Corn Growth and Development

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A cornfield is a complex and constantly changing community made up of many individual corn plants. Within the corn plant, the raw materials (water and minerals from the soil and carbon dioxide and oxygen from the air)—with sunlight providing the energy—combine to produce yield. The growth and yield of a corn plant are functions of the plant's genetic potential to interact with its environmental conditions. Although climatic conditions account for a major portion of the environmental influence on corn growth and development, a corn producer can manipulate the environment with various management practices. By understanding how a corn plant develops, a producer can use the proper production practices to obtain higher yields and profit. Following is a brief discussion of the growth and development of the corn plant.

The corn seed contains adequate stored nutrient reserves to get the seedling established. Seedling emergence usually occurs six to 10 days after planting (four to five days under warm, moist soil conditions). If the seed is placed in a cool, dry soil, it may take two weeks or longer for seedling emergence. The depth of planting also will influence how long it takes for the seedling to emerge. The depth at which the permanent root system (nodal roots) develops is not affected by planting depth and occurs approximately 1 inch below the soil surface. Three or four fully developed leaves are produced during the first three weeks after the plant emerges. A leaf is fully developed when the collar of that leaf is visible. Initiation of all the leaves, ear shoots, and tassel has occurred at the growing point by this stage, and the growing point of the plant is still approximately 1 inch below the soil surface. Damage to the seedling above the ground from frost, hail, or livestock would have little or no effect on the growing point or final yield.

After the tassel and all the leaves and ear shoots are initiated, the stalk begins a period of rapid growth. When six or seven leaves have fully emerged, the growing point has moved above the soil surface and any damage to the leaves and growing point could affect final yield. Plant height increases dramatically during this rapid growth phase, and the plant reaches its maximum height when the tassel is fully emerged from the whorl. Although the ear shoots were formed just before tassel formation (five leaves emerged), the length of the ear and potential number of ovules or kernels per row is determined between the development of 10 or 11 emerged leaves to 17 or 18 emerged leaves or about one week before silking. Moisture or nutrient stresses during this period of ear size determination may seriously reduce the number of potential seeds on an ear. Earlier maturing hybrids will advance through these stages in a shorter time, which usually results in smaller ears than later maturing hybrids. The nodal root system is developing rapidly during this stage, which allows for more rapid uptake of soil nutrients and water to meet the demands of this rapid growth rate. At tasseling, less than half of the final weight of the corn plant has been produced; however, more than 60 percent of the nitrogen, 50 percent of the phosphorus, and 80 percent of the potassium uptake have already occurred.

As vegetative growth nears completion, the ear develops very rapidly. The flowering stage, which includes pollination, is the most critical period in the development of the corn plant. The flowering stage occurs about 65 days after corn emergence in a medium maturity hybrid. Pollen shedding begins two to three days after the tassel has fully emerged from the last leaf sheath and just prior to silk emergence. Under favorable conditions, all silks will emerge within three to five days after tasseling, and the tassel will continue to shed pollen for five to eight days. The silks from near the base of the ear emerge first, and emergence progresses up the ear to the tip. When a pollen grain falls on a corn silk, it germinates and produces a pollen tube that grows the length of the silk in about 24 hours, after which fertilization occurs and a new kernel begins to develop. The silk is released by the kernel immediately upon pollination. Stress (moisture, temperature, nutrient) from one week before to one week after flowering may delay silking until after most of the pollen is shed, resulting in poor pollination, especially on the tips of the ears.

Grain production occurs between pollination and maturity. Drought or nutrient stress during this period can result in unfilled kernels, less weight per kernel, and light, chaffy ears. The grain filling period covers about 55 days for most corn hybrids. Plant physiological maturity is achieved when the kernel has reached its maximum dry weight. A black layer forms at the tip of each kernel at physiological maturity. The average moisture of the kernel at this stage is 30 to 35 percent. Grain drying is a matter of physical moisture loss and varies with climatic conditions but should average at least 0.5 percentage point per day.

Having a knowledge of the growth and development of the corn plant provides the producer with a better understanding of how different problems and stresses affect final yield. By understanding the effects that management practices have during the various stages of corn development, the producer can manage the corn plant more intelligently so that it can nearly reach its yield potential.