

Original Research Article

Seasonal abundance of Melon fruit fly, *Bactrocera cucurbitae* (Coquillett) infesting cucumber in relation to abiotic factors

ABSTRACT

The present investigation on seasonal abundance of melon fruit fly in relation to weather parameters was conducted in cucumber at the farmers field, Kharsad, Navsari, Gujarat using Nauroji Stonehouse fruit fly trap containing cue-lure baited wooden block during summer 2022. Studies on seasonal abundance revealed that in cucumber the activity of adults of *B. cucurbitae* commenced from 13th Standard Meteorological Week (SMW) *i.e.*, 4th week of March and continued till 19th SMW (1st week of May) which ranged from 38.00 to 59.75 with an average of 45.11 male fruit flies per four traps while, the peak adult population was observed during 17th SMW *i.e.*, 4th week of April (59.75 mean male fruit flies/4 traps). Moreover, adult population of melon fruit fly showed positive and significant correlation with maximum temperature and negative and significant correlation with morning relative humidity.

Key words: *Bactrocera cucurbitae*, abundance, weather parameters, cucumber

INTRODUCTION

The cucumber (*Cucumis sativus* L.) is a widely cultivated plant of the family Cucurbitaceae which originated in India and is one of the monoecious warm season annual crops cultivated by man for over 3,000 years (Enujeke, 2013). The climate of India is favorable for growing most cucurbit crops, especially cucumber. Cucumber prefers a hot climate *i.e.*, 65°F to 75°F. Several species of fruit flies have been reported damaging the cucurbit fruits in India *viz.*, *Bactroceracucurbitae* (Coquillett), *Dacus ciliatus* (Loew), *Bactroceradiversus* (Coquillett), *Bactroceralatifrons* (Hendel), *Bactroceraparvulus* (Hendel), *Bactrocera tau* (Walker), *Bactrocerazonatus* (Saunders) and *Myrioparispardaliva* (Bigot) (Kapoor, 1970). Among them, *Bactroceracucurbitae* (Coquillett) (Diptera: Tephritidae) [Synonyms: *Chaetodacuscucurbitae* (Coquillett); *D. cucurbitae* Coquillett; *Strumetacucurbitae* (Coquillett); *Zeugodacuscucurbitae* (Coquillett)] is one of the most damaging species to cucurbits and it was originally reported from Hawaii. It is also known as

melon fruit fly and cucurbit fruit fly due to its preference over melons and cucurbits, respectively (Kapoor, 1993).

The level of infestation of *B. cucurbitae* varies from host to host and environmental condition of particular area (Muhammad *et al.*, 2007). *B. cucurbitae* has become cosmopolitan in distribution and includes a very large number of hosts in its range due to their greater adaptability to different kinds of habitats (Udvardy, 1969). Its nature of damage depends mostly on prevailing climatic conditions and diversity of hosts. Therefore, monitoring its population build-up is one of the most important steps in determining appropriate time and suitable method of management (Dhillon *et al.*, 2005).

MATERIALS AND METHODS

The present investigation on the seasonal abundance of the melon fruit fly in cucumber was carried out 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 elevation/altitude of 14 meters above the mean sea level (MSL). The details of experiment are given in below.

Chart 1. Experimental details

1	Size of plot	0.5 acre
2	Crop and variety	Cucumber and Alamgir CT 380
3	Method of sowing	Dibbing on ridge
4	Spacing	1.50 m × 0.50 m
5	Date of sowing	24 th February, 2022

The experimental plot was kept free from the insecticidal spray throughout the crop season. Four Nauroji Stonehouse Fruit Fly traps containing cue-lure impregnated wooden block were installed by keeping trap to trap distance of 30.00 m for monitoring the melon fruit fly abundance during the crop season. The observations were recorded as soon as the incidence is noticed. Numbers of adult male of *B. cucurbitae* caught per trap were counted and recorded at weekly intervals as per SMW. Data on different weather parameters *viz.*, minimum temperature (T_{min} . °C), maximum temperature (T_{max} . °C), morning relative humidity (RH I %), evening relative humidity (RH II %) and rainfall (mm) were used to study their effect on seasonal abundance of *B. cucurbitae*. The degree of a linear relationship between number of adult male of *B. cucurbitae* caught per four traps and weather parameters was worked out through Karl Pearson's coefficient of correlation formula:

$$\text{Coefficient of correlation } (r_{xy}) = \frac{\text{Cov}(x, y)}{\sqrt{V(x) \times V(y)}}$$

Where, r_{xy} = coefficient of correlation, $cov(x, y)$ = covariance of the characters x and y , and $V(x)$ and $V(y)$ = variance of the characters x and y , respectively.

RESULTS AND DISCUSSION

Seasonal abundance of melon fruit flies infesting cucumber

Data on the mean number of male adult melon fruit flies per four traps per week in relation to weather parameters are presented in Table 1 and depicted in Figure 1. Data indicated that the activity of adults of melon fruit flies, *B. cucurbitae* in cucumber commenced from 13th SMW *i.e.*, six weeks after sowing (WAS) and continued till 19th SMW (1st week of May) which ranged from 38.00 to 59.75 with an average of 45.11 male fruit flies per four traps. The peak adult population was observed during 17th SMW *i.e.*, 4th week of April (59.75 54 mean male fruit flies/4 traps) whereas lowest population was noticed during 13th SMW (38.00 mean male fruit flies/4 traps).

Present findings are more or less in conformity with those of earlier workers. Patnaik *et al.* (2004) noted peak population of the melon fruit fly during April-May *i.e.*, around 18th to 20th SMW in bitter melon moreover, Sawai *et al.* (2019) noticed moderate to high adult melon fly activity during summer season (12th to 18th SMW) in bitter melon, while the sudden rise in fruit fly catches in cue-lure based traps was found during 14th (127.30 flies/trap/week) and 16th SMW (63.67 flies/trap/week). The difference in the abundance may probably be due to the difference in sowing dates of the crop.

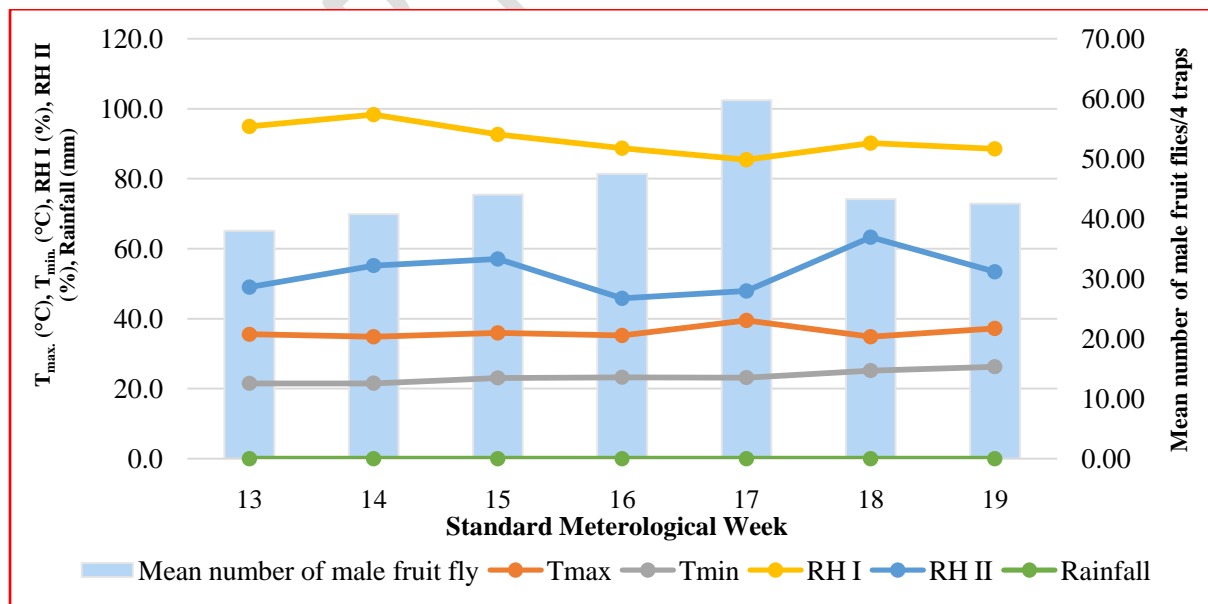


Fig. 1: Seasonal abundance of melon fruit fly, *B. cucurbitae* in cucumber in relation to weather parameters during summer 2022-23

Table 1: Seasonal abundance of melon fruit fly, *B. cucurbitae* in cucumber in relation to weather parameters during summer 2022

Month	SMW	WAS	Temperature (°C)		RH (%)		Rainfall (mm)	Mean number of male fruit flies/4 traps
			T _{max.}	T _{min.}	RH I	RH II		
March	13	6	35.50	21.53	94.86	49.02	0.00	38.00
April	14	7	34.80	21.56	98.28	55.19	0.00	40.75
	15	8	35.90	23.07	92.58	57.05	0.00	44.00
	16	9	35.16	23.29	88.67	45.79	0.00	47.50
	17	10	39.50	23.19	85.39	47.92	0.00	59.75
	18	11	34.81	25.21	90.11	63.30	0.00	43.25
May	19	12	37.17	26.29	88.49	53.38	0.00	42.50
Mean±SD								45.11±7.08

Correlation between adult population of *B. cucurbitae* infesting cucumber and weather parameters

The data on correlation between weekly mean male fruit flies caught in four Nauroji Stonehouse Fruit Fly traps containing cue-lure impregnated wooden block and weekly mean value of different weather parameters is presented in Table 2 and discussed here under.

Table 2: Correlation coefficient of mean adult male population of *B. cucurbitae* infesting cucumber in relation to different weather parameters

Sr. No.	Weather parameters	Correlation coefficient (r)
1	Maximum Temperature (°C)	0.793*
2	Minimum Temperature (°C)	0.099
3	Morning Relative Humidity (%)	-0.758*
4	Evening Relative Humidity (%)	-0.378

The result of the analysis on correlation between male fruit fly catches of *B. cucurbitae* and different weather parameters revealed that all the weather parameters contributed more or less towards increasing or decreasing melon fruit fly population. The abundance level of *B. cucurbitae* had a significant positive correlation with maximum temperature ($r=0.793$) while, the correlation of fly catches was significantly negative with morning relative humidity ($r=-0.758$). The correlation of fly catches was positive with minimum temperature ($r=0.099$), while it was negative with evening relative humidity ($r=-0.378$).

Similar observation with regard to influence of meteorological parameters on the seasonal abundance of melon fruit fly was also recorded earlier by several workers. Kate *et al.* (2009) revealed that the maximum ($r=0.667$) and minimum ($r=0.379$) temperature had positive correlation with fruit fly population while evening relative humidity had negative

correlation ($r=-0.1738$) in cucumber. Bhowmik *et al.* (2014) observed a significant positive correlation with maximum temperature and a negative correlation with RH-I and RH-II in bottle gourd. Abhilash *et al.* (2017) observed a significant positive correlation with maximum ($r=0.754$) temperature whereas, negative non-significant relationship with afternoon relative humidity ($r=-0.179$) in ridge gourd.

CONCLUSION

Seasonal abundance of melon fruit fly was maximum during second fortnight of April *i.e.*, 17th SMW. The activity of adults of melon fruit flies, *B. cucurbitae* in cucumber commenced from 13th SMW *i.e.*, 4th week of March and continued till 19th SMW (1st week of May). The weather parameters *viz.*, maximum temperature and morning relative humidity had greater influence on population fluctuation. The knowledge on seasonal abundance of melon fruit flies helps in deciding the timing of application of appropriate management practices.

REFERENCES

- Abhilash J, Naveen N E, Patil S U, Sharanabasappa and Mohankumar K S. 2017. Monitoring of melon fruit fly (*Bactrocera cucurbitae* Coq.) (Diptera: Tephritidae) in relation to weather parameters. *Journal of Entomology and Zoology Studies* 5(5): 1930-1935.
- Bhowmik P, Mandal D and Chatterjee M L. 2014. Melon fruit fly (*Bactrocera cucurbitae* Coq.) infestation and management on bottle gourd in West Bengal, India. *Research on Crops* 15(4): 876-883.
- Dhillon M K, Singh R, Naresh J S and Sharma HC. 2005. The melon fruit fly, *B. cucurbitae*: A review of its biology and management. *Journal of Insect Science* 5: 40.
- Enujeke E C. 2013. Growth and yield responses of cucumber to five different rates of poultry manure in the Asaba area of Delta state, Nigeria. *International Journal of Agricultural Science and Research* 3: 369-375.
- Kapoor V C. 1970. Indian Tephritidae with their recorded hosts. *Oriental Insects* 4(2): 207-251.
- Kapoor V C. 1993. *Indian Fruit Flies (Insecta: Diptera: Tephritidae)*, pp. 1-228. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Kate A O, Bharodia R K, Joshi M D, Pardeshi A M and Makadia R R. 2009. Seasonal incidence of fruit fly, *B. cucurbitae* (Coquillett) on cucumber. *Asian Science* 4(1): 83-84.
- Muhammad D G, Muhammad A, Muhammad A J, Muhammad K A and Fiaz A. 2007. Co-administration of insecticides and butanone acetate for its efficacy against melon fruit

- flies, *B. cucurbitae* (Diptera: Tephritidae). *Pakistan Journal of Entomology***29**(2): 111-116.
- Patnaik H P, Sarangi P K and Mahapatra P. 2004. Studies on the incidence of fruit flies and jassids on summer bitter gourd and their control. *Orissa Journal of Horticulture***32**(2): 87-90.
- Sawai HR, Godase S K, Narangalkar A L and Navik O. 2019. Population fluctuation of fruit flies in cucurbit ecosystem. *Journal of the Entomological Research***43**(2): 149-152.
- Udvardy M D F. 1969. *Dynamic zoogeography with special reference to land animals*, pp. 445. Van Nostrand Reinhold Co. New York.

UNDER PEER REVIEW