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Rootworm insecticide performance

Marlin E. Rice
Iowa State University, merice@iastate.edu

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Abstract
Two integrated pest management strategies are used widely to protect corn roots from corn rootworm injury: crop rotation and insecticides. If corn is not rotated, or if extended diapause northern corn rootworms occur in a field, a soil insecticide might be necessary to protect the roots in 2002. The reason we say it *might* be necessary is because many fields do not have a rootworm population of a sufficient size to cause economic damage. There are thousands of continuous cornfields across Iowa in which a rootworm insecticide is not used and is not necessary.

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Two integrated pest management strategies are used widely to protect corn roots from corn rootworm injury: crop rotation and insecticides. If corn is not rotated, or if extended diapause northern corn rootworms occur in a field, a soil insecticide might be necessary to protect the roots in 2002. The reason we say it *might* be necessary is because many fields do not have a rootworm population of a sufficient size to cause economic damage. There are thousands of continuous cornfields across Iowa in which a rootworm insecticide is not used and is not necessary. Without field scouting information from last August, it is difficult to know whether you will need a soil insecticide in 2002. If an insecticide is used next year, protection of corn roots should be one of the major considerations when selecting a product.

Corn rootworm insecticides were evaluated in side-by-side trials at several locations across the state. These field trials measure insecticide performance in protecting corn roots under a wide range of environmental conditions. Performance is measured two ways: root ratings and percentage of consistency.

Roots are rated using the new Iowa State node-injury scale, which replaces the traditional Iowa 1-6 injury scale. The Iowa State node-injury scale was developed to more accurately reflect the relationship of injury from the low end to the high end of the scale (Table 1). For example, with the Iowa 1-6 scale a rating of 3 did not necessarily rate twice as much injury as a rating of 1.5. But with the Iowa State node-injury scale, there is a straight linear relationship and a rating of 3 does indicate twice as much injury as a rating of 1.5. We encourage you to view the interactive root rating page [1]. This interactive site allows you to compare the Iowa 1-6 scale to the Iowa State node-injury scale, plus follow the progression of injury by rootworm larvae on a computerized root.

Injury by corn rootworm larvae can result in a significant amount of the roots being injured or removed from the plant. A low Iowa State node-injury root rating (0.25) is highly desirable (this is essentially the same amount of injury as 2.5 on the old Iowa 1-6 scale). This low root rating indicates that the insecticide adequately protected the roots from economic injury. Each insecticide was measured under moderate-to-heavy feeding pressure. Roots in the 2001 experiments from the untreated plots averaged 1.78, which indicates that 13/4 root nodes have been eaten away.

Interpreting root ratings and insecticide performance can be a challenge. Therefore, since 1992 we have measured root protection by using a standard called consistency. Consistency is measured as the percentage of times in which the insecticide-treated roots averaged a rating of 0.25 (1/4 node eaten away) or less on the Iowa State node-injury scale when attacked by a moderate or large population of corn rootworms. An easy way to understand percentage consistency is to think of it as being similar to a baseball batting average; the

higher the number, the better the performance.

No insecticide was 100 percent consistent in providing adequate protection (a rating of 0.25 or less) during 2001 (Table 2). Even the best products did not protect roots very well this year mostly because of larger than average rootworm populations and the wet spring in many parts of Iowa. Several tests were planted 7-10 days later than normal (mid-May). These later plantings had smaller root systems at the time of corn rootworm hatch and appeared to be more vulnerable to larval feeding. Under these conditions, some products, most notably the seed treatments, did not protect roots very well from corn rootworm damage.

From a statistical standpoint, all products in Table 2 from Counter 20CR to Fortress 5G T-band SmartBox provided similar levels of consistency. However, some products did not perform well--most notable are the two seed treatments, ProShield and Prescribe. They did not consistently protect roots from corn rootworm injury, especially if the field had a moderate-to-large rootworm population. There are other insecticides that give consistently better root protection. Table 3 provides a 4-year overview of soil insecticide performance in head-to-head comparisons. This table does not contain some of the newer insecticides because 4-years of data are not available.

Consistent performance is one factor to consider when using a corn rootworm insecticide. Other factors worthy of consideration might be cost, pounds of active ingredient being applied per acre, ease of handling, application equipment needed, other pests controlled, restricted use labeling, and potential hazards to surface water.

Table 1. Iowa State node-injury scale.

Value	Description
0.00	No feeding damage (lowest rating that can be given)
1.00	One node (circle of roots), or the equivalent of an entire node, eaten back to within approximately two inches of the stalk (soil line on the 7th node)
2.00	Two nodes eaten
3.00	Three or more nodes eaten (highest rating that can be given)

Damage in between complete nodes eaten is noted as the percentage of the node missing, i.e. 1.50 = 1 1/2 nodes eaten, 0.25 = 1/4 of one node eaten, etc.

Table 2. Summary of corn rootworm injury ratings and product consistency for planting-time insecticides.

Insecticide	Placement	Node Injury[a,b]	Product Consistency (%)[b,c]
Counter 20CR	Furrow	0.44 a	59 a
Aztec 4.67G	Furrow SB	0.42 a	58 a
Fortress 5G	Furrow SB	0.52 abc	58 a
Aztec 2.1G	Furrow	0.46 ab	54 ab
Aztec 2.1G	T-band	0.45 a	52 abc
Force 3G	Furrow	0.49 abc	52 abc
Counter 20CR	T-band	0.55 abc	50 abc
Aztec 4.67G	T-band SB	0.57 abc	45 abc
Force 3G	T-band	0.67 abc	42 abc
Lorsban 15G	T-band	0.66 abc	40 abcd
Fortress 5G	T-band SB	0.68 abcd	39 abcd
Capture 2EC	T-band	0.85 bcde	33 bcd
Capture 2EC	Furrow	0.88 cde	28 cd
Regent 4SC	Furrow-M	1.07 e	28 cd
Lorsban 15G	Furrow	0.81 abcde	27 cd
ProShield	Seed Treatment	1.05 de	27 cd
Prescribe	Seed Treatment	1.18 e	16 d
Untreated check	-	1.78 f	6 d

Side-by-side comparisons (Iowa State University, 2001) in 24 replications at five locations; chemical means based on 120 observations; multiple check means based on 170 observations; replications that did not have sufficient larval feeding to challenge a product's performance (untreated check <0.75 of a node injured) were deleted from these analyses (24 of 30 replications analyzed). T-band and Furrow, insecticide applied at planting time; SB, SmartBox application at planting time; Furrow-M, microtube application, in-furrow (water carrier rate of 4 gallons/acre).

[a] Iowa State node-injury scale (0-3): 0.44 = 44% of a node eaten, 1.78 = one complete node and 78% of a second node eaten.

[b] Means sharing a common letter do not differ significantly according to Ryan's Q test ($P < 0.05$).

[c] Product consistency represents the percentage of times node-injury rating was 0.25 (1/4 node eaten) or less.

Table 3. Four-year (1998-2001) summary of corn rootworm injury ratings and product consistency for planting-time insecticides.

Insecticide	Placement	Node Injury[a,b]	Product Consistency (%)[b,c]
Force 3G	Furrow	0.22 a	82 a
Aztec 2.1G	Furrow	0.23 a	80 a
Aztec 2.1G	T-band	0.23 a	78 a
Force 3G	T-band	0.30 ab	73 ab
Counter 20CR	Furrow	0.33 ab	72 ab
Counter 20CR	T-band	0.34 ab	72 ab
Fortress 5G	Furrow SB	0.39 ab	69 ab
Lorsban 15G	T-band	0.47 bc	62 b
Fortress 5G	T-band SB	0.47 bc	61 b
Lorsban 15G	Furrow	0.60 cd	50 c
Regent 4SC	Furrow-M	0.72 d	49 c
Untreated check	-	1.73 e	9 d

Side-by-side comparisons (Iowa Sate University) in 93 replications at 20 locations; chemical means based on 372 observations; multiple check means based on 764 observations; replications that did not have sufficient larval feeding to challenge a product's performance (untreated check rep mean <0.75 of a node injured) were deleted from these analyses (93 of 109 replications analyzed). T-band and Furrow, insecticide applied at planting time; SB, SmartBox application at planting time; Furrow-M, microtube application, in-furrow (water carrier rate of 1 gallon/acre in 1998 and 1999; 4 gallons/acre in 2000 and 2001).

[a] Iowa State node-injury scale (0-3): 0.22 = 22% of a node eaten, 1.73 = one complete node and 73% of a second node eaten.

[b] Means sharing a common letter do not differ significantly according to Ryan's Q test (P < 0.05).

[c] Product consistency represents the percentage of times node-injury rating was 0.25 (1/4 node eaten) or less.

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issue.

Source URL:
http://www.ipm.iastate.edu/ipm/icm//ipm/icm/2001/11-19-2001/performance.html

Links:
[1] http://www.ent.iastate.edu/pest/rootworm/nodeinjury/nodeinjury.html

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