

## Efficiency of Para-pheromones in Attracting true Infesting Fruit Flies (Diptera: Tephritidae) in Cucurbits

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**ABSTRACT:** Survey was conducted in Coimbatore (11°14' 60.00" N; 77°18' 60.00"E) and Dharmapuri (40° 26.767' N; 79° 58.933' W) districts of Tamil Nadu, India, during June 2017 to May 2018, to determine efficiency of methyl eugenol and cue lure in attracting fruit flies in cucurbits mainly ridge gourd, bitter gourd and snake gourd. The present study emphasising to know the peak incidence and period to implement the management practices. In Coimbatore, methyl eugenol attracted males of *B. dorsalis* and *B. correcta* to an extent of 20.92 to 23.07 flies/trap/week and 4.73 to 6.13 /trap/week respectively. Highest population for *B. dorsalis* (23.07 flies/trap/week) and *B. correcta* (6.13 flies/trap/week). In Dharmapuri district, the mean catches of *B. dorsalis* attracted to methyl eugenol fluctuated between 20.46 to 20.94 flies/trap/week and for *B. correcta* it was 6.67 to 7.01 flies/trap/week. Cue lure trap catches of *Zeugodacus cucurbitae* ranged from 5.78 to 8.53 flies/trap/week in snake gourd and 5.46 to 5.78 flies/trap/week in bitter gourd in Coimbatore and Dharmapuri, respectively. The population of *Z. cucurbitae* was observed throughout the year and reached peak during 36<sup>th</sup> standard week (29 flies/trap/week) at Coimbatore in snake gourd and only one fly/trap/week was recorded in the 49<sup>th</sup> standard week in bitter gourd. In Dharmapuri, the highest population was observed in 36<sup>th</sup> standard week (21 flies/trap/week) in snake gourd and only one fly was collected per during 52<sup>nd</sup> standard week in snake gourd. The results from the present study indicated that *Z. cucurbitae* trap catches varied from crop to crop and region to region where the maximum fly catch was observed during cooler months (September and October) at Coimbatore and in Dharmapuri. The results insists to take a management practices before insect reaches the peak.

**Keywords:** Methyl eugenol, cue lure, *Zeugodacus cucurbitae*, *Dacus ciliatus*, *Bactrocera dorsalis* and *B. correcta*.

### INTRODUCTION

Fruit flies (Diptera: Tephritidae) are important quarantine pests that may cause even up to 100 per cent yield losses in cucurbits (Dhillon *et al.*, 2005). Among the fruit fly species, the melon fly, *Zeugodacus cucurbitae* (Coquillett) infests over 70 hosts and it is the key insect species infesting cucurbits namely, snake gourd (*Trichosanthes anguina* L.), ridge gourd (*Luffa acutangula* L.), bitter gourd (*Momordica charantia* L.), muskmelon (*Cucumis melo* L.) and snap melon (*C. melo* var. *momordica* L.). The pest is widely distributed among tropical, sub-tropical and temperate regions of the world. On the other hand, the lesser pumpkin fly, *Dacus ciliatus* Loew is becoming a silent threat in cucurbits (Kumar *et al.*, 2006). Abundance of *D. ciliatus* over that of *Z. cucurbitae* was also observed in some parts of India, Nepal and Pakistan (Kapoor, 2005). In India, *D. ciliatus* infests large number of

melons and wild cucurbits causing serious damage in gourds ecosystem (Viraktamath *et al.*, 2003). Though the infestation pattern and damage symptoms of both *Z. cucurbitae* and *D. ciliatus* are same, their morphology and seasonal abundance differ from each other. *Zeugodacus cucurbitae* in fests throughout the year and maximum number of adults are found during August whereas *D. ciliatus* is heavy during May — October (Kumar *et al.* 2006; Kishor *et al.*, 2018). Among the IPM practices available for the management of fruit flies, traps with parapheromones like cue lure and methyl eugenol are most common, because of their easy method of trapping males (Kakar *et al.*, 2016). On the other hand, *D. ciliatus* adults are not attracted to these parapheromones (White and Elson-Harris 1992) and unable to attract females. Besides, parapheromones are synthetic, posing problem in biodegradation (Sankaram, 1999) and not accessible to farmers due to high cost and/or lack of availability

(Sookar *et al.*, 2002). Though several studies have been conducted on the management of fruit flies with parapheromones in cucurbits most of them are ineffective in attracting females.

Lack of knowledge about the specificity of the parapheromones have lead the farmers to use the unappropriated lures in the field. Hence, the present study is emphasising on the effectiveness of these parapheromones in attracting true damage causing fruit flies in the cucurbit ecosystem and also their population dynamics to determine the appropriate time to implement the management practices.

## MATERIALS AND METHODS

Survey was conducted in Coimbatore (11°14' 60.00" N; 77°18' 60.00"E) and Dharmapuri (40° 26.767' N; 79° 58.933' W) districts of Tamil Nadu, India, during June 2017 to May 2018, to determine efficiency of methyl eugenol and cue lurein attracting fruit flies in cucurbits mainly ridge gourd, bitter gourd and snake gourd. Commercially available traps and lures (Sun Agro, Pvt, Ltd. Chennai) for attraction of fruit flies. Ten traps of both lures were installed in alternative rows in each gourd field at both locations. The observations on number of fruit flies/trap/day and number of fruit flies /trap/week for eleven months from June 2017 to May 2018 were recorded in both the districts. The incidence of *D. ciliatus* was confirmed by observing their emergence after keeping the infested fruits in the cages. The flies collected in traps and cages were identified by taxonomic keys given by David and Ramani (2011).

## RESULTS AND DISCUSSION

The methyl eugenol attracted both *Bactrocera dorsalis* and *B. correcta* with F:M ratio of 0: 1 in both regions. Whereas, cue lure attracted only *Z. cucurbitae* (F:M ratio 0:1) in both regions. The data on mean population of fruit flies attracted to methyl eugenol in Coimbatore revealed that males of *B. dorsalis* and *B. correcta* were attracted to an extent of 20.92 to 23.07 flies/trap/week and 4.73 to 6.13 /trap/week respectively. Highest population for *B. dorsalis* (23.07 flies/trap/week) and *B. correcta* (6.13 flies/trap/week) was recorded on snake gourd indicates that the population of *B. dorsalis* was high compared to population of *B. correcta* in Coimbatore. In Dharmapuri district, the mean catches of *B. dorsalis* attracted to methyl eugenol fluctuated between 20.46 to 20.94 flies/trap/week and for *B. correcta* it was 6.67 to 7.01 flies/trap/week (Table 1). Cue lure trap catches of *Z. cucurbitae* ranged from 5.78 to 8.53 flies/trap/week in snake gourd and 5.46 to 5.78 flies/trap/week in bitter gourd in Coimbatore and Dharmapuri, respectively (Table 2).

The results of the study revealed that, the population of *Z. cucurbitae* was observed throughout the year and

reached peak during 36<sup>th</sup> standard week (29 flies/trap/week) at Coimbatore (Fig. 1) in snake gourd and only one fly/trap/week was recorded in the 49<sup>th</sup> standard week in bitter gourd. In Dharmapuri, the highest population was observed in 36<sup>th</sup> standard week (21 flies/trap/week) in snake gourd (Fig. 2) and only one fly was collected per during 52<sup>nd</sup> standard week in snake gourd. Our results are in accordance with findings of Konyak *et al.* (2023) who recorded high population of *B. dorsalis* during mid- July (31st SW) with the mean population of 60.66 flies/trap and was followed by another peak activity during 3rd July (29th SW) with 58.33 flies/trap. The lowest catch of *B. dorsalis* was during the end of the cropping season (34th SW) with a mean of 33.33 flies/trap followed by 33th SW (42.33flies/ trap) respectively. The results from the present study indicated that *Z. cucurbitae* trap catches varied from crop to crop and region to region where the maximum fly catch was observed during cooler months (September and October) at Coimbatore and in Dharmapuri. Manoj *et al.* (2017) reported that *Z. cucurbitae* trap catch was positively correlated to minimum temperature, morning and evening relative humidity, and rainy days. The soil moisture and moderate temperature are said to induce fly emergence and in present studies also the fly collection was positively correlated to rain fall and temperature. During the period of observation high rainfall was recorded during September and October which could have aided in higher emergence of adult fruit flies and hence higher collection in the traps. The findings reveal that the fruit fly population will be higher in cooler months and the management practices for fruit flies should be applied during this period in gourds.

The results further showed that *Z. cucurbitae* and *D. ciliatus* were the species attracted to gourds and also the parapheromones used in gourds are not suitable for trapping *D. ciliatus*. These findings are supported by White and Elson- Harris (1992) who also reported that *D. ciliatus* is not attracted to parapheromone lures. The results are more or less similar to findings of Kumar *et al.* (2006) who reported that the infestation of *D. ciliatus* was seen only during cooler months (June to October). The results from the relative abundance computed revealed that *Z. cucurbitae* was the predominant species in gourds. In contrast, in the study of Devi *et al.* (2022) *B. dorsalis* was observed to be 49.56 per cent followed by *Z. tau* (22.84 %) and *Z. cucurbitae* with 9.08 per cent. Though, *Z. cucurbitae* and *D. ciliatus* are the major pest species of gourds, the attraction of *B. dorsalis* and *B. correcta* was may be from neighbouring fruit crops, since the parapheromones are selective in nature and attract the insects from a long distance even up to 65 km (Steiner *et al.*, 1961).

**Table 1: Relative incidence of fruit fly species assessed using methyl eugenol traps in gourds.**

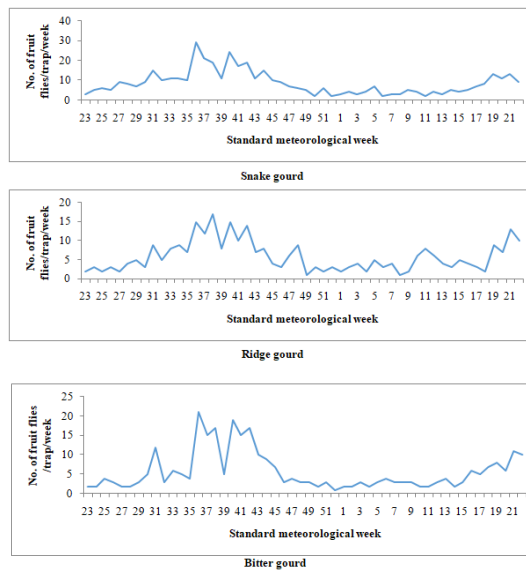
Fruit fly Species	Coimbatore						Dharmapuri					
	Snake gourd		Ridge gourd		Bitter gourd		Snake gourd		Ridge gourd		Bitter gourd	
	Flies / trap /week		Flies / trap /week		Flies / trap /week		Flies / trap /week		Flies / trap /week		Flies / trap /week	
	Mean*	F:M	Mean*	F:M	Mean*	F:M	Mean*	F:M	Mean*	F:M	Mean*	F:M
<i>B. dorsalis</i>	23.07	0:1	20.92	0:1	22.17	0:1	20.94	0:1	20.69	0:1	20.46	0:1
<i>B. correcta</i>	6.13	0:1	5.46	0:1	4.73	0:1	6.67	0:1	6.78	0:1	7.01	0:1

M- Male, F- Female; \*Mean of catches from 10 traps

**Table 4: Relative incidence of fruit fly species assessed using cue lure traps in gourds.**

Fruit fly Species	Coimbatore						Dharmapuri					
	Snake gourd		Ridge gourd		Bitter gourd		Snake gourd		Ridge gourd		Bitter gourd	
	Flies / trap /week		Flies / trap /week		Flies / trap /week		Flies / trap /week		Flies / trap /week		Flies / trap /week	
	Mean*	F:M	Mean*	F:M	Mean*	F:M	Mean*	F:M	Mean*	F:M	Mean*	F:M
<i>Z. cucurbitae</i>	8.53	0:1	5.86	0:1	5.78	0:1	5.78	0:1	5.65	0:1	5.46	0:1

M- Male, F- Female; \*Mean of catches from 10 traps



**Fig. 1.** Relative abundance of *Z. cucurbitae* species using cue lure traps in gourds at Coimbatore.



**Fig. 2.** Relative abundance of *Z. cucurbitae* using cue lure traps in gourds at Dharmapuri.

## CONCLUSIONS

The results of the present study showed the efficiency of cue lure in attracting the *Z. cucurbitae* which is the true infesting fruit fly and also revealed that methyl eugenol is not suitable for the cucurbit ecosystem. Based on the observations on the emergence of *D. ciliatus*, it was clear that, this species is unattractive for any of the lure and also can be a havoc for the cucurbit ecosystem. Based on the seasonal incidence pattern, the peak time of *Z. cucurbitae* incidence was understood and the management practices against this pest can be implemented before it cause drastic damage.

## FUTURE SCOPE

The current study was restricted to specific cucurbits and fruit flies hence the same study can be extend to with other fruit flies at larger area. The combination of different chemical and food lure can be explored to attract both sexes of fruit flies.

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**Conflict of Interest.** None.

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