

Sweet Corn Variety and Pest Management Trial Armstrong Farm, 2008

Kathleen Delate, associate professor
Andrea McKern, research assistant
Departments of Horticulture and Agronomy
Randy Breach, David Breach, and Bernie
Havlovic, ag specialists

Introduction

Organic sweet corn can be successfully grown in Iowa, based on our agricultural resources and our extensive experience with field corn production. With the continuing growth of organic consumers in the U.S., premium prices can be obtained for organic sweet corn from Iowa. With the potential for major markets across the U.S. identified, research on production, harvesting and processing protocols is needed to meet this demand. One of the key pests in organic sweet corn production is the corn earworm. Earworm control was improved through the addition of a certified organic spreader-sticker in preliminary tests in 2001. This project has investigated variety selection for organic markets and the efficacy of the naturally occurring soil bacterium, *Bt* (*Bacillus thuringiensis*), for improved pest management of the corn earworm in Iowa.

Materials and Methods

Compost (8 tons/acre) was applied to the field site on May 21, 2008. Three varieties of sweet corn, 'Ambrosia' (Crookham Seeds, Caldwell, ID) and two certified organic varieties 'Brocade' and 'Luscious' (Mesa Maize, Inc., Olathe, CO) were planted on June 1 at 35,600 seeds/acre in 30 in. rows. The unit area sampled was 30 in. (1 row) by 50 feet. Four replications of each variety/treatment were planted. Weed management included two row cultivations on June 14 and June 23, 2008. Plant population counts were taken on June 17 and on July 15.

Corn earworm treatments were as follows: control (no spray); Dipel® (*Bt*); and Dipel® (*Bt*) plus vegetable oil (to act as a surfactant). Treatments consisted of 1) 4 oz Dipel® to 3 gallons of water, and 2) 4 oz Dipel® plus 2 oz of vegetable oil to 3 gallons of water. Treatments were applied using a backpack CO₂ sprayer to the corn ears when 50% were silking, and 2 to 4 days later. All ears were sprayed on July 18 and 21. Sweet corn was harvested on August 5, 2008. Ten ears per plot were collected from randomly selected plants in the middle section of each row and rated for total earworm number, and percentage of ears exhibiting earworm damage. Each ear was weighed individually.

Results and Discussion

Organic sweet corn plant populations were highest in 'Ambrosia' at 23,333 and 20,667 plants/acre on June 17 and July 15, respectively (Table 1). 'Luscious' and 'Brocade' were lower, averaging 15,709 and 16,209 plants/acre across both sampling dates. Emergence was also reduced in 'Luscious' seed in 2007 compared to 'Ambrosia.' Weed populations were high at the initial sampling date (June 17), ranging from 70 broadleaf weeds/sq. meter in 'Ambrosia' plots to 21 broadleaf weeds/sq. meter in 'Luscious' plots (Table 1). Grass weed populations were lower, averaging 2 weeds/sq. meter across all varieties. On the second sampling date (July 17), weed populations were reduced to <2 grass and broadleaf weeds/sq. meter across all varieties. Yields were excellent in 2008, ranging from 16,263 to 23,531 ears/acre. 'Ambrosia' plants had a significantly greater number of ears at 23,333 plants/acre compared to 'Brocade' and 'Luscious' which averaged 16,928 ears/acre. Ear weight was significantly different among varieties, with 'Ambrosia' and 'Brocade' averaging 370 and 377 g/ear, respectively,

which was significantly less than ‘Luscious’ at 427 g/ear.

Earworm damage was somewhat higher in 2008 compared to 2007, with the percentage of ears showing damage from corn earworm ranging from 7.4% in ‘Brocade’ plants to 18.2% in ‘Luscious’ plants, and (Table 1). ‘Earworm damage in Ambrosia’ was intermediate, at 15%, and not statistically different from ‘Brocade’ and ‘Luscious’ damage levels. The number of live earworms in sampled ears was greater in ‘Luscious’ than in the other two varieties, but the overall number of earworms was low, at approximately 2 per 10 plants. Pest management treatments affected the percentage of damaged ears, with both Dipel™-treatments significantly lowering earworm numbers, earworm presence and damage compared to the control (Tables 2 and 3). Over all varieties, earworm damage averaged 29% in the unsprayed treatment compared to an average of 6% damage in the Dipel-treated plants. There was no increase in plant protection with the addition of oil to the *Bt* mixture in 2008.

There was a significant interaction between variety and pest management treatment in relation to the number of earworms and earworm-damaged ears, but not in relation to yield or ear weight (Table 3). When combining cultivar and treatment effects, there was an overall trend towards a lower percentage of damage in the ‘Brocade’ and ‘Ambrosia’ varieties treated with Dipel® and Dipel® plus oil, with the ‘Ambrosia’ and ‘Luscious’ control ears having the greatest amount of earworm damage (Table 3). Although there was no discernible difference in ear appearance, the spray treatments appeared to affect ear weight, with control ears weighing significantly more at 409 g/ear than the Dipel™-treated ears averaging 382 g/ear (Table 2). This experiment will be repeated in 2009.

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Table 1. Sweet corn performance by variety, Armstrong Farm, 2008.

Variety	Stand: 6/17/08 (plants/ acre)	Stand: 7/15/08 (plants/ acre)	Broadleaf weeds (plants/sq. meter)	Grass weeds (plants/sq. meter)	Earworm damage (% ears showing damage)	Earworm presence (% ears infested)	No. of earworms /plant	Yield (ears/acre)	Weight (g)
Ambrosia	23,333a	20,667a	69.6a	2.25	15.0ab	3.3b	0.03b	22,531a	370.4b
Luscious	15,417b	16,000b	20.9b	1.92	18.2a	12.4b	0.21a	17,593b	427.3a
Brocade	16,250b	16,167b	27.3b	2.00	7.4b	2.5a	0.03b	16,263c	377.5b
LSD 0.05	2,357	2,845	23.2	NS	8.6	5.6	0.09	1,251	16.0

Table 2. Sweet corn data by pest management treatment, Armstrong Farm, 2008.

Treatment	Yield (ears/acre)	Earworm damage (% ears showing damage)	Earworm presence (% ears infested)	No. of earworms /plant	Weight (g)
Dipel®	18,242	5.0b	2.5b	0.03b	388.9b
Dipel® and oil	19,058	6.6b	4.1b	0.04b	374.3b
Control	19,045	28.7a	11.5a	0.20a	408.7a
LSD 0.05	NS	8.0	5.7	0.09	20.83

Table 3. Sweet corn performance by variety and treatment, Armstrong Farm, 2008.

Variety and Treatment	Yield (ears/acre)	Earworm damage (%)	Earworm presence (%)	No. of earworms/ plant	Weight (g)
Ambrosia, Dipel®	23,336a	2.60b	2.6b	0.03b	354.0e
Ambrosia, Dipel® and oil	22,748a	2.40b	2.4b	0.02b	366.4e
Ambrosia, Control	21,523ab	40.0a	5.0b	0.05b	390.3bcde
Luscious, Dipel®	16,142cd	10.0b	5.0b	0.05b	427.5ab
Luscious, Dipel® and oil	17,680cd	10.0b	2.5b	0.03b	410.0abc
Luscious, Control	18,923bc	34.1a	29.3a	0.54a	444.1a
Brocade, Dipel®	15,374d	2.50b	0.0b	0.00b	384.6cde
Brocade, Dipel and oil	16,655cd	7.50b	7.5b	0.08b	347.0de
Brocade, Control	16,748cd	12.2b	0.0b	0.00b	396.0bcd
LSD 0.05	2,137	8.0	5.4	0.14	25.4