Hybrid Selection

Colorado corn production records date back to 1879, when Colorado farmers planted 23,000 acres and yields averaged about 20 bu/A. Now there are approximately one million acres of hybrid corn planted annually, with yields exceeding 300 bu/A. Most yield gain is due to improved genetics and producers must continually adopt new hybrids on their farms to stay competitive. The right combination of well-adapted corn hybrids is fundamental to a profitable corn production system.

Selection

When choosing hybrids, consider hybrids based on at least the past two years' performance over a range of locations and climatic conditions because these conditions change from year to year. Growers can reference the Colorado State University Corn Performance Trials to choose from the highest yielding hybrids at http://www.colostate.edu/Depts/SoilCrop/extension/CropVar/corn/corn1.html or from local seed dealers.

On-farm hybrid tests can also be useful in evaluating hybrid performance characteristics such as lodging, drydown, harvestability (ease of shelling, ear retention, etc.), disease and insect resistance, but are considered less reliable for yield results. Results of on-farm strip tests can be statistically reliable for determining yield performance provided there are 10 or more different locations of the strip tests.

In limited water situations, consider results from both dryland and irrigated variety trials. If a variety performs well in both dryland and irrigated conditions, it will usually perform well in limited water situations.

Dryland considerations

The increase in dryland corn acreage during the past decade has improved the information available for making better hybrid decisions for non-irrigated production. The Crops Testing Program at CSU has conducted dryland trials since 1995 and private companies are also putting more emphasis on testing hybrids suited for non-irrigated production (in drier environments) than in the past. The primary difference in selecting a variety for dryland instead of irrigated production is season length. When water is not limiting, season length is a primary factor in yield potential. However, when relying on natural precipitation, water and not season length limits yield potential. So, shorter and mid-season hybrids are typically recommended. In dryland situations, choose hybrids that develop their leaf area slowly, these tend to minimize early season water use.

Important hybrid selection factors:

- yield potential and consitency
- maturity
- stalk quality
- disease and insect resistance
- root lodging resistance
- dry down

Market Classes

Dent Corn – Yellow or white, it's the majority of corn grown in the U.S. Dent corn is used to make fuel ethanol, corn syrup and sweeteners, corn starch, and industrial products.

Sweet Corn – corn on the cob and canned corn are sweet corn. Sweet corn is primarily used for human consumption because it contains more sugar than other types of corn and is harvested when the plant is still immature and the kernels are soft.

Popcorn – a special kind of corn with a hard outer layer allows enough pressure to build within the kernel that it "pops" when heated because when the moisture inside the kernel turns to steam.

Specific-Trait Corn – includes blue, white, high-oil, waxy, high-amylose, hih fermentable, and other corns used in the production of food products such as corn bread and tortillas. These corn hybrids are grown for their specific milling, baking, biofuel, or nutritional characteristics.

Planting hybrids with different maturities ensures further genetic diversity in the crop, which can minimize certain pest problems or environmental stresses for which no specific resistance or tolerance is available. Such diversity may also downgrade losses from drought, heat, and green snap.

Hybrid Selection

Genetically engineered traits are just one of many important traits to evaluate in a hybrid. Yield, stalk strength, dry down, maturity and pest resistance should all be considered when choosing corn hybrids.

It is critical for growers to know which hybrids are conventional, approved for EU export, or not yet approved for EU export. Growers should take seed company grower agreements seriously and be aware of the requirements of those

European corn borer larvae feeding on a corn stalk.

Guidelines for planting Bt corn

- Plant no more than 80 percent of your total corn acreage to single event Bt hybrids.
- Plant non-Bt refuge acres adjacent to Bt hybrid fields; fields must be within 0.50 miles of each other for C.B and next to each other for Root worm Bt.
- Do not mix Bt and non-Bt hybrid seed.
- Refuge strips should be at least six to 12 rows wide.

Using genetically-engineered hybrids

Genetically-engineered hybrids (also known as genetically modified organisms) give growers additional tools for managing pests and may soon offer other value-added traits. Seed companies insert genes into several hybrids for a number of traits, such as herbicide tolerance or resistance to a common pest like European corn borer. Presently, consumer resistance to genetically modified crops limits the potential market for corn grain in Europe and some other places. However, as much as 80% of the corn grown in Colorado currently contains genetically-engineered traits. The advent of herbicide resistant corn hybrids has been rapidly accepted in the U.S. because it gives growers expanded weed control options and in some cases reduces pesticide applications and allows the use of more environmentally friendly chemicals.

Bt Corn

Corn hybrids highly resistant to European corn borer injury contain a gene from the bacteria, *Bacillus thuringiensis* (Bt), that produces an insecticidal protein. Using Bt-hybrids can reduce or eliminate the need for insecticide applications for corn borer. Bt corn growers must implement insect resistance management practices to preserve the usefulness of the Bt toxin for pest management. The resistance management program requires farmers to plant a block of corn acreage or “refuge” of a hybrid without the Bt gene. The refuge helps prevent insect resistance by maintaining a corn borer population that is susceptible to the Bt protein. If or when a resistant adult insect should emerge, it is likely that it would mate with susceptible moths and produce vulnerable offspring.

The use of Bt hybrids is a profitable and effective approach to European corn borer (ECB) management in years of heavy corn borer activity and in areas with consistent year-to-year corn borer activity. However, research and experience shows that using non-Bt hybrids with insect scouting and properly timed insecticide applications is also a profitable and effective approach to managing ECB.

The most likely zone in eastern Colorado for profitable use of Bt corn hybrids to control ECB is the Eckley-Wray-Wuaneta area. These hybrids are also a good choice for late-planted or late-maturing crops in the Yuma-Clarkville-Holyoke area. Using superior non-Bt hybrids along with proper scouting and timed insecticide application, is more profitable at Burlington, Bonny Dam and Kirk. Secondary pest management of western bean cutworm adult control is managed with corn borer treatments, and some Bt events.

In Colorado State University tests, currently available Bt corn hybrids did not control corn rootworm beetles or spider mites. Currently available hybrids provide some control of cutworms, Western bean cutworm, and fall armyworm. Bt corn hybrids that control corn rootworm larvae and others with a wider range of effectiveness against caterpillar species are now available. Bt corn for rootworm control is justified when using a soil insecticide in continuous corn.

Hybrid Maturity

Long-term studies show a clear yield and profit advantage for growing full-season hybrids that use the entire growing season to reach maturity when adequate moisture is available. Shorter season hybrids may be used to vary pollination dates, reducing potential environmental stresses such as high air temperatures, drough, and low soil water availability.

Ideally, grain corn reaches maturity (maximum kernel dry weight) or "black layer" one to two weeks before the first killing frost in the fall. To compare maturity of corn hybrids, some companies use relative days-to-maturity, while others use comparative relative maturity ratings (CRM). This number is relative; a 110-day hybrid may take less than 100 days to reach black layer in a hot year, or more than 125 days during a cool growing season. Growing degree units (GDU), also referred to as "heat units" or "growing degree days", are useful for making direct hybrid maturity comparisons across different seed companies. A GDU measures how much heat is accumulated for plant growth over a 24-hour period. Cumulative GDU's from planting date to black layer are used to indicate the maturity requirement of a given hybrid and can be used for valid comparison from year to year under different climatic conditions. Be aware that hybrids are often rated for GDU's to silk, black layer and 20% grain moisture.

The growing degree unit concept is based on:

- Corn does not grow below 50°F.
- A corn plant must accumulate a certain amount of heat energy to reach maturity.
- Growth rate increases with temperatures ranging from 50°F to 86°F.
- Above 86°F growth rate decreases.
- The total amount of heat needed is relatively constant for a given hybrid.
- Corn hybrids with different maturities require different GDU's.

GDU= (Max. daily temp up to 86°F) + (Min. daily temp)/2 – 50°F

GDU	CRM
2810	117
2680	112
2630	110
2550	105
2530	105
2450	100
2400	100
2350	97
2320	96

Approximate relationship between GDU and CRM for Colraodo

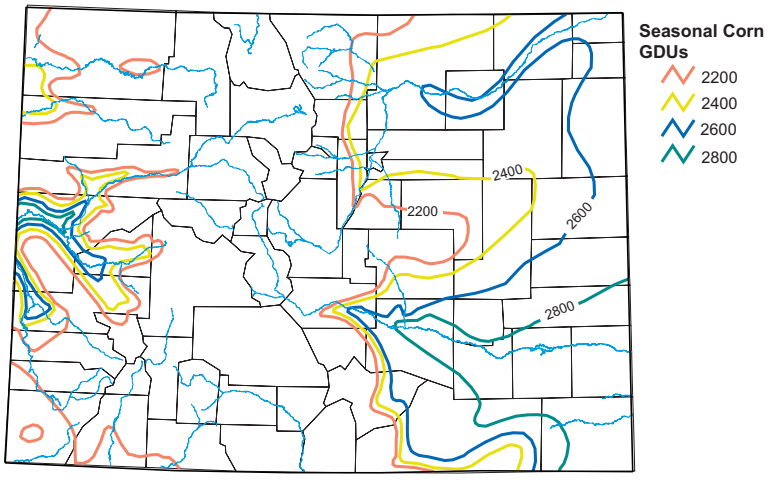

Figure 1. On Colorado's eastern plains, full-season hybrids generally require 2700 GDU to reach maturity, medium season hybrids need 2500 GDU and early season hybrids require 2300 GDU. Average GDU's, shown above, for the corn growing regions of Colorado and can be used for selecting the optimum hybrid maturity class for a given planting date. To get more localized GDU information, weather station data can be obtained on the internet at http://www.coagmet.com.

Source: Nolan Doesken, Colorado Climate Center