Evaluation of Insect Exclusion and Mass Trapping as Cultural Controls of Spotted Wing Drosophila in Organic Blueberry Production

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This project, which was supported by a NESARE Farmer grant, investigated the use of exclusion netting and mass trapping as cultural techniques to mitigate the damage caused by Spotted Wing Drosophila (SWD). SWD proved to be unusually damaging to 2012 berry crops in the Northeast. Despite the fact that the planting in question is quite young, farmer Lawrie Nickerson decided to be proactive and investigate netting as a control method. Research papers translated from Japanese by Cornell graduate student Masanori Seto provided the necessary incentive.

Unlike native species, SWD uses its saw-like ovipositor to deposit eggs in ripening fruit resulting in larval development inside the berry. Activity of the fruit fly corresponds to the ripening of blueberries, raspberries, day neutral strawberries and a variety of other cultivated and wild hosts. In 2012, levels of infestation reported state and region-wide ranged from 80-100% of fruit examined with individual fruit infested with as many as 25 larvae.

Traditional IPM, which relies on scouting to determine an economic threshold before pesticides are applied, has been temporarily abandoned. While monitoring for pest presence is still recommended, a 3-7 day insecticide spray schedule is currently the recommended management strategy. Organic berry growers are not inclined nor prepared to use insecticides at this frequency, and their customers are particularly concerned about pesticide use. There are very few organically approved pesticides available, making it difficult to properly rotate chemicals. This project evaluated the merits and costs of using insect exclusion netting to exclude SWD from a blueberry planting, and attempted to evaluate mass trapping as an additional means of reducing SWD effects.

Materials and Methods

Protek insect netting 1.00mm x .85mm was used in the trial. This netting is 80% porous and has 83% light transmission capabilities. The suggested life of the net is 7 years but if stored well it may last several additional seasons. The net was hung over 1 row of 50 plants that is intersected midway with an aisle for a total of 300 linear feet. To separate the treatment replications within this row we used extra netting material fastened with pig earrings. The treatments were netted after bloom and before berries began to color. The exclusion netting was hung over wires placed at a height of 6’ to accommodate pickers. The wires, anchored to 2 H-braces at rows’ ends, were supported by posts set strategically along the row. The net was weighted down with construction grade water hose. This may have been more than was needed since the net itself is fairly heavy, but this method prevented inadvertent ripping.

Five year old ‘Bluecrop’ blueberry plants were used and the treatments were replicated three times. We evaluated insect exclusion alone and in combination with two different types of traps – unbaited red solo cups covered with tanglefoot and a yeast baited trap that uses apple cider vinegar as a drowning solution. We also evaluated a weed suppression fabric, Lumite 994GC which is a woven fabric ground cover made of UV stabilized polypropylene which allows passage of water, nutrients and air while suppressing weeds. The treatments were 1) netted 2) netted with sticky traps 3) netted with vinegar traps, 4) netted with weed mat and 5) non-netted control with vinegar traps. The weed mat treatment was added as an afterthought and not part of the original proposal. The netted weed mat treatment was replicated 3 times, but the non-netted control of the weed mat treatment was only replicated once.

Each treatment was composed of 3 plants and fruit data was hand harvested twice weekly from the middle plant in the group for three weeks during peak production. The harvested
berries were examined for % SWD infestation, individual fruit quality and yield. The insect traps were checked and changed weekly and numbers of SWD and other insects were recorded. Light intensity and temperature under the nets was taken and compared to the untreated control on a weekly basis. Shoot regrowth in the netted, fabric mulch and control treatments will be evaluated during the spring of 2014.

The plants were treated consistently throughout the experiment. No sprays were used during the 2013 growing season except for a Neem application to control scale in the spring. All other cultural inputs were identical across all treatments and the control including pest control, fertilization, and irrigation. No frost control was necessary. Bird netting and deer fencing were in place for all treatments.

Temperatures were recorded weekly through the trial in each of the replications of the control and the netted treatment with no traps or weed mat.

Fruit size was measured by using a caliper on 10 randomly selected fruit from each replication at each picking date. Those same berries were individually examined under a microscope for evidence of SWD oviposition and then they were crushed together for a % Brix reading using a hand held refractometer.

Results

2014 prices for the insect exclusion netting (80 g weight of 0.85mm x 1.00mm ProTek netting) in the largest size possible of 13’ x 328’ was $665.00. Growers will need to sew the panels together in order to adequately net multiple rows.

SWD pressure was non-existent to very-low at this point in the season with only 3 females found in one control trap although there were SWD adults being trapped in an adjacent hedgerow at the time of the study. As shown in Figure 1, the sticky traps and vinegar traps showed that the netting effectively excluded many other insects of similar and larger size. The sticky traps attracted a higher percentage of ants and crawling insects apparently not attracted to the yeast bait in the vinegar traps. Native drosophilids were found in the control traps in very low numbers. No drosophilids were found in the traps in the netted treatments. Due to the low SWD pressure, we were unable to make any determination on the efficacy of mass trapping for SWD.

Fruit yield was not negatively impacted by netting or fabric mulch (Figure 2). Overall yield was slightly higher in some of the netted treatments.

Fruit quality was not negatively impacted by the netting. As shown in Figures 3 and 4, % Brix was slightly higher in the netted treatments, but individual berry size was larger in the controls. There was no evidence of SWD oviposition in any of the berries examined throughout the trial.

We were concerned about the effect of the net on light intensity and temperature underneath the nets. The temperature was slightly higher on two of the dates measured (Figure 5) and the light intensity was slightly lower on all three of the dates measured (Figure 6). These differences did not correlate with fruit quality and appear from this one season of observation to be insignificant. Light under the net – despite the 85% transmission rating – was still good most likely because the white color allowed it to get reflected throughout the netted area. This characteristic might be reduced as the netting ages. An observation made by pickers was that the

![Figure 1. Number of SWD caught in 3 different trap types through the summer.](image1.png)

![Figure 2. Total yield of blueberries under insect exclusion nets and various insect traps.](image2.png)

![Figure 3. Fruit soluble solids of blueberries under different exclusion nets and various insect traps.](image3.png)

![Figure 4. Fruit size of blueberries under different exclusion nets and various insect traps.](image4.png)
netted treatments, especially the netted treatment with the weed mat, ripened earlier by a few days than did the control.

No measurements were made yet on shoot regrowth although visual observation did not indicate any difference in growth habit.

The weed mat did not have much impact on plant performance, although shoot growth over time will have to be monitored.

Discussion

One aspect that the grower really liked was that dropped berries could be very easily removed from the weed mat treatment simply with a broom and dustpan unlike the use of bark mulch which is more problematic. The grower is also hoping that fabric mulch will reduce the humidity caused by weeds thus discouraging SWD.

The cost of covering an acre of blueberries with insect netting would likely range from $7,000 to $9,000 depending on the support system used. The life of the net is 7 years, so the amortized cost of an $8000 investment would be $1,143/year, not including labor. Given that estimates for annual increases in cost of production per acre to control SWD range from $36 to $290, netting blueberries may be a viable strategy for organic or small acreage plantings. Those growers that do not have bird netting in place might want to track the reduction in bird damage as a result of having insect netting installed.

The yield improvement realized from reducing bird damage might be enough to encourage netting as a sustainable option for SWD management.

Literature Cited


Laura McDermott is a regional extension specialist with the Eastern NY Horticulture team located in Hudson Falls, NY who specializes in berry crop production and IPM. Lawrie Nickerson is a blueberry grower in Hoosick Falls NY.
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