FIELD FACTS

PIONEER agronomy

Corn Tillers: Causes and Influence on the Main Plant

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Summary

- If substantial tillering occurs in corn fields, check stand density and distribution. Within-row gaps or less than optimum population may be responsible for the tillering.
- Extensive research indicates that tillers will have no appreciable influence on grain yield.
- Tillers will most often be shaded by the leaves on the main plants and these small tillers will shrivel and die.
- Larger tillers that form in fields at below-optimum plant populations or that develop after the main plant is damaged by frost or hail may form ears that contribute to harvestable grain yield.

Introduction

Tillers, the additional "stalks" that develop from underground buds on the main plant, are a common occurrence in grasses. In wheat and other small grains, tillering is an important growth stage that allows the crop to fill in thin spots in the stand, increase the number of grain heads, and reach its full yield potential. In pasture and lawn grasses, formation of tillers is instrumental to maintain the coverage of the stand, given inevitable damage from weather and traffic. But growers are often concerned when they encounter tillers in corn. In fact, the influence of corn tillers on grain yields has been the subject of debate among farmers for decades.

In the early 1900s, it was common for farmers in some areas to walk their fields and remove corn tillers soon after they appeared. They feared that the tillers, if allowed to remain, would take nutrients from the main plant while producing only nubbin ears themselves. The more common term "sucker" comes from this perception. In today's mechanized corn production, physically removing tillers is out of the question, but many growers do question both the causes and effects of tillering on grain yield, especially when tiller formation is extensive.

Causes of Tillers in Corn

Tillers are lateral branches that form at lower, below-ground nodes. Above ground, similar branches develop into ear shoots on the corn plant. Although tiller buds form at each below-ground node, the number of tillers that develop depends on the plant population and spacing, soil fertility levels, early season growing conditions, and the genetic makeup of the hybrid.

Figure 1. Corn plant with tillers at a very low population density in a Pioneer plant population study. (Johnston, IA; June 19, 2015)

Even though some hybrids tiller more than others, corn plants of nearly all hybrids adjust to take advantage of available soil nutrients and moisture by forming one or more visible tillers. This is most likely to occur where plant populations are below optimum, where there are skips in the row, or at the ends of rows. Extensive tillering can also occur if the primary growing point is damaged by hail, frost, herbicides or other injury.

Tillering is most likely when soil fertility and moisture supplies are ample during the first few weeks of the growing season. Hybrids with a strong tillering tendency may form one or more tillers on nearly every plant, even at relatively high plant populations if the environment is favorable early in the growing season.

Extensive Research: Tillers Do Not Drain the Main Plant

In early research, tillers were removed from the main plant early in the season and yields were compared to similar plants that had their tillers left on all season. In these early studies, tiller removal never increased yields and usually reduced yields.

Tillers were known to have roots, but it was unclear whether the greater yields sometimes documented with tillers were due to the tillers feeding the main plant or because additional grain was produced in tiller ears. Another theory suggested it was neither, but rather that a yield decrease resulted from the slight injury incurred when removing tillers in these studies.

Figure 2. Two Pioneer® brand corn products* planted at 30,000 plants/acre in a Pioneer plant population study showing genetic differences in tillering. Top: Pioneer brand P1151AM™ (AM,LL,RR2) corn; Above: Pioneer brand P1131AMXT™ (AMXT,LL,RR2) corn (Johnston, IA; June 19, 2015)

Later, leaf removal studies were conducted to provide a better understanding of the relationships and potential nutrient exchanges between tillers and the main plant. Corn was grown at low plant populations so that large tillers would develop on many plants. Then all the leaves were removed from the main plant during early grain fill. Half of the defoliated main plants had tillers; the rest did not. The tiller leaves were left intact. Plants with tillers yielded nearly twice as much grain as did plants that had no tillers. It appeared that a connection existed between the tiller and the main plant that allowed food produced in tiller leaves to get to ears on the main plant.

More recent techniques allow for direct measurement of nutrient movement. Carbon is an important component of both sugars and proteins needed for ear fill. The carbon in carbon dioxide can be labeled with radioactivity. When this labeled carbon dioxide is taken up by a leaf, it can be followed throughout the plant. Detection of this labeled carbon in other plant parts (such as an ear) later in the season indicates movement of the original labeled carbon from the leaf to its final destination.

Plant physiologists at the University of Wisconsin using such labeling techniques found that little movement of food takes place between the main plant and tillers before tasseling. In contrast, immediately after silking and during grain fill, substantial amounts of food moved from leaves of large, earless tillers to the ear on the main plant.

However, there was little food movement when ears were on both the tiller and the main plant. In other words, main plant ears received their food from main plant leaves, while tiller ears received their food from tiller leaves. The only time food moved from main plant to tiller was when there was an ear on the tiller, but none on the main plant. This, of course, is not a likely situation under most field conditions.

These studies were conducted at a low plant population to stimulate the formation of large, healthy tillers. The small, shaded tillers without ears that normally develop under a full stand in normal field conditions will probably have little influence on the main plant. If there is a slight influence on grain yield it would most likely be to increase yields.

Under low plant populations, tillers may be large and numerous, but they will not deplete the main stalk of nutrients needed to fill the grain. In fact, in very low plant stand situations, tillers may actually contribute to increased grain yields by either feeding the main plant or by producing grain on their own ears.

References

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