Screening Tool for Rice Seed Germination, Drought Tolerance Traits

Farmers around the world are considering dry direct seeding of rice, which not only reduces labor and time involved in land preparation, but also sustains rice production in rainfed conditions. Rice producers in the U.S. Midsouth practice dry drill seeded rice seed where the permanent flood is set at the fourth-leaf stage. However, one of the primary concern is that the dry soil conditions, sometimes, may result in non-uniform seed germination and poor stand establishment.

A recent article in *Crop Science* reports on an *in vitro* study that characterized the seed germination traits of 15 commercially grown rice cultivars in response to a wide range of osmotic potentials (0 to –1.0 MPa, with –0.2 MPa increments) using polyethylene glycol as a method to mimic soil moisture content. Time series of seed germination data at different osmotic potentials were used to estimate seed germination traits: maximum germination percentage (MSG) and seed germination rate (SGR), maximum osmotic potential when seed germination rate was zero (GROP_{max}), and maximum osmotic potential when seed germination was zero (MSGOP_{max}).

The study found significant cultivar differences for seed MSG, SGR, MSGOP_{max}, and GROP_{max}. The MSG and SGR declined significantly with decreasing osmotic potential in all cultivars. Cumulative drought response indices were developed to evaluate genetic variability among the cultivars for drought tolerance based on germination traits, which provided a method to numerically assign a value for the genotype and classify them as low, moderate, or high tolerance.

The identified tolerance scoring system will benefit rice producers in selecting a cultivar suitable for a particular production environment. Also, the technique provides a method for rice breeders to screen and develop genotypes best suited for environments affected by drought stress.


Improving Spelt Agronomy and Quality

Spelt (*T. aestivum* ssp. *spelta*) is an old hulled wheat currently receiving renewed interest among consumers, bakers, millers, and farmers. Research is necessary to facilitate a production chain with a satisfactory reward for producers and a final product of high quality.

In the March–April 2017 issue of *Crop Science*, researchers report on a study with 30 spelt varieties assessing the genetic variability and heritability of a large number of agronomic and quality traits together with the flavor and odor of breads. Knowledge about correlations among these traits allow important conclusions for spelt breeding targeting improved yield and quality.

The team concluded that a good estimation for protein quality is the sodium dodecyl sulfate (SDSS) method. They also determined significant genetic variation for bread flavor with a heritability of 0.56. Flavor was not correlated with protein quality, yield, or other agronomic traits.

Consequently, future breeding can simultaneously target improved yield, bread-making quality, and a more aromatic flavor of new spelt varieties. These findings should encourage intensified interdisciplinary research to develop faster methods for flavor and odor evaluation of breads and to expand this research to other bread cereals, like bread wheat and rye.


Demonstration of the 60 test breads. Photo courtesy of the University of Hohenheim.