

Bigger corn plants bully smaller neighbors in no-till fields

January 25 2010

It might not look like there's much going on in those roadside corn fields, but a Purdue University researcher has shown that corn plants are in a fierce battle with each other for resources.

Tony Vyn, a professor of agronomy, said it's been known for a long time that young [corn plants](#) are, on average, shorter in no-till, corn-on-corn fields, but that doesn't mean there is an overall stunting of growth among all plants. Instead, residue left over from last year's corn crop is changing soil conditions and creating a disadvantage for some plants fighting for [sunlight](#), water and [nutrients](#).

"There is a hierarchy that is formed, even though the plants are genetically the same and should be equal in size and stature," Vyn said about his findings, which were published in the early online version of the journal *Soil & Tillage Research*. "No-till corn yield reductions have little to do with an overall height reduction early in the season. They have more to do with height variability during vegetative growth."

Vyn said yield losses of up to 14 percent can be attributed to this competition in no-till fields where corn is planted the year after corn. In those fields, the leftover corn residue creates patches of soil with lower temperatures and different water and nutrient content. Seeds planted there are at a disadvantage.

"These conditions created by the field residue can affect root development," he said. "Plants that have better access to resources grow

faster and then dominate their smaller neighbors."

Vyn studied plant height data over 14 years and found that there were pronounced height differences among plants by four weeks. It had been thought that a no-till field situation with high residue cover and no soil loosening uniformly reduced the height of all plants because of overall cooler soil temperatures, but Vyn said significant height differences were observed from plant to plant.

The negative consequences of this plant competition are exacerbated as planting density increases.

"For example, competition for nitrogen increases as crowding increases," Vyn said. "The higher the density, the greater the intensity of the competition for all resources."

Weather conditions, such as a lack of rainfall during a critical development period, also can affect the final yield from plants fighting for limited resources.

While some plants dominate and grow to their full potential, the smaller, dominated [plants](#) decrease the field's overall yield.

Vyn said growers should ensure during the previous year's harvest that residue cover will be uniform, that fields are drained adequately, that surface soil compaction is avoided and that nutrients are evenly distributed. No-till fields are desirable because they decrease the amount of nutrients running off into nearby water, but Vyn said newer tillage options, such as vertical tillage, are less disruptive than the traditional intensive tillage and could ensure more uniform conditions for seeds.

The next step in the research is to investigate how vertical tillage systems and nutrient banding affect plant height uniformity and yield in corn-on-

corn fields and whether hybrids developed for rootworm resistance are as susceptible to plant height variations.

Provided by Purdue University

Citation: Bigger corn plants bully smaller neighbors in no-till fields (2010, January 25) retrieved 19 April 2024 from <https://phys.org/news/2010-01-bigger-corn-bully-smaller-neighbors.html>

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