# Sweet corn study provides large-scale picture of better fields

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In what amounted to a kind of census of sweet corn grown for processing, three years of data from 175 fields in Illinois, Wisconsin, and Minnesota shed light on what works and what doesn't. Along with identifying the most troublesome weeds, the results also revealed some of the more complicated relationships among factors influencing both weed control and sweet corn yield in the Midwest.

"Rather than a typical controlled field experiment, this was a large scale approach. We wanted to find out what some of the driving characteristics are on the regional level for sweet corn production," said University of Illinois and USDA Agricultural Research Service ecologist Marty Williams. "We contacted sweet corn processors in the Midwest. They supplied us with fields to study as well as a huge amount of information on the agronomic practices used in those fields, such as planting dates, tillage practices, and herbicide use."

From other sources Williams acquired environmental data for the fields, including temperature, rainfall, and latitude. In all, the study analyzed 20 environmental variables, 30 agronomic variables, and 56 weed species.

Identifying which weeds were most abundant was the easy part.

Just prior to harvest, Williams and his team walked the 175 fields and noted the weeds present. "Most of the fields had a number of species," Williams said. "On average, there were four to eight weed species in a field. Most the fields were dominated by a couple of species, but it

wasn't the same dominant species from field to field."

The most abundant weed species they observed in the Midwest were fall panicum, giant foxtail, wild-proso millet, common lambsquarters, and velvetleaf. Williams added that each state had its own uniquely dominant weeds.

The next step, finding characteristics of the best and worst fields, was much more complicated. Williams was looking at not only sweet corn yield of the 175 fields, but also weed diversity, weed interference, and the weed's ability to propagate within the short window to crop harvest.

"We were able to identify the highest yielding fields as those that used interrow cultivation, a sweet corn hybrid that matured in less than 84 days, and were in the northern part of the production region," said Williams. "One break in latitude came near 42 degrees north and that's right about the border line between Illinois and Wisconsin. Fields further north also had lower weed interference and produced fewer weed seeds."

For those fields that didn't do as well, weed interference was the best indicator of yield loss. During the field visits, Williams and his team also predicted yield loss due to weeds. "Ultimately, over half of the fields in the Midwest had a level of weed interference sufficient to cause yield loss," Williams said.

Planting the weediest fields in June or July was one recommendation for more successful weed management that surfaced from the study. When the fields are cleaner, earlier planting is actually beneficial for crop growth.

Williams said that information gained from the regional study was consistent with some of the controlled research in experimental field studies they've done. "We've tested various planting dates and the crop

tolerates common cornbelt weeds better in a June or July planting than it does in an April or May planting. Annual weeds that emerge and then are taken out when the soil is turned over for planting, you don't have to worry about again."

Another factor that played a major role was water supply. "We have no control over rainfall, of course, but we noticed that those conditions with poor water supply had bigger problems with weeds. Soil-active herbicides aren't nearly as effective when weed seedlings are emerging in dry soil. Likewise, drought conditions reduce effectiveness of postemergence herbicides."

One surprising observation from the data was that fields receiving the highest herbicide rates and most expense weed control programs had higher weed diversity, more weed interference, and produced the most weed seeds. Williams believes this may be the result of farmers applying more herbicides and at higher rates to the weediest fields, but with limited success.

The research team used a type of data analysis called Classification and Regression Trees (CART) to make sense of the enormous amount of data in the study. CART is more commonly used in social science experiments. The analysis looks for a single variable in the huge dataset which separates it into two distinct datasets, then four, then eight, like the branches of a tree. The analysis can also "prune" the tree back to something that's most meaningful, thus identifying the few variables most important to crop yield.

Although weeds are still a big problem for farmers, Williams noted that when this recent data was compared with weed surveys done some 50 years ago, "the overall weed density is an order of magnitude lower. Also, a lot of the current weeds weren't a major problem years ago, but then there are some like lambsquarters that are still pretty highly ranked.

So there's been a little shuffling of the players, which we expect to continue."

**More information:** "Residual weeds of processing sweet corn in the north central region" was published in a 2008 issue of Weed Technology. Linkages among agronomic, environmental and weed management characteristics in North American sweet corn was published in a 2009 issue of Field Crops Research. Other researchers include Adam Davis, Tom Rabaey, and Chris Boerboom.

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