

Can Tillage Help with Corn Insect Management?

- Insect mortality has been a contributing reason for conventional tilling in some fields.
- As reduced and no-till adoption has created some high-residue field situations, growers may be wondering if additional management is needed for insect populations.
- We answer questions on beneficial insects and on what species may be surviving under residue.

Can the tillage practice affect insect pressure?

Yes, tillage practices can affect insect pressure. Since the 1970s, acreage has continued to shift from conventional tillage to conservation tillage to help reduce erosion and increase water retention. Conservation tillage has many benefits, but the increased crop residue (Figure 1) can harbor insects. Reduced tillage can result in unincorporated corn residue and weeds in the field. These higher moisture, cooler temperature conditions with full soil cover can provide a habitable environment for slugs and white grubs. Grassy weeds left uncontrolled can attract black cutworm moths and grasshoppers. However, chemical control options can be implemented for weed management.

Wireworm and corn seed maggot populations were thought to thrive under no-till conditions, but newer studies are finding that tillage does not necessarily lower populations of these species.^{1,2} Adult seedcorn maggot flies prefer to lay eggs in partially incorporated corn residue. No-till corn fields may therefore be passed over as an egg-laying site, reducing seedcorn maggot populations.¹ Though due to the fact that soil, residue, and insect interactions are unique to geography and weather, it becomes difficult to rule out residue retention as a contributing cause to increased insect pressure.



Figure 1. Remaining corn residue on a strip-tilled field.

Is it necessary to switch fields with conservation tillage to conventional tillage?

No, it is not necessary to switch conservation tillage fields to conventional tillage fields. There are many ways to help reduce insect damage. Weed management, crop rotation, planting and harvest timing, and trait selection can help lower insect pest pressure without switching tillage practice. For some insects, reduced tillage can help reduce insect populations.

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Does residue from traited corn products affect insect populations?

Traits in live plant tissue protect plants from insects during the growing season. However, dead crop tissue – residue – has not been shown to carry the same insecticidal properties over winter. *Bacillus thuringiensis* (*B.t.*) proteins are decomposed and dissipated from plant residue, though the rate at which this occurs is influenced by the specific protein from the trait, soil clay content, and precipitation. Research has shown CryIA(b) and Cry3Bb1 proteins had near complete dissipation or decomposition after 41 days and 3.5 months, respectively.^{3,4}

Does reduced tillage benefit predatory insect species?

Yes. Natural insect enemies are generalists, switching prey and host species. This generalist activity is favored by providing the habitat and alternate prey of no-till fields. Below are some examples of insect predation from these ‘beneficials’.⁵

- Ground beetles are omnivores and their increased abundance and diversity can help reduce various insects.
- The red imported fire ant preys on several pest species, especially caterpillars. However, honeydew is consumed by red imported fire ants, and ants protect aphids and whiteflies to safeguard the sweet honeydew source.
- Green lacewings have sucking mouthparts and are a predator of European corn borer eggs. Conversely, those predators of European corn borer with chewing mouthparts are more common in conventionally tilled corn.
- Predatory mites, beetles, centipedes, and ants have been reported as having greater predation on immature rootworm stages.
- Spider numbers increase as ground cover increases. These arachnids are being identified as important natural enemies of crop system pests.

What modified tillage practices could be used on a field at elevated risk for insect damage?

When tillage is needed to incorporate fertilizer or cover crops, wait two weeks before planting.⁶ This wait period will expose insects to the elements and bird predation. Insects and slugs needing residue cover can be exposed by clearing any residue on top of rows. Strip-till, or row cleaners, help warm soils to encourage faster germination and reduce insect feeding on seeds.

Are there other pests that may be impacted by tillage system?

Yes, two additional major pests are slugs and millipedes. Slugs are common in no-till and conservation tillage systems, particularly after a mild winter that allows the immatures to survive along with the usual overwintering stage, eggs. Millipedes, while not insects, can behave in a similar manner. Millipedes feed on decaying plant matter, organic matter in the soil, and other, smaller soil-dwelling invertebrates. However, they can occasionally feed on corn seedlings. Millipede injury more often occurs under no-till conditions and in wet springs. This is particularly true if seeds are exposed where furrows did not completely close during planting. Seed treatments are not effective against millipedes.

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Sources:

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 - ⁶ Brown, C., Follings, J., Moran, M., and Rosser, B. (Eds.) 2022. Insects and pests of field crops. In, Agronomy Guide for Field Crops. Ontario Ministry of Agriculture, Food, and Rural Affairs. Pub 811. Ch. 15. <https://www.ontario.ca/files/2022-10/omafra-agronomy-guide-for-field-crops-chapter-15-en-2022-10-13.pdf>
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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and environmental conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on their growing environment.

The recommendations in this material are based upon trial observations and feedback received from a limited number of growers and growing environments. These recommendations should be considered as one reference point and should not be substituted for the professional opinion of agronomists, entomologists or other relevant experts evaluating specific conditions.

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