

Nets and covers to protect cherry trees from rain and insects

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Abstract

Cherry production is uncertain as it depends on weather conditions (cherries are at risk of being destroyed by rain due to cracking) and insects (*Rhagoletis cerasi*, *Drosophila suzukii*, wasps). Trees can die because of European goat moth (*Cossus cossus*) or flatheaded woodborer (*Capnodis tenebrionis*). In organic production of cherry fruit, natural treatments are not very effective for controlling *Rhagoletis cerasi*, *Drosophila suzukii*, wasps, *Cossus* or *Capnodis*. We have been studying different types of nets (mesh size) and structures to regularly produce good quality cherries. For two years we have been testing the efficiency of an orchard fully protected by nets for and covers, and in 2013 we tested a row-by-row protection. Some organic cherry growers also invested in nets row-by-row protection, after having reshaped young fruit trees. High protection provided gave full satisfaction, whereas no side effects due to aphids or fruit rot were observed.

Keywords: cherry, nets, covers, *Rhagoletis cerasi*, *Drosophila suzukii*, cracking.

Introduction

Protection against cherry insects (*Rhagoletis cerasi*, *Drosophila suzukii*, wasps) using nets "insect-proof" and covering against cracking is an expensive solution, but may be relevant in the case of high added value crops. Tests were conducted for 3 years, the results show a net mesh size less than or equal to 2.4 mm² (1.38mm x 1.71mm or "mesh 6x5") would be sufficient to prevent the passage of *D. suzukii* on individually wrapped trees. The laboratory results are worse: it would require a finer mesh 6x8 (1.1 mm²) to prevent passage of the insect.

Material and Methods

Trials in orchards:

Tree protection by different types of insect-proof nets (Figure 1) was evaluated in an orchard for 5 years from 2009 to 2013.

In 2011, 2012 and 2013, trees of two varieties of the same orchard of cherry were used for this test (Summit and Fertard harvested respectively on 13 and 27 June). For each type of net and for each variety tested, four trees were individually wrapped after flowering (picture 1). The observation at harvest was about 100 fruits per tree selected at random and peeled one by one in search of larvae of *D. suzukii* and *R. cerasi* (cherry fruit fly). Observations were also made on (row by row protection) mono-rank nets with mesh 6x8.

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Table 1: Different types of net tested (trials carried out with company Filpack)

Nets	Meshes		Weight	Shading
	mm	mm	g/cm ²	%
Woven net 5 x 4	2,21	3,42	72	10
Woven net 6 x 5	1,38	1,71	79	17
Woven net 6 x 6	1,38	1,38	85	18
Woven net 6 x 7	1,38	1,14	93	20



Picture 1: test insect protection net orchard

Orchard protection against rain-trees with row-by-row protection (covers width: 1.20 m, Net Filpack 6 x 8 (1.40 mm x 0.95 meshes mm)) (picture 2) was evaluated for 2 years in 2012 and 2013.



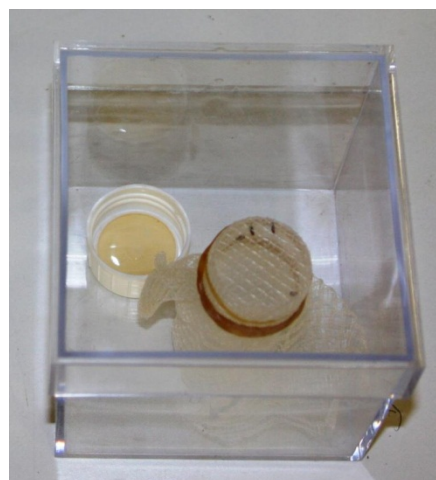
Picture 2: test anti-insect protection against the rain tarp and net orchard

Laboratory trials:

A laboratory test was carried out in 2012 in addition to test the ability of a greater range of gears to prevent passage of *D. suzukii*.

Six *D. Suzukii* (males and females, regardless) were placed in a clear plastic tube of 6 cm high and 3 cm in diameter, covered by the net test. This tube was itself placed in a clear square plastic box (10 x 10cm), in which we had a little apple cider vinegar and water in a plastic cap (picture 3).

After half a day, the number of *D. suzukii* was observed inside and outside the tube. The test was repeated from 3 to 8 times according to the test net.



Picture 3: laboratory test nets

Results

Trials in orchards:

Figures 1a, 1b and 1c represent the number of fruit with damage *D. suzukii* and *R. cerasi* for both varieties and each trial procedures in 2011.

For two varieties of cherry, trees protected by insect-proof net trees suffered no damage, while fruits on unprotected trees were heavily infested with *D. suzukii* and *R. cerasi* and by wasps. Under the conditions of this test, it confirms that mesh 2.4 mm² (1.38 mm x 1.71 mm or "mesh 6x5") is sufficient to protect cherry attacks *D. suzukii*. However net of 5 x 4 (2.21 mm x 3.42 meshes mm) are not suitable to control *D. suzukii*. The results are the same in 2012 and 2013 and on single-row nets.

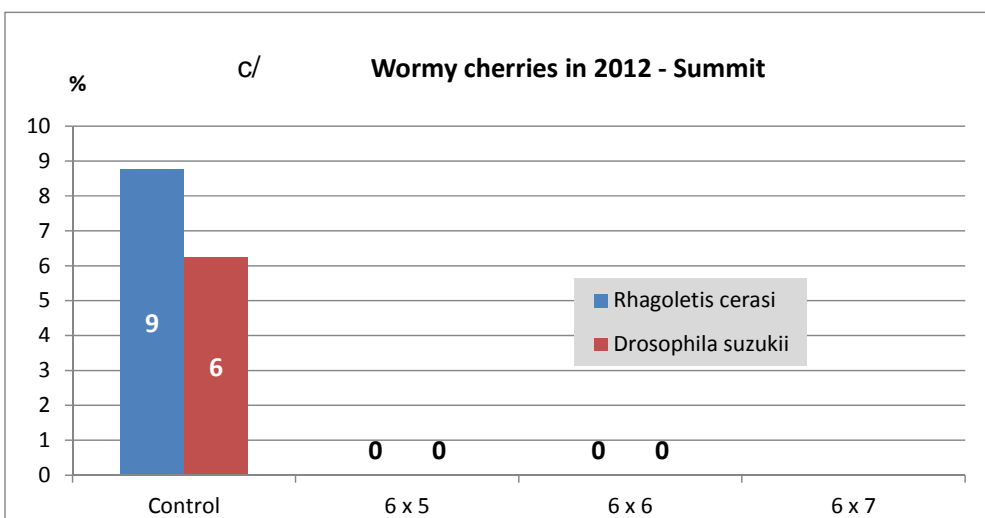
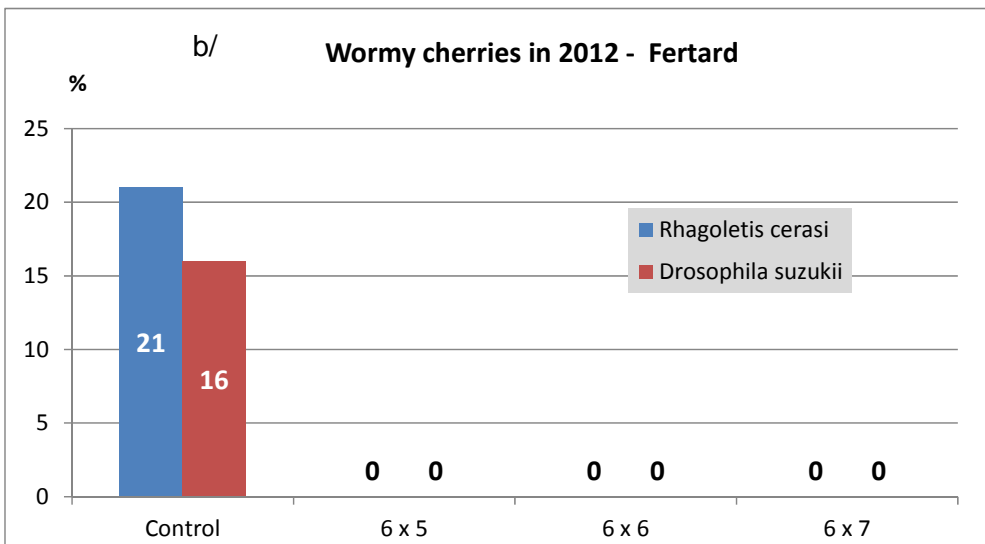
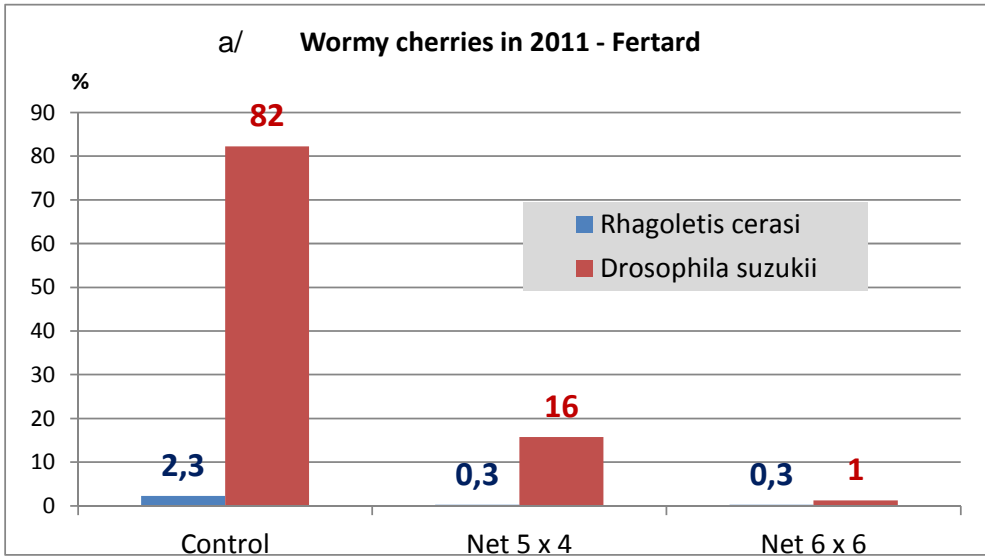


Figure 1: Test results netting in cherry orchard

In 2012, the row-by-row with protection covers presented only 3 % cracking against 28 % without protection.

Table 2: Example of installation costs for 2 rows (1000m²) with a producer in Apt (84).

		Amount	Cost (€)
Hardware	threads, structure		2600
	posts (18 € each)	1 per tree*	576
	backhoe	6 hours	240
Labor	establishment of structures (poles, ropes, son)	20 hours	360
	setting nets (3 people)	18 hours	324
	filleting (3 people)	6 hours	108
	training trees	7 hours	126
TOTAL			4334

* a post for 2 trees should suffice

** time estimated at 6 hours in total to unfold the nets from the 2nd year

Laboratory trials:

The results show that only the mesh of "6x9", 1.1 mm² (1.37mm x 0.81mm, or "6x9 mesh") completely prevents the passage of *D. suzukii* (Figure 2).

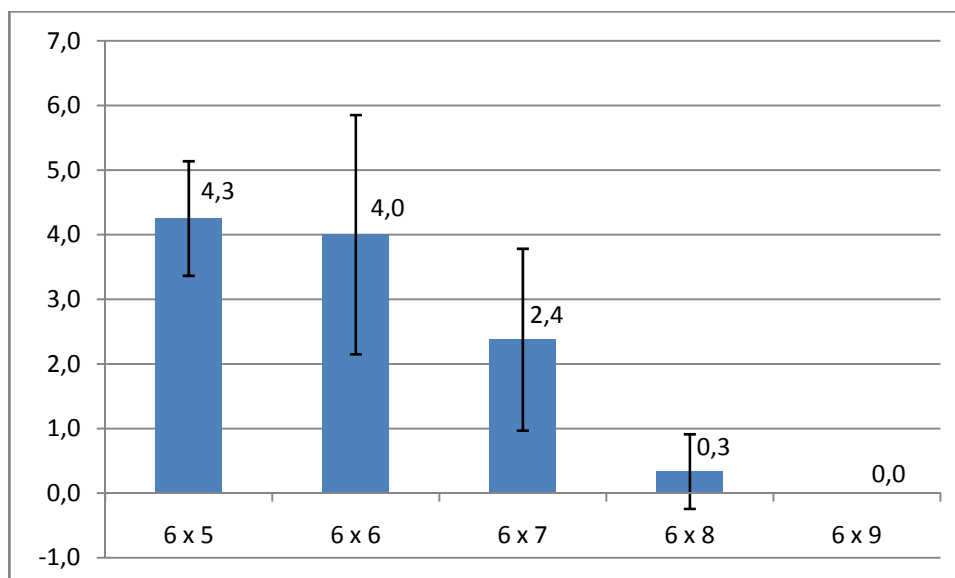


Figure 2: Number of *D. suzukii* out of 6 that passed through nets under laboratory conditions

Discussion

A mesh of 2.4 mm² (1.38mm x 1.71mm or "mesh 6x5") allows, in a cherry orchard protected tree by tree, limits the introduction of pests and therefore damage on fruit insects (*Rhagoletis cerasi*, *Drosophila suzukii*, wasps). But laboratory tests showed that only a mesh of 1.1 mm² (6x8) gives the guarantee of not having *D. suzukii*.

Row-by-row nets may be associated with a cover over it that will limit the cracking. The choice will also depend on the net price of the net but also its potential effects on climate (shading, limiting the breakdown of culture, heat retention). These nets can also be used to introduce auxiliary to fight against pests such as aphids. These features remain to be studied.