

Molecular Breeding Towards Efficient Product Advancement

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Abstract

With molecular marker usage dramatically increasing in commercial breeding programs from inception in the early 1990s to current, successful exploitation today still remains ultimately dependent on trait heritability (h^2). This holds whether exploitation is geared towards main effect QTL for marker assisted selection (MAS) or genomic selection (GS) strategies. There are a number of methods to improve h^2 such as experimental design and precision phenotyping, and as h^2 improves, the quality of MAS and GS accuracy follow suit. Today, MAS / GS play a role in selection at every stage in a commercial breeding program; however, quality and efficient deployment is dependent upon the breeder understanding predictability limitations and strengths associated with relevant traits and GS training data sets. This understanding should significantly influence how aggressive a breeder is when augmenting GS into their selection scheme. Ultimately, the breeder needs confidence in GS output to potentially discard untested material that is unfit for program goals; likewise, to potentially select high quality genetic elements for a more rapid advancement track when applicable. As inbred lines enter early generation hybrid testing, the breeder's goal is to utilize these molecular technologies in concert with pedigree knowledge to identify promising new hybrid combinations for field testing. Over ninety years of pedigree breeding, affords DuPont Pioneer breeders the ability to overlay this information on commercial hybrid success in an effort to explain and utilize specific combining ability in this pursuit.