Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(3): 1419-1421

Received: 21-03-2017
Accepted: 22-04-2017

Manoj Am
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India

Sridharan S
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India

Mohan C
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India

Nikita S Awasthi
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India

Correspondence
Sridharan S
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India

Varying infestation of fruit fly, *Bactrocera Cucurbitae* (Coquillett) in Different Cucurbit Crops

Manoj Am, Sridharan S, Mohan C and Nikita S Awasthi

Abstract
The preference of melon fruit fly, *Bactrocera cucurbitae* (Coquillett) to different cucurbit crops was studied November 2014 - April 2015 in farmer field at Thondamuthur, Coimbatore district of Tamil Nadu. The maximum adult catches of 10.25/trap/day was recorded from snake gourd cropping field as against minimum catches 2.5 adult/trap/day in bottle gourd field. Regarding infestation of fruits, mean number of mean number of maggots per infested fruit was maximum in snake gourd (10) showing more preference as compared to absence of maggot in bottle gourd indicating the least preference. Studies using penetrometer available in Post-harvest technology centre, Tamil Nadu Agricultural University, Coimbatore. Also showed low tissue firmness in 5 days old more preferred snake gourd as compared with high tissue firmness recorded in least preferred 5 days old bottle gourd. The preferences of cucurbit fruits studied under laboratory revealed more hairs 16.6/ microscopic field in bottle gourd as compared minimum hair of 1.4/microscopic field in highly preferred snake gourd indicating more susceptibility and damage.

Keywords: chewiness, firmness, gumminess, hardness and penetrometer

1. Introduction
Cucurbit fruit fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae), also called as melon fruit fly, is one of the devastating pests of cucurbits causing more than 60 per cent crop losses (Kapoor, 1993). It has been reported to damage mostly cucurbits as a major pest besides crops like tomato, watery rose apple and other plants [10] distribution in temperate, tropical and sub- tropical regions of the world. Mated gravid female lays eggs below the skin of the host fruit with visible signs of oviposition punctures. Egg hatches within a day or two and maggots bore their way into the interior of the fruit. The larvae are leg-less maggots which feed on the inner pulp of the fruit for another week or more.[15] The infested fruit may deform in shape and losses the nutritional quality. Premature fruit drop is observed due to attack of fruit flies. The full grown larva comes out the fruit and falls on the ground and pupates [3]. Losses in different crops due to melon fruit fly are varied. The extent of losses varies between 30 to 100 per cent, depending on the cucurbit species and the season. Fruit infestation by melon fruit fly in bitter gourd has been reported to vary from 41 to 89 per cent [12, 13, 11, 6, 14]. The melon fruit fly has been reported to infest 95 per cent of bitter gourd fruits in Papua (New Guinea), and 90 per cent snake gourd and 60 to 87 per cent pumpkin fruits in Solomon Islands [7, 16] reported 31.27 per cent damage on bitter gourd and 28.55 per cent on watermelon in India.
In addition, to the direct losses, fruit fly infestation poses serious threat to the international trade and export opportunity due to strict quarantine regulations imposed by importing countries [8]. Strict legal restrictions are being imposed now a days, which includes residues of chemical pesticides and use of fumigants. Presence of immature stages of fruit flies is the major cause for the rejection of Indian consignments from various importing countries [2]. Thus it is imperative to find alternative pest management strategies for fruit fly management and their integration. Host plant resistance is considered as an important component in integrated pest management programs which do not cause any adverse effect to the environment incurring no extra cost to the farmers. Attempts should be made for screening of different genotypes for the resistance to different fruit fly species and transferring resistance genes in the cultivated genotypes from the wild relatives for developing resistant varieties through wide hybridization. Unfortunately success in developing high yielding and fruit fly-resistant varieties has been limited.

With this view, attempts were made to the study of host preference of melon fruit fly in few commonly cultivated cucurbits in the Department of Agricultural Entomology, Tamil Nadu Agricultural University (TNAU), Tamil Nadu during 2014-15.

2. Material and Methods

2.1. Susceptibility of different cucurbit crops to fruit fly

Field studies were undertaken to study the preference of melon fruit fly to different cucurbit crop species in farmers field at thondamuthur, Coimbatore, Tamil Nadu, November 2014- April 15. Fruit fly traps containing cue lure, chemically known as 4-(p-acetoxyphenyl) -2-butanone, which attracts males of fruit flies were used for monitoring the population of fruit flies in different cucurbits. The cucurbit species monitored were snake gourd (*Trichosanthes cucumerina*), bitter gourd (*Momordica charantia*), ribbed gourd (*Luffa acutangula*) and bottle gourd (*Lagenaria siceraria)*.In each cucurbit field, four traps were fixed at equi distance from 45 days after sowing coinciding with initiation of flowering. The male adults collected in the trap were removed at weekly intervals and counted and recorded. The observation on the adult catches was continued till the last harvest of the crop. The number of adults trapped in various cucurbits was recorded upto last harvest. The preference of crop to fruit fly was determined by proper statistical analysis. Intensity of the fruit damage by counting the numbers of maggots per fruit in each crop by split opening the fruit.

2.2. Morphological basis of host plant preference in melon fruit fly

2.2.1. Pubescence on fruit

The morphological characters like pubescence on the fruit of different cucurbit species was assessed by observing under microscope (Leica DM4P) in the laboratory. The cut pieces of gourds of uniform age (5 days old) were prepared in individual cucurbit species. The inner tissues were removed leaving the epicarp with hairs intact. Then the cut pieces of fruits were in potassium hydroxide solution and placed on the stage at 100x magnification. The observations on hairs were made in five microscopic fields with eyepiece of 10x magnification. The number of hairs per microscopic field was counted in five places of fruit piece by moving the object and mean number of hairs per microscopic field was worked out.

2.2.2. Physical characters of fruit

The observation on fruit texture in two different ages of fruits namely 5 days and 15 days old were studied using Penetrometer (Agrosta14 field) available in Post-Harvest Technology Centre, TNAU, Coimbatore. The data on hardness, gumminess, chewiness and firmness were recorded.

2.2.3. Statistical analysis

Data was tabulated and subjected to statistical analysis after appropriate data transformation. The analysis of variance was carried out by Randomized Block Design using AGRES 3.01 and AGDATA software.

3. Results and Discussion

3.1. Influence of host on the incidence of fruit fly

Data recorded from the fruit fly catches revealed that activity of male adult fruit fly was maximum in snake gourd 10.25 adults/trap/day indicating the highest preference, followed by bitter gourd with 7.2 adults/trap/day (Table 1). Moderate preference of fruit fly to ridge gourd was observed with collection of 4.2 adults/trap/day. The least preferred cucurbit was bottle gourd with trap collection of 2.5 male adults/trap/day. Maggot activity found was the highest in snake gourd with mean number of 10maggots/fruit followed by bitter gourd and ridge gourd with 5 and 5.1 maggots/fruit (Table 1). Whereas, no maggot infestation was recorded in bottle gourd.

These results are in agreement with the report of [5] who found bitter gourd, musk melon, snap melon and snake gourd as the most preferred hosts for *Bactrocera cucurbitae.* Similarly, melon fruit fly has been reported to infest 95 per cent of bitter gourd fruit in Papua and 90 per cent snake gourd and 60 to 87 per cent pumpkin fruit in Solomon Islands [7].This finding was also in line with the present result. Relatively high preference of snake gourd to bitter gourd obtained in the present study was well supported by the investigations of [1] who found more oviposition in snake gourd followed by cucumber and bitter gourd under laboratory condition.

3.2. Morphological characters of cucurbits and their relation with fruit fly incidence

Table 2. Represents the density of hairs present on five days old fruits of snake gourd, bitter gourd, ridge gourd and bottle gourd. The number of hairs per microscopic field was maximum in bottle gourd 16.6 hairs per microscopic field followed by 8.5 in ridge gourd. Least number of hairs was present on snake gourd 1.4 per microscopic field followed by 5.4 hairs in bitter gourd.

The hardness, chewiness, gumminess and firmness were estimated (Table 3). The value on hardness was high in bitter gourd whereas the firmness was low in bitter gourd. The highly preferred snake gourd showed least firmness and least hardiness. The less preferred ridge and bottle gourd had high value of firmness as compared to bitter gourd and snake gourd.

The preference and non-preference of cucurbits by female fruit fly for oviposition can be attributed to the morphological and biochemical characters of the fruit. In the present study, the snake gourd was highly preferred by the female fruit fly for oviposition whereas bottle gourd was least preferred. This selected preference of female fruit fly for oviposition can be related to the presence of hairs on the young vulnerable stage of fruits (5 day old).

Physical characters of the fruit hardness, firmness, chewiness and gumminess also contribute to ovipositional preference of fruit fly. The fruits have less hardness and firmness has higher infestation and high preference for oviposition. Present result also showed that snake gourd with higher infestation and preference has the minimum hardness and firmness. The bitter gourd which is the next preferred host has more hardness and less firmness and intermediary number of hairs which makes the crop moderately preferable. The bottle gourd has high value of hardness and firmness as compared snake gourd also possesses maximum hairs on 5 day old fruits. These characters make the bottle gourd least preferable.

The reports of [4] that preference of fruit for egg laying is positively correlated with flesh thickness and negatively associated with fruit toughness. Besides, the positive association of fruit fly infestation and larval density/fruit with the moisture content of the fruit is in confirmation that morphological and physical characters influence the preference of fruits as obtained in the present results. Similarly, the higher order of preference of *Bactrocera cucurbitae* for ovipositon in snake gourd as compared to bitter gourd observed by [1] was in total agreement with the present result.

Table 1: Influence of different cucurbit species on fruit fly incidence

S.no.	Treatment	Mean adult catches /day/trap*(nos)	Mean maggots/fruit# (nos)
1	Snake gourd	10.25 (3.20)[a]	10.00 (3.32)[a]
2	Bitter gourd	7.50 (2.700)[b]	5.00 (2.34)[b]
3	Ridge gourd	4.20 (1.94)[c]	5.10 (2.36)[b]
4	Bottle gourd	2.50 (1.72)[c]	0.00 (0.71)[c]
CD at 5%		0.3957	0.2787

*Mean of 12 replication, # Mean of 10 replications, values in the parentheses are square root transformed, grouping is carried out by LSD

Table 2: Density of hairs on five days old fruits

S. no.	Crop	Mean number of hairs/microscopic field
1	Snake gourd	1.4
		(1.3)[d]
2	Bittergourd	5.4
		(2.4)[c]
3	Ridge gourd	8.5
		(3.0)[b]
4	Bottle gourd	16.6
		(4.1)[a]
	CD at 5%	0.0468

Mean of 5 replication, values in the parentheses are square root transformed; grouping is carried out by LSD.

Table 3: Bio Physical analysis of fruits using penetrometer

S. No	5 days				15 days			
	Hardness	Firmness	Chewiness	Gumminess	Hardness	Firmness	Chewiness	Gumminess
Snake gourd	835.9	0.0456	520	0.774	24402.4	0.0494	21573.15	224627.7
Bitter gourd	66918.87	0.038	-	-	32347.86	0.0609	11902.247	1541.466
Ridge gourd	404.1	0.0482	296.135	0.869	4060.775	0.0938	3432.22	3432.22
Bottle gourd	13802.4	0.0507	701.22	0.458	23419.7	0.0545	14897.8	14897.8

Conclusion

An attractive cucurbit crop less preferred by fruit fly identified from this study shall be suggested for crop rotation which utilize the existing pandal structures and reduce the pest load, besides giving revenue to the farmer. In addition the penetrometer studies on the physical parameters on the cucurbits fruits gives valid information for differential ovipositional preference of fruit fly in cucurbits.

Acknowledgement

The author acknowledges the Department of Agricultural Entomology, Tamil Nadu Agricultural University for providing the laboratory facilities and instruments to carried out the research programme successfully.

References

1. Akter H, Khan SA, Islam MS. Can Solanaceae vegetables serve as equivalent host to Cucurbitaceae for the Melon fly, *Bactrocera cucurbitae* (Coquillett) in Bangladesh. Research Journal of Agriculture and biological sciences. 2010; 6(6):697-700.
2. APEDA. Guide lines for export of Indian mangos, 2007.
3. Christenson LD, Foote RH. Biology of fruit flies. Annual review of entomology. 1960; 5(1):171-192.
4. Dhillon MK, Singh R, Naresh JS, Sharma HC. Evaluation of bitter gourd (*Momordica charantia* L.) genotypes to melon fruit fly, *Bactrocera cucurbitae* (Coquillett). Indian Journal of Plant Protection. 2005; 33:55-59.
5. Doharey KL. Bionomics of fruit flies (*Dacus* spp.) on some fruits. Indian Journal of Entomology. 1983; 45:406-413.
6. Gupta JN, Verma AN. Screening of different cucurbit crops for the attack of the melon fruit fly, *Dacus cucurbitae* Coq. (Diptera: Tephritidae). Haryana Journal of Horticulture Science. 1978; 7:78-82.
7. Hollingsworth R, Vagalo M, Tsatsia F. Biology of melon fly, with special reference to the Solomon Islands. *In*: Allwood A. J and Drew R. A. I editors. Management of fruit flies in the Pacific. In: Proceedings of Australian Country Industrial Agricultural Research. 1997; 76:140-144.
8. IPPC. International plant protection convention. FAO, Rome, 1997.
9. Kapoor VC. Indian Fruit Flies. Oxford & IBH Publishing Co. Ltd. New Delhi, India. 1993, 228.
10. Kapoor VC, Agarwal ML. Fruit flies and their natural enemies in India. In Cavalloro, R. (ed). Proceedings of the CEC/IOBC International symposium on fruit flies of economic importance. Athena, Greece, 1982. Balkema publications roterdam. 1983, 104-105.
11. Kushwaha KS, Pareek BL, Noor A. Fruit fly damage in cucurbits at Udaipur. Udaipur University Research Journal. 1973; 11:22-23.
12. Lall BS, Sinha SN. On the biology of the melon fly, *Dacus cucurbitae* (Coq.) (Diptera: Tephritidae). Science & Culture. 1959; 25:159-161.
13. Narayanan ES, Batra HN. Fruit Flies and Their Control. Ind. Council Agric. Res., New Delhi, India, 1960, 1-68.
14. Rabindranath K, Pillai KS. Control of fruit fly in bitter gourd using synthetic pyrethroids. *Entomon.* 1986; 11:269-272.
15. Rituraj SS. Efficacy of some control approaches in developing IPM package for cucurbit fruit fly, *B. cucurbitae* on bitter gourd M.Sc, Thesis, Department of Entomology, BAU. 2011, 62.
16. Singh SV, Mishra A, Bisan RS, Malik YP, Mishra A. Host preference of red pumpkin beetle, *Aulacophora foveicollis* and melon fruit fly, Dacus cucurbitae. Ind. J Entomology. 2000; 62:242-246.