

Seasonal Incidence of Fruit Borers with Special Reference to Melon Fruit Fly, *Bactrocera cucurbitae* (Coquillett) on Bitter Gourd (*Momordica charantia* L.)

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ABSTRACT

A field experiment was conducted during 2014-15 in kharif and rabi season at GKVK and IHR, Bengaluru, to document the population estimation and seasonal incidence of fruit borers viz., *Helicoverpa armigera* (Hubner), *Diaphania indica* (Saunders) and *Bactrocera cucurbitae* (Coquillett) on bitter gourd (*Momordica charantia* L.). Outcome of the study yielded, fruit infestation of fruit fly was more (40.07 & 30.57), followed by pumpkin caterpillar (5.85 & 3.20) and American bollworm was (1.88 & 1.95) in both kharif and rabi season, respectively. Fruit fly fruit infestation was peak during last week of September (52 %) and in last week of February (33 %). Incidence of fruit fly in kharif recorded significant positive correlation with rainfall ($r = 0.71$) and positively correlated with maximum temperature ($r = 0.35$) and maximum RH ($r = 0.59$). During rabi, significant positive correlation with maximum temperature ($r = 0.76$). Multiple linear regression suggests that incidence of fruit fly on bitter gourd was influenced by 51 per cent by rainfall during kharif and 59 per cent by maximum temperature during rabi.

Keywords: Bitter gourd, Fruit borer, Fruit fly, Seasonal incidence, *Helicoverpa armigera*

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) is one of the most popular vegetables in Southeast Asia. It is annual, tropical and subtropical vine of the family Cucurbitaceae along with cucumber, squash, watermelon and muskmelon¹. It is also known as bitter melon, bitter squash and balsam pear, and widely cultivated in Asia and Africa and is regarded as a noxious weed in South America! Numerous medicinal uses have been documented or claimed particularly, with reference to diabetes treatment² and prevention

of breast cancer³. This crop is attacked by several insect pests during different growth stages, which include melon fly, *Bactrocera cucurbitae* (Coquillett), aphids, *Aphis gossypii* Glover, red pumpkin beetle *Aulacophora foveicollis* (Lucas), hadda beetle, *Henosepilachna vigintioctopunctata* (Fabricius), pumpkin caterpillar, *Diaphania indica* (Saunders), and gall fly, *Lasioptera falcata* Felt that cause varying degrees of damage to the crop.

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The melon fruit fly is destructive pest and it is also known as pumpkin fruit fly or bitter gourd fly. Among the fruit flies which constitute an important group of pests infesting cucurbitaceous vegetables, two species namely *Bactrocera cucurbitae* (Coquillett) and *Bactrocera tau* (Walker), commonly called as melon fruit flies are the major two species. *Bactrocera scutellaris* (Bizzi) has also been recorded on cucurbits⁴. Generally, the female fruit flies puncture the soft and tender fruits by their sharp ovipositor and lay the eggs under fruit tissues and watery fluid oozes from the puncture. Sometimes pseudo-punctures (punctures without eggs) have also been reported on fruit skin, which reduces the market value of the produce. The eggs are also reported to be laid into unopened flowers and the maggots successfully develop in the taproots, stems and leaf stalks⁵. After hatching, the maggots feed on the pulp of the fruits by making galleries and simultaneously the secondary infection also manifests, resulting in rotting of fruits. About 50 per cent of the cucurbits are partially or completely damaged by fruit flies in India⁶. In the present study, considered major fruit borers for their population estimation and seasonal incidence in *kharif* and *rabi*.

MATERIALS AND METHODS

Investigation was conducted during 2014 - 15 *kharif* and *rabi* season at 12° 58' N latitude and 77° 35' E longitude at an altitude of 930 m MSL, in Horticulture division, G.K.V.K. U.A.S. Bengaluru and at 13° 13' N latitude and 77° 48' E longitude at an altitude of 890 m MSL, in IIHR, Hesarghatta, Bengaluru, respectively. Field study was carried out with variety 'Arka Harit' during second week of august for *kharif* and during second week of November for *rabi*. Experiment plot size 8 m X 11 m with spacing of 1.5 m X 0.6 m between the rows and from plant to plant, and it was sub divided into three subplots (8 m X 3.5 m) to ample easy observation. Observations was recorded from each randomly selected subplot made at weekly intervals on the seasonal incidence of insect pests and population estimation of fruit borers can be done with the help of different estimation methods.

The incidence of *Helicoverpa armigera* (Hubner) and *Diaphania indica* (Saunders) was recorded by counting the total number of bored fruits and healthy fruits from thirty randomly selected plants. Further, counts were made on the damage due to individual species of fruit borer by observing damage symptoms of each fruit borer. During fruiting stage at weekly intervals, the entire marketable size fruits irrespective of healthy and infested fruits were plucked separately. At every fruit picking, healthy and infested fruits were sorted out to calculate the per cent fruit infestation by fruit fly, *Bactrocera cucurbitae*.

$$\text{Per cent fruit infestation} = \frac{\text{No. of infested fruits}}{\text{Total no. of fruits}} \times 100$$

Correlation between population counts of these fruit borers and abiotic factors *viz.*, minimum temperature, maximum temperature, maximum and minimum relative humidity and rainfall was worked out. The multiple linear regression was calculated between fruit fly and abiotic factors.

RESULTS AND DISCUSSION

An outcome of the field trial carried out during 2014 - 15 at Bengaluru. During *kharif* season, *D. indica* infestation was ranging from 4.5 to 7.6 per cent with a mean of 5.85 per cent, during fruiting stage (Table 1). Similarly, during *rabi* season fruit infestation was ranging between 0.00 to 5.7, with a mean of 3.72 per cent (Table 2). The correlation was observed during *kharif* season, a positive correlation existed between pumpkin caterpillar with maximum temperature ($r = 0.33$), minimum temperature ($r = 90.43$), maximum RH ($r = 0.25$) and rainfall ($r = 0.22$) and negative correlation was observed with minimum RH ($r = -0.58$). Similarly, during *rabi* season positive correlation existed with minimum temperature ($r = 0.24$), maximum RH ($r = 0.45$) and minimum RH ($r = 0.13$) and negative correlation was recorded with maximum temperature ($r = -0.20$) (Table 3). Above results also related to the pest had a positive correlation with maximum temperature and negative correlation with minimum humidity in bitter gourd⁷.

The incidence of *H. armigera* was observed during both *kharif* and *rabi* seasons. During *kharif* season its infestation varied from 0.00 to 3.90 per cent, with a mean of 1.88 per cent during fruiting stage (Table 1). Similarly, during *rabi* season infestation varied from 0.00 to 4.30, with a mean of 1.95 per cent during fruiting season (Table 2). During *kharif* season, negative correlation with maximum temperature ($r = -0.21$), minimum temperature ($r = -0.57$), maximum RH ($r = -0.05$), minimum RH ($r = -0.29$) and rainfall ($r = -0.20$). Similarly, during *rabi* season significant positive correlation with maximum temperature ($r = 0.84$) and positive correlation with minimum temperature ($r = 0.03$) and negative correlation with maximum RH ($r = -0.64$) and minimum RH ($r = -0.58$) (Table 3). The above observation of *rabi* season were similar with the observations recorded⁸ in groundnut and in chilli⁹.

The incidence of melon fruit fly was observed during both *kharif* and *rabi* seasons. During *kharif* season fruit damage varied from 30.00 to 52.00 per cent, with a mean of 40.07 per cent (Table 1). However, the peak incidence was observed during second week of (42 SW) October. Similarly, during *rabi* season fruit damage varied from 26.00 to 33.00 per cent with a mean of 30.57 per cent (Table 2). These results were corroborated with the findings⁶ on bitter gourd. However, the peak incidence was observed during fourth week of (8th SW) February. The correlation co-efficient were computed between the incidence of melon fruit fly and weather parameters *viz.*, temperature, relative humidity (RH) and rainfall during both *kharif* and *rabi* seasons. During *kharif* season

significant positive correlation existed between incidence of melon fruit fly with rainfall ($r = 0.71$) and positive correlation with maximum temperature ($r = 0.35$) and maximum RH ($r = 0.59$) and negative correlation was found with minimum temperature ($r = -0.09$) and minimum RH ($r = -0.28$). Similarly, during *rabi* season significant positive correlation existed between melon fruit fly with maximum temperature ($r = 0.79$) and negative correlation with minimum temperature ($r = -0.48$), maximum RH ($r = -0.51$) and minimum RH ($r = -0.43$) (Table 3). Krishna Kumar *et al.*¹⁰ who reported that the rainfall, maximum RH, maximum temperature were significantly positively correlated with fruit fly infestation. The multiple linear regression analysis estimated between melon fruit fly on bitter gourd and the weather parameters, in *kharif* maximum temperature influenced 12.43 per cent over fruit fly incidence, minimum temperature influenced 8.40 per cent, maximum RH influenced 34.84 per cent, minimum RH influenced 8.21 per cent and rainfall influenced 51.47 per cent (Figure 1). In *rabi*, maximum temperature influenced increase in population of fruit fly by 59.20 per cent, minimum temperature influenced 23.87 per cent, maximum RH 26.69 per cent and minimum RH 19.02 per cent. No showers received during *rabi* months (Figure 2). Amongst, maximum temperature and minimum temperature played important role in pest population build up in *rabi* and solely rainfall influenced more during *kharif*. Singh and Naik⁷ and Lekshmi *et al.*¹¹, reported the same weather parameters play an important role in infestation of fruit fly on different cucurbitaceous crops.

Table 1: Seasonal incidence of fruit fly, pumpkin caterpillar and American bollworm at GKVK during *kharif*, 2014

Month	SW	Fruit fly (%)	Pumpkin caterpillar (%)	American bollworm (%)
SEPT	40	30.00	5.00	0.00
OCT	41	38.00	7.60	1.50
	42	52.00	6.70	1.60
	43	45.00	5.00	3.00
	44	40.30	6.40	3.20
NOV	45	38.00	4.50	0.00
	46	37.25	5.80	3.90
	Mean	40.07	5.85	1.88
	Max	52.00	7.06	3.90
	Min	30.00	4.50	0.00
	SD	6.88	1.10	1.54

Note: per cent in the parentheses indicates per cent fruit damage by respective insect pest.

Table 2: Seasonal incidence of fruit fly, pumpkin caterpillar and American bollworm at IIHR, Hesarghatta during rabi, 2014-15

Month	SW	Fruit fly (%)	Pumpkin caterpillar (%)	American bollworm (%)
JAN	03	26.00	4.00	0.00
	04	28.00	6.00	2.20
FEB	05	32.60	2.10	0.00
	06	30.40	4.00	2.00
	07	31.40	5.70	2.70
	08	33.00	0.00	2.50
MAR	09	32.60	4.30	4.30
Mean		30.57	3.20	1.95
Max		33.00	5.70	4.30
Min		26.00	0.00	0.00
SD		2.65	2.08	1.53

Note: per cent in the parentheses indicates per cent fruit damage by respective insect pest.

Table 3: Correlation between incidence of fruit borers of bitter gourd and weather parameters, during kharif and rabi, 2014 - 15

Weather parameters	Kharif			Rabi		
	Pumpkin caterpillar	Fruit fly	American bollworm	Pumpkin caterpillar	Fruit fly	American bollworm
Maximum tem. (°C)	0.33	0.35	-0.21	-0.20	0.76*	0.84*
Minimum tem. (°C)	0.43	-0.09	-0.57	0.24	-0.48	0.03
Maximum RH (%)	0.25	0.59	-0.05	0.45	-0.51	-0.64
Minimum RH (%)	-0.58	-0.28	-0.29	0.13	-0.43	-0.58
Rainfall (mm)	0.22	0.71*	-0.20	-	-	-

**Correlation is significant at $P \leq 0.01$ level (2-tailed); *.Correlation is significant at $P \leq 0.05$ level (2-tailed)

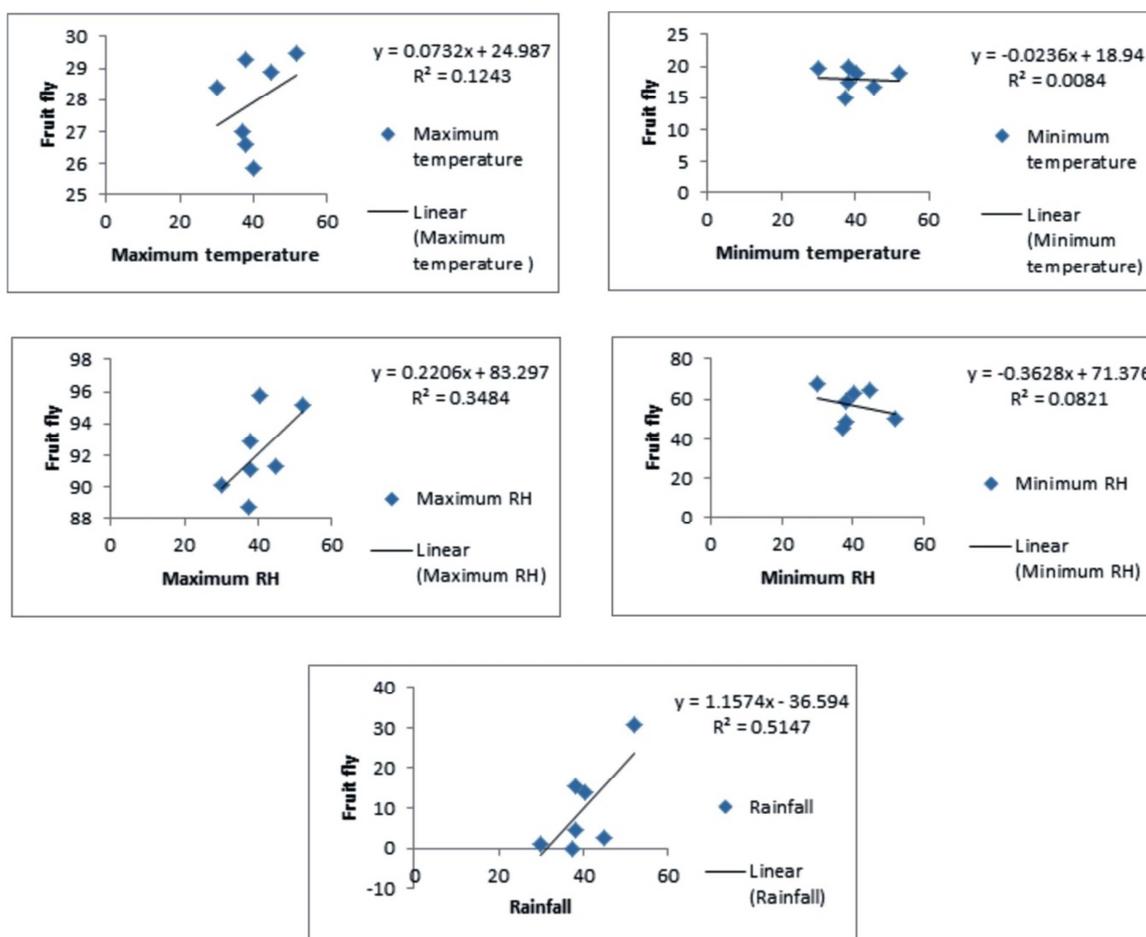


Fig. 1: Relationship between incidence of fruit fly and weather parameter in kharif

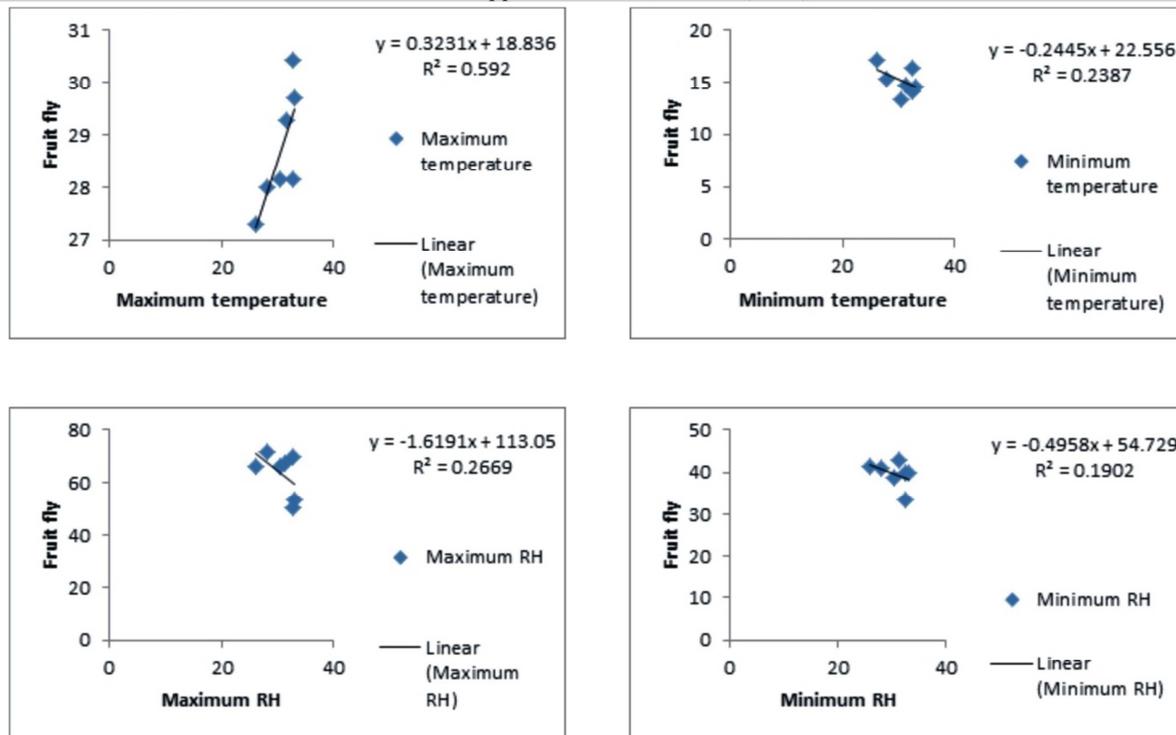


Fig. 2: Relationship between incidence of fruit fly and weather parameter in rabi

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