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Bio-efficacy of poison baits against Melon fruit fly, *Bactrocera cucurbitae* (Coquillett) in the open cucumber field

Chaudhary K.V., Patel S.R. and Akshay Kumar

Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari 396 450, Gujarat, India

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ABSTRACT

Present research work was carried out to assess the efficacy of different poison food baits against melon fruit flies infesting cucumber under field conditions. In the experiment, different bait mixtures comprised of fruit pulps mixed with protein hydrolysate (PH) and malathion 50 EC were assessed for their attractive potential against *B.cucurbitae* under field conditions. Out of all baits, bait treatment with a mixture of PH 2.5% (V/V) + pumpkin 2.5% (W/V) + malathion 50 EC (0.05%) found significantly superior as it recorded the highest mean number of fruit flies (57.38 fruit flies/trap/eight weeks). Thus, this bait treatment could be recommended for mass trapping of adult male and female melon flies.

Key words: *Bactrocera cucurbitae*, Poison baits, Fruit pulps, Malathion, Cucumber

Introduction

The cucumber (*Cucumis sativus* L.) is a creeping vine that roots in the ground and grows up trellises or other supporting frames wrapping around supports with thin spiraling tendrils. It has large leaves that form a canopy over the fruit. The fruit of the cucumber is roughly cylindrical, elongated with tapered ends and may be as large as 60 centimeters long and 10 centimeters in diameter (Azad *et al.*, 2013). Cucumber is used as a vegetable crop while its fruits are used for pickling or salad purposes in India. It is also high in water (95%) and low in calories, fat, cholesterol and sodium. It has been used for its anti-inflammatory benefits on the skin, soothing properties for digestion and other therapeutic uses (Murad and Nyc, 2016). The devastating effects that fruit flies inflict on the horticultural industry worldwide and the transboundary nature of their problem has

placed them at the top of the world's list of key pests of cucurbits (Enkerlin, 2003). To combat the losses, caused by fruit flies the farmers conventionally use various types of chemical insecticides this not only involves heavy expenditure but also causes several problems for human health and the environment (Shivangi *et al.*, 2017). The increasing acceptance of organic agriculture where chemicals are not permitted has led to a quest for the scientific community around the globe to either formulate or suggest safer alternatives for controlling fruit flies (Dhillon *et al.*, 2005). It involves integration of various management tactics *viz.*, raking of soil, field sanitation, bagging of fruits, use of male annihilation technique and bait application technique (BAT) for mass trapping and monitoring purpose (Chaudhary and Patel, 2008). Giving importance to the BAT and considering economic importance of melon fruit fly the proposed research study was carried out to evaluate

the poison baits against *B. cucurbitae* infesting cucumber.

Materials and Methods

The present investigation was made to evaluate poison baits against *B. cucurbitae* in cucumber during summer 2022 in farmer's field at Kharsad, Jalalpore, Navsari, Gujarat. Village Kharsad was geographically located at 20° 49' 54.6" N latitude and 72° 54' 32.0" E longitude with an altitude of 14 meters above MSL. The details of experiment are given in below.

1	Size of plot	0.5 acre
2	Crop and variety	Cucumber and Alamgir CT 380
3	Method of sowing	Raised bed
4	Spacing	1.50 m × 0.50 m
5	Date of sowing	24 th February, 2022
6	Experimental design	Randomized Block Design (RBD)
7	Treatments	08
8	Replications	03

The experimental plot was kept free from the insecticidal spray throughout the crop season. The poison baits were prepared from various materials viz., pH 5% alone and black jaggery, papaya, guava, sapota, banana, pumpkin and cucumber fruit pulps in combination with PH 2.5% for their efficiency to attract and kill *B. cucurbitae*. The pulp was prepared by crushing the fresh and tender fruits (peeled off) in a mixture-cum-grinder without adding water. In each bait mixture, malathion 50 EC (0.05%) insecticide was added. The aqueous poison bait (100 ml) was poured into a trap consisting of a plastic mineral water bottle having two holes each 2.00 cm in diameter on both sides. The trap with poison bait was hung with the help of a wooden stick one foot above the foliage equidistantly just after flowering. The baits were replaced once after one week of installation. The numbers of adult melon fruit flies, *B. cucurbitae* attracted and killed in a poison bait trap were recorded at weekly intervals as per SMW. The

data on fruit fly catches in each poison bait trap were analyzed statistically after doing necessary transformation. The details of treatments are given in below.

Results and Discussion

The result of male, female and total melon fruit fly (*B. cucurbitae*) catches recorded at weekly interval are presented in Table 1.

Male melon fly catch: The data on male fruit fly catches by different poison baits are presented in Table 1. The catches of adult male of *B. cucurbitae* varied in different poison bait treatments. The results indicated that bait treatment with a mixture of PH 2.5% (V/V) + pumpkin 2.5% (W/V) + malathion 50 EC (0.05%) proved the most effective with the highest number of male fruit flies (18.29 male fruit flies/trap/eight weeks). It was followed by the bait treatment of a mixture of PH 5% (V/V) + malathion 50 EC (0.05%) (12.29 male fruit flies/trap/eight weeks) which was at par with the bait treatment of mixture of PH 2.5% (V/V) + cucumber 2.5% (W/V) + malathion 50 EC (0.05%) (11.42 male fruit flies/trap/eight weeks). The next effective bait treatment was mixture of PH 2.5% (V/V) + banana 2.5% (W/V) + malathion 50 EC (0.05%) (10.42 male fruit flies/trap/eight weeks) which was at par with the bait treatment of mixture of PH 2.5% (V/V) + black jaggery 2.5% (W/V) + malathion 50 EC (0.05%) (9.38 male fruit flies/trap/eight weeks). Whereas, bait treatment of mixture of PH 2.5% (V/V) + sapota 2.5% (W/V) + malathion 50 EC (0.05%) found least effective with 4.79 male fruit flies per trap per eight weeks. Moreover, total number of male fruit flies caught during present experiment graphically depicted in Figure 1. It shows that overall, 1945 male melon fruit flies were trapped in different poison bait treatments which was 35 per cent of total catches.

Female melon fly catch: The data on female fruit fly

Treatment	Aqueous baits [Baits with Malathion 50 EC (0.05%)]
T ₁	Mixture of PH 2.5% (V/V) + Black jaggery 2.5% (W/V)
T ₂	Mixture of PH 2.5% (V/V) + Papaya 2.5% (W/V)
T ₃	Mixture of PH 2.5% (V/V) + Guava 2.5% (W/V)
T ₄	Mixture of PH 2.5% (V/V) + Sapota 2.5% (W/V)
T ₅	Mixture of PH 2.5% (V/V) + Banana 2.5% (W/V)
T ₆	Mixture of PH 2.5% (V/V) + Pumpkin 2.5% (W/V)
T ₇	Mixture of PH 2.5% (V/V) + Cucumber 2.5% (W/V)
T ₈	Protein hydrolysate (PH) 5% (V/V)

catches in different poison baits are presented in Table 4.14. The catches of adult female of *B. cucurbitae* varied in different poison bait treatments. The results indicated that bait treatment with a mixture of PH 2.5% (V/V) + pumpkin 2.5% (W/V) + malathion 50 EC (0.05%) proved the most effective with the highest number of female fruit flies (39.08 female fruit flies/trap/eight weeks). It was followed by the bait treatment of mixture of PH 5% (V/V) + malathion 50 EC (0.05%) (27.13 female fruit flies/trap/eight weeks) which differed significantly from the bait treatment of mixture of PH 2.5% (V/V) + cucumber 2.5% (W/V) + malathion 50 EC (0.05%) (22.04 female fruit flies/trap/eight weeks). The next effective bait treatment was mixture of PH 2.5% (V/V) + banana 2.5% (W/V) + malathion 50 EC (0.05%) (18.08 female fruit flies/trap/eight weeks) which was at par with the bait treatment of mixture of PH 2.5% (V/V) + black jaggery 2.5% (W/V) + malathion 50 EC (0.05%) (16.29 female fruit flies/trap/eight weeks). Whereas, bait treatment of mixture of PH 2.5% (V/V) + sapota 2.5% (W/V) + malathion 50 EC (0.05%) found least effective with 7.63 female fruit flies per trap per eight weeks. Moreover, data graphically depicted in Figure 1 further revealed that total 3686 female melon fruit flies (65%) were caught irrespective of poison bait treatments over entire period of present study. As all the bait treatment contains protein hydrolysate it could be the reason behind more attractiveness of females towards them to fulfil their requirement of protein source to mature sexually and for the development of their eggs.

Pooled melon fly catch: The data on total number of male and female melon fruit flies caught per poison bait treatments are presented in Table 1 indicated that the bait treatment with a mixture of PH

2.5% (V/V) + pumpkin 2.5% (W/V) + malathion 50 EC (0.05%) found significantly superior among all the tested poison bait treatments as it recorded the highest mean number of fruit flies (57.38 fruit flies/trap/eight weeks). Moreover, the second highest number of fruit flies were caught in bait treatment of mixture of PH 5% (V/V) + malathion 50 EC (0.05%) with 39.42 fruit flies per trap per eight weeks and it differ significantly from the bait treatment of mixture of PH 2.5% (V/V) + cucumber 2.5% (W/V) + malathion 50 EC (0.05%) (33.46 fruit flies/trap/eight weeks). However, the bait treatment of mixture of PH 2.5% (V/V) + banana 2.5% (W/V) + malathion 50 EC (0.05%) and bait treatment of mixture of PH 2.5% (V/V) + black jaggery 2.5% (W/V) + malathion 50 EC (0.05%) were at par with each other, but differed significantly from rest of the bait treatments. Whereas, bait treatment of mixture of PH 2.5% (V/V) + sapota 2.5% (W/V) + malathion 50 EC (0.05%) recorded 12.42 fruit flies per trap per eight weeks and found significantly inferior to rest of the bait treatments.

It was indicative from the review of available lit-

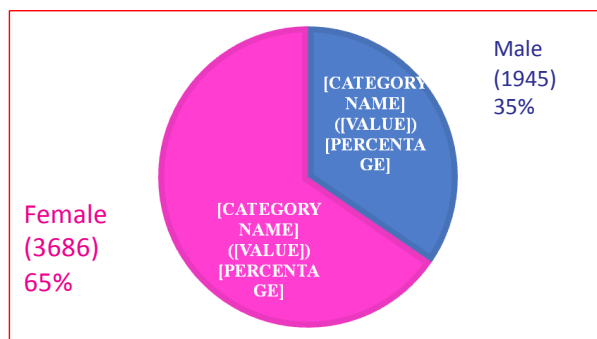


Fig. 1. Total number of melon fruit flies caught in different poison bait traps starting from 12th to 19th SMW during summer 2022

Table 1. Efficacy of different poison baits traps in attracting and killing *B. cucurbitae* infesting cucumber

Tr. No.	Aqueous baits [Baits with Malathion 50 EC (0.05%)]	Number of melon fruit flies/trap/eight weeks		
		Male	Female	Total
T ₁	Mixture of PH 2.5% (V/V) + Black jaggery 2.5% (W/V)	3.11 ^{de} (9.38)	4.06 ^{de} (16.29)	5.07 ^{de} (25.67)
T ₂	Mixture of PH 2.5% (V/V) + Papaya 2.5% (W/V)	2.90 ^{ef} (8.17)	3.60 ^f (12.83)	4.57 ^f (21.00)
T ₃	Mixture of PH 2.5% (V/V) + Guava 2.5% (W/V)	2.56 ^g (6.29)	3.26 ^{fg} (10.50)	4.09 ^g (16.79)
T ₄	Mixture of PH 2.5% (V/V) + Sapota 2.5% (W/V)	2.22 ^h (4.79)	2.80 ^h (7.63)	3.51 ^h (12.42)
T ₅	Mixture of PH 2.5% (V/V) + Banana 2.5% (W/V)	3.27 ^{cd} (10.42)	4.26 ^d (18.08)	5.33 ^d (28.50)
T ₆	Mixture of PH 2.5% (V/V) + Pumpkin 2.5% (W/V)	4.32 ^a (18.29)	6.25 ^a (39.08)	7.57 ^a (57.38)
T ₇	Mixture of PH 2.5% (V/V) + Cucumber 2.5% (W/V)	3.43 ^{bc} (11.42)	4.70 ^c (22.04)	5.78 ^c (33.46)
T ₈	Protein hydrolysate (PH) 5% (V/V)	3.56 ^b (12.29)	5.22 ^b (27.13)	6.28 ^b (39.42)
	SEm (±)	0.072	0.124	0.128
	CD (0.05)	0.219	0.377	0.389

erature that very little work had been done in past with the same bait components as taken in present study. However, other workers have evaluated different poison food baits for their suitability to attract and kill the adult melon fruit flies. Present findings are more or less supported by Kumar (2001) who found that the bait consisting of malathion (0.05 %) + protein hydrolysate in 1.00:4.00 ratio was highly effective in suppressing population build-up of *B. cucurbitae* while Stonehouse *et al.* (2005) also stated that cover spray with the bait of protein hydrolysate (3%) provided the maximum percentage improvement over no control followed by banana bait. Moreover, Thakur and Gupta (2013) observed that food bait containing protein hydrolysate attracted maximum adults (6.30 melon fruit flies/30 minutes), followed by yeast hydrolysate (5.10 melon fruit flies/30 minutes), sugar (3.70 melon fruit flies/30 minutes), cucumber (3.40 melon fruit flies/30 minutes) and bitter gourd (3.40 melon fruit flies/30 minutes). However, female melon fruit flies visited the test food material more frequently 4.80 females/30 minutes in comparison to 3.90 males/30 minutes. Whereas, Patel *et al.* (2019) noticed that the highest number of cucurbit fruit fly was trapped in the trap having banana pulp bait with an average of 3.31 flies/bait.

Conclusion

Among all aqueous poison baits, bait treatment with a mixture of PH 2.5% (V/V) + pumpkin 2.5% (W/V) + malathion 50 EC (0.05%) found significantly superior and catches of female fruit flies were comparatively higher (65%) than that of male hence, it can be incorporated in integrated pest management (IPM) programme of melon fruit fly, *B. cucurbitae*.

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References

- Azad, A. K., Sardar, A., Yesmin, N., Rahman, M. and Islam, S. 2013. Eco-friendly pest control in cucumber (*Cucumis sativus* L.) field with botanical pesticides. *Nat. Resour.* 4: 404-409.
- Murad, H. and Nyc, M. A. 2016. Evaluating the potential benefits of cucumbers for improved health and skin care. *J. Aging Res. Clin. Pract.* 5(3): 139-141.
- Enkerlin, W. 2003. Economics of area-wide SIT control programs. In: *Recent trends on sterile insect technique and area-wide integrated pest management economic feasibility, control projects, farmer organization, and Bactrocera dorsalis complex control study*, Research Institute for Sub-tropics, Naha, Japan, p. 122.
- Dhillon, M. K., Singh, R., Naresh, J. S. and Sharma, H. C. 2005. The melon fruit fly, *B. cucurbitae*: A review of its biology and management. *J. Insect Sci.* 5: 40.
- Shivangi; Lekha and Swami, H. 2017. Bio-intensive management of fruit fly, *Bactrocera cucurbitae* (Coquillett) in cucumber. *J. Entomol. Zool. Stud.* 5(3): 1823-1826.
- Thakur, M. and Gupta, D. 2013. Efficacy of different food attractants for control of fruit flies [*Bactrocera tau* and *B. cucurbitae* (Diptera: Tephritidae)]. *Int. J. Agric. Stat. Sci.* 9(2): 575-580.
- Chaudhary, F. K. and Patel, G. M. 2008. An integrated approach of male annihilation and bait application technique for fruit fly management in pumpkin. *Pest Mgt. Ecol. Zool.* 16(1): 57-61.
- Kumar, P. 2001. *Bio-ecology and management of melon fruit fly, Bactrocera (Dacus) cucurbitae* Coquillett on bitter gourd (*Momordica charantia* L.). Thesis M.Sc.(Agri.), Sher-E-Kashmir University of Agricultural Sciences and Technology, Jammu, India. 54 p.
- Stonehouse, J. M., Jiji, T., Singh, H. S., Satpathy, S., Patel, R. K., Tamilvel, D., Nair, B., Senthilkumar; Mohanta, A., Joshi, B. K., Verghese, A. and Mumford, J. D. 2005. Lure and Bait IPM of melon flies in gourds in Kerala, Orissa, Uttar Pradesh and Gujarat. *Pest Manag. Hortic. Ecsyst.* 11(2): 145-150.
- Patel, N. M.; Patel, K. A. and Shukla, A. 2019. Effect of different non-chemical baits against fruit fly in bitter gourd. In: *Souvenir of National symposium on Sustainable Management of Pests and Diseases in Augmenting Food and Nutritional Security*, 120 p.