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## An innovative strategy to control codling moth: “ALT'CARPO” Concept

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### Abstract

A new device has been developed and tested on 30 hectares in 2007, to protect apples from codling moth *Cydia pomonella* damages. Different meshes, dates and strategies have been tested, and observations on various orchards give an outstanding efficacy with very few damages at harvest.

**Keywords:** codling moth, *Cydia pomonella*, net, physical control

### Introduction

Codling moth remains the most damaging pest on apples in southern France (Sauphanor, 2007).

The “Alt'carpo” concept was created and tested for the first time in 2005, then validated experimentally on 9 tests in 2006.

In 2007, it was set up to :

- assess the performance of this method for the first year of development in commercial orchards,
- make some targeted tests on some questions: behaviour of codling moth (CM) under nets, influence of the nets closing date and the damages caused, as well as the importance of the size of the net's mesh (Severac *et al.*, 2008).



“Alt'carpo” installed on apple trees

### Material and methods

About 60 acres (30 hectares) of apple orchards in southern France were enveloped in “Alt' carpo” nets. Most of those covered orchards, conducted in organic (2/3) and integrated (1/3), showed some important CM damages the previous year (between 3 and 40% according to plots).

For the trials shown below, observations were made at the end of every CM generation, as well as at picking time, on 1000 fruits per treatment, chosen randomly.

The closing of nets was generally done around April 20<sup>th</sup>, just before first egg layings. For technical reasons, some nets have been set up after this date, and one treatment with granulosis virus (GV) had to be applied just before.

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### 1) Effectiveness in 2007

Protection by the « Alt'carpo », was compared to a classical grower's plant protection programme :

- GV + Bt every 8 days for organic orchards,
- Synthetic insecticides every 10 days for conventional ones.

The net was the only protection against CM ; however, in case of a late set up of the net, some producers used GV at the beginning of season.

No untreated plot could be associated to the trial, because of a high level of CM risk.

The counting of all the covered orchards (around 3000 m<sup>2</sup> each) at the end of each generation of CM was done.

### 2) Influence of the net's set up date.

The orchards were protected with "Alt'carpo" (only protection against CM) ; 3 orchards have been observed, per date :

- *date 1* : nets set up at the right time.
- *date 2* : nets set up the month following the right date, with an additional GV treatment.
- *date 3* : nets set up more than a month after the right date, with one or two additional GV treatments.

### 3) Influence of net's mesh :

Alt'carpo "4\*4" (ie 2,2 x 5,4 mm) was compared to a classical hail net (3 x 7,4 mm).

## Results

### 1) efficacy in 2007 : 99.94%

We compared the protection with simple nets to growers protection strategies. Evaluation led to the conclusion that nets provide a much better protection against CM damages than treatments, either in organic or integrated production (IP). IP suffered 11% damages, probably because of an acquired resistance to registered pesticides.

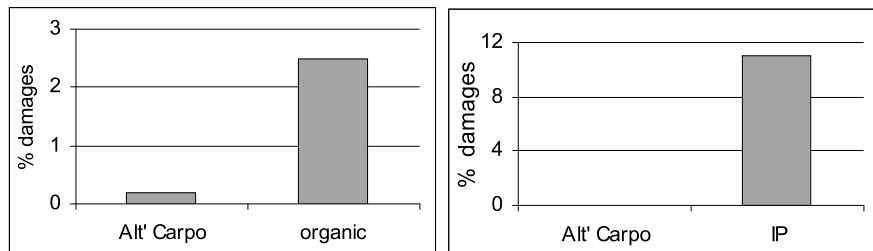


Figure 1 : efficacy of protection with net compared to organic or integrated production

The development of the technique in 2007 allowed a global overview of the method suitability on 15 different orchards. Figure 2 shows the damage rate at harvest, and the number of orchards with such damages. It shows that on a total of 15 orchards controlled, 10 had no damages on 1000 fruits checked on each, at harvest. Only one orchard got up to 3‰ damages.

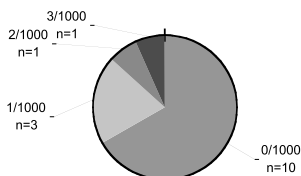


Figure 2 : efficacy of « Alt' Carpo » at harvest 2007, number of orchards per damage rate (‰)

### 2) influence of net's set up date

It seems like GV treatments shall be done in any case, if nets are set up at the right time, or later (for thinning reasons for example). Light damages can be observed at the end of first generation, but bites are generally getting dry and negligible.

Proportion of bites is proportional to the time needed to set up the net. At the end of Generation 1, no new bites has appeared. At the end of G2 and G3, only old and dry bites could still be found.

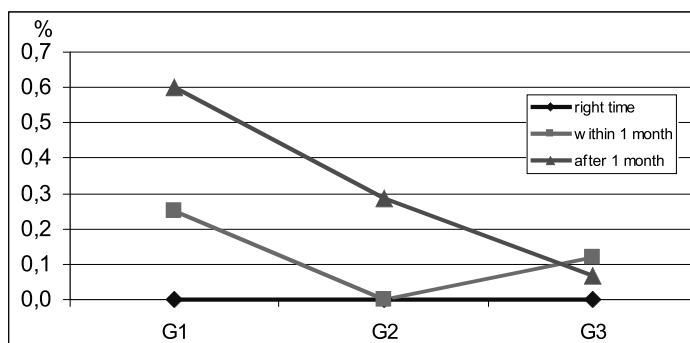


Figure 3 : Influence of set up date on CM damages under net

### 3) influence of net's mesh

No difference was found in 2006 between both meshes.

In 2007, a trial on a big plot was carried out, on Granny Smith, with a high 2006 pressure (40%) and a low 2007 bearing.

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 Hail net (with bigger mesh) seemed to compress trees under, and possibly led to more egg layings through the net. Its efficacy was therefore lower, with regular damages throughout the season, on fruits in direct touch with the net, or with neighbouring leaves touching the net.

Results obtained (figure 4) with hail net remain very satisfying with 2% of damaged fruits at harvest, but this result is still below the optimum.

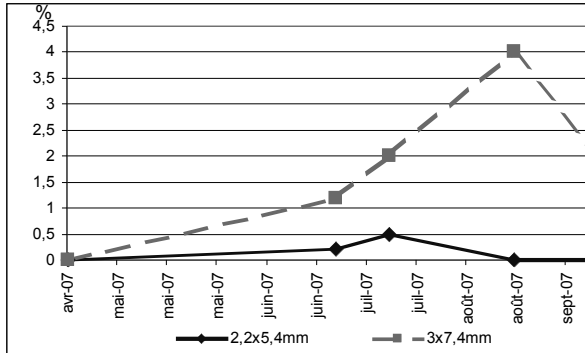


Figure 4 : Influence of net's mesh on CM damages

The fruits protected by the other net (smaller mesh) suffered from no CM damages.

## Conclusion

Withdrawal of some insecticides, climate change favouring pests, resistance encountered to more and more molecules (including GV), restricting legislation on treatments and residues, poor efficacy of natural alternatives such as mating disruption, lead to major difficulties for growers.

In such a context, we assume "Alt'carpo" strategy provide a relevant and successful alternative to growers. Results obtained in commercial orchards on various situations confirm the first preliminary trials carried out since 2005.

The results gathered in 2007 give additional information to propose a more accurate protection strategy.

## References

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