Integrated Pest Management of Pome Fruits in Cyprus

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Abstract

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An Integrated Pest Management Programme of pome fruits was introduced nearly 15 years ago in Cyprus. After establishing an effective monitoring programme for Codling Moth using pheromone traps, it was possible to reduce by 50% the number of chemical treatments. At the same time more selective and less destructive to the environment pesticides have been suggested. Based on the same principles an effective schedule was also recommended for other pome fruit pests such as: *Hoplocampa brevis, Psylla pyri, Eriosoma lanigerum, Ceratitis capitata* and *Mites.*

Introduction

The total cultivated area of Pome fruits in Cyprus is 1,200 ha. The fruit production fluctuates between 8-10,000 mt and their value is about 10$ million. For a period of more than twenty years (1960-1980), the spraying schedule against pome fruit pests was based on regular time intervals, according to the residual activity of the pesticide. The side effects of this programme such as, outbreaks of new pests, pest resistance residue problems, and the high risk of poisoning during the spraying process, were realized and the Integrated Pest Management (IPM) approach was suggested as the most sensible way to overcome such problems (4, 12, 16, 19).

The objectives, therefore, of the recommended Integrated Pest Management programme for pome fruits in Cyprus were:

- To reduce insecticidal applications
- To use selective chemicals as much as possible
- To restore natural enemies
- To reduce production costs

Despite the fact that not all the information needed to implement an IPM programme was available, a start was made and after ten years of experience the following approach, which must be considered flexible, was adopted for the most serious pests occurring on pome fruits in Cyprus.

1. Codling Moth (*Carpocapsa pomonella*)

The warm climate of Cyprus during the summer months, favours the breeding of Codling moth. It is estimated that there are 3-4 generations per year according to the locality. The yield losses may reach up to 80% if the right control measures were not implemented.

Codling Moth being the key pest of pome fruits received most of the attention when designing the control programme. In an effort to modify the traditional spraying programme, and reduce the number of treatments, a monitoring programme by using pheromones was initiated. The pheromone traps were installed early in April in all major fruit producing villages. Moth catches were recorded at weekly intervals. Subsequently a graphic presentation of these records show the moth activity throughout the season (Fig. 1a, b). Soon after the first moth catches in April the day degrees are estimated by using a maximum and minimum thermometer. When 125-145 day degrees are recorded then the message for the first treatment is passed to the farmers, through radio and announcements in the village. The day degrees is based on a lower temperature threshold of 11°C. Chemical treatments are also based on the following therholds that have been suggested by the University of California (17) according to the number of moth catches in pheromone traps.

Thresholds for chemical management

Trap catches	Population levels	Comments
1) 8-10 moths/trap/week	High population	Requires heavy insecticide use
2) 3-8 moths/trap/week	Medium population	Sprays should be applied accurately for each generation
3) 2 moths/trap/week	Low population	Sprays are sometimes necessary

Trap catches may be affected by the type of trap, tree size, trap density, trap placement, brand of pheromone, wind speed and temperature. The recommended spraying programme against codling moth is the following:

a) **First treatment with Azinphos methyl.** This chemical is still one of the most widely used pesticide against Codling moth. Its use early in the season, end of May, does not cause serious detrimental effect on natural enemies. Other pesticides that are recommended in the following chemical treatments are not excluded for use as a first treatment.

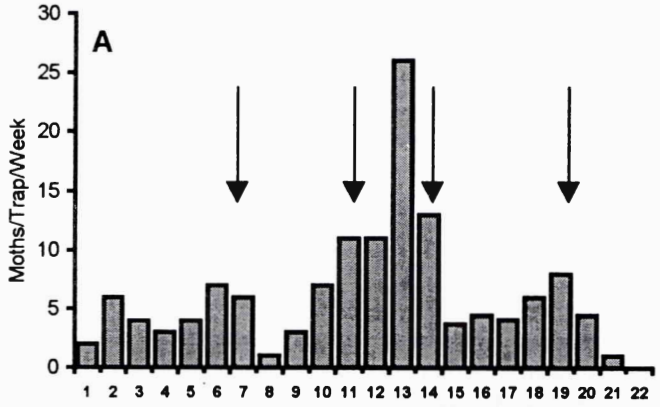
b) **Second and third chemical treatment.** Insect Growth Regulators (IGR) such as Diflubenzuron (Dimilin), Triflumuron (Alsystin) Flufenoxuron (Cascade) and fenoxycarb (Insegar) are recommended. More IGR were registered for Codling Moth recently, and are under consideration, such as lufenuron (Match) hexaflumuron (Consult) ethophenprox (Trebon) and Diofenolan (Aware).

As it is shown in Figure la the treatments are conducted at approximately one moth interval which is the generation time.

For the Fourth treatment which is usually applied in September, again the IGR's are preferable, but in certain occasions during picking period, there is the risk of having infestation from Medfly. If this is the case other chemicals may be considered.

During the last decade a lot of research work has been in progress with mating disruption, which is going to be one step

forward in Integrated Pest Management of pome fruits. The results received so far are very encouraging (9, 10, 15, 18, 20). Furthermore, another tool in the Codling Moth control may be available very soon, the technique of Attract and kill, which combines the sexual pheromone with an insecticide (7, Novartis). The above mentioned approaches for Codling Moth control are certainly much more friendly to the environment, than the approach followed twenty years ago, and are expected to be adopted by the majority of farmers in Cyprus.



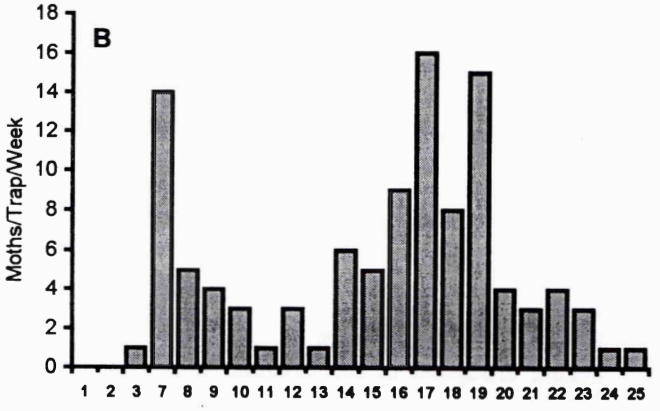


Figure 1. (A) Catches of codling moth pheromone traps, Palechori Village 1994 (Arrows represent time of treatment). (B) Caches of codling moths in pheromone traps, Kyperounda Village 1994.

2. Pear psylla (*Psylla pyri*)

Pear psylla causes three types of damage:

a) Defoliation of vegetative growth, when there is heavy psylla infestation.
b) Loss of quality in fruits as a results of the sooty mold development on honeydew excretion of the nymphal stage of the pest.
c) It transmits the pear decline virus (8).

For an effective spraying programme of pear psylla, dormant sprays are recommended, because the adult at this stage are more easily exposed to the treatment. The second and most crucial stage at which treatments should be applied, if the first dormant spray failed to do the job, is before blooming, when the adults start laying eggs. Selective chemicals such as Fenoxycarb (Insegar), when applied at this stage is very active on egg stage and beneficial insects are not (11, 14).

3. Pear Sawfly (*Hoplocampa brevis*)

Pear sawfly may cause serious damage on newly formed pears. Monitoring is again essential for an effective control. White sticky traps are used for this purpose, which are placed one or two weeks before blooming. Four traps per hectare are recommended. A total catch of 100-120 insects is considered as threshold for chemical treatment. Fluvalinate or thiocyclam hydrogen oxalate (Evisect) proved to be effective (2, 6).

4. Apple wooly aphid (*Eriosoma lanigerum*)

Outbreaks of Apple Wooly Aphid may occur in orchards, where there has been an intensive spraying programme. In Cyprus it has been well demonstrated that this pest can be kept under permanent biological control if the parasite *Aphelinus mali* is preserved.

5. Medfly (*Ceratits capitata*)

Although most of the pome fruits are grown in mountainous areas, where temperatures are not favouring quick breeding of Medfly, occasionally severe losses may occur if a good monitoring programme is not available. This pest not only infests pome fruits pests, but, other deciduous fruits as well. Monitoring of Medfly is possible by using trimedlure as attractant. The threshold for treatment is one fly per trap per day. There are two approaches to tackle the Medfly problem. The first and most effective is to control the pest on a collective basis and cover a big area of treatment in a short period of time. The control is based on bait treatment by a usual mixture of Malathion 0.25 kg ULV and 0.75 kg Hydrolized protein per ha (13). The second approach, if the first was not possible, is when the farmers have to treat separately. Again regular bait treatment may solve the problem or full coverage sprays with one of the less toxic materials available (e.g. pyrethroids or malathion) because treatment against this pest are conducted, when fruits are close to harvest. Spinosad is a new promising product, against Medfly (1).

6. Mites

The mite species reported on pome fruits in Cyprus are the following (5):

- *Bryobia praetiosa*
- *Genopalpus pulcher*
- *Eotetranychus pruni*
- *Eviophyes pyri*
- *Tetranychus telarius*
- *Tydeus* sp.

Among the mite species, two of them *Bryobia praetiosa* and *Tetranychus telarius* are the most destructive, especially

during July and August. Again a control programme should be based on a permanent monitoring programme. Four mites per leaf on apples and one mite per leaf on pears is considered as a threshold for initiating the chemical treatment (3). The availability of new novel acaricides such as flufenoxuron (Cascade), Clofentezine (Apollo), hexythiazox (Nissorun), Fenazaguin, Abamectin, have made it possible to make progress in mite control.

7. Other pests of minor economic importance

1. *Zeuzera pyrina*
2. *Lyonetia clerkella*
3. *Parlatoria oleae*
4. *Stephanitis pyri*

The IPM philosophy is widely accepted, but its adoption is still far from complete. The reported programme of control on pome fruits in Cyprus is not finalized, it is flexible and need further improvements which can be implemented step by step. The well informed and motivated grower, together with his consultant, will remain the basis for IPM.

الملخص

كرامبياس، أ. 1998. المكافحة المتكاملة لأشجار التفاحيات في قبرص. مجلة وقاية النبات العربية. 16(1): 49-51.

أدخل برنامج المكافحة المتكاملة لأشجار التفاحيات في قبرص منذ حوالي 15 سنة. بعد استخدام برنامج متابعة ذو كفاءة عالية لدودة ثمار التفاح باستعمال مصائد فيرمونية، أمكن تقليل عدد الرشات حوالي 50%. في نفس الوقت استعملت مبيدات اختيارية وذات تأثيرات خفيفة على البيئة. وبناء على نفس الأسس تم اقتراح برنامج لمكافحة آفات التفاحيات الأخرى مثل: *Eriosoma lanigerum*، *Psylla pyri*، *Holocampa brevis*، *Ceratitis capitata* وأنواع الحلم.

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