



Preference of *Bactrocera* spp. to methyl eugenol based different coloured traps

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In Tephritid fruit flies (Diptera: Tephritidae), both chemical and visual stimuli from plants may play a role in guiding adults to sites where essential resources can be found (Jang and light 1996). More specifically, when seeking oviposition sites after arrival on host plants, female of many frugivorous tephritid species respond positively (Fletcher and Prokopy 1991). In India, there exist numerous species of frugivorous tephritids in the genus *Bactrocera*. Out of which, *Bactrocera dorsalis* (Hendel) and *Bactrocera zonata* (Saunders) are highly destructive pests of peach, pear, guava and Kinnow causing up to 80, 70, 100 and 60–80% infestation respectively. These fruit flies are very difficult to manage due to the fact that they are polyphagous, multivoltine, adults have high mobility and fecundity and all the development stages are unexposed (Sharma *et al.* 2011). Among the various tools available for the management of fruit flies, the use of methyl eugenol in traps is considered one of the effective strategies in IPM. The use of methyl eugenol along with the insecticide in a trap is known as male annihilation technique (MAT). Methyl eugenol attracts male fruit flies from a distance of 800 m (Roomi *et al.* 1993) and then, fruit flies are ultimately killed, thus reducing the number of males for mating (Cunningham 1989). The most effective way to capture the fruit flies is use of those traps having combined effect of both olfactory and visual stimuli and these stimuli help in host location (Daniel *et al.* 2014). The present study was, therefore, carried out to determine the preference of fruit flies to methyl eugenol based different coloured traps in peach, pear, guava and Kinnow orchards.

Studies on abundance and management of fruit flies were carried out during 2016–17 at Fruit Research Farm, Punjab Agricultural University, Ludhiana (30° 55' N, 75° 54' E), Punjab. In this study, different coloured PAU fruit fly traps, i.e. red, green, yellow and transparent traps were used.

The experimental orchards comprised peach, pear, guava and Kinnow mandarin and observations were recorded at weekly intervals. Mineral water bottle traps (1 litre capacity) designated as PAU fruit fly traps, recommended by PAU, Ludhiana were used (Singh and Sharma 2013). The trap consisted of a plywood dispenser, suspended vertically inside the bottle, aligning with four vents that allowed entry of fruit flies inside the bottle. The traps used in MAT technique consisted of immersing water absorbable plywood blocks (7.5 cm × 6.0 cm × 2.0 cm) having the solution of ethyl alcohol, methyl eugenol and malathion in the ratio of 6:4:1 (v/v). The baited traps were hanged on the trees at equidistance. The traps were fixed in first week of April in peach orchard and subsequently in pear, guava and Kinnow orchards, in a uniform manner. The fruit flies trapped in the trap were collected in the carry bag after every 7 days and counted. For evaluating fruit infestation, sample of 50 fruits at random/treatment collected at weekly interval were sorted out as infested (based on ovipositor puncture) and healthy fruits. The data were recorded at weekly interval till the fruit harvesting was over. Per cent fruit infestation was worked out. Trap catches and per cent fruit infestation were subjected to completely randomized block (CRD) analysis by CPCS1 after suitable conversion of the data.

For trap catch, mean population of *Bactrocera* spp. males captured/trap/week in peach, pear, guava and Kinnow orchards using different coloured PAU fruit fly traps based on MAT revealed that yellow coloured traps had significantly more population of fruit flies captured as compared to red, green and PAU fruit fly traps (Fig 1). In peach, pooled mean of all the weekly observations revealed that the number of fruit fly males captured/trap/week was significantly high in yellow traps (53.00 males) followed by green traps (23.58 males), whereas PAU fruit fly traps (14.28 males) and red traps (11.08 males) were significantly at par with each other. In pear, pooled mean of all the weekly observations revealed that the number of fruit fly males captured/trap/week were significantly high in yellow traps (101.39 males) as compared to PAU fruit fly traps (59.03 males), green traps (38.14 males) and red traps (35.61 males). In guava, number of fruit fly males captured/trap/week were significantly high

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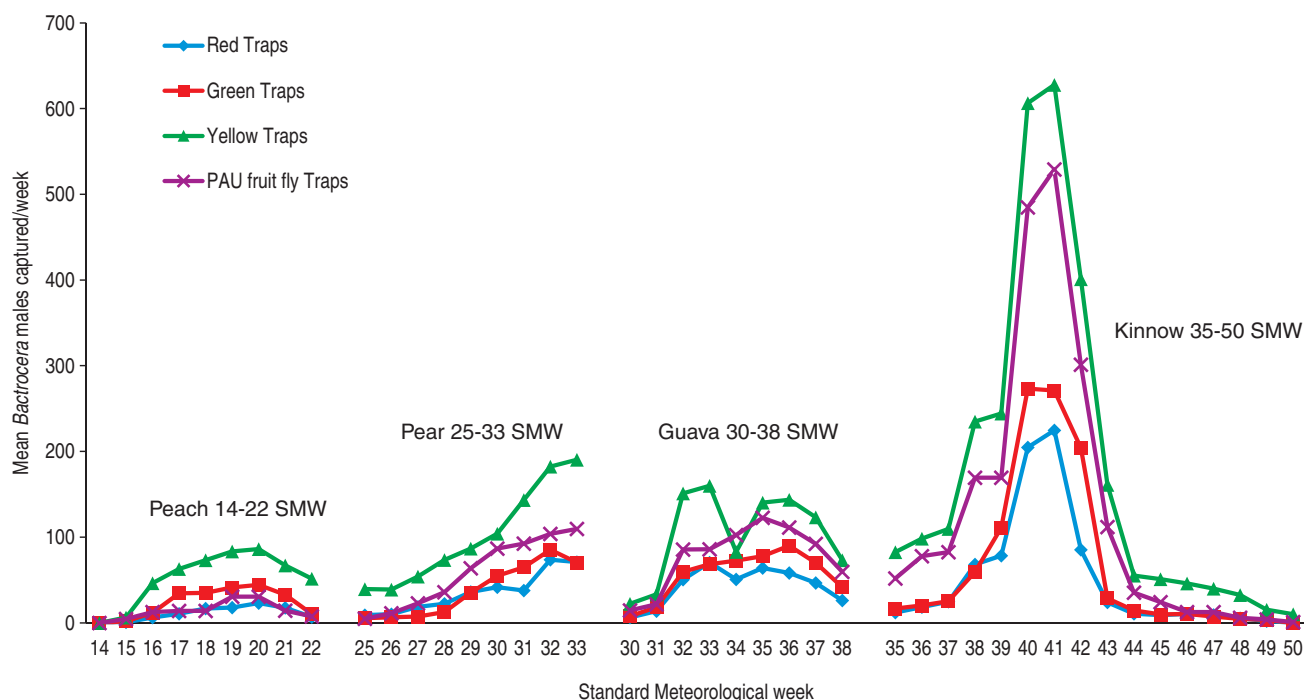


Fig 1 Mean population of *Bactrocera* spp. male captured/trap/week in different coloured PAU fruit fly traps in different fruit crops.

in yellow traps (103.36 males) as compared to PAU fruit fly (77.36 males), green (56.31 males) or red (43.00 males) traps. Similar observations were recorded in Kinnow, with yellow traps trapping highest males (176.03 males) followed by PAU fruit fly (129.58 males), green (66.27 males) and red (49.25 males) traps.

To evaluate the impact of different treatments on capturing of male fruit flies in peach, pear, guava and Kinnow, infested fruits were recorded in different treatments (Fig 2). The per cent fruit infestation was recorded lowest in yellow traps followed by red, green and PAU fruit fly trap but were non-significant in all the crops. In peach, pooled mean of all the weekly observations revealed that per cent fruit infestation was lowest (3.67%) in yellow traps as compared to PAU fruit fly (4.39%), red (4.58%) and green (5.00%) traps. In pear, pooled mean showed that per cent fruit infestation was lowest (5.11%) in yellow traps as compared to PAU fruit fly (6.14%), red (6.36%) and green (7.11%) traps, but were non-significant. Similar observations were seen in guava with lowest fruit infestation (14.61%) in yellow traps as compared to PAU fruit fly (16.72%), red (16.80%) and green (17.44%) traps. In Kinnow, per cent fruit infestation was again lowest (9.19%) in yellow traps as compared to red traps (9.92%), green traps (9.94%) and PAU fruit fly traps (10.47%) though the results were non-significant.

The results in the present

studies indicated that trap catch of males followed a uniform pattern on different fruit crops, viz. peach, pear, guava and Kinnow. Present studies clearly indicate that *Bactrocera* spp. responds more towards the yellow colour stimuli, i.e. yellow coloured PAU fruit fly traps has highest population of male fruit flies captured and lowest per cent fruit infestation, which are in conformity with the reports of Marmaini and Saputra (2016), Sikander *et al.* (2017) and Abu-Ragheef and Al-Jassany (2018). Yellow is one of the most influential physical stimuli used in the mass trapping or in the monitoring programme of pests (Hill and Hooper 1984). The most probable reason for the preference of fruit flies species to yellow colour traps might be due to reflection of yellow colour (Madhura 2001).

Contrary to present findings, Rajitha and Viraktmath (2005b) and Jamwal *et al.* (2015) reported that green traps captured significantly more number of fruit flies in mango orchards. However, Rajitha and Viraktmath (2005a) reported

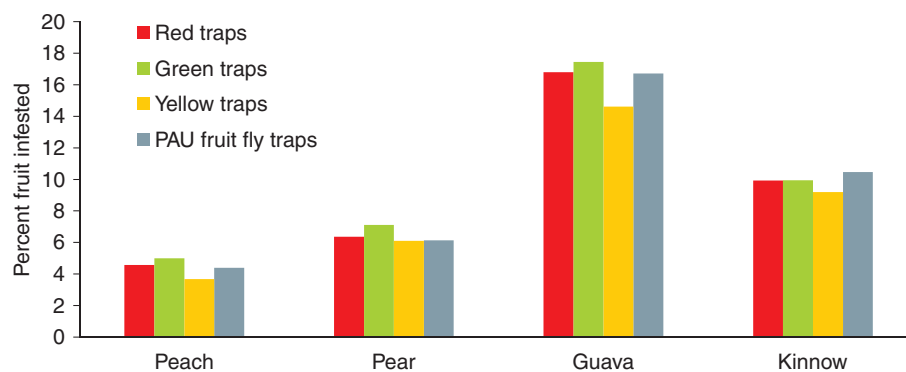


Fig 2 Per cent *Bactrocera* spp. infested fruits of peach, pear, guava and Kinnow with different coloured PAU fruit fly traps during 2016-17.

that red traps captured more fruit flies. Math *et al.* (2017) opined that transparent bottle trap having 2 per cent methyl eugenol captured highest number of fruit flies as compared to yellow, green and blue traps.

Present studies concluded that trap colour significantly affected the trap effectiveness in capturing *B. dorsalis* and *B. zonata*. Yellow traps had captured highest population of male fruit flies as compared to red, green and transparent traps in peach, pear, guava and Kinnow orchards. Per cent fruit infestation was lowest in yellow traps. The traps must be installed in the orchards at colour break stage of the fruit. Timely installation of the traps in orchard will help the farmers in detection and management of fruit flies at preliminary stages, resulting in significantly reduced population density at peak season of crop. This strategy should be implemented as a part of integrated pest management to minimize the huge damage caused by fruit flies. Other management practices such as orchard sanitation, weed control, picking and burying of dropped fruits should also be incorporated as a part of IPM in the orchards to achieve the satisfactory results for the control of fruit flies.

SUMMARY

Fruit flies, *Bactrocera dorsalis* (Hendel) and *Bactrocera zonata* (Saunders) are highly destructive pests of peach, pear, guava and Kinnow mandarin causing up to 80, 70, 100 and 60–80% fruit infestation, respectively. These fruit flies are very difficult to manage due to the fact that they are polyphagous, multivoltine adults have high mobility and fecundity and all the development stages are unexposed. Males of *Bactrocera* spp. are highly attracted toward para-pheromone methyl eugenol. Studies on the response of fruit flies to methyl eugenol based different coloured PAU fruit fly traps (red, green, yellow and standard transparent trap) were carried out in peach, pear, guava and Kinnow orchards during 2016–17. The result showed that yellow trap was consistently the most attractive as compared to other trap colours in all the four crops. The use of yellow coloured fruit fly traps can help in attracting more fruit flies, thereby reducing their population in the respective orchards.

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