

IR-4 Insecticide Evaluation for Stink Bug Control on Peppers

Michael Seagraves, Entomology Post-Doctoral Researcher

Ric Bessin, Extension Entomologist

Stink bugs are serious pests of some horticultural crops including tomatoes, peppers, apples, peaches, blackberries, okra, and sweet corn. Damage can be particularly severe in years following mild winters, as stink bugs overwinter in the adult stage in wooded areas near crop land. Relatively high levels of damage can be caused by low numbers of stink bugs in these crops. In Kentucky, we have two species that are horticultural pests, the brown stink bug, *Euschistus servus* (Say), and the green stink bug, *Acrosternum hilare* (Say). While both cause the same type of damage, the brown stink bug is more difficult to manage as it is less sensitive to the insecticides that are available for its control.

Stink bugs feed with piercing-sucking mouthparts, and like other insects with these types of mouthparts, they inject enzymes into the fruit to liquefy plant material for ingestion. These enzymes cause yellow corky areas to form around the feeding sites just under the skin of tomatoes and peppers. As the fruits ripen and turn color, these one-centimeter corky areas do not and remain as visible, yellow spots under the skin. They are often referred to as 'cloud spots' and reduce the marketability of the fruit if common.

Because stink bug control can be difficult and the number of effective materials to manage them is limited, a study was conducted at the UK Horticultural South Farm to screen several new insecticides for stink bug activity. As this project was funded in part through the IR-4 Project Southern Region, many of the insecticides screened are considered bio-rational alternatives to existing products.

Some of the products included in this report are not registered for use on peppers, this report does not recommend, encourage, or endorse their use on peppers or other crops until they have obtained the necessary EPA Section 3, Section 24(c), or Section 18 approval for use. Always read and follow pesticide label directions.

Procedure

Peppers transplants were started in the greenhouse (without insecticide use) and transplanted into the field after 7 weeks on May 23, 2006. The bell pepper variety was 'Aristotle' as this is bacterial leaf spot resistant and commonly used by growers in Kentucky. A double-row plasticulture system was used with raised beds on 6 foot centers, two rows of peppers per bed with the trickle tube between the rows, and 15 inches between transplants in the row. Each experimental plot was 27 feet of bed (including both rows of peppers). The field was arranged similar to a checker board such that each plot had an untreated bed on either side and at either end. There were 5 replications of each treatment. Insecticides were applied with a CO₂ sprayer at 30 psi with one nozzle over the top and one drop nozzle on either side of the row.

The trial was conducted twice. For the first evaluation, all the foliar insecticide treatments were applied on July 19 and again on July 31, however the soil drench of dinotefuran was applied on June 20. Plants were striped of mature fruit and a second evaluation of the same treatments was initiated after the first trial. The second round of treatments were applied on August 24 and September 1.

Each week, two set of three peppers plants in each plot were carefully beaten next to a ground cloth to dislodge stink bugs. While the beat sheet may be the best sampling tool for stink bugs in peppers, it is not very efficient and care must be taken to avoid plant breakage, particularly when the plants are laden with fruit.

Table 1. Insecticides and rates evaluated for stink bug control on peppers.

Treatment	Active Ingredient	Rate	Method
Untreated	-	-	-
Prev Am	Sodium tetraborohydrate decahydrate	0.4%	Foliar spray
Prev Am Venom 20 SG	Sodium tetraborohydrate decahydrate dinotefuran	0.4% 14 oz	Foliar spray
Venom 20 SG	dinotefuran	21 oz	Soil drench
Venom 20 SG	dinotefuran	14 oz	Foliar spray
Battalion	deltamethrin	11.5 fl oz	Foliar spray
Novaluron	novaluron	12	Foliar spray
Battalion Novaluron	deltamethrin novaluron	11.5 fl oz 6 oz	Foliar spray
Flonicamid	flonicamid	2.8 oz	Foliar spray
Flonicamid	flonicamid	4.15 oz	Foliar spray
Bug oil	modified citrus oil	4 gal / 200 gal	Foliar spray
Agricure	potassium bicarbonate	5 lbs / 100 gal.	Foliar spray
Warrior	lambdacyhalothrin	2.56 fl oz	Foliar spray
Clutch 50 WDG	clothianadin	6 oz	Foliar spray
Assail 30 WDG	actetamiprid	4 oz	Foliar spray

Fifty random, mature, peppers were sampled from each plot during the period from Aug 15 through Aug 21 (first round evaluation) and September 13 (second round evaluation) then evaluated for stink bug injury. The number of stink bug 'cloud spots' were recorded from each pepper, if the damage was questionable, the skin was carefully peeled back to examine for the characteristic corky tissue. When a pepper was found to have any signs of stink bug injury it was considered damaged. Some of the damaged fruit would not have been considered culls. The data were subject to Analysis of variance and treatments

means compared to the damage in the control treatment by Dunnett's test. Percent control is based on the reduction in the number of stink bug damaged peppers.

Results

Based on the beat sheet samples throughout the summer, there was approximately an equal number of brown and green stink bugs. What was surprising was the high amount of stink bug damage caused by the low numbers of adults observed in the first round evaluation, but the level of stink bug damage dropped for the second round making those conclusions less reliable. The high level of damage early with the low numbers of adult stink bugs observed may be attributed to the low efficiency of sampling for stink bugs on pepper plants.

Table 2. Incidence and severity of stink bug damage to peppers following two foliar applications (July 19 and 31) of various insecticides.

Treatment	Percent stink bug damaged fruit	Stink bug 'cloud spots' per fruit	Percent control
Untreated	49.2	4.1	0.0
Prev Am	38.0	2.8	21.5
Prev Am Venom 20 SG	27.6 * ¹	1.0	43.0
Venom 20 SG ²	26.8 *	2.4	44.6
Venom 20 SG	23.2 *	0.9 *	52.1
Battalion	34.0	2.4	29.8
Novaluron	42.4	3.4	12.4
Battalion Novaluron	37.6	2.5	22.3
Flonicamid	27.6 *	1.6 *	43.0
Flonicamid	29.0 *	2.3	40.1
Bug oil	33.6	2.4	30.6
Agricure	30.4 *	2.0	37.2
Warrior	26.4 *	2.0	45.5
Clutch 50 WDG	24.8 *	1.3 *	48.8
Assail 30 WDG	25.2 *	1.9	47.9
¹ Significantly different from the control damage for this measurement (Dunnett's test).			
² This one treatment was applied only once as a soil drench on June 20.			

First Trial

In general, there was considerable damage to the pepper fruit in the control treatment with nearly half of the peppers displaying stink bug injury. The neonicotinoid insecticides (Clutch, Assail, and Venom), Warrior, Flonicamid, and Agricure demonstrated the greatest reduction in stink bug damage to the peppers relative to the control. The foliar and soil applications of Venom were similar with respect to damaged fruit, but the soil application was not different from the control in terms of reducing the number of cloud spots per fruit. While one pyrethroid, Warrior, showed good control of stink bug damage, another, Battalion, failed to demonstrate significant difference from the control peppers indicating practical differences within that class of chemistry.

Second Trial

Table 2. Incidence and severity of stink bug damage to peppers following two foliar applications (Aug 24 and Sep 1) of various insecticides.

Treatment	Percent stink bug damaged fruit	Stink bug 'cloud spots' per fruit	Percent control
Untreated	18.4	2.1	-
Prev Am	8.4	1.2	54.3
Prev Am Venom 20 SG	7.6	0.3	58.7
Venom 20 SG ²	11.6	3.1	37.0
Venom 20 SG	9.6	1.0	47.8
Battalion	10.4	1.6	43.5
Novaluron	17.6	3.4	4.3
Battalion Novaluron	16.0	1.8	13.0
Flonicamid	11.6	1.7	37.0
Flonicamid	12.8	1.4	30.4
Bug oil	15.2	1.7	17.4
Agricure	11.6	1.6	37.0
Warrior	8.8	0.9	52.2
Clutch 50 WDG	5.2 *	0.9	71.7
Assail 30 WDG	9.2	2.3	50.0

¹ Significantly different from the control damage for this measurement (Dunnett's test).
² This one treatment was applied only once as a soil drench on June 20.

The incidence of stink damaged peppers was reduced in the second round of testing, which in some respects can make the data less reliable. Damage in the control treatment was less than half of what was observed with the first harvest. Clutch was the only treatment was found to be different from the control in terms of reducing the percentage of stink bug damaged fruit. With the shorter interval between treatments and between treatments and harvest, improved performance was expected with these products, but the reduced damage may have reduced the sensitivity of the test.

Recommendations

While several of the insecticides and combinations were not significantly different from the control, it is possible that used at different rates, intervals, and/or frequencies could improve their performance. Several of these new insecticides show promise for stink bug control and further evaluation on peppers as well as other high-value horticultural crops is warranted.

From University of Kentucky, Extension Entomology Research Reports at:
<http://pest.ca.uky.edu/EXT/Res/ResPubs.shtm>