Hybrid Selection

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One of the most important decisions that a producer must make when planning for the next corn planting season is what hybrid or hybrids to plant. Currently, most commercial corn producers plant single-cross hybrids, and most of these hybrids are produced and marketed by private seed companies. The corn producer's challenge is to select those hybrids that are appropriate for each management situation, keeping in mind the risks associated with potential weather extremes and field limitations. Managing to get the highest possible yield starts with selecting those corn hybrids that are best adapted to your farm and farming practices. Among the agronomic characteristics to consider in choosing hybrids are yield, maturity, standability, insect and disease tolerance, seedling vigor, and stress tolerance.

Yield

The bottom line for most producers, all other things being equal, is to use the highest yielding hybrids available. Under stress conditions, high yielding hybrids with superior stalk quality are most desirable. If a hybrid cannot stand under stress conditions, lodging can severely decrease yields. State yield trial reports provide the most complete and unbiased information on the relationship between yield and lodging. Most state trials are conducted at several locations under varying degrees of stress conditions and include most of the hybrids sold in the state. Each year, the University of Kentucky College of Agriculture conducts the Kentucky Hybrid Corn Performance Tests. This information is made available both on a Web site and as a progress report available from your county Cooperative Extension Service office.

The process of hybrid selection should consider the stability of performance across years and locations. Selection of more than one hybrid will reduce risk from weather and disease. Each year several new hybrids are included in the test. Selecting new hybrids that are within one least standard deviation (LSD) of the best hybrids in the test will provide more chance of stability of performance. In addition to yield, data are presented on moisture at harvest, percent stand, lodging, and test weight. Separate tables are presented on the protein, oil, and starch composition of the corn hybrids.

Other good sources of information about hybrid performance are from well-managed local corn demonstration plots sponsored by county Extension groups, FFA chapters, and seed corn companies. To be meaningful, these plots should have at least three replications of each hybrid or a check hybrid between plots of every two or three hybrids with yield adjustments made for location in the field. Many corn companies today combine data from several locations, which does improve the reliability of the data. Strip test or plots with each hybrid entered only once are of little value for yield comparisons, as field variation is usually greater than most differences among the hybrids.

Maturity

Choosing the appropriate maturity or maturities for each field, situation, or farm operation is important when selecting hybrids. The Kentucky Hybrid Corn Performance Test is a good source of information on relative maturity of hybrids. The hybrids are divided by maturity: early, medium, and late. Once you have selected the desired maturity, you can choose among the hybrids within a maturity group based on their performance characteristics.

Deciding which maturity or maturities to plant depends on a number of factors that may be unique to each field or farm operation. In general, full-season hybrids (hybrids that use most of the growing period in that area) produce the highest yields. However, recent hybrid development has resulted in early and medium maturity hybrids having about the same yield potential as the full-season hybrids. Currently, the majority of the corn grown in Kentucky is of medium maturity. Early and medium maturity hybrids will have an earlier harvest and a lower moisture content than later maturing hybrids. Early maturity hybrids are useful for late plantings (after early June) because of the shorter growing season. Yield potential of early maturity hybrids is comparable to later maturity hybrids when planted at later planting dates with a lower moisture content at harvest. Early and medium maturity hybrids are also a good choice for stress situations, particularly soils with low water-holding capacity since they require less moisture to mature.

Producers should plant several hybrids differing in maturity, particularly if a large acreage of corn is planted. Hybrids that differ in maturity reduce the risk of adverse weather (heat or drought) and stress at pollination. It also spreads the harvest period so corn can be harvested at optimal grain moisture levels. The optimal proportion of different maturities differs for each farm operation and depends on acreage, soil types, and other management factors. A typical recommendation of different maturities might be 10 to 15 percent early hybrids, 60 to 70 percent medium hybrids, and 15 to 20 percent late hybrids.

Growing Degree Days (GDD)

Most producers consider corn maturity as the number of calendar days from planting to maturity. This system allows a farmer to compare the maturities between different hybrids but does not necessarily indicate how many days it will take for that hybrid to reach physiological maturity. The number of days that are required for a hybrid to reach maturity depends on location, date of planting, and the weather during the growing season. A hybrid that is labeled as a 115 day hybrid may take from 110 to 120 days to mature depending on the above factors. This system of measuring corn maturity does not take into account the complicated physiological processes that control growth and development of corn.

Each day that a corn plant grows from emergence to maturity does not contribute equally to the development of the plant. Development is faster during warmer days than it is during cooler days. Although factors other than temperature may enter into determining rate of growth, the corn industry adopted the Growing Degree Days (GDD) system in 1970. This system uses a heat unit approach to the prediction of maturity that is more accurate than the old days-to-maturity ratings and is based on the number of heat units necessary for corn to reach physiological maturity.

Growing degree days are calculated by subtracting the base temperature (50°F) from the average of the maximum and minimum daily temperatures. Little or no corn plant growth occurs when the temperature drops below 50°F, and when the temperature rises above 86°F development is reduced. Consequently, a GDD is calculated according to the following equation:

$$GDD = \frac{\left(\text{Max Temp.}_{(\leq 86^\circ F)}\right) + \left(\text{Min Temp.}_{(\geq 50^\circ F)}\right)}{2} - 50^\circ F$$

The maximum temperature is the highest temperature for the day (adjusted downward to 86°F, if necessary), and the minimum temperature is the lowest for the day (adjusted upward to 50°F, if necessary). For example, if the high temperature for the day is 90°F and the minimum is 60°F, the GDD = (86 + 60)/2 - 50 = 23 for that day. The University of Kentucky Agricultural Weather Center (AWC) starts recording GDDs for corn on April 1. These graphs are available at the following URL: wwwagwx.ca.uky.edu/cgi-bin/cropdd_www.pl. By knowing the GDDs required for a particular hybrid to mature, one can determine from the AWC when a particular hybrid should mature from the date that it emerged. For example, if the corn emerged on April 15 and required 2,700 GDDs to mature, corn would reach physiological maturity about August 26. This assumes fairly normal weather. The same site can also tell you on August 26 how many GDDs has accumulated by that date. This information can be used to determine if a particular hybrid will mature before the average date of the first frost in the fall.

Corn Seed

Hybrid seed corn is available in different kernel sizes and shapes. Location on the ear influences the size and shape of the kernels. Large round seed comes from the base of the ear; small round seed, from the tip; and flat seed, from the center of the ear. The key to accurate planting is to select kernel size and shape to fit their planting equipment. For plateless-type planters that use vacuum or air pressure to hold seed to a plate or drum or finger pickup units, seed size and shape are not as important. These types of planting units can use different seed sizes and shapes.

Research has not found any relationship between kernel size or shape and emergence on yield. Thus, within a given hybrid, seed of any size or shape has the same genetic potential. Growers with plateless planters can take advantage of lower prices often associated with less popular seed sizes and shapes. Corn hybrids should be selected on the basis of their agronomic performance, not on their kernel size or shape, if the planting equipment is suitable.

The following equation can be used to determine the number of live plants that can be expected from corn seed at a given seeding rate:

$$\text{Expected stand} = \text{seeding rate} \times \frac{\text{\% pure seed}}{100} \times \frac{\text{\% germination}}{100}$$

It is fairly common to find that as many as 10 to 15 percent of the seeds planted do not produce a live plant under field conditions.