Foliar Insecticides for Control of Cabbage Flea Beetles in Cabbage and Pak choy

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Introduction

Several conventional and OMRI-listed organic insecticides were compared for control of flea beetles (*Phyllotreta cruciferae* Goeze) in fresh-market cabbage and pak choy production. Materials tested included one rate each of Entrust SC (spinosad 1SC, Dow Agrosciences, OMRI-listed = Organic Materials Review Institute), Surround WP (95% kaolin, Tessenderlo, OMRI), PyGanic 5.0 (5% pyrethrins, Valent/MGK, OMRI), M-Pede (49% potassium salts of fatty acids, Gowan, OMRI), SuffOil-X (80% mineral oil, BioWorks, OMRI), Molt-X (azadirachtin 0.28EC, BioWorks, OMRI), Assail 30SG (acetamipridm UPI), Warrior II (lambda-cyhalothrin 2.08EC, Syngenta), Harvanta 50SL (cyclaniliprole 0.42SL, Summit Agro). Unsprayed blocks were used as a control for both crops.

Materials and Methods

Treatments were compared in two large-plot field experiments on transplanted "Cheers" cabbage and pak choy at the Long Island Horticulture Research and Extension Center (LIHREC) in Riverhead, NY. On June 5 and July 7, 2018, respectively, cabbage and pak choy seeds were sowed in Speedling trays. Trays were maintained on a greenhouse bench with overhead irrigation as needed including a commercial soluble fertilizer (15-5-15 Cal-Mg, 150 ppm N, Jack's Professional). On July 17 (cabbage) and August 6 (pak choy) seedlings were transplanted to the field spaced 11" apart in 34". Four 30' rows (approximately 340 sq. ft.) per replication and four replications per treatment were used for both experiments. One day after transplanting the area was treated with Devrinol 50DF (2 lbs/A) for weed control. Treatments were assigned randomly to plots and arranged in a randomized complete block design.

Figure 1. Flea beetle damage on Pak choy (left), transplanting cabbage (center), and the field design at LIHREC (right).

Treatments were applied as foliar sprays to coat the leaf surface using a CO2-powered backpack sprayer fitted with TJ60 8003EVS nozzles operating at 40 psi. Treatments were applied at 10-day intervals on 7/27, 8/6, and 8/15 for cabbage and at weekly intervals on 8/10, 8/17, and 8/23 for pak choy. Number of cabbage flea beetles, flea beetle damage ratings (Ohio Scale, 1 - 6), and % foliage feeding damage from flea beetles (0 - 100%) to new

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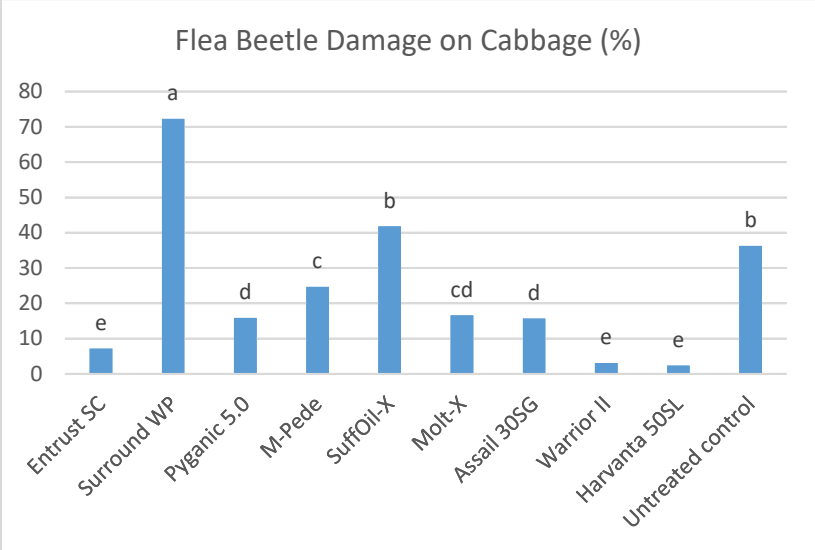
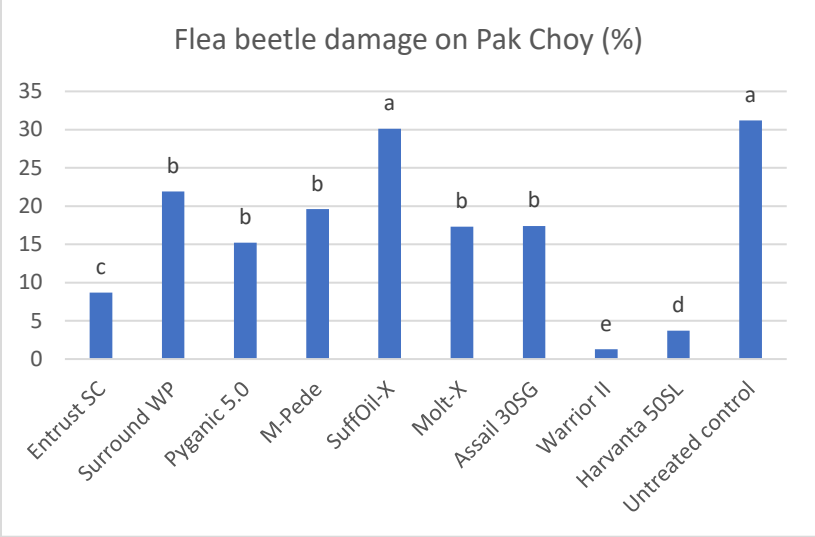
growth (since previous application) were taken from 10 randomly selected plants per replication at a weekly interval from 7/25 to 8/30 in cabbage and 8/10 to 8/30 in pak choy (selected data is presented here). Plant quality data were collected at harvest, including head diameter and weight for cabbage on 10/3 and above-ground plant height, width, and weight for pak choy on 9/7, respectively. Marketable quality ratings (0 – 5, 0 = dead plants, 3 = marketable, 5 = excellent) were also done at harvest for both crops. ANOVA and multiple comparisons among treatments were performed on data using Tukey's HSD (JMP Pro 10.0 SAS Institute). Treatments and data are shown in Table 1.

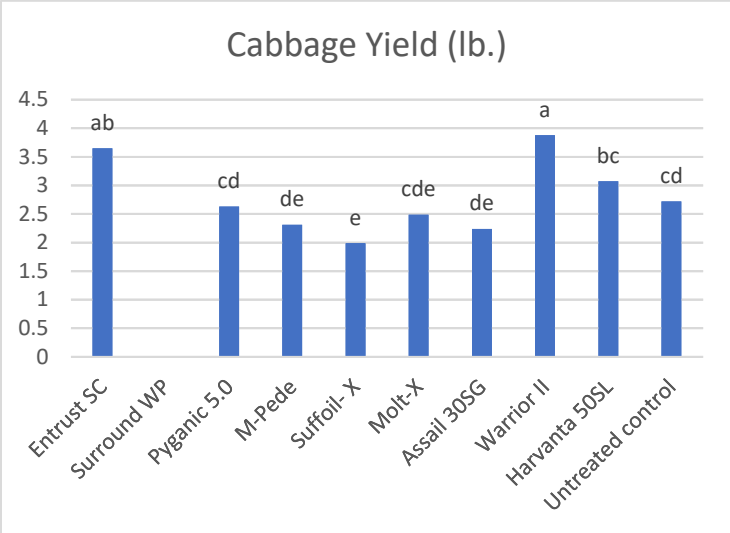




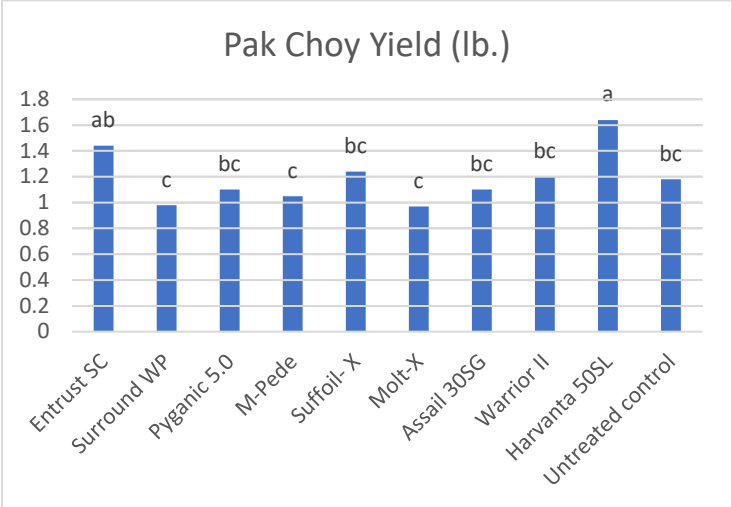
Results and Discussion

Cabbage flea beetle populations were similar among treatments at the start (7/25 and 8/10) of both experiments. Plots treated with conventional insecticides Warrior II and Harvanta had significantly fewer flea beetles throughout the trial period. Assail was moderately effective in cabbage but not in pak choy. The residual activity of Assail appears to last only a short period (2 – 3 days) and that may explain why it was less effective on a fast-growing crop like pak choy—we observed many new pak choy leaves between treatment applications. Some of the OMRI-listed insecticides were partially (at some time-points) effective in reducing flea beetle damage in these trials. Although Surround WP-treated cabbage had significantly lower numbers of flea beetle on plants, the foliar damage was relatively high, inconsistent with the numbers seen. Application of Surround-WP on cabbage transplants was associated with stunted plant growth across all replications. Plants in these plots were comparatively smaller with less foliage and they failed to produce heads. The lower numbers of flea beetles in Surround-treated plots could be due to repellency from the kaolin clay

coating to the newest leaves, but damage ratings, which were done on the entire plant, suggest feeding may be occurring where the residues wash off or beetles were choosing to feed on undersides of treated leaves.



Percent leaf area with feeding damage by flea beetles was significantly lower in plots treated with conventional insecticides (Assail, Warrior, and Harvanta) compared with untreated plants in both trials. Of the OMRI-listed materials reduced foliar damage, Entrust performed best but M-Pede, Molt-X, and Pyganic also significantly reduced damage to cabage relative to the untreated control. Foliage feeding damage ratings, taken using the Ohio Scale (1 - 6, 1 = no damage, 3 = moderate, 6 = high) (Table 3 & 6) were fairly consistent with the percent foliage damage and flea beetle number on plants.



It is important to note that the study area had a high flea beetle population at the time of the trial and the small plots were bordered by other less effective treatments and untreated plants, which would not be typical for a commercial setting where the entire field would be treated with a single insecticide with usually no untreated area. In such cases, the efficacy of some less effective products may be greater than that observed in these trials.

Plant quality such as height, width and head weight were generally higher in the effective treatments (Warrior, Harvanta, Entrust) at least partly due to less flea beetle damage. Marketable quality was also generally higher in the effective treatments but from this study it was very hard to solely determine the impact of flea beetle control on the quality of the harvested heads. Near the end of the trial, collecting flea beetle damage data became more difficult due to presence of damage from other foliage feeding insects such as imported cabbage worm, cabbage loopers, and diamondback moth, since no insecticide was applied to control other insects (Harvanta, Entrust, and Warrior and to some extent Assail are generally effective to highly effective against these pests).

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Conclusions

Conventional insecticides Warrior II and Harvanta 50SL treated plants have shown significantly less flea beetle damage than untreated control and other treatemnts. Assail 30SG has provided moderate control against flea beetle. Among the OMRI listed products, Entrust SC has provided good flea beetle damage control nearly comparable to the conv entional insecticides.

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