VARIETY TESTING: AN EVOLVING SCIENCE

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Abstract

Variety selection has become an increasingly more important challenge facing cotton producers across the U.S. Modern cotton varieties are currently released onto the marketplace very rapidly, due to increase competition among the major seed companies, the expiration of single-gene Bt technologies (in some regions), advancements in herbicide tolerant traits for management of Palmer amaranth and 2-gene insect technologies, and accelerated advancements in breeding for higher yield potential, nematode tolerance, and fiber quality improvements. Modern cotton varieties vastly differ with regard to maturity, response to water deficit stress, management requirements, and environment for which optimal yields may be achieved. Due to the rapid release of cotton varieties onto the marketplace, there is little time to effectively evaluate performance of such varieties, nor to determine how to position new varieties into environments where they are likely to perform competitively. Further complicating the matter is the rising seed and associated technology costs of modern varieties, shifting a larger proportion of the investment in growing cotton towards the beginning of the season, unlike other agronomic input decisions which can be adjusted for crop performance throughout the season. Variety selection is also a very expensive decision that has a significant impact on profitability, but is essentially a no-cost decision for growers that intend to grow cotton, unlike other inputs that may or may not be required. In Georgia during 2012, growers potentially lost an average of $116 to $334 per acre due to improper variety selection (equating to $150,800,000 to $434,200,000 statewide), which included only the top performing varieties brought forward by the major seed and technology companies. Variety decisions set the maximum yield potential for a particular field or environment for that season, therefore there is a great need for timely and robust variety performance information across the belt in order to reduce losses associated with improper variety selection.

The Extension Cotton Specialists Working Group, with the support of Cotton Incorporated, identified states where robust on-farm variety evaluation programs were being conducted. These programs were used as templates to develop similar programs in surrounding states within each region (Southeast, Midsouth, Southwest US). Eight to 12 varieties (representing nearly all brands and technologies) were selected based on grower interest, needs within each state, industry interest, and the interest of each state's cotton specialist. These varieties were planted in replicated (two to four replicates depending on field variability) on-farm trials in producers' fields in representative soils and geographies within each region (31 trials in the Southeast, 43 trials in the Midsouth, and 20 trials in the Southwest). Some regions conducted both Glufosinate-based and Glyphosate-based trials, as some technologies express tolerance to one or the other. Each trial was managed by the cooperating grower with the input of the Extension Cotton Specialist, Regional Agronomist, and/or the County Extension Agent. Results from individual states were made available through several outlets, but were all included in the SeedMatrix website. Contrary to Official Variety Trials, this on-farm testing program focused primarily on the most competitive varieties, captured many more environments, and evaluated performance under management of the grower with regard to technology, whereas OVT can generally evaluate many more varieties (including experimentals) based on yield potential alone (without regard to technology) and in fewer environments.

Within a single production season, this program effectively captured and evaluated variety performance across a broad range of yield environments (trial averages ranging from less than 500 lbs to over 1800 lbs), soil types, geographies, planting dates, harvest dates, grower management (growth regulators, weed management, insect management, fertility), degree of irrigation, rainfall patterns, water and heat stress, etc., allowing for robust variety stability and positioning information to be generated. Some varieties were observed to consistently perform at or near the top, indicating a high degree of stability as they performed well across many of the aforementioned factors. Other varieties only performed well in certain environments, suggesting that some varieties may need to be positioned only in heavily stressed environments, productive higher yielding dryland environments, moderately irrigated environments, or high yield heavily irrigated environments, or by their most yield-limiting factor in order to be competitive.

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