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## Studies on combination of different traps and lures in cucurbit fruit flies attraction

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### Abstract

The melon fruit fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae) is distributed widely in temperate, tropical, and sub-tropical regions of the world. It is a major pest of cucurbitaceous vegetables and fruits in many parts of the world. The objective of the study was to assess the effectiveness of different combinations of traps and lure in trapping melon fruit fly and finding the best combination of treatment for management. The experiment was carried out in pumpkin and bottle gourd field in Tamil Nadu Agricultural University, Coimbatore. The trap was placed at the distance of 10 m for each replication. All the traps used in this study were checked for number of melon fruit flies collected was observed every week for ten weeks. The mean of overall captured of *B. cucurbitae* in Jar trap + Cue lure + ME (DISC) combination were significantly greater than all other treatments (208.5 numbers) and less in treatments Jar trap + AA (Disc) combination (5.75 numbers) respectively.

**Keywords:** *Bactrocera cucurbitae*, combination of traps, methyl eugenol, cue-lure, cucurbit ecosystem

### Introduction

Cucurbits belong to the family Cucurbitaceae, which includes about 118 genera and 825 species. Cucumbers, muskmelons, watermelons, squashes, gourds, and pumpkins are commonly grown cucurbits in most parts of the world [1]. The cucurbits were infested by several insect pests which were considered to be the significant obstacles for economic production. Among them, Cucurbit fruit fly, *Bactrocera cucurbitae* (Coquillett), is one of the most important pests of cucurbits [2]. There was 243 species of fruit flies have been recorded from India. The cost of losses due to infestation of fruit flies can be surprisingly high, there are examples where losses have been up to 100% in cucurbit species, caused by Melon fly (*Bactrocera cucurbitae*) [3]. The cucurbit fruit fly, *Bactrocera cucurbitae* can attack about 16 different types of cucurbit crops [1]. The management of fruit flies is challenging because third instar larvae leave decaying fruits and drop to the ground to pupate in the soil; consequently both larvae and pupae in fruits and soil are protected from surface applied insecticides [4]. Early monitoring and detecting the pest infestation was must for effective management. Pheromone trap was one of the best monitoring as well as mass trapping tool available in pest management. Pheromone trap catches in relation to field infestation and environmental factors are crucially important for decision making process. Cue-lure trap has been used for monitoring and mass trapping of *B. cucurbitae* males [5-7]. Pheromone trap could be used to indicate and determine the need to initiate IPM measures. Therefore an attempt has been made to evaluate the efficiency of different types of pheromone trap models and lure combinations for better monitoring and mass trapping before recommending them for field use.

### Materials and Methods

The present investigation was carried out to identify suitable trap dispenser combination for monitoring fruit flies.

Monitoring of Cucurbit Fruit flies *Bactrocera cucurbitae* in cucurbit crops:

A Study was carried out in field of Cucurbit crops i.e., Pumpkin and Bottle gourd in Orchard of Tamil Nadu Agricultural University, Coimbatore. To ascertain the presence of fruit fly present in cucurbit field. The survey was conducted during March - May, 2011. The traps are used for both monitoring and mass trapping of fruit flies. The traps of different combinations were used to find the suitable trap dispenser combinations. The traps were tied in 6" bellow the pandal wire in Bottle gourd field and 60 cm above the ground in case of Pumpkin field. Nine treatments were tested in Randomized Block Design with four replications.

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- T1 = Jar trap + Cue lure (Disc)
- T2 = Jar trap + Cue lure + AA (Disc)
- T3 = Jar trap + AA (Disc)
- T4 = Jar trap + Cue lure (VIAL and WICK)
- T5 = Collapsible Trap + Cue lure (Disc)
- T6 = Jar trap + Cue lure + ME (DISC)
- T7 = Jar trap (with gum inside) + Cue lure (DISC)
- T8 = Jar trap (with gum inside) + Cue lure (PCI- DISC)
- T9 = Dome trap (with water inside) + Cue lure (PCI- DISC)
- ME- Methyl eugenol
- PCI- Pest control of India
- AA – Ammonium acetate

Each replicates were kept at about 10 meters distance then the replication of the treatments were shifted the location every week and the weekly observation of number of catches of fruit fly were recorded for 10 weeks. Then the sample fruit flies collected in a butter paper cover and were sent to Sun Agro Chennai for species identification. Then the identified species was conformed as *Bactrocera cucurbitae*. Identifying characters of adult melon fruit fly are 6 to 8 mm in length. Distinctive characteristics of the adult are the wing Pattern, long third antennal segment, the dorsum of the thorax reddish yellow with light yellow markings and without black markings, and the head yellowish with black spots [8].

**Results and Discussions**

The fruit fly collected data were then analyzed by RBD through ANOVA technique and significant results were compared and find the effective trap combination based on fruit fly collected. Weekly catches pooled over 10 weeks were compared (Table 1). The Maximum male melon fruit flies were attracted and killed in all the traps. The present findings agree with the Taiwan study

[9] in which the two lures mixed together increased capture of *B. cucurbitae* males. Mixing ME with CL in the same trap may be most effective. [10] Cunningham also reported that Methyl eugenol and cue-lure mixtures were compared with pure methyl eugenol or cue-lure over 4 seasons. *B. dorsalis* captures differed significantly with treatment and season. *B. dorsalis* captures with 100% methyl-eugenol were significantly greater than all other treatments (25, 50, and 75%). In addition, the price of ME is only about 20% that of CL (J. Knapp, pers. comm.), and therefore use of a ME-CL mixture could reduce costs considerably.

In this study the greatest overall catches were with T6 i.e., Jar trap + CL + ME (DISC) this superior combination involved cylindrical shape, entry holes on the sides and wooden block as the dispenser impregnated with Methyl Eugenol (ME) and cue lure.

Present results are in conformity with the reports of Delpaux and Dequine, 2015 [11] and Dhillon *et al.* 2005c [12] that Traps designs, including different colors and shapes, are essential to obtain a high efficacy in fruit fly catches. The total number of fruit fly attracted and killed maximum was observed in this trap was mean of 208.5 numbers and percentage of 34.32 (Table 2) in 10 weeks of observation taken in four replications followed by T1 mean (103.2) and percentage (17.11), T2 mean (102.5) and percentage (16.23), T4 mean (61.75) and percentage (10.89), T5 mean (51.25) and percentage (8.95), T9 mean (39.75) and percentage (6.783), T7 mean (25.75) and percentage (4.66), T8 mean (9.25) and percentage (2.9), and at last T3 mean (5.75) and percentage (0.73). In 10 weeks observations an average of 20.85 fruitflies was trapped in treatment T6 (fig.1). The present results are in line with the findings of Suckling *et al.*, 2008 [13] Among commercial traps, Flight-TTM attracted more *B. cucurbitae* (Coquillet) than modified Steiner trap

**Table 1:** Efficiency of different combination of traps and lures in trapping the adult melon fruit fly *Bactrocera cucurbitae*

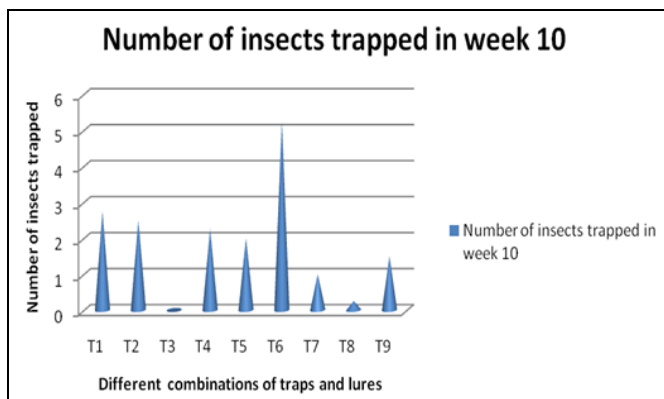
S. No	Treatments	Number of insects trapped (Weekly observation)									
		1	2	3	4	5	6	7	8	9	10
1	T1	31	13.5	11.75	11	8.25	10.25	5.5	5.25	4	2.75
2	T2	34	13.75	10.25	10	7.25	11	6.25	4	3.5	2.5
3	T3	2	1.5	0	0.75	1	0.25	0.25	0	0	0
4	T4	20	7.25	6.5	5.75	4	5.5	4.25	3.5	2.75	2.25
5	T5	16	6.5	5.75	4.5	3	4.5	3.5	3	2.5	2
6	T6	51	37.25	29.25	26	16.25	15.75	10.25	9	8.5	5.25
7	T7	6	3.25	3.25	2.75	2	3	2.25	1.5	0.75	1
8	T8	2	2	0.5	1.25	0.75	1	0.75	0.5	0.25	0.25
9	T9	12	5.25	5	3.75	2.5	3.25	3	2	1.5	1.5
CD (p = 0.05)		3.13	2.35	3.00	3.07	1.87	2.17	1.18	1.67	1.64	1.47
CV		11.11	15.32	24.11	26.95	23.28	22.69	18.05	30.98	35.85	41.29
SEd		1.52	1.14	1.45	1.49	0.90	1.05	0.57	0.81	0.79	0.71

Values are the mean of 4 observations

**Table 2:** Percentage of melon fruit fly collected in different combination of traps and lures

week	T1	T2	T3	T4	T5	T6	T7	T8	T9	TOT	T1%	T2%	T3%	T4%	T5%	T6%	T7%	T8%	T9%
1	31	34	2	20	16	51	6	2	12	174	17.82	19.54	1.15	11.49	9.19	29.31	3.45	1.15	6.90
2	13.5	13.75	1.5	7.25	6.5	37.25	3.25	2	5.25	90.25	14.96	15.23	1.66	8.03	7.20	41.27	3.60	2.22	5.82
3	11.75	10.25	0	6.5	5.75	29.25	3.25	0.5	5	72.25	16.26	14.19	0	9	7.96	40.48	4.50	0.69	6.92
4	11	10	0.75	5.75	4.5	26	2.75	1.25	3.75	65.75	16.73	15.21	1.14	8.74	6.84	39.54	4.18	1.90	5.70
5	8.25	7.25	1	4	3	16.25	2	0.75	2.5	45	18.33	16.11	2.22	8.89	6.67	36.11	4.44	1.67	5.55
6	10.25	11	0.25	5.5	4.5	15.75	3	1	3.25	54.5	18.81	20.18	0.46	10.09	8.26	28.90	5.50	1.83	5.96
7	5.5	6.25	0.25	4.25	3.5	10.25	2.25	0.75	3	36	15.28	17.36	0.69	11.80	9.72	28.47	6.25	2.08	8.33
8	5.25	4	0	3.5	3	9	1.5	0.5	2	28.75	20.39	15.53	0	13.59	11.65	34.95	5.82	1.94	7.77
9	4	3.5	0	2.75	2.5	8.5	0.75	0.25	1.5	23.75	16.84	14.74	0	11.58	10.53	35.79	3.16	1.06	6.31
10	2.75	2.5	0	2.25	2	5.25	1	0.25	1.5	17.5	15.71	14.28	0	15.71	11.43	30.0	5.71	14.43	8.57
TOT	103.25	102.5	5.75	61.75	51.25	208.5	25.75	9.25	39.75	607.75									

Values are the mean of 4 observation



**Fig 1:** Efficiency of different combination of traps and lures in trapping the adult melon fruit fly *Bactrocera cucurbitae*

The trap one combination Jar trap + Cue lure (Disc) and trap two combination Jar trap + CL + AA (Disc) also trapping moderate number of adult fruit fly, this can also used as monitoring. Falillah, 2015 [14] has reported that the flat trap trapped maximum number of fruit flies compared to delta and box trap. But in using trap six combination we can locate the place where the infestation is more and also this trap can be not only used for monitoring but also for mass trapping of melon fruit fly. The present result shows that the trap catches may decrease gradually from first week to tenth week this may be due to the reasons that is temperature influence or crop stage influence. The positive correlation exists for trap catches with maximum temperature [15]. The study conducted by Sapkota *et al.*, 2010 [2] concluded that the Cucurbit fruit fly causes significant damage in young and immature stage so in young stage of crop the trap collection may be found to be high in first week and may be gradually reducing in successive weeks.

### Conclusion

The jar trap in combination with cue lure and methyl eugenol (Disc) was very effective pheromone trap combination. It can be recommended not only as monitoring purpose but also in mass trapping and management of melon fruit flies.

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