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Rootless corn syndrome

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Rootless corn syndrome

Abstract

Current corn development is from just planted to V4 (four-leaf stage) across Iowa. First plantings of corn are reported to have good color and stand, according to Iowa State University Extension field crop specialists on May 21, 2007; although some corn, particularly in the southwest, west, and northwest regions, is exhibiting problematic stands if it was planted between the many rainstorms. In particular, it is corn that was planted under too wet conditions; it would be approximately V2 (two-leaf) or V3 (three-leaf) now. Corn that is placed into a wet seed furrow can have restricted root growth, resulting in "rootless" corn (also referred to as rootless corn syndrome) among other problems that will become apparent as the season unfolds. See photo.

Keywords

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ICM > 2007 > IC-498(11) -- May 21, 2007

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Rootless corn syndrome

by Roger Elmore and Lori Abendroth, Department of Agronomy

Current corn development is from just planted to V4 (four-leaf stage) across Iowa. First plantings of corn are reported to have good color and stand, according to Iowa State University Extension field crop specialists on May 21, 2007; although some corn, particularly in the southwest, west, and northwest regions, is exhibiting problematic stands if it was planted between the many rainstorms. In particular, it is corn that was planted under too wet conditions; it would be approximately V2 (two-leaf) or V3 (three-leaf) now. Corn that is placed into a wet seed furrow can have restricted root growth, resulting in "rootless" corn (also referred to as rootless corn syndrome) among other problems that will become apparent as the season unfolds. See photo.

Rootless corn occurs in plants with poorly developed root systems and is usually observed in plants from about the three- to eight-leaf stage of development. Plants exhibiting rootless corn symptoms have either lodged and are laying on the ground or are about to lodge. Sometimes the corn will only be anchored in the soil by a single nodal root or by seminal roots. Before the problem is evident, corn plants may appear vigorous and healthy but can fall over due to limited or no support later. Affected plants lack all or most nodal roots; existing nodal roots may appear stubby, blunt, and not anchored to the soil. Due to a lack of root mass, the affected plants can be expected to wilt, have stunted growth, or eventually die in extreme conditions.



Rootless corn syndrome (John Sawyer)

What type of environment causes this poor root development?

Under normal field conditions, seeds absorb moisture and growth begins. The radicle emerges from the seed, which is soon followed by the coleoptile. Plant emergence occurs due to rapid mesocotyl elongation, which pushes the coleoptile to the soil surface.

Corn has two root systems that are easily visible early in the year: seminal and nodal. The initial root system, the seminal roots, is comprised of the radicle and lateral seminal roots. The seminal roots help anchor the young seedling and provide it with nutrients and water. Seminal roots cease new growth shortly after the coleoptile emerges from the soil surface.

Nodal root growth develops at the base of the coleoptile (at the junction of the mesocotyl and coleoptile). They should form approximately 1 to 1.5 inches below the soil surface. Once the plant is approximately V1, the nodal root system is visible.

Seminal root growth slows after seedling emergence. Although the seminal roots continue to function throughout most of the plant's life, their most important contribution comes before the nodal roots are established. The nodal roots are important in providing the majority of the water and the mineral nutrients that the corn plant needs for growth and development after V6.

Many investigators have attributed rootless corn problems to weather-related conditions that coincide with development of the nodal root system and other environmental factors. These include hot, dry surface soils, shallow planting depths, compact soils, and loose or cloddy soil conditions. With loose soils or with rotary hoeing, coleoptiles are exposed to light sooner than normal, and nodal roots may form closer to the soil surface. Abrasive action of strong winds can also break off secondary roots and inhibit establishment of a permanent root system. Excessive rainfall and shallow planting depths may cause erosion and soil removal around the crown region that can result in rootless corn.

Although certain types of herbicide injury and insect feeding may cause lodging to occur in corn plants during vegetative development, generally there has been little evidence of their involvement in causing rootless corn. Nevertheless, there may be situations where insect feeding (e.g., corn rootworm) and/or growth regulator herbicides (e.g., 2,4-D and dicamba) appear to contribute to rootless corn problems. Wait to apply herbicides if significant portions of the field show this rootless syndrome; see [Rootless Corn](#) by Bob Hartzler for more information.

Can rootless corn recover?

Yes, after plants lodge, adequate rainfall will promote nodal root development and many plants can recover. Recovery is severely hampered if conditions are dry.

Cultivation to move soil around exposed roots will aid the corn's recovery, yet this is extremely difficult if plants are laying on the ground or in a no-till situation. Rain is the best solution as it moistens the seedbed allowing for root growth and establishment.

Resources

Abendroth, L., and R. Elmore. 2006. [Corn Root Development](#). Iowa State University.

Elmore, R., F. Roeth, and B. Wright. 16 June 2000. [Rootless corn syndrome--finding the cause](#). University of Nebraska.

Hartzler, B. 2001. [Rootless Corn](#). Iowa State University.

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