Evaluating rootworm damage and soil insecticide performance

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After western corn rootworms emerge, its time to think about evaluating corn fields for rootworm damage. Root ratings can be done in rotated fields to assess the presence of the "rotation-resistant" variant, or in continuous fields to evaluate the performance of soil insecticide.

There are several ways to evaluate fields. First, you can estimate the percentage of lodged plants, comparing treated and untreated areas. The problem with using this method is that while rootworms prune roots, they are not always to blame for lodging. Lodging can be caused by any factor that weakens the root structure or stunts root development. This includes compaction, nematode feeding, herbicide damage, root rot, cold weather in the spring, dry weather, or a combination of these factors. Even undamaged plants in very wet soil can lodge under windy conditions.

The preferred way to evaluate root damage and insecticide performance is to dig and examine root masses. As usual, academics like to complicate matters, and root rating is no exception. You may already be familiar with the 1 to 6 scale, often called the Iowa Scale. The Iowa Scale always was problematic. For example, a "1" means no feeding damage (as opposed to a 0, a bit confusing). But in the last few years, Iowa has developed a new, improved 0 to 3 scale. Many insecticide and variety trials are now being evaluated using the new scale.

Ratings should be taken in late July or early August, just as adult emergence is increasing, because roots can regenerate and mask damage. In small plots, we generally dig 5 to 10 plants per plot, for a total of 20 to 40 plants evaluated per treatment. Randomly select plants for evaluation - do not pick only lodged or visibly damaged plants. Dig plants using a shovel, being careful to collecting the entire root system (i.e. do not prune the root system with the shovel). Wash the roots thoroughly to remove all soil. Soaking roots overnight in buckets helps to loosen soil. A power washer is generally used to clean roots thoroughly. As you can imagine, root rating can be a messy business, and time consuming – a couple of roots from the edge of a large field is not enough to draw conclusions about insecticide performance or variant levels across an entire field.

Once roots are washed, rootworm feeding is usually obvious as rusty brown feeding 'tracks', holes bored up into roots, or pruning—entire roots or nodes of roots chewed back on the root mass. In contrast, healthy root tissue is white.

The traditional Iowa Scale

Rating	Description of root damage
1	No discernible rootworm feeding damage
2	Feeding scars or tracks, but no pruning
3	At least one root pruned to within 1.5" of the plant
4	At least one full node (or equivalent of a node) of roots pruned to within 1.5", but less than two full nodes.
5	At least two full nodes (or equivalent) of roots pruned to within 1.5" but less than three full nodes.
6	Three or more full nodes of roots pruned to within 1.5"

Generally an average root rating of 3.5 or greater on the Iowa Scale is indicative of economic loss, but this number can vary depending on several factors. Under good growing conditions, quick root regeneration after feeding may mean that a rating above 3.5 will not result in economic loss. On the other hand, in a dry year when the corn is under water stress and roots do not recover, economic damage can occur with a rating below 3.5.

The new Node-Injury Scale

Rating	Description of root damage
0	No apparent feeding
1	Equivalent of 1 full node destroyed
2	Equivalent of 2 nodes destroyed
3	Three or more nodes destroyed

Damage less than, or between, full nodes eaten, is indicated using a decimal system. For example, if half a node of roots is severely pruned, the rating is 0.5. If one full node, plus a few more roots, are pruned, the rating would be 1.2 [one full node, plus 2-3 roots on another node]. Incidental feeding damage – brown scrapes and tracks on roots, but no pruning or tunneling - is given very small numbers – 0.01 or 0.02. This type of damage is economically unimportant, and is expected even on insecticide treated or transgenic corn. A 0.5 on the node-injury scale is similar to a 3.5 on the traditional Iowa Scale.

An on-line interactive node-injury scale can be found on the Iowa State web site at: http://www.ent.iastate.edu/pest/rootworm/nodeinjury/nodeinjury.html

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