment Station, introduced agriculture in Virginia and the activity of Virginia Tech agricultural research.

**State report highlights:**

**Alan Taylor** (Cornell University): Summarized recent seed technology projects and in particular, on hemp seed science and technology. Also, contrasted the performance of water as a carrier versus dry powder coating. All seed biological enhancements tested were ineffective to reduce damping-off in hemp. Organic copper seed treatments showed efficacy comparable to chemical seed treatment fungicides.

**Daniel Leskovar** (Texas A & M University): Presented transplant stress adaptation and stand establishment. Low levels of N reduced shoot growth in tomato, pepper, and lettuce. More vigorous transplants performed better under abiotic stress. Under biostimulants, Novihum produced the most vigorous plant and higher yield. Wildtype rootstock performed better under drought stress. Biomolecules, growth regulators, carbon-based media, and spectral lights blends can modulate the root system for better adaptation to stress.

**Sabry Elias** (Oregon State Univ.): Evaluated the effect of x-ray energy of the electromagnetic spectrum on seed quality for pear and peach seeds. Shelled seeds, typically, have better germination. But when applied with x-ray on the shorter duration of exposure, it had a positive effect on germination for both whole and shelled seeds, but when prolonging the exposure, it had significantly low germination. A fortuitous extra day of chilling seeds improved germination significantly. Overall, seed x-ray exposure and exposure time were not the factor affecting vigor or viability but rather due to deep dormancy.

**Grace Fleming** (Michigan State Univ.): Explained the ongoing project of Dr. Beal's seed viability experiment. Seeds stored in the bottle underground for more than 140 years were tested for germination and the seeds of the genus *Verbascum* were germinated.

**Imtiyaz Khanday** (Univ. of California, Davis): California presented their research focusing on the fundamental mechanisms underlying embryo initiation in rice and its applications in haploid breeding and clonal seed development. Four *BABY BOOM* (*BBM*) genes redundantly regulate embryogenesis, and the egg cell-specific expression of *BBM1*-*3* genes can induce parthenogenesis and produce haploid plants. By combining this parthenogenesis strategy with a genetic meiosis elimination scheme called *MiMe* (*Mitosis instead of Meiosis*), they achieved the production of clonal seeds. Furthermore, California introduced their efforts to enhance seed vigor in tomatoes. Preliminary findings from a mutant created with CRISPR-Cas9 gene editing in the abscisic acid (ABA) biosynthesis pathway were presented. The mutant seeds exhibited faster and more synchronized germination in comparison to the control wild-type seeds, along with the ability to germinate at higher temperatures. This research underscores the potential for modulating ABA biosynthesis to improve seed quality and vigor.

**Héctor Pérez** (Univ. of Florida): Detailed the impacts of different crop management systems and interannual climate variation on the production of high quality vegetable and flower seeds in the humid, warm southeastern region. The project, via developmental physiology studies, identified ideal seed harvesting time-frames to ensure seed quality. It also provided proof-of-concept regarding relatively low-cost, scalable, desiccant-based seed drying systems.   This project consisted of collaborative on-farm research and included farmer suggested crops. Collaborating farmers adopted the seed drying system and can use information from developmental studies to incorporate seed production into their operations.

**Susana Goggi** (Iowa State. Univ): Seed size of corn and planting depth in cool-season perennial grass. A detailed experiment was conducted in precise seed sizing the seed materials to determine the impact of seed size on germination performance. In the end, seed size was not a factor in germination but more so in seeding depth.

**Jessica Torrion** (Montana State Univ.): Presented winter wheat studies that include exposure of winter wheat classes (hard reds and soft whites) with various irrigation management using surface drip system. It also included simulation of raindrops during seed-fill development using a center pivot. It was summarized that continuing irrigation in the seed-fill plus the onset of rains late in the season negatively impacts falling number (increase late-season amylase activity in the grain). In avoidance, early termination of irrigation works better especially on soft white market class.

**Ramin Yadegari** (Univ. of Arizona): Described efforts to identify the transcriptional network associated with and the function of a set of MYBR transcription factor (TF) genes expressed in the basal endosperm transfer layer (BETL). Reverse-genetic analysis using CRISPR-Cas9-targeted mutagenesis of two of the MYBR TFs indicated that both single- and double-mutant plants can produce smaller kernels than found in wild-type inbred background. A preliminary analysis of the mutant endosperm showed defects in BETL cell differentiation. Furthermore, analysis of mRNAs expressed in the mutants suggested that the MYBR TFs regulate a set of genes predominantly expressed in BETL as hypothesized previously and that these genes are likely responsible for proper development of BETL. These results support a role for a MYBR-regulated transcriptional network driving BETL cell differentiation and in turn kernel size.

**Tomo Kawashima** (Univ. of Kentucky): Presented variations in soybean seed development among cultivars with different seed sizes. The data suggest that longer lag phase duration allows developing cotyledons to divide more, generating more cells to produce larger seeds.

**Greg Welbaum** (Virginia Tech): A new 344 page text/reference book published by CAB International entitled *Vegetable Seeds Production and Technology* by Greg Welbaum is suitable for college students, researchers, and professionals in the seed industry. Research is ongoing to optimize the apple latent spherical virus (ALSV)-based virus-induced gene silencing (VIGS) system using ALSV cDNA. If successful VIGS can study effects of various genes on resistance to bacterial fruit blotch disease of cucurbits. We are now generating watermelon and melon DMR6 mutant plants via CRISPR/Cas9-mediated gene editing to create genotypes resistant to bacterial fruit blotch disease. An international seed treatment patent has been applied for to control surface bacterial infection of seeds. The method involves application to seeds of green tea or its active constituents:  epigallocatechin-3 gallate, catechin, epicatechin, in combination or as various mixtures. The patent also covers applications of epigallocatechin-3 gallate, catechin, epicatechin, in combination with antibiotics, that produce synergistic effects.

**Business meeting:**

New Member Recruitment: We have generated several ideas for recruiting new members.

1. Contact the Ag Experiment Station to recruit members.
2. Create our group website as a recruiting tool (further discussed below).
3. Include not only 1862 institutions but also 1890 Land Grant Institutions for outreach.

W5168 Proposal: During our discussions, we emphasized the importance of collaborations; however, we have several focal areas shared among participants. Accessibility to information and expertise is critical to promote collaborations. This group represents a significant resource, and we have devised a plan to consolidate our research and resource information on our group website. This approach will not only help us recruit new members but also inform existing members about available resources to facilitate research discussions.

Group Website: Kawashima has agreed to initiate the group website. He will establish a web-based system to collect and organize individual members' research and resource information and use it to create the website. Our new member, Oscar Fleming, has developed a seed-themed scratch game and will assist us in outreach activities and introducing seed science to younger generations.

2023 Meeting Location: Fleming has generously offered to host next year's meeting at Michigan State University.

Group activity: Yadegari will organize Marc Cohn symposium at an ASPB meeting. We will further discuss how this opportunity can synergistically be utilized to present/advertise the group and research.

It was agreed that Perez would serve as the Chair, Kawashima as the Vice-Chair, and Khanday as the Secretary.