

Efficacy trials of OMRI approved materials on vegetable crops, 2001

Abby Seaman, Area Extension Educator, WNY Vegetable IPM

The number of pest management materials approved for organic production is quite small, and many of the products that are available have not had the extensive efficacy testing that synthetic pesticides have had. It's hard to know what to use for some of the pest problems that persist in organic management systems. As part of a Northeast SARE funded project, I subsidized the addition of OMRI approved materials in several efficacy trials conducted by Cornell faculty. The trials were not conducted on organically managed land, but can give us an idea of which products have potential for controlling some of the difficult to manage pests.

Potato leafhopper

Surround is a formulation of finely ground kaolin clay that has been reported to reduce insect feeding in many crops. Potato leafhopper (PLH) is a serious pest that is very difficult to manage in organic management systems. Toxins injected into the plant when the insects feed cause leaflet curling and leaf edge browning accompanied by potentially significant yield reduction. Two rates of the commercial formulation of Surround and two experimental formulations were included in a 2001 potato leafhopper trial. The trial was planted with the variety Superior. It was a good year for a leafhopper trial; leafhopper numbers were relatively high and there were good differences between treatments. Treatments were applied five times at approximately weekly intervals starting June 26th. Hopperburn was rated on a 1-4 scale as follows:

- 1) Little or no leaf curling
- 2) Moderate leaf curling plus some leaflet necrosis
- 3) Severe leaf curling accompanied by leaf necrosis
- 4) Most lower leaves necrotic and/or dead

Treatment	Mean PLH nymph/5 lvs*	Mean Hopperburn Rating	Yield (cwt/A)
Surround WP (13.5 lb./A)	11.8	3.2	142.0
Engelhard KV-36 (13.5 lb./A)	12.2	3.5	173.8
Engelhard KV-3 (13.5 lb./A)	12.8	3.5	184.0
Surround WP (20.5 lb./A)	13.8	3.3	155.2
Untreated control (water)	16.5	3.6	140.2

* Seasonal mean

I can't assign letters indicating significantly different means to this table without breaking statistical rules because the validity of the test that was used to see if the means are statistically different depends on all of the treatments (there were 28). In the context of the larger trial, all the kaolin formulations reduced the mean number of leafhopper nymphs compared with the untreated control. The two Surround treatments reduced the mean hopperburn rating compared with the control, but the rating reductions did not translate into significant increases in yield compared with the control. The reductions in leafhopper numbers and hopperburn ratings were not enough to prevent significant yield reduction. The yields of the most effective treatments in this trial ranged from 277-305 cwt/A. Surround can be a problem in the sprayer if you don't

follow the mixing instructions on the label. Soft lumps of unwetted product can cause clogging. John Mosko from Engelhard Corporation offers the following tips for avoiding problems:

Add the Surround to a sprayer that is half full of water. That allows better agitation if it's a backpack or other sprayer that you can physically shake.

Allow all the product to wet before agitating or shaking.

Top off the water to the intended volume after agitating or shaking.

Agitate or shake regularly to keep the product in suspension.

Another option for backpack sprayers is to mix the product in a 5-10 gallon bucket so you have the option of using a drill operated paint mixer.

Crucifer flea beetle

Crucifer flea beetles are another difficult to control pest for which the most commonly used control options are row cover and rotenone. Some of the newer materials, such as neem products (Ecozin and Neemix) and Hot Pepper Wax, have repellent effects, so we thought they might have some usefulness against flea beetles. Two separate trials were conducted. Broccoli transplants were grown in four inch pots until they reached the 5-leaf stage, treated, and placed in caged in which field collected flea beetles were released and allowed to feed for four days. A spreader-sticker was added to all treatments. Damage was evaluated using a rating system which ranged from 0 (no damage) to 4 (severely injured).

Treatment	Rate/A	Mean damage rating	
		8/29	9/7
Surround WP	15 lb.	2.3 a	2.5 b
Hot Pepper Wax	8.0 oz	2.4 ab	2.0 a
Rotenone 5%	3 lb.	2.5 ab	2.3 ab
Surround/Safer soap	15 lb.	3.6 cd	3.0 b
Ecozin	8.0 oz	4.0 d	4.0 c
Neemix	16.0 oz	4.0 d	4.0 c
Control		4.0 d	4.0 c

Values followed by the same letter are not significantly different

In these trials both Surround and Hot Pepper Wax provided control equivalent to rotenone. While the level of control is not what you would want for greens, it may be enough to get seedlings and small transplants established. They may need frequent re-application; that aspect was not tested in these trials.

Cabbage aphid

Cabbage aphid is a pest that has been reported to build up late in the season on kale and other fall crucifers, especially after the first frosts. The aphids may be more frost-tolerant than their natural enemies. The aphids are covered with a white waxy exudate, which protects them to

some extent from insecticides, and their feeding can cause leaf distortion. In any case, greens infested with cabbage aphids are not marketable.

Broccoli transplants were grown in six inch pots until they reached the 6-leaf stage and were then placed in cages into which field collected cabbage leaf aphids were released, and allowed to colonize and acclimate. The plants were removed from the cages to be treated, returned to the cage, and evaluated after seven days by counting the number of live aphids. After evaluation, an additional application was applied to treatments that still had living aphids, and again evaluated after 7 days.

Treatment	Rate/A	<u>Mean # aphids/leaf</u>	
		10/2	10/9
Surround WP	15 lb.	21.9 a	8.0 a
Rotenone 5%	3 lb.	24.3 ab	12.3 a
Ecozin	8.0 oz.	29.9 ab	14.3 ab
Naturalis L	16 oz.	33.9 b	21.0 b
Control		75.9 c	86.4 c

Values followed by the same letter are not significantly different

All of the treatments significantly reduced the aphid populations compared with the controls, but this level of reduction may not be enough to make the crop marketable. The two treatments with the best control are the least attractive in terms of potential residue. The Surround product leaves a significant visible residue on the plants, which may render them unmarketable, and cool fall conditions may delay the breakdown of the Rotenone residue.

Onion thrips

Onion thrips can be serious pests of onions and cabbage in hot, dry seasons. On onions, the thrips rasp away at the surface of leaves, leaving bleached-looking areas with no chlorophyll, which can reduce photosynthetic capacity and yield. On susceptible cabbage varieties thrips feeding can cause raised, warty areas to form on the leaf, although this is not a problem I've ever heard organic growers having to any serious extent. In fact, this fall I heard about a large field of organic cabbage that did not have high thrips populations during the 2001 growing season when the surrounding conventionally managed fields had serious thrips problems. Tony Shelton is planning to do some research to find out what's going on in the organic fields that's not going on in the conventional fields.

The thrips trials were conducted in the greenhouse on 5-6 leaf onion plants (variety Stuttgart) grown from sets. Plants were treated, and field-collected immature thrips were caged on individual plants for five days, after which time surviving thrips were counted.

Treatment	Rate/A	Adjusted % Mortality
Mycotrol	0.3 qt.	69 a
Engelhard F-01-KV-3	15 lb.	61 ab
Engelhard F-01-KV-6	15 lb.	58 ab
Surround WP	15 lb.	64 ab
Neemix 4.5	1 pt.	48 ab
Ecozin	8 oz.	46 ab
Rotenone 5%	48 oz.	39 b
Control		0 c

* Adjusted to account for the background population of thrips in the greenhouse
 Values followed by the same letter are not significantly different

All of the treatments reduced thrips numbers compared with the control. Rotenone caused the lowest mortality, and Mycotrol (a commercial product containing the entomopathogenic fungus *Beauveria bassiana*) the highest. The three kaolin formulations (Surround WP and the two numbered formulations) and the two neem products (Neemix and Ecozin) produced intermediate mortality levels.

Tomato early blight

Two materials approved for organic production were tested for disease control on tomatoes on a certified organic farm in western New York. Tomatoes of the variety Daybreak were transplanted into black plastic with trickle irrigation on June 8th. The field rotation for the previous two years had been barley underseeded with clover followed by a year of clover hay. Composted chicken manure was broadcast over the field at a rate of 1T/A, and an additional 1.5T/A was rototilled into the beds before the plastic was laid. Between-row spacing was 6 ft. and in-row spacing was 18 inches. The plants were not staked. Plots consisted of 15 ft of a single row of plants. Treatments were replicated four times and randomized in a complete block design. Treatments were as follows:

Treatment	Rate
Plantshield drench at transplanting	10 oz./100 gallons
Plantshield foliar applications	2 lb./A
Plantshield drench plus foliar	10 oz./100 gallons drench, 2 lb./A foliar
Trilogy	1% solution
Untreated control	

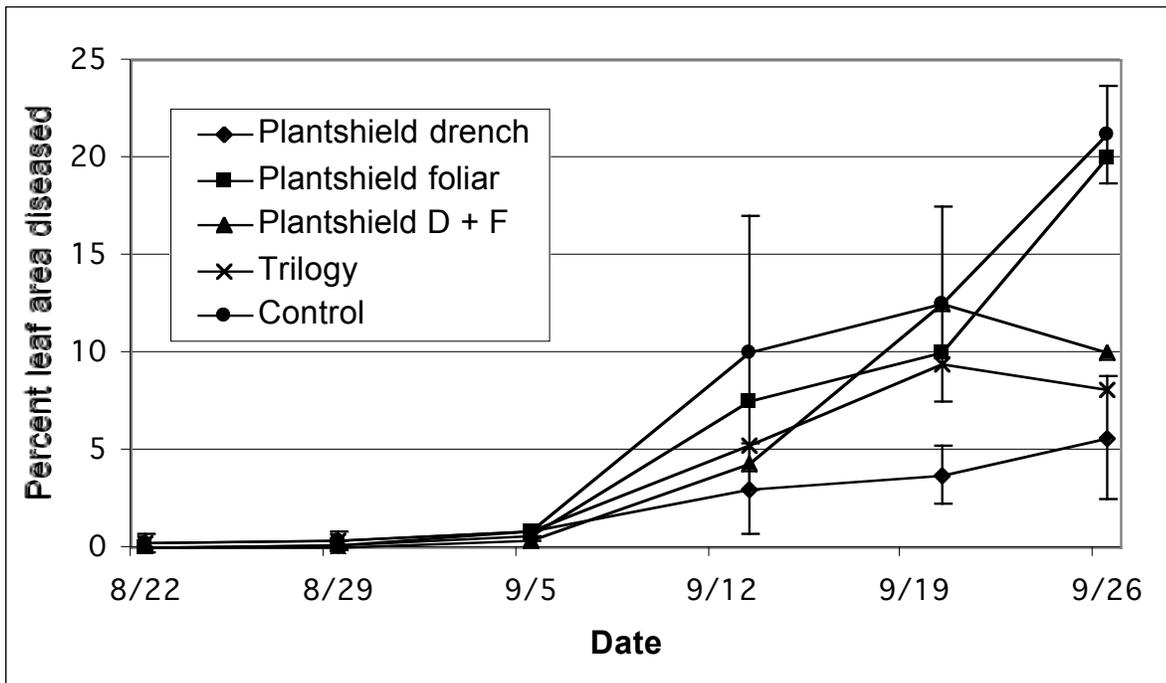
A spreader-sticker (Natur'l Oil, 0.2%) was used with the Plantshield foliar applications. Plants in plots receiving the two Plantshield drench treatments were drenched the day after transplanting with 4 oz. of solution each, enough to saturate the root ball. Each foliar treatment was applied three times, at approximately two-week intervals, starting on July 27th and ending on August 22nd. Percent foliage diseased was recorded for each plot at weekly intervals for six weeks, starting August 22nd. Plants in the middle 5 ft. of each plot were rated.

The 2001 growing season was very dry, with a total of 4.7 inches of rain falling at the trial location during the months of June, July, and August. Leaf wetness periods were short during

the entire period of the trial, disease symptoms appeared late, and pressure was relatively light. The trickle irrigation kept the plants growing well, and the fruit load was heavy. When the last foliar treatments were applied on August 22nd, disease was just starting to appear on the plants and harvest had not begun. Early blight (caused by *Alternaria solani*) was the only foliar disease observed in the trial.

On the last disease rating date the lowest levels of disease were observed in the Plantshield drench and Trilogy treatments (Fig. 1), which were both significantly different from the control. The Plantshield foliar and foliar plus drench treatments were not significantly different from the untreated control (Table 1). It was very interesting and unexpected that the lowest disease levels were in the Plantshield drench treatment. This may be an indication that Trichoderma is able to induce disease resistance in the above-ground parts of the plants. This trial will be repeated in 2002, in hopes of having some better disease pressure and possibly the opportunity to look at Septoria control as well.

Figure 1.



Thanks to Ward Tingey, Tony Shelton, Brian Nault, Bill Wilsey, and Jason Plate for including these products in their trials. Thanks to Lee Stivers for conducting, and Porter farms for hosting, the tomato disease trial. The following companies supplied products for the trials: AMVAC Chemical Corporation, Bioworks, Certis USA, Engelhard Corporation, and Troy Biosciences.