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## Studies on Menthly Eugenol as a Sex Attractant for Fruit Fly *Dacus zonatus* (Saund) in Relation to Abiotic Factors in Peach Orchard

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**Abstract:** Density fluctuation of trapped fruit flies male, *Dacu zonatus* was studied through out two consecutive years and effect of abiotic factors on its trapping was investigated in peach orchard. Three traps were placed in the peach orchard on 1st September 1995. The trapping of males continued from 8th September to 8th December, 1995. During 1996, the trapping continued from 6th September to 22nd November. No male was trapped from mid of December to end January during 1995-96 and end of November to 1st week of March, 1996-97. From February to April, mean number of males caught per trap was very low. The month of May, June and July were found as the period of high trapping during 1996, while the same was observed in the month of June and July during 1997. All abiotic factors contributed significantly towards increasing/decreasing fruit fly catches. Mean maximum and minimum temperature, rainfall had a positive and highly significant correlation with mean number of males per trap. Mean relative humidity was the only factor, which had a negative and significant correlation.

**Key words:** Fruit fly, population fluctuation, abiotic factors, sex pheromon

### Introduction

The discovery of a number of compounds strongly attractive to male fruit flies (*Tephritidae*) have suggested the possible significance of male attractants. Ripley and Hapburn (1935) claimed that each male fly removed from the wild fly population by an attractant would represent one unmated female. Steiner and Lee (1955) first applied methyl eugenol (a constituent of citronella and Huo pine oil) in an area of 15.5 km<sup>2</sup> for suppressing the females bred outdoors, flew into the treated area and maintained a low level of infestation. The successful application of male annihilation method was demonstrated by Steiner *et al.* (1965), when oriental fruit fly, *Dacus dorsalis* was eradicated from the semi-isolated 33 square mile island of Rota, Marina islands. Methyl eugenol was also observed as a effective sex attractant for fruit flies by many workers like Qureshi *et al.* (1981), Fang and Chang (1984), Shukla and Parsad (1985) and Tan and Jall (1985).

Keeping in view the know efficiency of methyl eugenol as a sex attractant, it was found desirable to study the population fluctuation of trapped male fruit fly, *Dacus zonatus* (Saund) through out the year and effect of abiotic factors on its trapping in peach orchard.

### Materials and Methods

Three cylindrical plastic raps were hanged about 6 feet above the soil at three places in peach orchard of approximately 2 acre. About 4-6 ml of lure/toxicant mixture (96% menthyl eugenol and 4% phosphomidon) was replenished at fortnightly interval and the trapped flies were removed and counted every week starting from 8th September, 1995 to 30th August, 1997. The study was conducted in peach orchard, National Agricultural Research Centre, Islamabad. Mean number of flies per trap per week was determined. Correlation between mean number of fruit flies per trap and abiotic factors like mean maximum temperature, mean minimum temperature, relative humidity and rain fall was also computed.

### Results and Discussion

Seasonal fluctuation of fruitfly males, *Dacus zonatus* (Saund) trapped with the help of methyl eugenol has been presented in Table 1. Three traps were placed in the peach orchard on 1.9.1995. The trapping of males continued from 8th September to 8th December 1995. During 1996, the trapping started from 2<sup>nd</sup> February and continued until 22<sup>nd</sup> November. Males were not seen trapped from 1<sup>st</sup> week of December to end of January during 1995-96 and end of November to 1st week of March 1995-96. The results are in agreement with Tanaka *et al.* (1987), who reported

Table 1: Seasonal fluctuation of fruit flies trapped with the help of methyl eugenol in peach orchard

Date of sampling	Mean No. of fruit flies caught per trap $\pm$ S.E.	Date of sampling	Mean No. of fruit flies caught per trap $\pm$ S.E.
08.09.95	12.00 $\pm$ 1.16	06.09.96	12.33 $\pm$ 3.18
15.09.95	12.33 $\pm$ 2.34	13.09.96	16.33 $\pm$ 3.29
22.09.95	09.0 $\pm$ 0.58	20.09.96	13.67 $\pm$ 2.19
29.09.95	09.67 $\pm$ 1.34	27.09.96	14.00 $\pm$ 2.09
06.10.95	18.00 $\pm$ 4.59	04.10.96	15.33 $\pm$ 1.77
13.10.95	20.33 $\pm$ 4.10	11.10.96	17.60 $\pm$ 3.22
20.10.95	19.67 $\pm$ 1.77	18.10.96	14.67 $\pm$ 2.34
27.10.95	09.33 $\pm$ 2.19	25.10.96	11.00 $\pm$ 3.22
03.11.95	08.67 $\pm$ 0.89	01.11.96	06.67 $\pm$ 2.03
10.11.95	02.67 $\pm$ 0.34	08.11.96	01.33 $\pm$ 0.34
17.11.95	00.67 $\pm$ 0.34	15.11.96	01.33 $\pm$ 0.34
24.11.95	01.00 $\pm$ 0.58	22.11.96	00.67 $\pm$ 0.34
01.12.95	01.00 $\pm$ 0.58	29.11.96	00.00
08.12.95	00.00	06.12.96	00.00
15.12.95	00.00	13.12.96	00.00
22.12.95	00.00	20.12.96	00.00
29.12.95	00.00	27.12.96	00.00
05.01.96	00.00	03.01.97	0.00
12.01.96	00.00	10.01.97	00.00
19.01.96	00.00	17.01.97	00.00
26.01.96	00.00	24.01.97	00.00
02.02.96	00.67 $\pm$ 0.34	31.01.97	00.00
09.02.96	00.67 $\pm$ 0.34	07.01.97	00.00
16.02.96	00.67 $\pm$ 0.34	14.02.97	00.00
23.02.96	00.67 $\pm$ 0.34	21.02.97	00.00
01.03.96	05.67 $\pm$ 1.77	28.02.97	00.00
08.03.96	02.00 $\pm$ 0.58	07.03.97	00.00
15.03.96	02.33 $\pm$ 0.34	14.03.97	00.67 $\pm$ 0.34
22.03.96	04.67 $\pm$ 1.20	21.03.97	00.33 $\pm$ 0.34
29.03.96	03.33 $\pm$ 0.88	28.03.97	00.67 $\pm$ 0.66
05.04.96	02.32 $\pm$ 0.88	04.04.97	00.00
12.04.96	03.33 $\pm$ 0.34	11.04.97	00.33 $\pm$ 0.34
19.04.96	07.33 $\pm$ 2.19	18.04.97	00.00
26.04.96	21.00 $\pm$ 4.51	25.04.97	00.33 $\pm$ 0.34
03.05.96	27.00 $\pm$ 4.59	02.05.97	04.67 $\pm$ 0.34
10.05.96	30.00 $\pm$ 2.89	09.05.97	08.00 $\pm$ 0.58
17.05.96	45.00 $\pm$ 2.89	16.05.97	14.00 $\pm$ 1.53
24.05.96	25.33 $\pm$ 3.29	23.05.97	16.00 $\pm$ 0.58
31.05.96	48.33 $\pm$ 9.29	30.05.97	45.67 $\pm$ 8.69
07.06.96	19.67 $\pm$ 1.20	06.06.97	25.00 $\pm$ 4.94
14.06.96	23.67 $\pm$ 10.74	13.06.97	23.00 $\pm$ 4.36
21.06.96	26.33 $\pm$ 3.39	20.06.97	15.00 $\pm$ 1.53
28.06.96	24.00 $\pm$ 4.94	27.06.97	22.00 $\pm$ 1.16
12.07.96	32.00 $\pm$ 4.36	11.07.97	53.33 $\pm$ 8.12
19.07.96	36.67 $\pm$ 7.28	18.07.97	42.33 $\pm$ 3.18
26.07.96	38.33 $\pm$ 10.41	25.07.97	34.33 $\pm$ 10.41
02.08.96	08.00 $\pm$ 0.58	01.08.97	17.33 $\pm$ 1.86
16.08.96	13.67 $\pm$ 3.29	08.08.97	15.33 $\pm$ 2.91
23.08.96	08.00 $\pm$ 1.16	15.08.97	14.33 $\pm$ 1.77
30.08.96	11.67 $\pm$ 2.85	22.08.97	13.67 $\pm$ 0.88

Mahmood *et al.*: Fruit fly population fluctuation in peach orchard

Table 2: Correlation between mean fruit flies caught per trap and abiotic factors

Abiotic factors	1995-96			1996-97		
	Mean	Correlation	Reg. Equ.	Mean	Correlation	Reg. Equ.
Maximum Temp.(°C)	28.67	0.713**	$y = 24.38 + 0.36x$	27.09	0.691**	$y = 23.64 + 0.397x$
Minimum Temp.(°C)	14.48	0.746**	$y = 8.72 + 0.480x$	11.77	0.784**	$y = 7.95 + 0.460x$
Relative humidity(%)	65.89	-0.381**	$y = 72.02 - 0.480x$	72.20	-0.499**	$y = 78.51 - 0.600x$
Rainfall (mm)	03.96	0.410**	$y = 6.43 + 1.699x$	02.82	0.359**	$y = 6.17 + 1.254x$

\*\* : Highly significant at 1% level of significance

Reg. Equ. (Regression Equation)

that in general, the population of melon fly, *D. cucurbitae* increased in autumn and decreased markedly in winter. Similar findings were also reported by Lui and Yeh (1982), who studied the population fluctuation of oriental fruit fly, *Dacus dorsalis* and observed the smallest population from January to March. The month of May, June and July were found as high trapping period during 1996, whereas the months of June and July were high trapping period during 1997. The period of maximum trapping showed the maximum activity of fruit flies in this area. Similar observations were reported by Pradhan (1980) that *Dacus dorsalis* trapped by steiner traps in peach, pear, plum and apple orchards were maximum in the month of June.

The fruit ripened from June to mid July, for the most of the peach varieties in this study. The peak of fruit flies trapping has a good relation with the period of fruit ripening. Although the crop and insect specie were different, yet similar results were reported by Liu and Yen (1982), who claimed that the population of oriental fly was related to the ripening of citrus fruit in Taiwan. These findings also confirm the results of Shukla and Prasad (1985), who noted the coincidence of population peaks of oriental fly with ripening of guava and mango fruits.

As observed, the methyl eugenol proved as an effective sex attractant for fruit flies and it has also been reported by Qureshi *et al.* (1981), Fang and Chahg (1984), Shukla and Prasad (1985) and Tan and Jall (1986). Although the data regarding the percentage of fruit infestation were not recorded yet in some of the varieties a high percentage of fruit infestation was observed.

**Effect of abiotic factors on trapping of fruit flies:** All abiotic factors contribute significantly toward increasing or decreasing fruit flies trapped with the help of methyl eugenol (Table 2). Mean maximum and minimum temperature has positive and highly significant correlation with fruit flies caught per trap (Table 2). Similar results were reported by Su (1984) and Shukla and Prasad (1985), who claimed a significant and positive correlation between maximum and minimum temperature and fruit flies caught per trap. Liu and Yeh (1982) also found temperature as a most important climatic factor affecting the population of fruit fly, *Dacus dorsalis* in Taiwan. Relative humidity is the only factor which is negative and highly significant correlated factor. Su (1984) also noted a negative correlation (-0.269) between male fruit flies per trap and relative humidity. Shukla and Prasad (1985) found a significant correlation between relative humidity and fruit flies caught per trap. Rainfall was also found as a positive and significantly affecting factor in fruit flies trapping.

The month May, June and July were found as the period of high trapping during 1996 while the same was observed in the month of June and July during 1997. From February to April, mean number of males caught per trap remained very low.

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