

## Exclusion net to control spotted wing *Drosophila* in blueberry fields

Daniel Cormier, Jonathan Veilleux, Annabelle Firlej

Institut de recherche et de développement en agroenvironnement, 335 rang des Vingt-Cinq Est, St-Bruno-de-Montarville, J3V 0G7, Québec, Canada

**Abstract:** In 2012, the populations of spotted wing drosophila, *Drosophila suzukii*, caused high levels of damage in soft fruit production in Quebec, Canada. In an organic blueberry field, we tested exclusion nets as a physical control method against *D. suzukii* adults. Exclusion nets were compared with insecticide treatments and control. Baited traps were placed to catch *D. suzukii* adults and blueberries were harvested regularly to evaluate different parameters. No *D. suzukii* adults were collected from traps and blueberries of the exclusion net treatment. However, adults were caught in traps and infested blueberries outside the nets. Nets had no significant effect on sugar content, yield and damage from other pests. Blueberries harvested inside the nets were significantly larger than blueberries from control plots. The results for this first year demonstrate the effectiveness of exclusion nets to protect blueberry plants from *D. suzukii* infestations.

**Key words:** *Drosophila suzukii*, SWD, organic production, physical barrier, sugar content

### Introduction

Although the spotted wing *Drosophila* (SWD), *Drosophila suzukii* (Matsumura) (Diptera: Drosophilidae), was first recorded in Quebec, Canada, in 2010, its population only reached important levels in summer 2012, particularly in soft fruit productions. In order to support organic growers who do not use insecticides, exclusion nets were seen, in our area, as a *D. suzukii* control method in blueberry production. Exclusion nets are used to protect fruits and vegetables from pests in Europe and North America (Murphy & Ferguson, 2000; Lloyd *et al.*, 2005; Dib *et al.*, 2010; Sauphanor *et al.*, 2012). The use of exclusion netting to protect crops against the SWD has not been evaluated since the first record of the pest in North America, while this method is cited as a means of physical control against SWD adults (Dreves & Langellotto-Rhodaback, 2011; Cini *et al.*, 2012). The objectives of this study were to evaluate the efficacy of exclusion nets against SWD in blueberry production and to evaluate their impact on yield, fruit quality and on other pests, including diseases.

### Material and methods

Twelve plots of five bush rows were selected from five rows from an organic blueberry field. Three treatments were assigned to these plots: net, insecticide (Entrust<sup>TM</sup>SC) and control. There were four replicates for each treatment. Exclusion nets had mesh of 1 x 0.6 mm in size, a mesh size enough small to exclude SWD (Kawase & Uchino, 2005). They were deployed on wooden crosses and their borders were buried in the ground (Figure 1). Baited traps were placed in the four netted plots as well as in a control plot central to all other plots. The baits were yeast and apple cider vinegar. Baits were changed weekly and the trap contents were observed in the laboratory. The number of *D. suzukii* adults was recorded. Weekly blueberry

picking started as soon as the fruits were mature. Only the blueberries from the three central bushes of each row for each plot were used in the laboratory. For each plot, 100 fruits were stored in rearing chambers at 25 °C to check for *D. suzukii* and another 100 were evaluated for all types of damage. The diameter of 50 fruits was measured and, for the first three harvests only, the sugar content of 50 other fruits was also measured. Finally, all blueberries picked were weighed to determine the total yield for each bush from all plots.

## Results and discussion

The insecticide treatment was not conducted as planned. Instead, the four plots of this treatment were added to the four control plots, for a total of eight control plots versus four netted plots.



Figure 1. Experimental set-up of the exclusion nets arranged in a completely randomized design.

No *D. suzukii* adults were caught in baited traps placed inside the nets, but 16 were caught in the baited trap in the control plot. No *D. suzukii* adults were reared from blueberries picked from netted plots whereas many emerged from fruits picked in the control plots (Figure 2). Emergence was observed from the third harvest onward. On average,  $72.2 \pm 45.3$  *D. suzukii* adults were reared from the 100 blueberries picked on the sixth harvest on August 27.

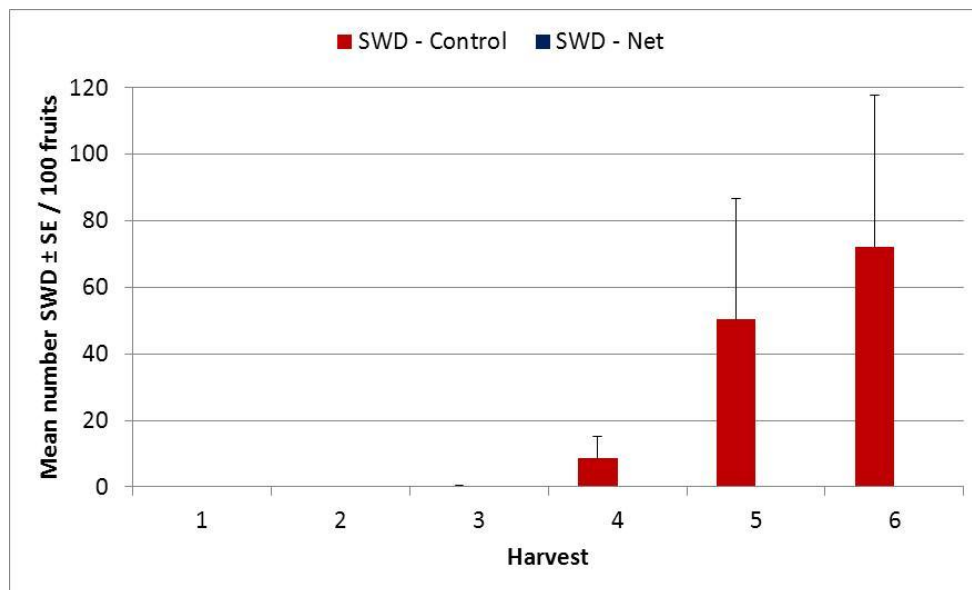


Figure 2. Mean number of spotted wing drosophila adults (SWD) emerged from 100 blueberries picked from plants inside (blue) and outside (red) the nets at each harvest.

Nets did not have a significant impact on the sugar content of blueberries picked inside these plots. The sugar content of all blueberries from the second harvest was significantly lower than that of the first and third harvests (Figure 3).

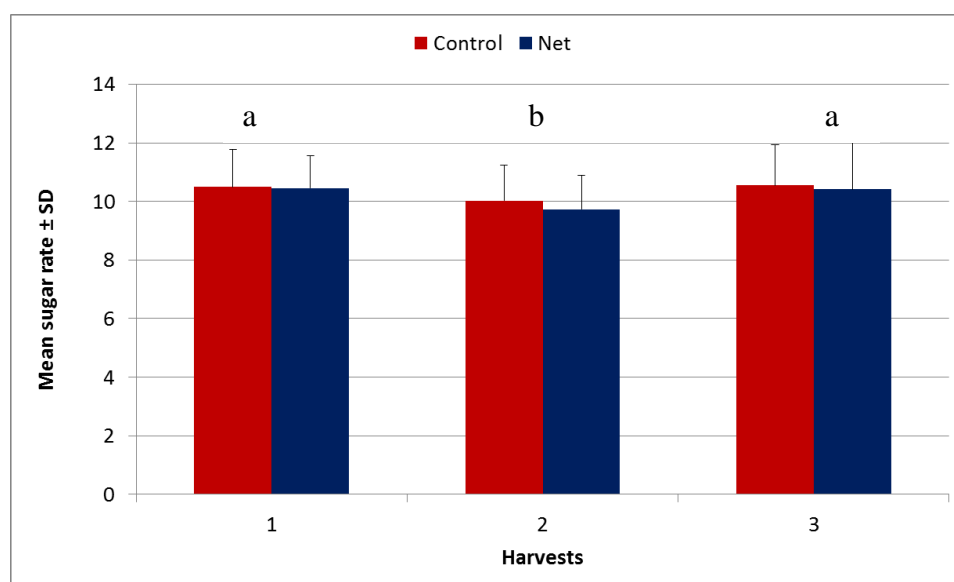


Figure 3. Mean sugar rate of 50 blueberries from three harvests in 2013. Fruits were picked from plants inside (blue) and outside (red) the nets.

Growth between the first and second harvests was most likely affected by abiotic factors such as temperature, humidity and sunlight. Nets did not have a significant impact on yield. On average, bushes from netted plots produced  $3.6 \pm 0.6$  kg of fruits as opposed to

2.7 ± 0.4 kg for bushes from control plots. Nets did have a significant impact on the diameter of fruits; blueberries picked from netted plots were larger than that of control plots. Throughout harvests, the diameter of fruits significantly decreased. The larger diameter of fruits from netted plots is probably caused by the generally higher humidity of these plots. As for temperature, records were similar in both type of plots and so, it is unlikely that this factor would have caused the difference in diameter of the fruits. Also, there was a tendency for blueberries to burst more in netted plots than in control plots. As for other types of damage, significant differences were observed for fly damage, unidentified insect damage and mechanical damage; there was significantly less of these in the netted plots. Nets did not have a significant impact on the percentage of healthy blueberries produced. Overall, 65.1 ± 17.7% of blueberries from netted plots were healthy as opposed to 70.5 ± 17.3% from the control plots. However, nets were deployed late in the season – four weeks after fruit set, the period regarded as optimal – and damage caused by other pests was probably more important than it could have been if the nets were deployed earlier. Also, *D. suzukii* damage was undervalued; from the fourth harvest onward, blueberries were prioritized for rearing rather than checked for damage. The results from the first year of this research project demonstrate the efficacy of exclusion nets against the spotted wing drosophila without having any adverse effects on blueberry production.

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