

Short communication

INTERACTIVE EFFECTS OF ETHYL
(2E,4Z)-2,4-DECADIENOATE AND SEX PHEROMONE
LURES TO CODLING MOTH: APPLE ORCHARD
INVESTIGATIONS IN BULGARIA

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Abstract: The kairomone, ethyl (2E,4Z)-2,4-decadienoate, a potent attractant of both males and females of *Cydia pomonella* in regions of the USA, was tested alone and together with the synthetic sex pheromone in apple orchards of Bulgaria in 2002 and 2003. No female moths were caught in any trap containing kairomone as a lure or lure component. Furthermore, traps baited with kairomone caught only low numbers of males. Greatest numbers of male moths were caught in traps baited with the “combined-lure,” comprised of pheromone and kairomone together.

Key words: *Cydia pomonella*, Bulgaria, kairomone, pheromone, capture efficacy

Light et al. (2001) discovered that the “pear ester”, ethyl (2E, 4Z)-2,4-decadienoate (Et-E,Z-DD) acts as a kairomone lure that attracts both sexes of codling moth. The kairomone was found to be a very effective lure in attracting both male and female codling moths in the Western USA, in both walnuts of California and pomefruits of Washington State (Light et al. 2001), and in recent studies world-wide. The purpose of this study was to test the effectiveness of this

kairomone lure in South-eastern Europe, through a two-year field investigation in apple orchards of Bulgaria.

All the experimental and commercial lures used (listed in Table 1) were loaded and provided by Trece Inc., USA. Five replicated experiments were carried out in apple orchards of the Institute of Fruit Growing – Plovdiv in the years 2002 and 2003. Numbers of the moths caught were recorded and then transformed to $\log(x+1)$ prior to analysis of variance. For separation of means the Duncan NMRT was applied, at $P < 0.05$.

Traps baited with kairomone caught no female moths, while capturing only a low number of males. The greatest numbers of male moths were caught in traps baited with various “combined-lures”, comprised of pheromone and kairomone at various load rates (Table 1). Unfortunately, in all, except for one test, the load amounts of the pheromone and kairomone in the different combined-lures were not compared directly to the same load rates of pheromone alone or kairomone alone, applied as individual lures. The only direct comparison that can be made was between the standard pheromone lure (ca. 3 mg) and the combined-lure containing 3 mg of pheromone and 3 mg of kairomone, tested in 2003. In this test, catches in the traps baited with combined-lure were significantly higher than those in the traps baited with the pheromone alone (Table 1).

The trap capture data was used to delineate the seasonal flight curves of the pest, comparing the standard pheromone lure (ca 3 mg, Pherocon CM-L2) and the “10X” pheromone lure (Pherocon MEGALURE) versus the combined-lure of 3 mg synthetic pheromone and 3 mg of synthetic kairomone for pest monitoring (Fig. 1). The trends in flight curves (*i.e.* take-off, peaks, and inflection points) were similar and consistent for the standard pheromone and the combined-lure. However, traps

Table 1. Effectiveness of different lures in capture of male codling moths in apple orchards of the Institute of Fruit Growing – Plovdiv during 2002–2003

Lure Composition	No. of moths caught per trap		
	2002		2003
	Orchard 1	Orchard 2	
Et-E,Z-DD (3 mg)*	14 b	6 c	
Et-E,Z-DD (40 mg)*			4 d
Et-E,Z-DD (20 mg)*	12 b	17 c	5 d
E8, E10-12OH (1.0 mg) & Et-E,Z-DD (0.1 mg)*	329 a	472 a	
E8, E10-12OH (0.3 mg) + Et-E,Z-DD (3 mg)* (combined, single dispenser)	280 a	404 a	
E8, E10-12OH (3 mg) + Et-E,Z-DD (3 mg)* (combined, single dispenser)			501 a
E8, E10-12OH (ca. 3 mg), Pherocon® CM L ² , Standard Commercial Pheromone lure	235 a	366 b	286 b
Pherocon® MEGALURE™, High Amplitude (“10X”) Commercial Pheromone lure			48 c

*Trece® Incorporated formulation.

Figures with the same letter are not significantly different at $P=5\%$ by Duncan’s NMRT [before analysis data were transformed to $\log(x+1)$]; data shown in the Table are untransformed, actual numbers caught.

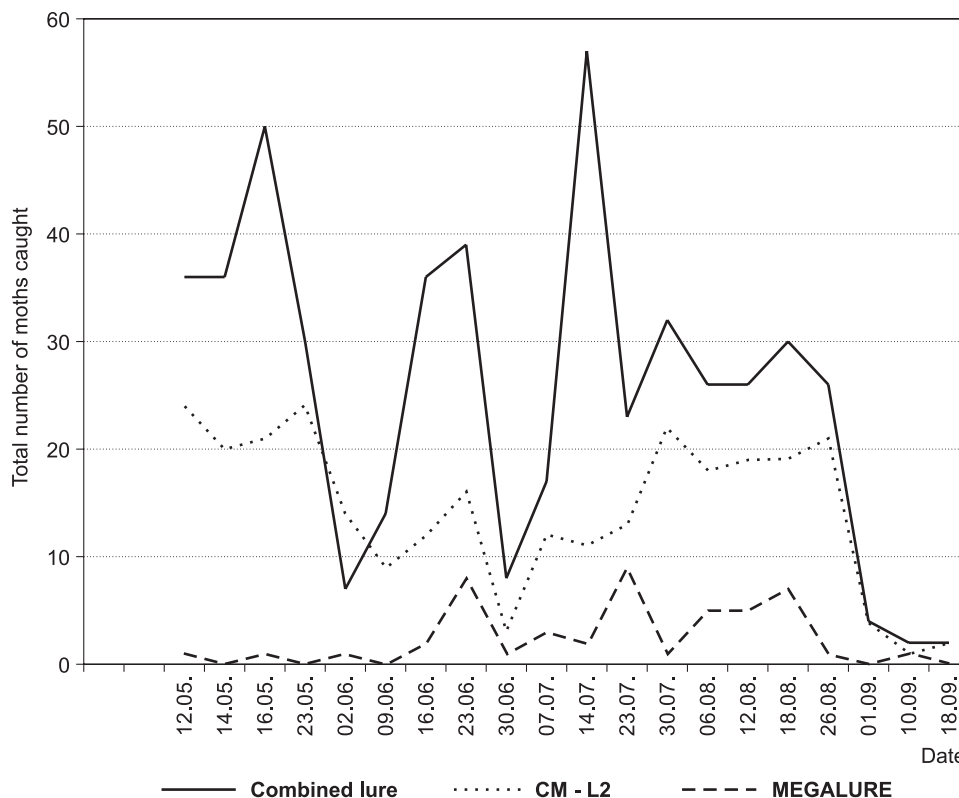


Fig. 1. Capture efficacy of traps baited with different lures for their ability to monitor the seasonal flight of codling moth males; Plovdiv, 2003

with the combined-lure captured a significantly greater number of males, outperforming the pheromone-alone lures in more accurately monitoring the flight emergence and intensity.

Ethyl (2E,4Z)-2,4-decadienoate effectively attracted both sexes of *C. pomonella* in California and Washington States (Light et al. 2001; Knight and Light 2004; Knight et al. 2004). However, this kairomone attracted a greater proportion of male than female *C. pomonella* in other geographic regions, as observed in Italy, France, Spain, Australia, Argentina, Chile, and South Africa (e.g. Ioriatti et al. 2003; Thwaite et al. 2004). In this study the preponderance of male attraction to this kairomone was demonstrated in the Eastern European region. Further investigations are needed to clarify the role of the kairomone as a possible male-specific synergist for the synthetic sex pheromone of *C. pomonella*.

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POLISH SUMMARY

WZAJEMNE ODDZIAŁYWANIE ESTRU ETYLOWEGO KWASU (E, Z)-2,4-DEKADIENOWEGO I ATRAKTANTÓW FEROMONOWYCH NA OWOCÓWKĘ JABŁKOWECZKĘ: BADANIA W SADACH JABŁONIOWYCH BUŁGARII

Kairomon, ester etylowy kwasu (*E, Z*)-2,4-dekadienowego, znany w niektórych rejonach USA jako silny atraktant zarówno samców jak i samic *Cydia pomonella*, był testowany w sadach jabłoniowych w Bułgarii, pojedynczo i w połączeniu z syntetycznym feromonem płciowym. W żadnej pułapce zaprawionej kairomonem jako przynętą ani kairomonem jako składnikiem przynęty nie odłowiono samic owocówki. Liczba samców przywabionych na pułapki z kairomonem była też niewielka. Największą liczbę samców odłowiono na pułapkach z przynętą kombinowaną, złożoną z feromonu i kairomonu.