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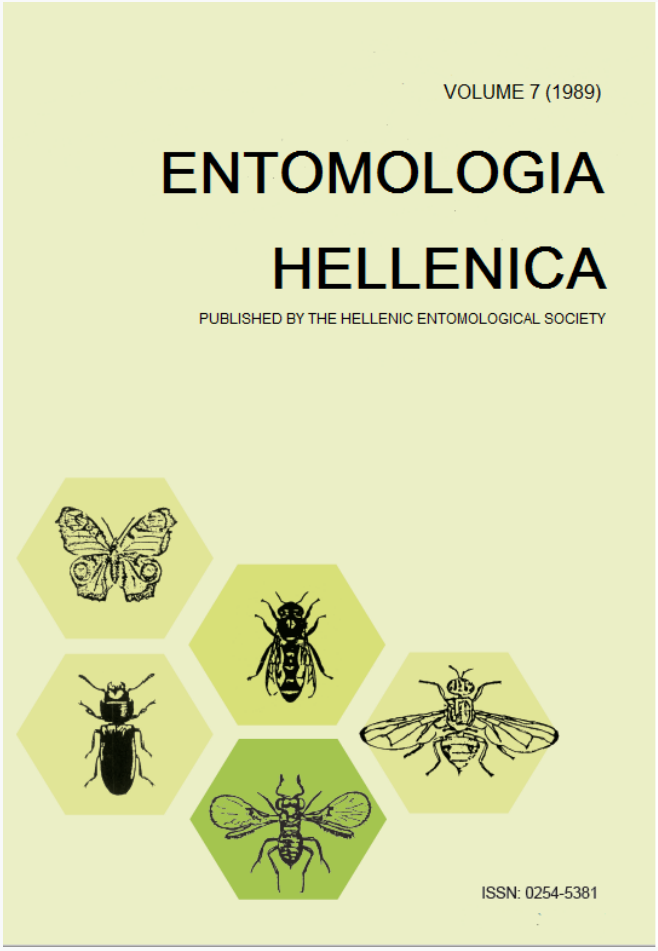

Control of Cydia molesta (Busck) by mating disruption using Isomate-M pheromone dispensers in Northern Greece

D. S. Kyparissoudas

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Control of *Cydia molesta* (Busck) by Mating Disruption Using Isomate-M Pheromone Dispensers in Northern Greece[1]

D. S. KYPARISSOUDAS

Regional Centre of Plant Protection and Quality Control, GR-546 26 Thessaloniki, Greece

ABSTRACT

Trials were carried out in 1986 and 1987 with the mating disruption method for the control of oriental fruit moth *(Cydia molesta* Busck) in peaches of Northern Greece. One or two applications during April-September of the synthetic pheromone Isomate-M, at a rate of 1,000 units per ha, resulted in a 100% prevention of captures in pheromone traps in all trials, with fruit damage ranging from 0.1-2.0%. Damage in the conventionally sprayed treatments was 0.3-2.4% while infestation in the unsprayed plots reached 6-17%. The encouraging results, especially when taking into account the relatively small size of the orchards, opens opportunities for the integrated control of this peach insect pest under the conditions of Northern Greece.

Introduction

The oriental fruit moth (OFM), *Cydia molesta* (Lepidoptera: Tortricidae), is one of the key pests in peach orchards of Central and Western Macedonia (Northern Greece), and regular insecticide sprays are applied against this pest. The possibility of controlling OFM with sex pheromones by the mating disruption method has been undertaken by several researchers in the past (Gentry et al. 1975, Rothschild 1975, Cardé et al. 1977, Charlton and Cardé 1981). There has now been documented a number of examples where the mating disruption method could be soon introduced in practice for the control of insect species (Audemard 1984, Vickers et al. 1985, Audemard and Leblon 1987, and Rice 1987). Further, Charmillot (1986) reported that this method has been used in half of the commercial peach orchards in Australia.

This study collates and analyses the results of trials, using the Isomate-M synthetic sex pheromone formulation, to control OFM by mating disruption method in peach orchards of Northern Greece.

Materials and Methods

During 1986 and 1987 three mating disruption trials (designated as trials 1, 2, 3) were conducted. These trials involved one 0.25 ha and two 0.5 ha commercial peach orchards in Northern Greece, treated with Isomate-M pheromone dispensers. These dispensers consist of a semi-permeable hollow polyethylene tube 1 mm in diameter, 20 cm long, and sealed at both ends. Imbedded into one side of the tube is a thin aluminium wire to facilitate tying the dispensers onto tree limbs or twigs. Dispensers, each containing 75.25 mg of pheromone (93% Z-8-DDA, 6% E-8-DDA, 1% Z-8-DDOL), were placed in the trial orchards in late March, prior to the first moth captures on the pheromone traps (Kyparissoudas 1988), and again in late June at the rate of 1,000 per ha. Dispensers were tied around young branches at a height varying from 1.5 m for short trees up to 2.0 m plus for taller trees. Each treated orchard was compared with equal size control orchards using a conventional insecticide program in the same locality. Treatments and control orchards of each trial were separated by a minimum of 80-100 m (Rothschild 1975).

The effects of Isomate-M, i.e. the dispruption of the male insects' orientation system, were moni-

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tored using the following techniques:

a. Pheromone traps. At each experimental orchard two or three Pherocon I-C pheromone traps (Zoecon Palo Alto, California) for monitoring male insects were placed 1.8-2.0 m above the ground in the north-east side of the trees (Rice et al. 1982). Each trap contained a pheromone dispenser (Zoecon's). Trap catches were recorded 2 times each week and dispensers were replaced every 4 weeks. The same number of traps were placed in corresponding control orchards.

b. Fruit damage at harvest. A sample of 500 or 1,000 fruits assessed at harvest for OFM infestation.

Experiments 1986. Two trials (1, 2) were carried out in the region of Velvendos. In site 1 the orchard was 0.5 ha and contained the peach variety Redhaven which was harvested on 14 July. It was surrounded on 3 sides by wild vegetation and a small area of cereal crop. On the fourth side there was a road with cereals and a block of peaches approximately 60 meters away. Trees were planted at rate of 50 per 0.1 ha. Two applications of Isomate-M were made; the first in late March and a second at the end of June using two dispensers per tree. The trial site 2, orchard of 0.25 ha, contained the peach variety Junegold harvested at 28 June. It was situated immediately across the road from the Co-op store-rooms/packing. Two other sides were flanked by wild vegetation, while the fourth had a small plot of peaches of 0.04 ha. Trees were also planted at a rate of 50 per 0.1 ha. Only one application of Isomate-M was made in late March. The trials (1, 2) received no chemical treatments during the season. A treatment of Endosulfan was applied (trial 2) at post bloom (29 March) in an attempt to prevent a build-up of peach twig borer (PTB), *Anarsia lineatella* Zeller.

Control orchards contained peaches of Redhaven (site 1) and Junegold (site 2) varieties harvested at a similar to the above time. During the season, in site 1 five applications (28.4, 16.5, 5.6 with Guzathion 25 WP and 5.7 with Sevin) were made, while in site 2 four applications (28.4, 16.5, 5.6 with Guzathion 25 WP and 20.6 with Sevin) were made against OFM and PTB. Sprays were timed using the warning service advice. In both control orchards, a block of 25 trees, about 0.05 ha in size, were left unsprayed.

In all pheromone treated and control orchards the flights of PTB were also monitored, with pheromone traps at a rate of 4 per ha, because this insect has become a major problem in peaches of Northern Greece (Kyparissoudas 1986).

Experiments 1987. Only one trial (3) was carried out in the region of Naousa. The trial orchard, 0.5 ha, contained the peach variety Junegold which was harvested on 5 July. It was surrounded on 3 sides by apple orchards and on the fourth side there was a road with cereals. Trees were planted at a rate of 80 per 0.1 ha. Only one application of Isomate-M was made at the end of March.

The control orchard, 0.4 ha in size, contained the same peach variety. During the season, four treatments were made (30.4, 15.5, 1.6 and 20.6) using Gusathion 25 WP. A block of 40 trees, about 0.05 ha in size, was left unsprayed. This enabled information on the actual level of DFM and PTB infestation.

Results and Discussion

The pattern of pheromone trap catches of OFM in the two areas is shown in Fig. 1. It is seen that in the control orchards, the spring emergence flight extends from early April to late May, while males of the first generation appeared from early June to mid July. Comparisons of the total catch in the first two flights in the Isomate-M treated and control orchards indicated that 100% male disruption, in terms of male captures in pheromone traps, had oc-

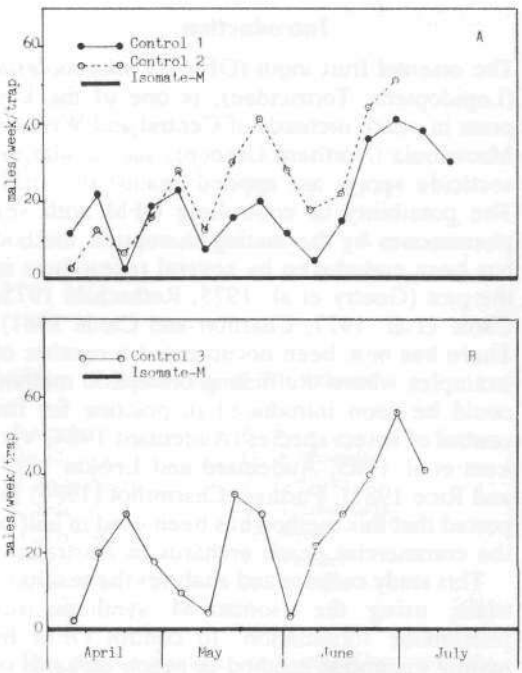

FIG. 1. Weekly catches of OFM males on pheromone traps in Isomate-M treated and control orchards. A=Velvendos, 1986; B=Naousa, 1987.

curred in the treated orchards (Fig. 1 and Table 1).

The effect of Isomate-M treatments on OFM fruit infestations at harvest were quite encouraging. In all trials, OFM damaged fruits in the Isomate-M treatments were equal to or lower than in the insecticide or untreated controls, and ranged between 0.1-2% (Table 1). In the conventionally sprayed orchards the damage was 0.3-2.4%, while in the unsprayed blocks the infestation was 6-17%.

The information available from the two locations indicated that Isomate-M had worked very well for the control of OFM during 1986 and 1987. These data are in agreement with those of Rice (1987), who used Isomate-M for the control of OFM in California. Further, in trials 2 and 3 the Isomate-M dispensers gave a continuous control of OFM within the orchards for a period of 3 months (April-June). It appears that one application of Isomate-M prior to the first moth emergence, may be used for the control of the first two generations of OFM in peach orchards which contain varieties that are harvested until early-July.

A major problem was the presence of *A. lineatella* which caused considerable damage at peach harvest in the two test areas. Fruit damage from PTB was in all cases much higher in the Isomate-M treated plots, because of no in-season sprays for OFM control, and ranged between 7.4-19.4%, while in the conventionally sprayed plots the damage was 0.8-2.0% (Table 1). Further, in trial 2, treated with Isomate-M, the post bloom insecticide treatment recommended against PTB was ineffective. This pest occupies a similar niche with OFM, and with moth flights closely synchronized to those of OFM after May (Figs. 1 and 2). Therefore, the development of a pheromone control for PTB as well as OFM would offer the ideal solution. The encouraging results of Audemard and Leblon (1986) have opened opportunities towards reaching this goal. Until then, Isomate-M can be used in an integrated program, i.e. until the end of May to replace two sprays for varieties which are harvested till early July, followed by

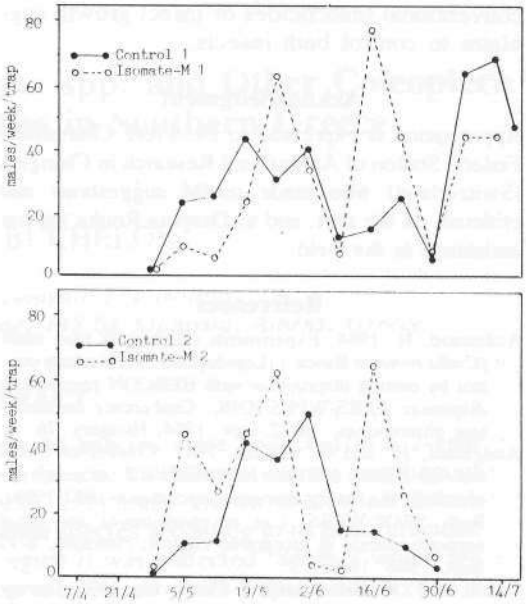

FIG. 2. Weekly catches of PTB males on pheromone traps in Isomate-M and control orchards, Velvendos, 1986.

TABLE 1. Efficacy of Isomate-M treatments for mating disruption and control of oriental fruit moth in Northern Greece, 1986 and 1987.

Year	Location	Trial	Treatment	Pheromone trap	% infested fruits	
					OFM	PTB
1986	Velvendos	1	Isomate-M	0	2.0	19.4
			Control	365	2.4	2.0
			Unsprayed*	–	17.0	19.2
		2	Isomate-M	0	0.6	12.0**
			Control	295	1.2	0.8**
			Unsprayed*	–	10.0	11.6
1987	Naousa	3	Isomate-M	0	0.1	6.2
			Control	340	0.3	1.0
			Unsprayed*	–	6.0	7.4

* Included in the control treatments.
** Sprayed with Endosulfan at post-bloom (29.3.86).

conventional insecticides or insect growth regulator to control both insects.

Acknowledgment

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KEY WORDS: *Cydia molesta,* Isomate-M, Mating disruption

Καταπολέμηση του Εντόμου *Cydia molesta* (Busck) με τη Συνθετική Φερομόνη Isomate-M σε Οπωρώνες Ροδακινιάς της Βόρειας Ελλάδας

Δ. Σ. ΚΥΠΑΡΙΣΣΟΥΔΑΣ

Περιφερειακό Κέντρο Προστασίας Φυτών & Ποιοτικού Ελέγχου, Τ.Θ. 145 16, 546 26 Θεσσαλονίκη

ΠΕΡΙΛΗΨΗ

Το 1986 και 1987 διενεργήθηκαν δοκιμές για την καταπολέμηση της καρποκάψας της ροδακινιάς (*Cydia molesta* Busck) σε ροδακινεώνες της Β. Ελλάδας με τη μέθοδο παρεμπόδισης της συνάντησης των δύο φύλων ή σύγχυσης του αρσενικού. Χρησιμοποιήθηκε η συνθετική φερομόνη Isomate-M στη δόση 7,525 g ανά στρέμμα και εφαρμογή. Με μία ή δύο εφαρμογές ανά περίοδο (Απρίλιο-Σεπτέμβριο), η παρεμπόδιση των συλλήψεων στις φερομονικές παγίδες, σε όλες τις δοκιμές, ήταν του επιπέδου 100%, ενώ η προσβολή στους καρπούς κυμάνθηκε μεταξύ 0,1-2,0%, έναντι 0,3-2,4% των αντίστοιχων ψεκαζόμενων οπωρώνων. Σε τμήματα των ψεκαζόμενων οπωρώνων που χρησιμοποιήθηκαν ως μάρτυρες, η προσβολή στους καρπούς κυμάνθηκε από 6-17%. Τα ενθαρρυντικά αυτά αποτελέσματα και μάλιστα σε σχετικά μικρούς από απόψεως μεγέθους οπωρώνες, φαίνεται να ανοίγουν νέες προοπτικές για την αντιμετώπιση του επιζήμιου αυτού εχθρού των ροδακίνων με βιολογικά μέσα, στις συνθήκες της Β. Ελλάδας.