

INSECT MANAGEMENT TRIALS IN SWEET CORN IN VIRGINIA

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Effective control of insect pests is essential for commercial sweet corn production. In the northeastern U.S., the major insect pest concerns for sweet corn are the ear-infesting lepidopteran larvae (caterpillars): corn earworm (CEW) *Helicoverpa zea*; European corn borer (ECB) *Ostrinia nubilalis*; and the fall armyworm (FAW) *Spodoptera frugiperda*. All three species may feed on green leaf tissue as well as infest ears. Pest pressure from these lepidopteran larvae can vary from year to year depending on weather and the numbers of migratory moths arriving from more southerly regions. In addition, ECB, which has been a major pest in the northeastern U.S. for over a century, has dropped tremendously in pest status due to regional population suppression from the increased use of transgenic Bt field corn. Because of the variability in pest pressure from year to year and throughout the season, the use of pheromone traps to monitor local population levels of these moth pests is strongly recommended for commercial sweet corn growers. Trap catch can provide the grower with knowledge of when the moths are actively reproducing and laying eggs and the relative size of the pest density on their farms. Such information can guide control decision-making. For instance, a catch of 10 or fewer moths per night is relatively low, and a spray interval of 4-5 days between sprays may be adequate; however, a trap catch of 50 or more moths in a night is very high suggesting a need to increase the spray interval to perhaps every 2-3 days.

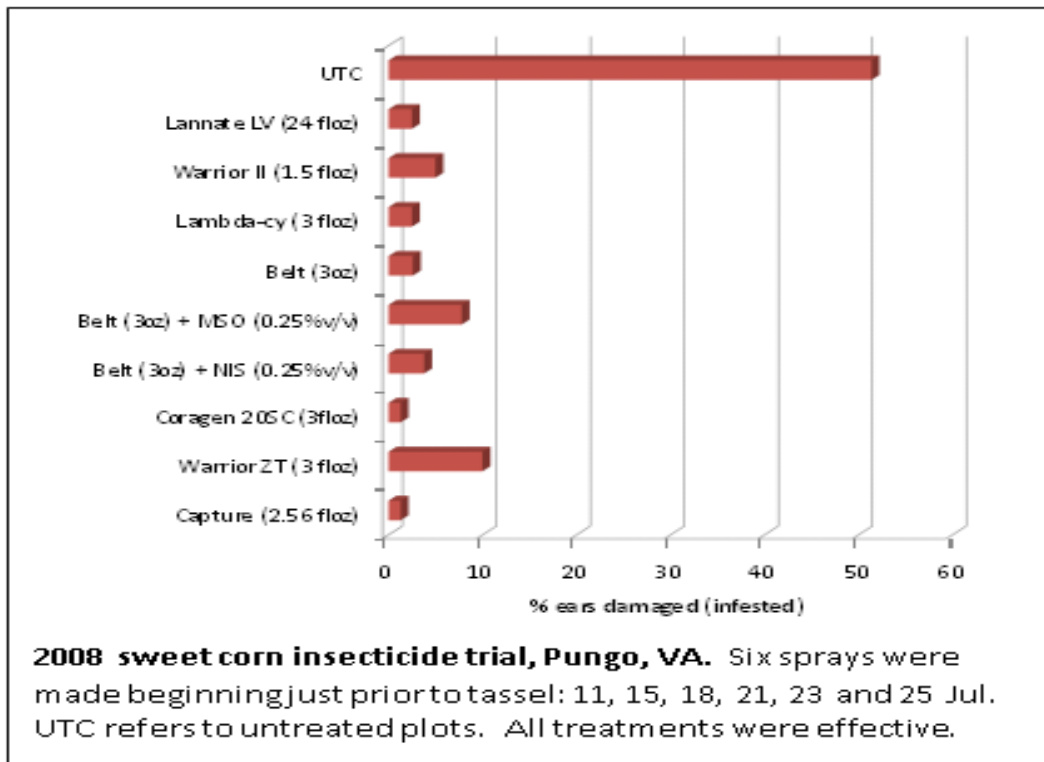
Which insecticide should you use?

For the past three decades, pyrethroids have been the most widely used class of insecticides in sweet corn, and include products such as: Asana XL (esfenvalerate), various permethrin formulations, Tombstone (cyfluthrin), Baythroid XL (beta-cyfluthrin), Warrior II and other formulations of lambda-cyhalothrin, MustangMax (zeta cypermethrin), various bifenthrin formulations, or Hero, which contains both zeta cypermethrin and bifenthrin. The number of pyrethroid products available for growers is almost endless, and most are relatively cheap and do an effective job at controlling the key insect pests. However, recent concerns over pyrethroid resistance, particularly in CEW, has made control challenging in some regions of the U.S., such as the Upper Midwest. In addition, because they are broadspectrum toxicants, pyrethroids as well as the carbamate Lannate LV, typically destroy natural enemy populations in fields and thus are not compatible with IPM/biological control programs or with recent heightened concerns over pollinator protection.

Today growers have a wider selection of more IPM-friendly and bee-friendly insecticide options in sweet corn. Some newer products include: Blackhawk (spinosad) and Radiant (spinetoram), derived from the fermentation of a soil actinomycete, Belt and Vetica (each containing the diamide insecticide flubendiamide), Coragen (containing the diamide insecticide chlorantraniliprole) and Besiege (containing chlorantraniliprole + lambda cyhalothrin). For the

past several years, we have evaluated the efficacy of these newer insecticides on sweet corn in Virginia.

In the trial below conducted on a commercial farm in Pungo VA, which evaluated six applications of all treatments beginning at early tasseling, the products Belt and Coragen provided excellent control equal to any of the pyrethroid insecticides or Lannate. The addition of either MSO or a non-ionic surfactant (NIS) did not increase the efficacy of Belt.



In another efficacy trial conducted at the Eastern Shore AREC in Painter, VA, under heavy pest pressure from CEW, a range of efficacies was detected among the treatments. Some notable results were: 1) the only treatment to achieve >80% clean ears was the tank mix of Asana XL + Lannate applied six times (not exactly IPM friendly); 2) Besiege rotated with Warrior II was one of the top treatments and appeared to perform slightly better than straight Warrior II for all six sprays; moreover, increasing the rate of Besiege to 9 fl. oz/A while reducing the total number of sprays to four, was equivalent to the six spray rotation of Besiege at 8 fl. oz/A; 3) three sprays of Besiege at 9 fl. oz/A alone was fairly efficacious compared with many other treatments that included up to 6 sprays; 4) use of the neonicotinoid insecticide Assail, which has activity on lepidopteran eggs and neonate larvae primarily, did not provide adequate control when used alone or in rotation with lambda-cyhalothrin.

Trial 2. Sweetcorn trial - Eastern Shore AREC, Painter, VA, 2009.

Treatment	Rate / acre	# spray applications	% clean ears	% marketable ears (clean + tip damage)	Mean no. live larvae / 50 ears
Untreated control		-	6.5 h	42.0 ef	126.5 a
Belt SC	3 fl. oz	6	39.0 efg	85.0 ab	29.0 cd
Besiege	9 fl. oz	3	65.5 abc	80.5 abc	13.8 def
Besiege rotated with Warrior II	8 fl. oz / 1.92 fl. oz	6	72.0 ab	93.0 a	9.0 ef
Besiege rotated with Warrior II	9 fl. oz / 1.92 fl. oz	4	77.5 a	87.5 a	6.3 f
Warrior II	1.92 fl. oz	6	65.5 abc	81.0 a	8.3 ef
Lambda-Cy	3.84 fl. oz	6	59.5 a-e	82.5 ab	14.0 def
Coragen SC + MSO	3.5 fl. oz	5	63.5 a-d	74.0 a-d	11.0 ef
Coragen SC + MSO	5 fl. oz	4	39.0 defg	82.5 ab	27.8 cd
Assail 30SG	5.3 oz	6	9.5 h	49.0 def	48.5 b
Assail 30SG rotated with Lambda-Cy	5.3 oz / 3.84 fl. oz	6	45.0 c-f	68.5 a-e	23.8 cde
Lannate LV	24 fl. oz	6	47.0 c-f	78.0 a-d	31.0 c
Asana XL	9.6 fl. oz	6	69.5 abc	87.0 a	8.0 ef
Asana XL + Lannate LV	9.6 + 24 fl. oz	6	81.5 a	93.0 a	7.8 ef

In the next two trials, we evaluated the new reduced risk insecticides rotated every other spray with a pyrethroid standard. The assumption for these tests is that growers will likely be rotating products and thus we evaluated them in the same exact rotation with a pyrethroid product, either Hero™ EC (4 fl oz/A) or Warrior II. In trial 3, which was conducted near Blacksburg, VA in 2014, four total spray applications were made and Hero™ EC (4 fl oz/A) was rotated every other spray. The overall level of control was relatively low and probably the result of too few spray applications. Similar levels of control were achieved with Belt, Coragen, Besiege, Blackhawk and Radiant. There appeared to be a rate effect with the use of Belt from 2 to 3 fl. oz/A.

In Trial 4, which was conducted on the Eastern Shore of VA in 2014, seven total sprays were applied and each product was rotated every other spray with Warior II ZT (1.92 fl oz/A). Belt, Coragen, and Besiege each resulted in ≥97% marketable ears, but the high rate of Besiege also had 96% clean ears, which was higher than the other treatments.

Trial 3. Evaluation of insecticides rotated every other spray with Hero™ EC (4 fl oz/A) - Blacksburg, VA, 2014 (4 sprays: July 14, 17, 21, 24)

Treatment	Rate / acre	% marketable* ears	% clean ears	No. larvae/ 25 ears
Untreated Control		54.1	10.4	13.2 a
Belt SC	2 fl. oz (low)	57.4	29.4	1.1 b
Belt SC	2.5 fl. oz (med)	66.0	42.1	1.1 b
Belt SC	3 fl. oz (high)	75.4	64.4	0.7 b
Coragen 1.67SC	3.5 fl. oz (low)	65.0	46.7	0.7 b
Besiege	7 fl. oz (low)	70.7	45.7	2.9 b
Blackhawk 36WG	2.2 oz (low)	62.4	36.7	5.5 ab
Radiant SC	3 fl. oz (low)	61.9	50.2	0.0 b
Hero 1.24EC	4 fl. oz (high)	75.8	50.4	1.8 b

Trial 4. Evaluation of insecticides rotated every other spray with Warrior II™ ZT (1.92 fl oz/A), Eastern Shore of VA, 2014 (7 sprays: Aug 4, 6, 8, 11,13, 15, and 18)

Treatment	Rate / acre	% marketable* ears	% clean ears	No. larvae/25 ears
Untreated Control		83 a	12	28.0 a
Belt SC	2 fl. oz (low)	97 bc	45	8.8 b
Coragen 1.67SC	5 fl. oz (high)	97 bc	79	1.8 c
Besiege	10 fl. oz (high)	99 c	96	0.3 c
Blackhawk 36WG	3.2 oz (high)	89 ab	58	12.3 b

Bt sweet corn. In addition to insecticides, transgenic Bt sweet corn hybrids have been another effective strategy to control “worm” pests. Numerous Attribute™ insect-protect Bt sweet corn varieties are available from several seed companies. Bt sweet corn can substantially reduce the need for or numbers of applications of insecticides. In numerous trials with Bt sweet corn varieties in Virginia, we have found 100% prevention of whorl and stalk damage from European corn borer. Bt sweet corn varieties also have provided excellent protection against larvae hatching and entering ears during fresh silking, with 80 to 90% control typical.