The Journal of Extension

Volume 42 | Number 4 Article 22

8-1-2004

A Model for Testing New Seed Technologies

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August 2004 // Volume 42 // Number 4 // Ideas at Work // 4IAW5

A Model for Testing New Seed Technologies

Abstract
Extension specialists from several North Central states recently proposed a new approach to expedite and facilitate evaluation of new genetically modified organism (GMO) hybrids through multi-state testing. As an example of this approach, newly released GMO glyphosate tolerant (GT) corn hybrids were evaluated at multiple locations across five states in 1999 and nine states in 2001. This cooperative testing effort demonstrated that powerful sets of data across a range of production environments could be generated with a minimal amount of input and resource allocation for the individual states.

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Background

New seed technologies, especially those involving genetically modified organisms (GMOs), are often commercialized and marketed to grain producers in the U.S. at the same time they become available to public researchers for evaluation. This rapid commercialization provides limited opportunity for public researchers to conduct field trials that provide objective results before wide-scale planting begins.

Although entomologists and weed scientists at some land-grant universities evaluate GMOs prior to their commercial release, these investigations are limited to assessing the efficacy of these new products from the standpoint of insect resistance or herbicide tolerance. Often only a single experimental hybrid or cultivar representative of a new seed technology is considered, and little or no information on yield and other important agronomic information (such as crop maturity, stalk quality, and disease resistance) is collected.

Many producers are adopting GMO hybrids and cultivars to reduce yield losses caused by insects (e.g., Bt-corn or cotton) or obtain more effective weed control (e.g., glyphosate tolerant or resistant soybean, corn, or cotton). However, some farmers perceive that insect- and herbicide-resistant GMO cultivars and hybrids are inherently lower yielding than their conventional counterparts due to yield "drag" or "lag." Growers need non-biased information on whether GMOs suppress yield potential if they are to make profitable decisions involving cultivar selection. Moreover, producers expect university Extension programs to provide such information.

Recent studies by Elmore et al. (2001; 2002) provide an example of a typical evaluation of a new GMO crop. To test the agronomic performance of recently commercialized glyphosate resistant soybean cultivars, five glyphosate resistant (GR) soybean cultivars were compared with their non-GR counterparts in replicated tests conducted at four Nebraska locations for two years. This study demonstrated the lower yield potential of GR soybeans compared to non-GR counterparts. A related study compared the response of twelve GR soybean cultivars to glyphosate.

However, with major budget cuts and downsizing occurring in agricultural programs at many land-grant universities and less external funding available from public and private sources for crop production research, it has become difficult to conduct such comprehensive evaluations of new GMO seed technologies.

Development of a New Approach for Testing GMO Crops

Given the reduced funding available for testing new GMO seed technologies, we proposed a new approach for testing GMO seed technologies and an alternative to in-state multi-location evaluations. The objective of this new approach was to develop a cooperative crop testing procedure that could produce meaningful, unbiased data on new GMO crops within 1 year without funding.

Instead of conducting multiple tests of GMOs within a state for 2 or more years, a state Extension specialist would establish one or two tests comparing a set of GMOs and their conventional counterparts, which would be common to all locations. To minimize costs, planting, and harvesting, the GMO and non-GMO hybrid plots could be integrated into existing state crop hybrid testing programs.

In 1999 and 2001, participating states used this approach to evaluate the agronomic performance of newly released GMO glyphosate-tolerant (GT) corn. In the 1999 study, GT hybrids contained the GA21 event or gene insertion, while in the 2001 study, they contained the NK603 gene insertion. In 1999, multi-state testing of GT hybrids was conducted at nine locations across five states (NE, MN, WI, OH, and PA) and coordinated by a Nebraska Extension specialist. In 2001, the testing was performed at 12 locations across nine states (SD, NE, KS, IA, MO, WI, MI, OH, and PA), and coordinated by an Ohio Extension specialist. The testing coordinators' responsibilities included distributing seed, planting schemes, and data collection protocols. Project coordination and communication relied primarily on e-mail.

The 1999 and 2001 evaluation indicated the following:

- Glyphosate herbicide had no effect on GT corn hybrids (Elmore et al., 2000).
- There was no evidence of yield suppression associated with GT corn technology (Elmore et al., 2000).

Benefits and Drawbacks

Results of the cooperative GT corn hybrid tests were widely disseminated using a variety of Extension information delivery mechanisms, as the following indicates for 1999:

- 44 meetings with a total of 2150 people attending (5 states),
- 2 news releases (1 state),
- 5 newsletter articles (3 states),
- Internet postings (2 states) (Elmore, 2000; Roth, 2000), and
- 2 radio tapes (1 state).

Collaborators identified the following as some of the major benefits of this approach for GMO crop testing:

- Generated a powerful set of data for a range of production environments within a single year,
- Required a minimal amount of input and resource allocation, and
- Provided unbiased data that producers could use to address a practical question.

Although all the collaborators indicated that it was vital to continue this kind of cooperative evaluation, several suggestions were offered for future improvement:

- A simpler design to facilitate analysis of the study;
- High-yielding non-GMO checks;
- Additional funding (however this may enhance credibility of data in eyes of growers);
- A shorter turn-around time to get data assembled, analyzed, and released;
- A need to discuss data dissemination and project promotion early in development of the

project; and
- Establishment of an *ad hoc* committee to consider and coordinate future efforts.

Topics identified for future collaborative testing included:

- Any new seed based technology with value added traits (e.g., rootworm resistance, nutritional enhancements),
- Non-traditional crop amendments, and
- New seed insecticide treatments.

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