

Evaluation of food lures and pheromone based yellow sticky lure traps for tephritid fruit flies in mango and sapota in Kerala

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ABSTRACT: In Single Killing Point (SKP) cage experimentation, among different banana fruit macerates tested, varieties poovan and robusta were found to be with maximum fruit fly attraction and orientation. Among the different mango and different fruits tested, prior variety of mango and rose apple were found to be the highest responding food lures to fruit fly. Methyl eugenol based yellow sticky lure traps in mango and sapota orchards revealed that the yellow poly pack board of size 30 x 20 cm in a vertically hanging position recorded the maximum number of fruit flies.

Key words: Tephritid fruit fly, *Bactrocera dorsalis*, Mango and sapota, Food lure, Yellow sticky lure trap.

INTRODUCTION

Fruit fly species of the subfamily Dacinae (Diptera : Tephritidae), are one of the most serious group of pests in different horticultural ecosystems. The annual loss caused by the fruit flies belonging to these two genera is estimated to be around Rs.2,600 crores in India [6]. The Oriental fruit fly, *Bactrocera dorsalis* (Hendel) (Tephritidae: Diptera) is polyphagous and infests more than 250 host plants, including many types of commercial fruits [4,9,8].

Tephritid fruit flies attack a wide variety of fruit crops not only mango and sapota also in orange, banana, guava, fig, rose apple, papaya, ber, apple, etc. and vegetables like cucurbitaceous crops, tomato, brinjal, moringa etc. Fruit flies heavily affect the quality of the fruits. These fruit flies cause direct damage to fruits and vegetables which can lead to up to 90-100% yield loss depending on fruit fly population, locality, variety and season. In addition, to the direct losses, fruit fly infestation can result in serious losses in trade value and export opportunity due to strict quarantine regulations imposed by most importing countries. In this regard, the present studies were carried out to study the performance of different food lures and a para-pheromone, methyl eugenol based yellow sticky lure traps on the attraction and

orientation of the tephritid fruit flies in Kerala conditions.

MATERIALS AND METHODS

(i) Food Lures: The comparative performance of food lures on the relative attraction and orientation of the Oriental fruit fly, *B. dorsalis* and their distribution was analysed under cage experimentation by Single Killing Point (SKP) studies. This study was carried out at Department of Entomology, College of Horticulture, Kerala Agricultural University, Vellanikkara, Thrissur, Kerala during 2007. Laboratory SKP studies were undertaken in two sets of specially designed choice cages with three compartments each designed and fabricated in the Department of Agrl. Entomology.

Excised mango shoots with the lure treatments were kept in pots in cages under symmetrical features. On the day of treatment application freshly reared out *B. dorsalis* pupae at 15 numbers each were placed at the centre of the insect cage dividing the two paired comparative treatments representing one replication. Ten per cent honey solution was also kept at the centre as the adult feed. The following comparisons were tried to evaluate the relative attraction and performance of the various food lures for the relative orientation of *B. dorsalis*.

C ₁ :	Palayankodan	:	Jaggery
C ₂ :	Palayankodan	:	Robusta
C ₃ :	Robusta	:	Poovan
C ₄ :	Fig	:	Roseapple
C ₅ :	Guava	:	Papaya
C ₆ :	Peeled mango	:	Unpeeled mango
C ₇ :	Var. Prior	:	Var. Muvandan
C ₈ :	Var. Neelam	:	Var. Banganapalli
C ₉ :	Var. Alphonso	:	Var. Ollur

Banana fruit slurry after preparation was added with malathion (0.01 ml of 0.2%) and applied over 1 cm² area on the mango leaves in the shoot. For solid fruits, it was cut into 2 cm³ pieces and kept in petridish at the bottom of the cage under mango shoot tips for the fruit fly orientation. The cut faces of fruit cubes were smeared with malathion (0.01 ml of 0.2%) for intoxication. Observations on the dead flies got distributed on both sides of each of the three paired compartments with the paired treatments constituting three replications were made at 24 h intervals. It was continued till all the flies got killed within 3-5 days.

(ii) Sticky Lure Trap Technique in Mango and Sapota: Yellow sticky lure trap experiments were conducted in mango and sapota orchards, College of Horticulture campus, Vellanikkara during 2006-07. to evaluate the efficiency of methyl eugenol mediated food lures with yellow colour perception against fruit flies. Three sizes of yellow sticky fibre boards were prepared and each type installed in the field at vertical and horizontal position. The sticky yellow fibre boards were swabbed with the attractant mixture i.e., methyl eugenol - banana slurry refreshed at weekly intervals. Three replicates were maintained to optimize the catch data.

The yellow sticky board sizes tried were,

- 1) 30 x 20 cm vertical
- 2) 30 x 20 cm horizontal
- 3) 30 x 10 cm vertical
- 4) 30 x 10 cm horizontal
- 5) 20 x 10 cm size yellow card

Preparation of methyl eugenol - banana slurry :

One ml of methyl eugenol and 20 g of banana pulp was macerated and made upto 100 ml by adding water. Malathion (0.1 ml of 0.1%) was added into the solution and mixed well. Finally 20 g of gelatin was added as the sticky base into the mixture and thoroughly mixed by using a glass rod. It was kept for 10 minutes for drying to get it as a slurry for easy pasting on the yellow fibre boards. Counts were taken continuously at weekly intervals on the number of

fruit flies stuck onto the yellow fibre board and the efficiency was evaluated.

RESULTS

(i) Food Lures: Among the comparisons (C1), the Palayankodan banana swab treatment was more attractive with a total fly count of 8 while, jaggery swab attracted only 4.5 flies (Table 1). In C2, Robusta banana swab attracted 8.5 flies while Palayankodan attracted 4 flies only. In C3, Poovan banana swab was giving highest count with 8.5 fly while Robusta attracted only 6.5 flies.

In C4, the rose apple fruit piece attracted more fruit flies (9 flies), while fig fruit piece attracted only 4 flies. In C5, the Guava fruit piece was attracting higher number with a fly count of 6.5 while, papaya fruit piece attracted 4.5 flies only. In C6, the unpeeled mango attracted 7.5 flies, while peeled mango fruit piece attracted a lesser number of 6.5 flies only.

In C7, the fruit piece of Prior variety mango attracted higher number of flies (8.5) than Muvandan fruit piece with 4.5 flies only. In C8, the Banganapalli mango piece performed better with a mean of 6.5 flies while, Neelam fruit piece was less attractive with 2.5 flies. In C9, the fruit piece of Alphonso variety mango was better in its attraction than the Olour mango (7 and 4.5 number of flies respectively).

(ii) Sticky Lure Trap Technique in Mango and Sapota

(a) In mango: The mean fruit fly catch on the yellow sticky traps, showed a significant difference among the sizes of the boards and the hanging positions (Table 2). 30 cm x 20 cm sized vertical yellow sticky board trap gave the maximum fruit fly catch of 27.7 flies, while the same sized board in horizontal position recorded mean catch of 18.7 flies only. While comparing 30 cm x 10 cm horizontal board and 30 cm x 10 cm vertical board trap, it was found that the 30 cm x 10 cm horizontal sticky board trap had highest mean catch (17.4), where as 30 cm x 10 cm vertical trap had the least catch of 11.7 flies. The yellow sticky board trap of 20 cm x 10 cm size had the least mean catch of 5.3 flies only.

(b) In sapota: The mean catch of fruit flies, showed a significant difference among the treatments (Table 2). The 30 cm x 20 cm vertical board trap showed a maximum mean catch of 22.3 flies while, 30 cm x 20 cm horizontal and 30 cm x 10 cm horizontal board traps recorded a mean catch of 15.8 and 12.4 flies respectively. The 30 cm x 10 cm vertical board trap and 20 cm x 10 cm traps had the least mean catch of 7.9 and 2.6 flies respectively. The 30 cm x 20 cm

vertical board trap recorded significantly higher catches in all the observations, while all the other traps recorded the low fruit fly catches.

DISCUSSION

The results of the SKP studies revealed that among different banana macerates evaluated, robusta and poovan were found to be attracting more number of *B. dorsalis* flies both in terms of faster orientation and total numbers attracted as against the more attraction of palayankodan variety to the melon fly *B. cucurbitae* [7]. Among the cut pieces of fruits tested, Prior mango and rose apple were showing more performance in terms of speedy response and total number of fruit fly orientation. As with banana macerates, the pulp texture, sugar content, the odour and the sliminess might be the influential factors for increased attraction of fruit flies. In the case of fruit pieces, softness, colour, sugar and odour might be the parameters that attracted more number of flies to the fruit substrates.

The common types of traps used in capturing Indian fruit flies are Steiner type trap, G-K collapsible trap, sticky boards and McPhail trap. Among the different traps, the sticky boards are cheaper, easy to be assembled and transported. They were good for detection purposes (especially for quarantine aspects) around airports and towns as reported by Kapoor [2]. So, these traps were evaluated for its efficiency against fruit fly monitoring in orchard crops viz, mango and sapota systems at Vellanikkara. The results of yellow sticky boards based on the attractant lure base with methyl eugenol + banana + gelatin macerate mix conducted in mango and sapota orchard system revealed that the yellow coloured vertically hanged, fibre board of polypack material of size 30 cm x 20 cm was optimum in its efficiency for the fruit fly monitoring and detection purposes as evidenced by the number of entrapped fruit flies with a mean number of 27.7 flies per trap per week.

Robacker and Heath [3] made a sticky trap for fruit flies made from fruit fly adhesive paper (FFAP) covered with a plastic mesh of either 1.5 x 1.5 cm or 2.2 x 2.2 cm size and was found as effective as pherocon AM traps in capturing Mexican fruit flies (*Anastrepha ludens*). Khater *et al.* [1] also observed that the yellow sticky trap was more effective in attracting adult males than females, and mostly during periods of low temperature and high relative humidity. Stark and Vargas [5] reported that the white and yellow traps caught the highest number of flies, whereas green, red and black caught lesser numbers in plastic bucket traps. Based on earlier reports and present

investigation, it was evident that the yellow coloured sticky traps attracted more male flies and methyl eugenol + banana + gelatin macerate based yellow sticky trap attracted both male and female flies together for longer periods which would offer a more realistic population prediction.

Table 1
The comparative evaluation of different food lures on fruit flies orientation and attraction under SKP cage experimentation

Compa- rison	Food lures	No of fruit flies attracted	Food lures	No of fruit flies attracted
C ₁	Palayankodan	8.0	Jaggery	4.5
C ₂	Palayankodan	4.0	Robusta	8.5
C ₃	Robusta	6.5	Poovan	8.5
C ₄	Fig	4.0	Rose apple	9.0
C ₅	Guava	6.5	Pappaya	4.5
C ₆	Mango unpeeled	7.5	Mango peeled	6.5
C ₇	Prior	8.5	Muvandan	4.5
C ₈	Neelam	2.5	Banganappalli	6.5
C ₉	Alphonsa	7.0	Ollur	4.5

Table 2
Performance evaluation of different yellow sticky lure traps against fruit flies in mango and sapota orchards

Size of the trap	Mean fruit fly catch	
	Mango	Sapota
1. 30 x 20 cm Horizontal	18.7 ^b (4.38)	15.8 ^b (4.03)
2. 30 x 20 cm Vertical	27.7 ^a (5.31)	22.3 ^a (4.77)
3. 30 x 10 cm Horizontal	17.4 ^b (4.23)	12.4 ^c (3.59)
4. 30 x 10 cm Vertical	11.7 ^c (3.49)	7.9 ^d (2.89)
5. 20 x 10 cm	5.9 ^d (2.52)	2.6 ^e (1.76)

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