EVALUATION OF VARIETY PERFORMANCE WITH REGARD TO BOLLWORM MANAGEMENT IN N.C.

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Abstract

Variety selection continues to be one of the most important economically impactful decisions that growers make in a given year. For many years, 2-gene Bt varieties provided adequate bollworm control with minimal or seldom additional sprays needed for caterpillar control. Widespread resistance of bollworms to 2-gene Bt traits became problematic in NC beginning in 2016, and furthermore in 2017, necessitating additional and costly diamide sprays to achieve acceptable control, which is now considered to be a relatively common practice. Simultaneously, 3-gene Bt varieties became commercially available in 2017. The alarming costs of additional diamide sprays incentivized many growers to transition to 3-gene varieties, however, some 2-gene varieties may yield greater than some of the top-performing 3-gene varieties. Yield advantages of a few 2-gene varieties may be high enough to cover the costs of additional required diamide sprays while still returning greater profits to producers. The objectives of this research were to quantify to determine if BGII varieties provide yield advantages over 3-gene varieties that may justify the added cost of spraying for bollworms, and to quantify changes over time regarding variety advancements in yield potential that may close the yield gap between 2- and 3-gene varieties.

Large-plot replicated trials were conducted across NC in 2017-2019, encompassing all cotton-producing regions within the state. This program is designed to capture as many environments, representative soil types within a region, planting dates, etc. as possible within a given year. This program includes the top 2 varieties from each seed company as determined by participating seed companies. Although every company has a broad portfolio of competitive varieties to offer, the entries were chosen to be the best of each brand for all regions of the state. All varieties and replicates within a trial were managed equally for all practices throughout the year. Cooperating growers were asked to utilize a mild to moderate PGR program as to avoid penalizing early maturing varieties through aggressive PGR management. Bollworm management decisions were made according to thresholds in Bollgard II plots within a trial. Defoliation occurred when all varieties and all replicates were mature. Percent damaged bolls were measured by cooperating entomologists near the time of defoliation or shortly after, but prior to harvest. 2017 was considered to be a “heavy” year with regard to bollworm pressure, with 2018 experiencing relatively lighter pressure, and 2019 with very little bollworm pressure.

When comparing yields for varieties in the on-farm trials, varieties are ranked according to average yield across all locations. Trials are sorted progressively according to the average yield of all varieties within each trial. Yield means are highlighted in green to indicate that yield for that variety was statistically no different than that of the highest yielding variety in each trial ($p<0.01$). For the purposes of this research, yield and value/acre for the highest yielding (on average) 2- and 3-gene variety were compared in each year, only in trials where a statistical difference in yield between the two varieties was observed. Value is calculated as yield x \$0.75/lb, adjusted for the cost of each diamide spray applied to the 2-gene variety (\$18/A per application). In 2017, the highest yielding 2-gene variety (on average) resulted in greater value per acre considering the additional cost of both 1 (\$108/A) and 2 (\$90/A) diamide sprays in 43 % of trials. The highest yielding 3-gene variety (on average) resulted in greater value per acre (\$250.50/A for one application; \$268.50/A for two applications) than the 2-gene variety in only 7% of trials. There were no difference in yields between the highest yielding 2- and 3-gene varieties in 43% of trials, and neither yielded in the statistically highest group in 7% of trials. In 2018, the highest yielding 2-gene variety (on average) resulted in greater value per acre considering the additional cost of both 1 (\$86.65/A) and 2 (\$68.65/A) diamide sprays in 38 % of trials. The highest yielding 3-gene variety (on average) resulted in greater value per acre (\$81.38/A for one application; \$99.38/A for two applications) than the 2-gene variety in only 15% of trials. There were no difference in yields between the highest yielding 2- and 3-gene varieties in 31% of trials, and neither yielded in the statistically highest group in 15% of trials. In 2019, the highest yielding 2-gene variety (on average)

resulted in greater value per acre considering the additional cost of both 1 ($141.19/A) and 2 ($123.19/A) diamide sprays in 25 % of trials. The highest yielding 3-gene variety (on average) resulted in greater value per acre ($113.50/A for one application; $131.50/A for two applications) than the 2-gene variety in 19% of trials. There were no difference in yields between the highest yielding 2- and 3-gene varieties in 31% of trials, and neither yielded in the statistically highest group in 25% of trials.

In conclusion, prior to 2019, one 2-gene variety has consistently provided enough yield advantage over the highest yielding 3-gene variety to justify the added costs of either 1 or 2 diamide sprays in approximately 40% of trials. Over the last 3 years, but particularly in 2019, some of the newer 3-gene varieties have more frequently closed the yield gap between 2- and 3-gene varieties, allowing for maximum profitability without currently requiring additional diamide sprays.

Further research needs to be conducted, to evaluate yield advantages between BGII varieties and some of the newer higher yielding 3-gene varieties. Additionally, similar research needs to be conducted in lower-yielding drought stressed environments, and in years that experience significant losses to tropical weather during the early fall, to determine if these yield advantages are repeatable in lower yielding environments, or if yield of newer 3-gene Bt varieties is as stable and consistent as some of the currently high-yielding 2-gene Bt varieties.

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