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How Fast and Deep do Corn Roots Grow in Iowa?

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Abstract
Corn roots grow rapidly starting at the 4th-leaf stage and continue throughout vegetative development. This typically occurs from June to early July. Several factors affect root growth, but temperature and soil moisture are the most relevant factors in the absence of soil constraints. Well-developed, deep root systems are essential to support water and nutrient uptake and thus high yield potential. Hot and dry weather results in a depletion of moisture in the top 6-inch soil layer. This occurred in June of 2016 and also during the first two weeks of June 2017. Crop stress was evident in light soils or where root development was restricted. Should you be concerned about this? Maybe, maybe not. It is known that plant roots cannot grow in dry or saturated soil conditions. However, at this time it is unlikely that water is limiting root growth below a 6-inch soil depth.

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Integrated Crop Management

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In 2016, the FACTS team collected root depth measurements at critical crop stages in six corn fields across Iowa. Measurements were taken on the row and at the center of two 30-inch rows. These fields had different treatments such as planting date and tile drainage. Results indicated that root depth increased over time consistently across sites and treatments. On average, corn roots grew about 2.75 inches per leaf stage to a maximum depth of 60 inches (Figure 1). Going into more specifics, corn roots initially increased at a slow rate (0.29 in./day) up to 5th-leaf and from then on with a rate of 1.22 in./day until silking stage when maximum depth is reached.

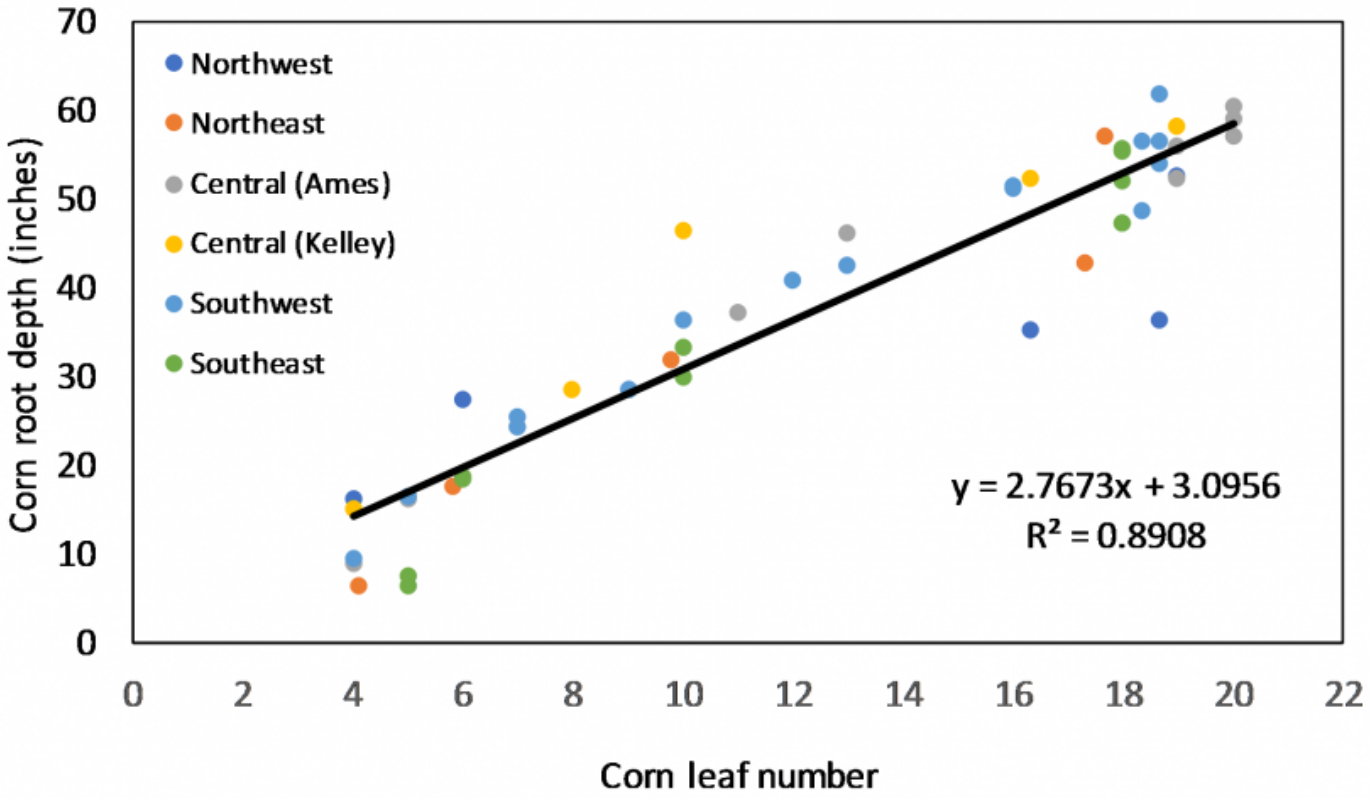

Figure 1. Corn root growth progression from the 4th- to 20th-leaf stage at the in-row sampling location at six field locations across Iowa. Each point represents an average of three replications.

Other important findings from this work are:

1. Roots merge between the two 30-inch rows at approximately the 6th-leaf stage.
2. Maximum rooting depth is largely determined by the depth of the groundwater table, root growth stops when it reaches a water table.

These findings match closely with information in Corn Growth and Development where it is stated that corn roots grow at a rate of approximately one inch per day, meet in 30-inch row centers at approximately the 3rd-leaf stage, and reach maximum depths of six feet or greater near the blister to milk stage (Abendroth et al. 2011). Differences can occur due to geographic location, hybrid characteristics, and climate conditions. Additionally, accurately detecting rooting depth is difficult because root biomass is much less at deeper depths compared to those in the surface 6-inches.

References

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