The Fruit.Net project (pome and stone fruit) in Catalonia (NE Spain)

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Abstract: The Fruit.Net Project has been carried out since 2009 on apple orchards in Girona and since 2011 on peach orchards in Lleida, both in Catalonia, Spain. The main objectives are to reduce chemical spraying by maximising the use of alternative methods, and to minimize residue content on fruits at harvest.

Strategies of pest and disease control were based on predictive models for apple scab and brown rot on peach, mating disruption for codling moth and oriental fruit moth, and mass trapping for Mediterranean fruit fly. These strategies required far fewer fungicide and insecticide sprayings and, at preharvest, fewer residues of active ingredients of pesticides were found in the Fruit.Net fruits compared with samples from orchards under standard management.

Key words: residue, minimising residues, fruit, apple, peach

Introduction

Catalonia is an important producer of fresh fruit. Currently, as in the major production areas of the world, fruit protection is based primarily on pesticide applications to control diseases and pests. The current requirements regarding fruit quality include tasting parameters and health considerations for consumers. Reducing the amount of spraying in the production process meets EU Directive 128/2009 with regard to reducing the risk of pesticides to human health and the environment and promoting integrated pest management and alternative methods to chemicals, and also allows consumers to enjoy residue-free fruit.

In this context, the Fruit.Net project was set up in 2010 by the Department of Agriculture of the Government of Catalonia (DAAM), the Institute for Food and Agricultural Research and Technology (IRTA), universities and the fruit sector. The main objectives of this project are to reduce the chemicals on fruit orchards by maximising the use of alternative methods and to reach harvest time with a minimum residue content.

Material and methods

The project has been carried out in two provinces of Catalonia, NE Spain. In Girona it began in 2009 with 21 common apple orchards (49.4 ha), and in Lleida it began in 2011 with 12 stone fruit (peach and nectarine) orchards (27.0 ha). Conventional orchards under standard management were used for comparison: 9 of apple (17.7 ha) and 12 of stone fruits (25.0 ha).

The Fruit.Net project consists of the use of plant protection strategies based on predictive models for the major pathogens (apple scab on apples with RIMpro and brown rot on stone fruits) and the use of non-chemical methods for insect pests such as mating disruption (codling moth, oriental fruit moth, twig peach borer and leopard moth) and mass trapping (Mediterranean fruit fly).

Apple

Fungicides were used only for apple scab primary infections if there were no symptoms after the ascospores release (about May 15), and only on a few cultivars for postharvest diseases. The decision to apply fungicides was taken on the basis of the RIMpro model, which uses ascospore captures with a Burkard vacuum pump and weather data from the official weather station to adjust the model to the local conditions. Insecticides were sprayed against pests if there were no alternative methods available (San José scale, rosy apple aphid) and also, where necessary, to reinforce the above-mentioned methods for the most important pests. Orchards were visited weekly to check traps and three field disease and pest evaluations were performed regularly throughout the season: at the end of ascospores release of apple scab, at the end of the second generation of codling moth, and at preharvest. A reference laboratory analysed the residues of the fruit samples.

Peach

On stone fruit, the Fruit.Net plant protection strategy is based on specific fungicides according to a prediction model for brown rot disease and on the use of the mating disruption method for oriental fruit moth and peach twig borer. Other pests (San José scale, green peach aphid and thrips) are sprayed chemically. This strategy was commercially validated on 7 nectarine and 5 peach orchards with the varieties ‘Big Top’ and ‘Merrill O’Henry’, respectively. Several field evaluations were performed during the growing season and at harvest time.

Results and discussion

Apple

In general, apple scab and powdery mildew disease control were similar in the two management systems (Fig. 1), with an average reduction of 24% in fungicide spraying in the Fruit.Net orchards.

Control of codling moth, one of the most important pests, was good in all orchards (Fig. 2). Populations of other pests such as aphids (rosy apple aphid, woolly apple aphid and green apple aphid) were variable and no great differences were found between Fruit.Net and standard orchards (Fig. 3), while European red mite and phytoseiid mites were present in both management systems and only a few orchards required a miticide spraying (Fig. 4). During the study period the Fruit.Net orchards received on average 37% fewer insecticide sprayings than the ones under standard management.

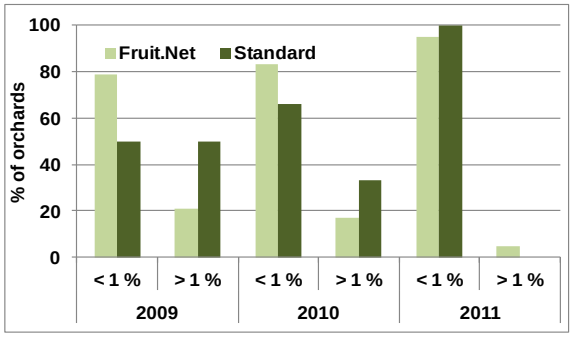

Figure 1. Percentage of orchards belonging to each category of apple scab–damaged fruit at harvest in the two management systems, Girona, 2009-11.

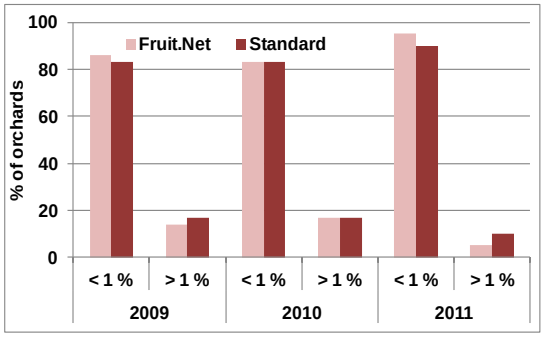

Figure 2. Percentage of orchards belonging to each category of codling moth–damaged fruit at harvest in the two management systems, Girona, 2009-11.

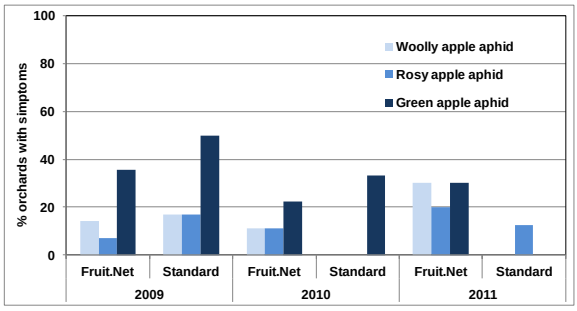

Figure 3. Percentage of orchards with aphid symptoms (woolly apple aphid, rosy apple aphid, green apple aphid), Girona, 2009-11.

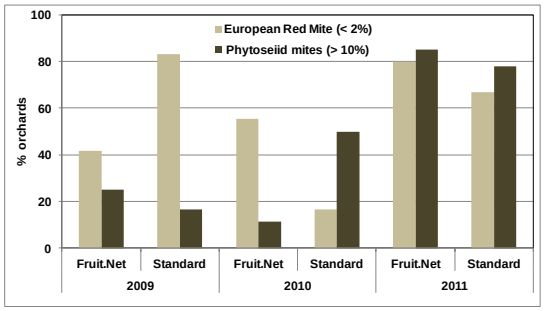

Figure 4. Percentage of orchards with low populations of European red mite (<2% of occupied leaves) and high populations of phytoseiid predatory mites (>10% of occupied leaves), Girona, 2009-11.

Peach

Results on peaches and nectarines in 2011 indicated that there were similar levels of incidence of pests and diseases in the Fruit.Net and standard management systems (Fig. 5). However, the average of fungicide and insecticide treatments carried out using the Fruit.Net strategy was reduced by around 25% and 43%, respectively, in comparison with a conventional plant protection strategy (Fig 6).

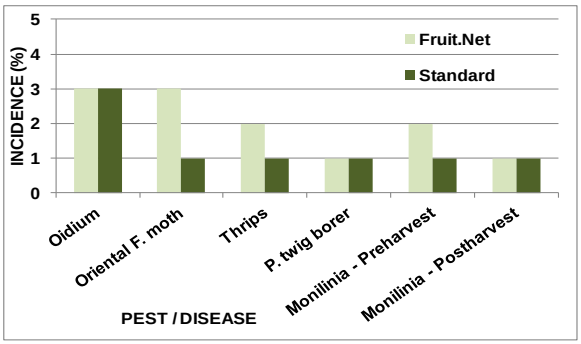

Figure 5. Incidence of pests and diseases in Merrill O'Henry orchards, Lleida, 2011.

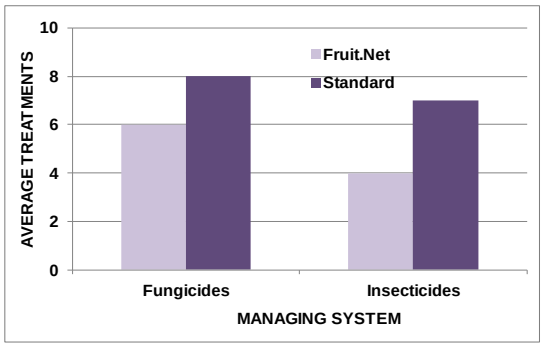

Figure 6. Average number of fungicide and insecticide sprayings, Lleida, 2011.

Residues on apple and peach

In all cases, the residues analysed on apple and peach/nectarine of the Fruit.Net samples were below the official maximum residue limits. No residues were found in most of them and, where some substances were found, Fruit.Net samples showed lower levels of residues and fewer active ingredients per sample than the standard ones (Fig. 7 and Fig. 8). In both Fruit.Net and standard samples there were fewer active ingredients than in the National Programme of Pesticide Surveillance of the Catalonia region.

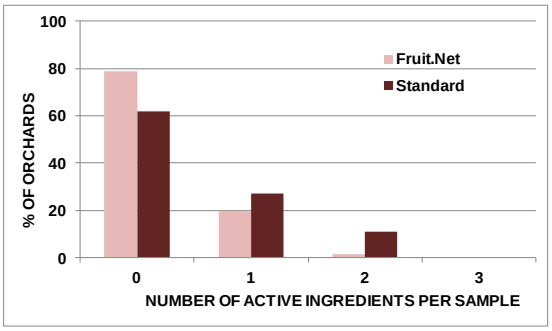

Figure 7. Distribution of apple orchards of the Fruit.Net project (at preharvest) according to the number of active ingredients found on fruit samples, Girona, 2009–11.

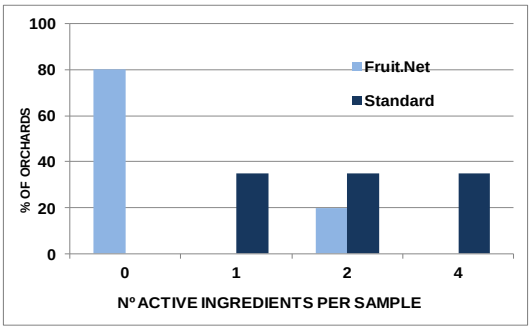

Figure 8. Distribution of O'Henry peach orchards of the Fruit.Net project (at preharvest) according to the number of active ingredients found on fruit samples, Lleida, 2011.

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