

**PHENOLOGY OF THE MEDITERRANEAN FRUIT FLY,  
*CERATITIS CAPITATA* WIEDEMANN IN CRETE**

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**ABSTRACT**

The Mediterranean fruit fly appears in the citrus orchards of Crete, around May each year, and lasts up to December. Various traps were used to study the phenology of this insect. The vertical yellow, plastic or wooden traps, the triangular trap and the McPhail glass trap were tested in combination with different baits: Capilure, Trimedlure and ammonium. The highest attractivity was shown by the triangular trap combined with Trimedlure or Capilure. The medfly catches in the least attractive ammonium McPhail traps were very small and started in May. They showed a maximum of about eight adults per trap around the middle of July until August, while they decreased towards the beginning of September. The yellow triangular traps baited with Capilure or Trimedlure showed a much higher attractivity with peaks of about 250 and 400 males per trap, respectively, during July-August. The insect population increased since the end of September and lasted up to the end of December, with a second peak around October-November.

**KEY WORDS:** *Ceratitis capitata*, phenology, traps, attractivity, Crete, Greece.

**INTRODUCTION**

The Mediterranean fruit fly infests more than 250 host species and is a serious pest of fruits, nuts, and vegetables. In Crete it damages citrus, which is an important crop of the island, as well as fig, apple, pear, apricot and peach. However, the damage to citrus in Crete is small, because the air bait applications against the olive fly also reduce the medfly population in citrus groves adjacent to olive orchards. These air treatments are known to have a detrimental effect on the environment and on the biological balance, and there is a tendency for their reduction. It is expected, therefore, that the medfly problem will increase following restriction of the air treatments and also because of the planting of new varieties of citrus and other tree crops which are more sensitive to the attack of the medfly.

This paper presents the results of a study on the phenology of the adult medfly on citrus in Crete.

**MATERIALS AND METHODS**

In order to study the phenology of the adult medfly population, four types of traps and three types of lures were used during the period 1986-88: the McPhail glass trap, the triangular yellow "Southampton" type trap with a sticky base of about 20 x 20 cm and two vertical sticky plates of about 20 x 15 cm, one wooden of brown colour and the other plastic of yellow colour. The lures used in these traps were Trimedlure and Capilure. In the McPhail trap an ammonium phosphate solution in 2% water was used. Trimedlure and Capilure were used in amounts of 1 g per trap in dental cotton sticks and were renewed every 15 days. The ammonium solution in the McPhail traps was renewed every week.

Towards the end of the period a new type of trap was also tested. This trap, named P.M.C., is made of a yellow plastic bottle containing about 650 cm<sup>3</sup> of lure with 35 g Lannate (Methomyl) and 80 g ammonium sulfate and is hung upside down on the trees. Drops of the lure, which evaporate afterwards, are absorbed by a sponge in a horizontal disc (about 11 cm diameter).

Five traps of each type were placed in the citrus orchard of the Institute of Subtropical Plants and Olive Tree in Agrokipo near Chania. The orchard contains about 400 different citrus cultivars. The traps were checked weekly and the trapped adults were counted and sexed.

### RESULTS AND DISCUSSION

It was observed that male captures start mainly at the end of May, but a few captures occur sometimes during April. The captures fluctuated in the different years. In 1986 (Fig. 1) the medfly captures started during May and the maximum was around June–July. The captures dropped during August until the middle of September and then a second smaller peak was observed during September–October, while the declining captures lasted up to the middle of December. In 1987 (Fig. 2) the adult captures started later, that is during June, while the peak of the captures appeared during August. The population dropped in September and a new increase of the adult numbers was observed between the beginning of October and the end of December. The population found during the autumn of 1987 was higher than that observed in 1986 and was high until almost the end of December, probably due to the favorable weather conditions of that period.

Comparing the attractiveness of the traps baited with different lures on male captures (Table 1), it is obvious that the triangular yellow trap baited with Trimedlure or Capilure gives the highest number of adult catches while lower captures are shown by the McPhail glass trap baited with ammonium salt. Among the yellow and the wooden vertical traps, the ones with yellow colour trapped more than the others, but the differences are not statistically significant. The P.M.C. yellow bottle trap trapped more adults than the vertical wooden or yellow traps but less than the triangular traps, especially if both sexes of the medfly adults are considered (Table 2). The phenology of the adult medfly population observed in these experiments is similar to the phenology observed in Sicily (Benfatto and Longo, 1983) with peaks of medfly captures in summer and in autumn. The peaks of the medfly population coincide with the peaks of the olive fly population in Crete. This is the reason why the medfly population is up to now kept low because of the air treatments against the olive fly. The Trimedlure used in combination with yellow traps is a very attractive lure. This is a specific blend of the tert-butyl esters of 4- and 5-chloro-2-methyl cyclohexane carboxylic acids. It attracts exclusively the males and is now commercially available. Due to its high selectivity Trimedlure is used worldwide as a standard attractant. The captures in these traps, however, do not reflect the actual insect population fluctuations in the field because the trapping efficiency is very much influenced by climatic conditions (Delrio, 1984; Delrio and

TABLE 1  
Mean numbers of adult males of *C. capitata* caught per trap per week on citrus in Crete during 1988

Type of trap and lure	June	July	August	September	October	November	December
Vertical yellow + Capilure	0.1	30.5	141bc	13.8	42.2b	19.2b	5.4ac
Vertical yellow + Trimedlure	0.7	29.5	136.1bd	7.4	14.4b	20.8b	4.3c
Vertical wooden + Capilure	0.5	44.5	110.3cde	7.8	25.6b	24.4b	4.5c
Vertical wooden + Trimedlure	4.8	6.9	42.1e	9.6	17.6b	19.8b	5.0cb
Triangular yellow + Capilure	0.0	15.8	194.5ab	17.4	74.6a	117.3a	42.8a
Triangular yellow + Trimedlure	2.3	12.9	230.1a	12.3	75.7a	118.8a	41.3ab
McPhail glass + ammonium	1.0	0.5	5.2f	1.7	3.6c	4.2c	0.9c

Means of each column followed by the same letter are not significantly different (Duncan 0.05).

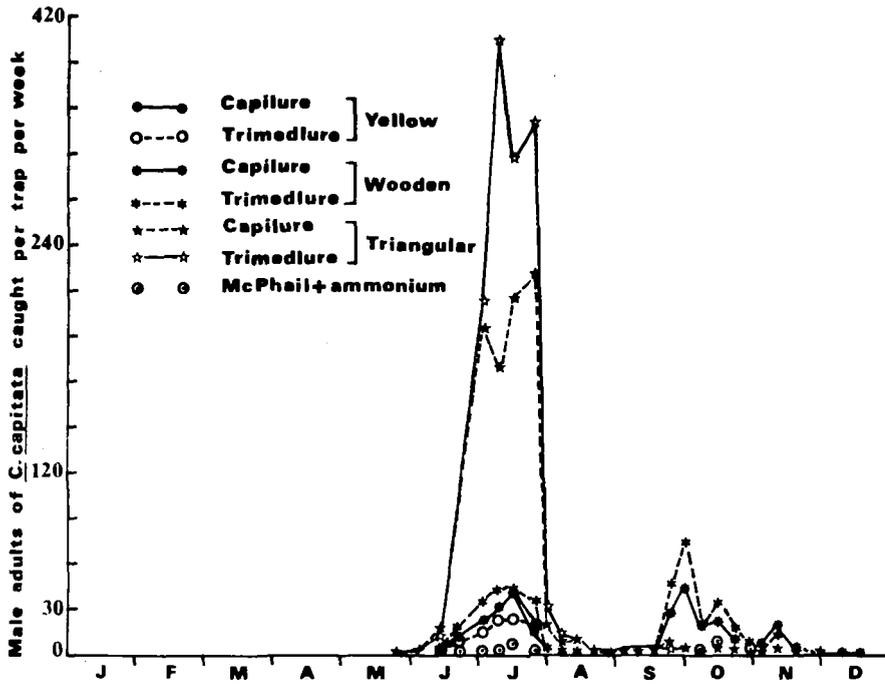


Fig. 1. The phenology of the medfly male population in 1986 using different traps on citrus in Crete.

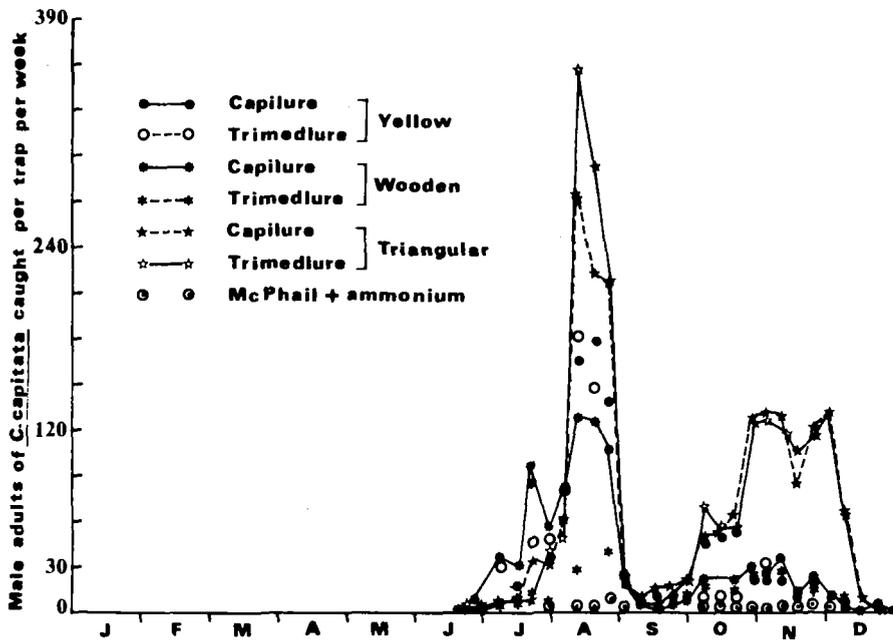


Fig. 2. The phenology of the medfly male population in 1987 using different traps on citrus in Crete.

TABLE 2  
The distribution of medfly adults (♀ + ♂), in % (per trap), trapped in different traps,  
on citrus in Crete, during 1988

Date	Vertical yellow		Vertical wooden		Triangular yellow		McPhail	P.M.C yellow bottle	
	Capi- lure	Trimed- lure	Capi- lure	Trimed- lure	Capi- lure	Trimed- lure	Ammo- nium	Plain	Trimed- lure
28.9.88	0.8	9.7	6.6	5.8	14.9	34.8	1.6	9.1	16.7
5.10.88	3.7	7.5	5.9	12.0	14.9	25.7	3.0	10.1	16.9
12.10.88	3.9	7.3	5.0	3.4	5.8	23.8	4.9	22.6	23.1
19.10.88	2.8	13.9	3.3	11.4	4.6	39.1	6.2	3.6	15.1
26.10.88	1.0	9.1	8.3	16.8	10.7	19.3	11.0	4.2	19.3

Ortu, 1988). For adult females, however, no efficient attractant is available. The ammonium compounds used in the experiments in combination with McPhail traps, attract, the same as protein hydrolysates, both sexes of the insect but in very reduced numbers. These substances, however, are not selective and their attraction efficiency is very much impaired by the humid climate (Delrio, 1984; Gothilf and Levin, 1987) although their efficiency may be increased by adding single amino acids (Tsiropoulos and Zervas, 1985). The male sex pheromone has not yet been developed to a potent and selective attractant for females although there are some good indications for this in the future (Zümreoglu, 1983). The trap may also be used in control programmes for *C. capitata* with the mass-trapping technique. The results, obtained up to now in developing such a supertrap that combines known and available attractants, were not very satisfactory and brought to light the need for deeper studies into the interaction between attractants (Delrio and Ortu, 1988; Gothilf and Levin, 1987).

There are, however, some possibilities in protecting the citrus production by the use of traps (Ortus and Prota, 1988). In these cases the need to safeguard the natural enemies population must be kept in mind when choosing the traps, avoiding the yellow chromotropic type which is known not to permit selective captures (Neuenschwander, 1982; Ortus and Prota, 1988).

#### REFERENCES

- Benfatto, D. and Longo, S. 1983. Results in capturing Mediterranean fruit fly (*Ceratit capitata* Wied.) on citrus in Sicily. *Proceedings CEC/IOBC Symposium*. Edit. R. Cavalloro. pp. 577-583.
- Delrio, G. 1984. Biotechnical methods for *Ceratit capitata* Wied. *CEC/IOBC Symposium on Fruit Flies of Economic Importance*:11-21.
- Delrio, G. and Ortus, S. 1988. Attraction of *Ceratit capitata* to sex pheromones, Trimedlure, ammonium and protein bait traps. *IOBC Bulletin* 1988/XI/6:20-25.
- Gothilf, S. and Levin, G. 1987. Attraction of the Mediterranean fruit fly to ammonium and protein bait traps. *CEC/IOBC Symposium on Fruit Flies of Economic Importance*. Rome, 7-10 April, 1987.
- Neuenschwander, P. 1982. Beneficial insects by yellow traps used in mass-trapping of the olive fly, *Dacus oleae*. *Entomologia Experimentalis et Applicata* 38:286-296.
- Ortus, S. and Prota, R. 1988. Biotechnical control means adopted against *Ceratit capitata* Wied. in "Clementine" groves. *IOBC Bulletin* 1988/XI/6:14-19.
- Tsiropoulos, S.J. and Zervas, G. 1985. Trapping *Ceratit capitata* in McPhail traps baited with amino acids and ammonium salts. *Proceedings Experts Meeting Integrated Pest Control in Citrus Groves*. Edit. R. Caballoro and E. Dimartino. pp. 389-392.
- Zümreoglu, A. 1983. Field cage evaluations of the male sex pheromone (Methyl (E)-6-nonenote) of the Mediterranean fruit fly (*Ceratit capitata* Wied.). *Proceedings CEC/IOBC Symposium*. Edit. R. Caballoro. pp. 495-499.