Invited Editorials

Editor's note: Two recipients of the *AOSA Merit Award*, Sabry Elias (2017) and Susan Alvarez (2018), were invited to share some of their thoughts with *Seed Technology* readers. Recipients of this award are recognized by fellow AOSA members for their significant contributions to the organization and to the field of seed technology.

Seed Testing is Key to Successful Crop Production

Sabry G. Elias

The main objective of testing seeds is to avoid poor stand establishment, low yield, and ultimately crop failure. Although many factors contribute to crop failure; in this article I will focus on environmental conditions and seed quality. Unforeseen adverse weather conditions, such as extreme cold or warm temperatures and extended periods of rain or drought, as well as poor farming practices, and disease and pest outbreaks, are among the environmental factors that can negatively impact crop performance. However, even if these factors were at optimum levels, planting poor quality seeds would still result in crop failure.

The use of high-quality seeds is the cornerstone in any successful agricultural production program. Planting high quality seeds has become more crucial than ever for providing enough food security to an increasing world population. Selecting high yielding varieties adapted to the area of production, with disease, insect, lodging and shattering tolerance or resistance, along with other desirable characteristics, are basic keys for satisfactory crop performance and yield, but the starting point should be high-quality seeds. To avoid the potential of planting poor quality seeds, testing seeds before planting is a fundamental practice that contributes to the success of crop production programs.

What does seed quality mean, and how do we measure it? Seed quality is a collective term for the condition of seeds, including genetic and physical purity, viability, vigor and seed health, in addition to any other factors that may affect seed performance in the field. Poor viability and/or vigor, excess weed seeds, heat and mechanical damage could significantly affect seed quality and performance in the field. Other characteristics, such as specific chemical composition or resistance to certain diseases or insects, also contribute to the quality of seeds. In general, complex interactions of genetic, environmental, physiological, biochemical, cytological and pathological factors influence the expression of seed quality. Factors under genetic control may include, but not be limited to, seed size, color, chemical composition, hard-seededness, hybrid vigor, susceptibility to mechanical damage, and disease resistance. The success of crop production in one area and its failure in another illustrates the importance of environmental influences on seed development and maturation, as well as its genetic makeup. Environmental conditions during seed development and maturation, including temperature, water stress or excessive rain, lack of nutrients, disease infestation, insect pressure, and the stage of seed maturity at harvest, influence the quality of the seed produced. Harvesting seeds too early or too late may reduce the quality of the seeds. During prolonged and less than optimum storage conditions, physiological, biochemical, and cytological changes occur in seeds leading to the deterioration of their quality. Slower growth rate, abnormal seedlings

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and loss of vigor and viability are among the physiological symptoms of low-quality seeds. Mechanical injuries due to harvesting, conditioning, and handling can also affect seed quality. Storing seed under poor conditions of high temperature and relative humidity or at high moisture content accelerates seed deterioration and reduces their quality. The magnitude of seed deterioration depends on species, storage environment, length of storage period, and the initial quality of the stored seeds. Therefore, testing the quality of seeds stored for different lengths of time is important to determine the effect of aging on seed quality. Each step in the crop production program, from planting the proper variety at the appropriate time to following weed and disease control practices, fertility programs, harvesting at the right time, cleaning the seeds, storage, testing and shipping, is critical for achieving high quality seeds.

There are many tests to measure the various aspects of seed quality. For example, seed viability is measured by the standard germination and tetrazolium tests. The accelerated aging test, cold test and electrical conductivity are among the tests that measure seed vigor. There are tests to measure genetic and physical purity. Other tests are designed to measure the presence of seed borne diseases. Other tests measure various aspects of seeds such as mechanical damage, ploidy level, varietal identification and herbicide tolerance. No one test could provide all the information about the quality of seeds. Therefore, growers need to identify the target quality trait to measure and choose the appropriate test. In addition to testing seeds to determine their value for planting, seed may be tested for labeling in certification programs, official control to protect buyers from purchasing fraudulent seeds, seed research, monitoring seeds in storage, or simply to determine the value of seeds. There is no doubt that seed testing is a good investment in an overall crop production program, and key to successful stand establishment and satisfactory yield.

A Look at the Past, Present, and Future of *Seed Technology*

Susan Alvarez

In 1976, the Association of Official Seed Analysts (AOSA) launched a new scientific journal. They named it the *Journal of Seed Technology,* and its mission was to provide a forum for seed scientists, graduate students, and researchers to present their studies in order to promote seed testing and advances in the seed industry. It was to be free of page charges, and this has remained so to this day. The first Editor was Larry Copeland, of Michigan State University. Many of the papers published came from major universities in the United States, including Michigan State, Ohio State, Iowa State, Oregon State, Mississippi State, Colorado State, the University of Kentucky, UC Davis, Virginia Tech, and many others.

In 1994, the *Journal* began to languish. There was a hiatus of two years, but in 1997 the journal was revived as *Seed Technology,* an International publication and published jointly by AOSA and the Society of Commercial Seed Technologists (SCST). The new Editor was Dennis TeKrony of the University of Kentucky.

Since 1976, there have been 39 volumes published, including this one. Most of the volumes have included two issues. Increasingly, the manuscripts published in the journal have come from sources other than the major US universities. Many have come from branches of the USDA, crop improvement organizations, private laboratories and companies within the US, and the Canadian Food Inspection Agency. More still have come from universities in foreign countries, most notably Brazil, India, Iran, Argentina, Nigeria, Jamaica, and more than 18 other countries.

In 2002, a new organization called the Seed Testing Research Foundation was established by SCST—its mission was "to support applied research in seed testing, to promote standardization in laboratory seed testing, and to increase the benefits of seed analysis to the seed industry." The STRF endowment fund was started in order to provide grants to individuals engaged in research into new methods for seed technology. The goal was to reach a minimum of $100,000 as a base and at that point research in seed testing would be funded and the research made available to the public. The first research project funded by STRF was a study of annual-perennial ryegrass testing using DNA techniques, completed by Reed Barker of Grass Genomic Testing in Oregon. An abstract of his work was published in *Seed Technology,* Volume 34, No. 2, in 2012. The journal remains the logical place for results of research projects funded by STRF to be published.

In 2019, the journal has reached another critical turning point. Due to many factors, mostly financial in nature, there is a real possibility that publication of the journal may no longer be feasible. While there are still many prospective

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authors submitting manuscripts and a willing and able editorial team, sufficient funding is just not there. Should the journal be required to be a self-sustaining, money-making enterprise, or should it be allowed to continue with subsidies because of its important contributions to seed science and applications to the seed industry?

The journal serves a specific and vital function in the sharing of new information and new technologies relating to seeds and seed testing. It is a place in which seed analysts can both learn from others with similar interests and showcase their own professionalism and research. It is a place where ideas can lead to improvements and needed changes in standardized seed testing and rules. We do not know what the future holds, but certainly there ought to be a place in it for the journal.