

Nov 29th, 12:00 AM

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D. R. Hicks

University of Minnesota, hicks004@umn.edu

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Hicks, D. R., "Corn Hybrid Selection, Yield Stability, and Performance" (2007). *Proceedings of the Integrated Crop Management Conference*. 4.

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Corn hybrid selection, yield stability, and performance

D. R. Hicks, Emeritus Professor, Agronomy and Plant Genetics, University of Minnesota

Selecting corn hybrids

Selecting high yielding corn hybrids is the most difficult thing that corn producers must do each year and the most important management decision that affects profitability. Production costs are fixed for a given set of management practices for each grower, so any increase in yield because of selecting good yielding hybrids adds extra net income and increases profitability potential.

In this discussion, I will present a process for selecting corn hybrids that increases a grower's probability of obtaining high corn yields. I will show the data that support the process which simply is to get yield information from several locations of small, replicated yield trials. One then needs to rank the hybrids based on the average over locations, and then starting from the top and go down the list select as many hybrids as the grower wants to grow. This process only considers yield; one can consider other traits such as stalk quality, genetic traits, etc.

Hybrid stability

Corn seed salesmen often talk about "stability" of hybrids. They often use the term "racehorse." I've been interested in this and have asked what they mean by racehorse and get different replies, but the description usually is "it's a hybrid that does well on your best land." Right or wrong, this implied to me that those hybrids described as racehorses might not then do as well as others on lower yielding fields. Then, what hybrids should one choose to grow on the lower yielding fields? Do "racehorse hybrids" exist? These questions haunted me for some time until I looked into the matter further.

Plant breeders define variety stability as a variety that is not influenced by the environment. They calculate the stability index as the linear regression coefficient of the yield of a variety grown in several environments as a function of the environmental index. The environmental index is the difference of the average yields at one location from the average yields of all locations. They define a stable variety as one having a regression coefficient (b value) that is not different from 1.0.

If a hybrid has a regression coefficient that is greater than 1.0, then it performs better in high yielding environments than do other varieties. I've called these "racehorse" hybrids. Hybrids that have a regression coefficient less than 1.0 would perform better than others in a low yielding environment. I called these hybrids "workhorses."

Are there such corn hybrids as racehorse and workhorse as described here? If so, corn growers should know this to improve corn hybrid selection and where they position them on their farm.

I've analyzed several yield data sets and have found similar results. I've concluded that hybrids today are stable and are unlikely to have regression coefficients that are different from 1.0. Seed companies test hybrids over many environments before a hybrid is commercially released and one of the criteria for release is overall good average performance (or a regression coefficient of 1.0). This analysis also reconfirms for me what I have told corn growers for many years - "Good

yielding hybrids are good yielding hybrids in all environments.” To this end, corn growers need to get unbiased yield information and chose the higher yielding hybrids to increase their chances of choosing hybrids that will perform well next year. The supporting figures for this part of this paper can be found at: <http://www.extension.umn.edu/cropenews/2005/05MNCN54.htm>

Traits – Do they increase yield?

Corn yields have continued to go up and many give credit to the new corn traits for these yield increases. We sorted data from the southern and central zones of the 2006 Minnesota Corn Performance tests to determine the effect of herbicide resistance- and Bt-traits on yields. At the outset, we should point out that these comparisons confound genetics and traits. However, it's valid to make these comparisons because a grower is interested in the yield potential of the combination of genetics and traits. And the large number of hybrids in most categories gives validity to the conclusions.

The analysis shows there is little to no yield increase due to the addition of insect or herbicide traits in corn hybrids. We feel that corn producers can still select hybrids based on genetic yield potential and then consider insect or weed management tactics based on integrated pest management strategies to protect the genetic yield potential. The supporting paper for this subject can be found at:

<http://www.extension.umn.edu/cropenews/2007/07MNCN08.htm>

Other articles you may find of interest are listed below. They are based on Minnesota research, but the principles will apply to other corn growing regions.

The Rotation Effect For Corn Yields

<http://www.extension.umn.edu/cropenews/2007/07MNCN09.htm>

Higher Population or Row Spacing?

<http://www.extension.umn.edu/cropenews/2007/07MNCN27.htm>

Hybrid Maturity for Southern Minnesota

<http://www.extension.umn.edu/cropenews/2007/07MNCN10.htm>

A Look at Minnesota Corn Yields over Time

<http://www.extension.umn.edu/cropenews/2005/05MNCN57.htm>