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Integrated Crop Management NEWS

How Many Corn Traits Do You Need?

By Roger Elmore, Department of Agronomy and Aaron Gassmann, Department of Entomology

We seem to live in a "have it your way" world. Everything from fast food hamburgers to "designer" clothing tailored in countries some of us didn't know existed. In contrast to this, modern, mass-production systems encourage wholesale consumption of identical products worldwide: "one-size fits all."

These contradictions also exist in the world of corn production.

A quick look at a soils map or a yield map generated from a combine yield monitor demonstrates volumes about in-field variability. Few uniform fields exist. Fields within farms vary more; farms within counties vary yet more; and so on. Adding the human dimension to this makes it more complex; each producer manages corn differently than their neighbors.

Thinking about Hybrids

Do we expect too much from a hybrid or a specific stacking of traits considering that one product may be grown across thousands of acres and varying environments? Can we assume it maintains its productivity and profitability? Is one combination of traits the best for all environments? Not likely.

Grateful producers in the mid-1990s eagerly adopted European corn-borer (ECB) resistant transgenic hybrids recognizing their value in protecting yield potential as well as reducing pesticide use. Our heads swam when industry colleagues mentioned the long-term goal of stacking multiple traits. Since then, the seed industry introduced various types of herbicide and rootworm (RW) resistance. Double and triple stacks of transgenic traits comprise the norm.

In 2009, 57 percent of Iowa's corn crop were stacked gene varieties and seven out of eight fields were planted with one or more transgenic traits according to USDA statistics (see page 24 of June 2009 Acreage report, and Figure 1 below). In 2010, producers across the country may plant 3 to 4 million acres of hybrids with eight genetic modifications for insect control and herbicide tolerance, SmartStax.

Multiple Traits - Stacking

What are the advantages of stacking multiple traits that target the same groups of pests?

- First, producers may legally reduce acreage planted to a refuge hybrid by using SmartStax hybrids, from 20 percent to 5 percent. We must make it clear though, legal refuge required with all other Bt hybrids currently remains at 20 percent.
- Second, if reduced yields occur with the refuge, planting fewer acres to the refuge will result in more yield.
- Third, stacking multiple traits for above ground insects will increase the range of insects controlled in some cases.

• Fourth, adding additional traits for the same pest may increase the durability of the traits. If this indeed happens, it will delay the development of pest resistance.

What possible disadvantages occur with stacking multiple traits that control the same pests?

• First, reducing refuge acres may not increase yields. Refuge hybrids can produce comparable yields if either no insect pressure occurs, or insecticides effectively control insects.
• Second, producers will see limited additional insect protection as single trait transgenic hybrids already effectively control key insect pests such as ECB and RW. Increasing the number of traits protecting against the same pests will not necessarily improve insect pest control or yield.
• Third, although adding two traits to control the same pest may increase durability of the traits, this is only true if each trait acts in a unique manner to control the insect pest. Scientists currently do not know if an insect that develops resistance to one mode of action will simultaneously develop resistance to the other mode of action.

Does "One size fit all?"
We encourage producers to carefully evaluate their production systems and select high-yield hybrid platforms based on research evaluations across multiple environments before deciding which package of transgenic traits to purchase. (See recent Rouse ICM News article.) For example, if a producer plants corn following soybeans where neither the western corn rootworm soybean variant nor the extended-diapause variant of the northern corn rootworm occur at levels above economic injury, there is no need to invest in transgenic RW protection; crop rotation will effectively control RW.

Let's hope producers can have it their way; "one size fits all" is not necessarily the best fit!

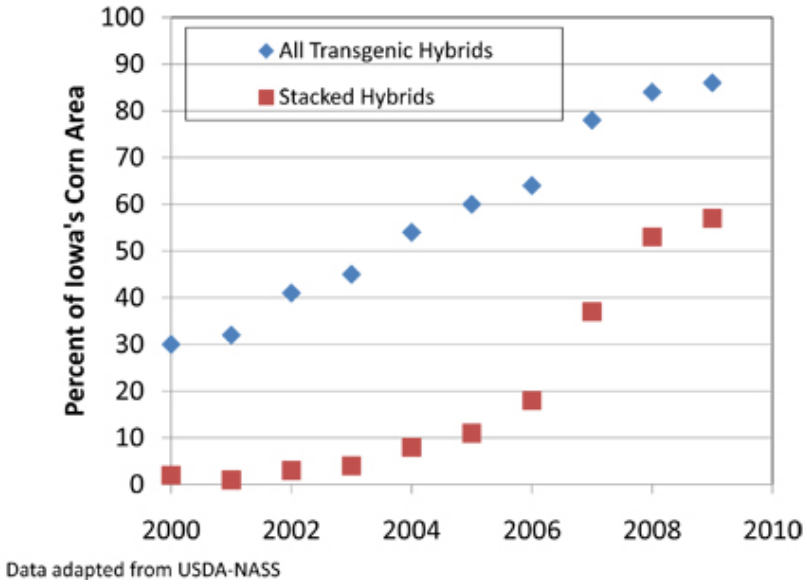

Figure 1. Transgenic Hybrid Area in Iowa, including percentage with stacked hybrids, 2000-2009. Data adapted from USDA-NASS.

Roger Elmore is a professor of agronomy with research and extension responsibilities in corn production. He can be contacted by email at relmore@iastate.edu or (515) 294-6655. Aaron Gassmann is an assistant professor of entomology with research and teaching responsibilities in insect

pest management. He can be contacted by email at aaronjg@iastate.edu or (515) 294-7623
