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Impact of close proximity of traps baited with various attractants on fruit fly catch

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Abstract

The study was conducted at peach, plum and pear plantation mixed with cucurbits during 2013 at Agricultural Research Institute Swat. The three food attractants, Methyl eugenol (ME), Nu Lure® (NL) and Cue-lure (CL) each comprised of 85% lures, 10% sugar and 5% insecticide (Diptrax 80-SP®) were applied in a plastic trap alone (one trap on a tree) or in combination where two or three traps of these attractants were installed. When single trap used, a distance of 24 meter was maintained while in case of two or three traps on a single tree a distance of 3 or 2 meters was maintained respectively. Each treatment was replicated three times and data were collected on weekly basis. Among the seven treatments, ME & CL baited traps installed on a single tree resulted a significantly higher number of fly catch (61.88) during the six weeks period followed by ME and NL baited traps installed in a single tree with 51.66 mean flies. ME, NL & CL baited traps installed in a single tree recorded 3rd in effectiveness with 47.83 mean number of flies for the whole season. While NL & CL baited traps resulted a significantly lowest number of flies (10.72) catch. Methyl eugenol baited traps installed as a single trap with 24 m distance with other traps resulted in 34.94 flies followed by CL with 26.06 flies while NL was the least effective treatment with 2.06 flies as seasonal mean. A total of 4215 flies were captured in the seven treatments. *Bactrocera zonata* was the dominant species followed by *B. cucurbitae*, *B. dorsalis*, *B. diversa* and *B. tau*.

Keywords: Fruit fly spp, traps, lures, close proximity

Introduction

Fruit flies are the major pests of fruits, vegetables, and ornamental plants [1]. The thirty five percent of the known fruit fly species are responsible for the attacked on the soft fruits and vegetables, including mango, guava, citrus, ber, peach and cucurbitaceous vegetables in India [2]. *Bactrocera cucurbitae* have 60% losses in Pakistan [3]. The fruit flies are very difficult to manage due to the fact that they are polyphagous and have high mobility, fecundity and unexposed developmental stages. Even insecticidal treatments are ineffective against the eggs and maggots of fruit flies [4]. Alternative pest management control methods like male annihilation technique and bait application technique (BAIT) may be relatively beneficial. In BAIT method, the adults stage the fruit fly are attracted and killed by protein bait mixed with insecticide in formulation [5] while in MAT, adult males fruit fly are attracted and killed by Para pheromone including insecticide, so female fruit flies are left unmated and the fruit may be protected [6]. Several studies were conducted on the effectiveness of both methyl eugenol and cue lure traps combine used and as a result doubled the fruit fly males that attracted cue lure trap alone [7, 8]. The earlier observation revealed that male of *Bactrocera dorsalis* and *Bactrocera cucurbitae* species of fruit fly attracted to the alternate lure when two lure Methyl eugenol and Cue lure baited traps or installed in close proximity [9]. These methods are fairly valuable in the fruit fly management, however a drawback of BAIT is if flies have fed elsewhere, they may be less attracted to protein bait at least for a short period [10] and so the fruit fly enter the treated area for the food and not become target of Protein Bait. Similarly, in MAT, mated females fly species may enter a treated area with their reproductive potential and was not target of MAT by local male's fruit fly [6]. In swat valley there are some large orchards while in most cases medium size and few irregular, scattered fruit trees on territories. Methyl eugenol, Nu lure and Cue lure required enough space in large to medium size orchards. However the Methyl eugenol, Nu lure and Cue lure traps are installed in close proximity in the small orchard which is normally discouraged by the agricultural extension personnel (Personal

communication) So in this study we investigated the impact of bringing the three attractants in close proximity against the fruit fly.

Material and Methods

The research was conducted at mixed orchards of fruits and vegetables in Agricultural Research Institute Swat Pakistan during 2013. The selected orchard size was five acres but in small blocks. Each row roughly contains 8 plants of peach, plum, pear, almonds and pomegranate along with summer vegetables (mostly cucurbits; bottle gourd, cucumber, bitter melon, luffa gourd etc) grown as intercropping. The plant to plant distance and row to row distance were 6 meters. Traps used for the experiments were modified cone shape bottle made of plastic material having four holes for the entry of fruit fly. Thirty six Plastic traps were used in the trial. The Para pheromones; Methyl Eugenol (ME) & Cue-lure (CL) and Nu Lure® (NL) (Miller Chemical & Fertilizer Australia Pvt.Ltd.) were used in the experiment. Each treatment contained 85% Para pheromones, 10 % sugar and 5% Diphax 80 SP® insecticide (Bayer Crop science Pvt. Limit). The trap was baited with 5ml of the above mixture applied once but in case of Nu Lure, it was replenished after three weeks. All the seven treatments were applied in separate traps but the traps were hung on either on separate trees or on the same tree. In case of T1 (ME), T2 (NL) and T3 (CL) single baited traps

were installed 24 m apart. In the remaining treatments; T4 (ME & NL baited traps on the same tree), T5 (ME & CL baited trap on the same tree), T6 (CL & NL baited traps on the same) two traps were installed at 3m apart on the same tree while in case of T7 (ME, NL and CL baited traps on the same tree) three traps of the lure combination were applied on the same tree with 2 m apart. The experiment was replicated three times. The data were collected on the weekly basis. All the dead flies per traps per treatment were collected in a clear Plastic bag along with relevant information, secured with a rubber band and brought to the lab for flies count and further analysis. The Two factorial CRD designs were applied and the data were subjected to analyzed by using Statistix 8.1 software 2005 [11] version.

Results and Discussion

Results showed that Methyl eugenol, Nu lure and Cue lure baited traps installed alone at a distance of 24 meters, captured 34.94, 2.06, 26.06 mean numbers of flies in six weeks duration. However, more mean number of flies attracted when ME was used separately in a single trap position. Similar result also reported by Vargas. 2000: Khan *et al.* (2010); Shelly *et al* (2004) [8, 12, 9]. The second treatment CL was also proved effective in the whole experimental period (Table 1) and this was supported by Vargas (2005): Khalaf *et al* (2011) [13, 14].

Table 1: Mean number of fruit flies trapped in baited traps during six weeks experimental period in the year 2013

S.NO	Treatment	Time interval during fruit fly catch (weeks)						Mean
		Week1	Week2	Week3	Week4	Week5	Week6	
T1	M.E	26.33	38.33	33.67	32.33	37.67	41.33	34.94 d
T2	NL	1.00	2.67	4.00	0.667	2.67	1.33	2.06 g
T3	CL	26.00	25.33	23.33	28.00	25.00	28.67	26.06 e
T4	ME,NL	44.00	44.67	49.00	52.33	58.66	61.33	51.66 b
T5	ME,CL	52.66	67.67	61.33	65.00	62.00	62.67	61.88 a
T6	NL,CL	3.33	4.67	13.33	7.33	9.00	26.67	10.72 f
T7	ME,NL,CL	37.33	25.67	49.00	54.66	61.00	59.33	47.83 c
	Mean	27.24c	29.86c	33.38b	34.33b	36.57b	40.19a	33.46

Means in last column followed by same letters are not significantly different at 5% level of probability. ME stands for Methyl eugenol, NL for Nu Lure® and CL for Cue-lure.

The Nu lure was used as single baited traps but showed poor performance. Similar results also reported by Sooker *et al.*, 2006 [15]. However, the two traps ME & NL, ME & NL, NL & CL and other treatment i.e. ME, NL and CL three baited traps captured 51.66, 61.88, 10.72, 47.83 means fruit fly in six weeks duration. The ME & CL captured maximum mean number of flies in the whole duration. Similar observation were recorded

by Shelly *et al* (2004) [9]. The ME & NL was recorded second in performance Similarly, Abughath *et al.* 2012 [16] used Nu lure as spray with other attractants and found effective. All fruit flies were identified by using the keys of Prabhakar *et al.* 2012 and Ganie *et al.*, 2013 [17, 18]. *Bactrocera zonata* was recorded as dominant species followed by *Bactrocera cucurbitae* as shown in table 2.

Table 2: The different fruit fly species recorded from seven treatments in six week's duration

S.NO	Treatment	<i>B.zonata</i>	<i>B.dorsalis</i>	<i>B.cucurbitae</i>	<i>B.tau</i>	<i>B.diversa</i>	Total
T1	ME	490	81	9	0	31	611
T2	NL	4	1	28	4	0	37
T3	CL	10	22	420	17	0	469
T4	ME + NL	586 + 4	241 + 0	7 + 65	1+6	20+0	930
T5	ME+ CL	546 +17	150+9	35 + 281	5+14	39+18	1114
T6	CL+ NL	0	10+0	143 + 4	21+2	12+1	193
T7	ME+NL+CL	355+0+0	150+0+14	4+ 4 + 285	1+1+23	9+1+14	861
	Total	2012	678	1285	95	145	4215

Conclusion and Recommendation

The present research revealed that the Methyl eugenol and Cue-lure traps used in close proximity about three meters in fruit trees show high performance and best attractants in mixed fruit orchards. These studies proved that Nu lure have negative effect on Cue lure when both attractants baited traps

were placed in close proximity in fruit tree. It was further recommended that the Methyl eugenol and Cue-lure baited traps could be used in close proximity in mix orchard of fruits and vegetables.

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