



E-ISSN: 2320-7078

P-ISSN: 2349-6800

[www.entomoljournal.com](http://www.entomoljournal.com)

JEZS 2020; 8(3): 1012-1015

© 2020 JEZS

Received: 28-03-2020

Accepted: 30-04-2020

**S Vignesh**

PG Research Scholar, Anbil Dharmalingam Agricultural College and Research Institute, TNAU, Trichy, Tamil Nadu, India

**M Chandrasekaran**

Assistant Professor, (Entomology), Horticultural College and Research Institute for Women, TNAU, Trichy, Tamil Nadu, India

**S Jeeva**

Professor and Head, Department of Fruit Science, Horticultural College and Research Institute for women, TNAU, Trichy, Tamil Nadu, India

**S Sithanantham**

Director, Sun Agro Biotech Research Centre, Mugalivakkam, Chennai, Tamil Nadu, India

## Impact of climatic factors on seasonal occurrence and species diversity of fruit fly, *Bactrocera* spp. in mango orchards

S Vignesh, M Chandrasekaran, S Jeeva and S Sithanantham

**Abstract**

Mango “King of fruits” is known for its delicious taste and pleasant aroma; besides this it’s nutritive property make the people to consume the fruit. The mango is the second major crop cultivated in India and it has a significant place in international market. The yield and quality aspects of the mango are highly inflicted by various insects, among them fruit fly deserves a unique position. The varied agro climatic conditions prevailed in India and polyphagous nature of fruit fly makes them to spread all over the country. The studies on the species diversity with it’s distribution pattern in a particular area and the influence of weather parameters on the population dynamics of fruit flies are essential to take preventive measures and to carry out effective management practices. Therefore, the present investigation was undertaken to find out the species diversity and seasonal abundance of fruit fly. The trap catches of fruit flies were taxonomically identified and categorized at species level. The major diversity of species registered in the experimental location is viz., *Bactrocera caryeae* (Kapoor), *B. dorsalis* (Hendel) and *B. correcta* (Bezzi) with a minor population of *B. nigrofemorialis* (White and Tsuruta) and *Dacus ramanii* (Drew and Hancock). The trapping population on seasonal dynamics showed that, the peak incidence (56.50 no. /trap) in the month of August and the least trapping population of fruit fly activity (3.50 no. /trap) in the month of December. The trapped population of fruit flies was also correlated with the location specific meteorological weather parameters during the experimental period. The correlation analysis results revealed that, the fruit fly incidence is positively correlated with maximum, minimum temperature and negatively correlated with morning, evening relative humidity (RH) and rainfall.

**Keywords:** Fruit fly, mango, seasonal abundance, Parapheromone, weather factors

**1. Introduction**

Mango, the most important fruit of India, is grown in an area of 1.23 million ha with an annual production of 10.99 million tonnes, which accounts for 57.18 per cent of the total world production [10]. The production of mango and it’s quality were severely affected by various insect pests among them fruit fly is the predominant one. The fruit flies, *Bactrocera* spp. is also known as “Peacock flies” due to its unique architect wings. These minute flies which is found to be a major menacing pest in mango orchards belonging to the family Tephritidae and order Diptera. The major species of fruit flies infesting mango are *Bactrocera dorsalis*, *B. caryeae*, *B. correcta* and *B. zonata*. These species can cause yield loss up to 31% with an annual mean of 16% in mango [2]. Besides causing the direct damage to fruit, it will also causes indirect loss by affecting the export of fruits [12]. Generally farmers rely on the insecticides; the usage of pesticides in large scale for the control of fruit flies has more negative impacts on the health of human beings and to the natural environment. The pesticide residues present in the fruits will reduce the export and brings a huge loss. In order to overcome this problem the first need is adequate knowledge on identification to take up the management measures in time. Therefore, the present investigation was made for the prediction of occurrence, species diversity and pattern of spread of these fruit flies species in the orchards to forecast and recommend the need based suitable management measure to the farmers.

**2. Materials and Methods****2.1. Location of the experiment**

The experiment on the species diversity and seasonal abundance of fruit flies in mango orchards was carried out in the A<sub>3</sub> block of experimental orchards of Horticultural College and

**Corresponding Author:****S Vignesh**

PG Research Scholar, Anbil Dharmalingam Agricultural College and Research Institute, TNAU, Trichy, Tamil Nadu, India

Research Institute for women, Tamil Nadu Agricultural University, Tiruchirappalli, Tamil Nadu, India located between 10°45'N latitude and 78°36'E longitude at an altitude of 85m above the Mean Sea Level. The observation was carried out from the 21<sup>st</sup> Standard Meteorological Week of 2017 to 20<sup>th</sup> Standard meteorological week of 2018 at weekly interval.

## 2.2. Trapping of fruit flies

The prediction of occurrence, species diversity and pattern of spread of these fruit flies species in the mango orchards during 2017-18 was made by using the methyl eugenol based parapheromone traps procured from sun agro biotech research centre, Chennai. The white cylindrical jar type trap of about 15cm height and 10cm diameter with two holes of size about 5cm diameter in the sidewall, which act as entry point for fruit fly will be taken for monitoring the fruit fly activity in mango orchards. A wooden dispenser of size 4x2x1cm charged with methyl eugenol is hanged at the top of the trap using an iron wire act as an attractant for fruit fly. Top of the trap is entirely sealed and the perforated bottom is screwed with the jar trap. The perforations present in the bottom of the trap aids in drainage of the rain water. The traps were hanged in the mango trees at a height of 1.5m above the ground level. To counteract the positional effect of traps its position will be changed once in a week during the observation.

## 2.3. Identification of species

The fruit flies trapped were collected in a plastic container with care and taken to the entomology laboratory of Anbil Dharmalingam Agricultural College and Research Institute for identification of species. The collected specimens were observed under the stereoscopic microscope using the taxonomic keys [1]. After identification the specimens were mounted and preserved accordingly for further studies.

## 2.4. Data analysis

Weather variables such as maximum temperature, minimum temperature, morning and evening relative humidity, precipitation during the 52 standard meteorological weeks were collected from the meteorological laboratory of Anbil Dharmalingam Agricultural College and Research Institute, TNAU, Trichy. The weather details collected were summarized into weekly average and correlated with the weekly average of trap catches using spearman rank correlation to assess the influence of varied weather factors on the diversity and spread of fruit flies.

## 3. Results and Discussion

The observations on the trapping population of fruit flies throughout the experimental period revealed that the prevalence of fruit fly in mango ecosystem throughout the year. The major species of fruit flies occurred in the mango orchards of experimental location is *B. caryeae*, *B. dorsalis* and *B. correcta* in addition to this minor population of *B. nigrofemorialis* and *Dacus ramanii*. The prevalence, abundance and distribution of all these five species of fruit flies in the mango ecosystem were also documented and substantiated both in mango [15] and guava [18]. Among the five species registered the population and occurrence of *B. caryeae* and *B. dorsalis* are more when compared with *B. correcta*, the same trend of prevalence of *B. dorsalis* was documented in fruit orchards of different agro climatic zones of Karnataka [17]. The seasonal dynamics of fruit fly in mango

orchards are given in Table1 indicated that, the peak incidence of fruit flies with abundance in population i.e., flies trapped per trap is maximum during the month of August'17 (56.50) and it was followed by September'17 (55.00) and April'18 (27.25), the least count of fruit flies were recorded during the months of October, December, January and February with the population of < 6 flies/trap/catch with the annual mean trap catch of 17.49 flies/trap/tree. The prevalence and pattern of occurrence of fruit fly throughout the year and its peak incidence observed during the month of August and September was also strengthened and supported with the findings on composition of dacine fruit flies in cucurbit ecosystem of varied districts of Tripura [9] and in chilli ecosystem [19]. The population dynamics also showed the abundance of *B. caryeae* in the experimental location, which is followed by *B. dorsalis* and *B. correcta*. The annual mean trap catch of fruit flies/trap/tree registered is in the order of *B. caryeae* (7.39) > *B. dorsalis* (7.22) > *B. correcta* (3.47). The peak incidence of *B. caryeae* i.e., 26.75 and 24.00 flies/trap/tree was recorded during the month of August'17 and September'17, respectively and the trap catches were logically reduced in the months of July and April (< 6.5 flies/trap/tree) simultaneously, the minimum trap catches of 1.75 flies/trap/tree was recorded in October, January and February. The observations on minimum incidence of fruit fly population in the month of October and January is also well documented both in mango and guava [5].

Considering the trapping population of *B. dorsalis*/trap/tree, the high incidence was observed during the month of August'17 (20.50). It was gradually increased in the month of September'17(21.75) and again the trapping population was in reduction up to March'18 but, in the month of April'18 again the average population of 11.75/trap/tree was noticed. The least number of trapping population i.e., < 2 flies/trap/tree was entrapped during the months of June, December and January. The least population and poor dispersal of *B. dorsalis* in the months December and January was also in tune with the earlier findings reported in mixed fruit plantations [16]. The overall diversity and distribution pattern of *B. dorsalis* recorded in the experimental period is in accordance with the previous findings registered in the melon fly, *Bactrocera cucurbitae* in the foot hills of Himalaya [8].

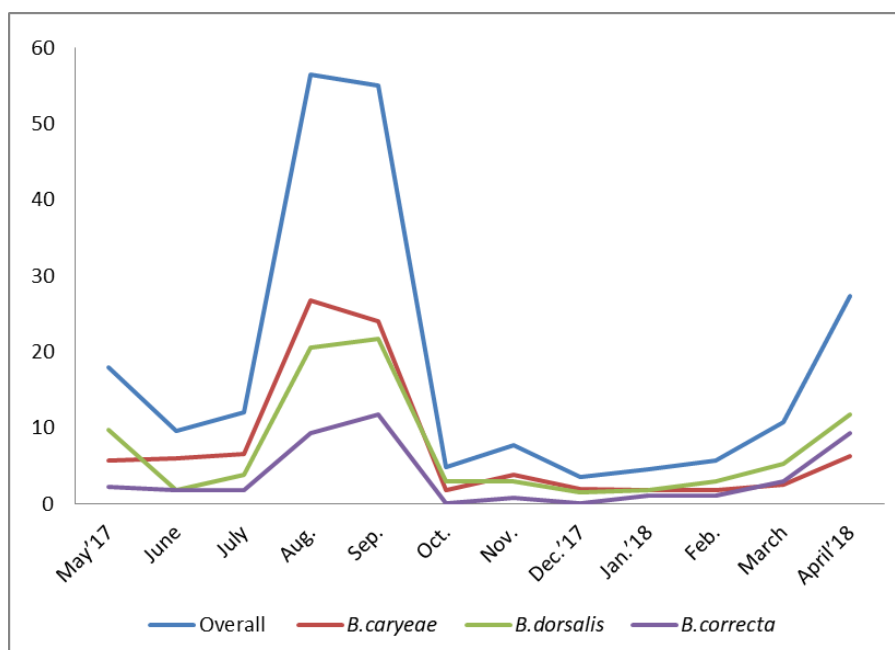
**Table 1:** Seasonal incidence of *Bactrocera spp.* during 2017 – 2018

Month (2017-18)	Mean fruit fly population trapped / trap			
	Collective Population	<i>B. caryeae</i>	<i>B. dorsalis</i>	<i>B. correcta</i>
May'17	18.00	5.75	9.75	2.25
June	9.55	6.00	1.75	1.75
July	12.00	6.50	3.75	1.75
August	56.50	26.75	20.50	9.25
September	55.00	24.00	21.75	11.75
October	4.75	1.75	3.00	0.00
November	7.75	3.75	3.00	0.75
December'17	3.50	2.00	1.50	0.00
January'18	4.50	1.75	1.75	1.00
February	5.75	1.75	3.00	1.00
March	10.75	2.50	5.25	3.00
April'18	27.25	6.25	11.75	9.25

The seasonal occurrence of *B. correcta* in mango orchard is comparatively less when compared with the *B. dorsalis* and *B. caryeae*. The presence of *B. correcta* was not found throughout the year and it was out numbered only during the months of September (11.75), April and August (9.25). In

particular, the least catches of 0.75 flies/trap/tree in November and nil catches in the months of October and December are notable findings. The overall trapping population showed that the first peak incidence occur during the month of August and September with the maximum trapping of fruit flies and the second peak occurs during the month of April (Fig.1), it was

in tune with the past reports on *B. zonata* [14] and *B. dorsalis* at West Bengal [3]. The prevalence and pattern of occurrence of fruit fly throughout the year and its peak incidence during the month of August and September was also strengthened and supported with the results obtained at different locations of Western plain zone of Uttar Pradesh [7].



**Fig 1:** Diversity and pattern of spread of fruit fly, *Bactrocera* spp.

**Table 2:** Correlation studies between fruit fly incidence and weather parameters (Period: May 2017 – April 2018)

Fruit fly species	Temperature °C		Relative humidity %		Rainfall (mm)
	Maximum	Minimum	Morning	Evening	
<i>B. caryeae</i>	0.247	0.251	-0.134	-0.151	-0.368
<i>B. dorsalis</i>	0.237	0.197	-0.066	-0.171	-0.410
<i>B. correcta</i>	0.327	0.274	-0.086	-0.218	-0.380

The influence of weather parameters on the population of fruit fly should be studied to take necessary precautionary measures for managing the pests [16]. The results on the correlation analysis of trapping population with the weather factors clearly indicated the impact of abiotic factors on the spread, diversity and abundance of fruit flies in varied climatic conditions (Table 2). The correlation study revealed that the maximum temperature, minimum temperature is positively correlated with all the three *Bactrocera* species of fruit flies, while the morning, evening relative humidity (RH) and rainfall is negatively correlated with the trap catches (Fig.1). Among the *Bactrocera* species recorded, *B. correcta* shown the tendency of positiveness in spread and multiplication by increasing 0.38 units and 0.28 units towards the every one unit increase in maximum temperature and minimum temperature respectively, when compared with other two species viz., *B. caryeae* and *B. dorsalis* (0.20 - 0.25 units). The fruit flies are active throughout the year in southern parts of India [6], especially when the minimum and maximum temperature surges minimum level [13]. In general, throughout the year the relative humidity and rainfall shown a negative correlation and brings down the population which is on par with the findings [4]. The pattern of spread and it's positive correlation with the temperature factor and negative correlation with the relative humidity and rainfall factors observed in this present investigation was also in corroboration with the previous findings on the two species of

*Bactrocera* (*B. dorsalis* and *B. zonata*) assessed through methyl eugenol traps at lower gangetic alluvium of West Bengal [3].

#### 4. Conclusion

The abundance of fruit flies in the few months of the year itself enough to cause the economic injury to the fruits and drastic loss to the farmers [11]. It is concluded that, the continuous monitoring of the occurrence of fruit flies by trap catches in mango orchards provides the valid month wise information on it's diversity, spread and abundance [20]. The abundant trapping population in the month of August and the least population in rainy and winter seasons registered in the present findings reflects it's positive correlation with the temperature and negative correlation with the relative humidity and rainfall, which ultimately helps the farmers to take up the protection measures in time to maximize the yield with marketable and consumable fruits.

#### 5. Acknowledgement

The corresponding author is greatly thankful to M/s. *sun agro biotech research centre*, Mugalivakkam, Chennai 600 125, Tamil Nadu, for their material support by supplying the cylindrical jar traps with parapheromones and technical advices in keeping the traps for the successful conduct of this experiment.

**6. References**

1. Agarwal ML, Sueyoshi M. Catalogue of Indian fruit flies (Diptera: Tephritidae). *Oriental Insects*. 2005; 39(1):371-433.
2. Baloda S, Sharma JR, Kumar M, Singh S, Malik A. Studies on performance of rejuvenated plants and fresh plants of guava. *International Journal of Pure and Applied Bioscience*. 2018; 6(1):939-941.
3. Das U, Okram S, Jha SKKS. Species diversity and monitoring of population dynamics of two species of *Bactrocera* (*B. dorsalis* and *B. zonata*) through methyl eugenol traps at lower gangetic alluvium of West Bengal. *Journal of Entomology and Zoology Studies*. 2017; 5(4):372-376.
4. Kannan M. Ecological studies on mango fruit fly, *Bactrocera dorsalis* Hendel. *Annals of Plant Protection Science*. 2015; 14(2):340-342.
5. Kapoor VC. *Indian Fruit Flies* (Insecta: Diptera: Tephritidae). Oxford and IBH Publishing Company Pvt. Ltd., New Delhi. 1993, 1-228.
6. Khan RA, Naveed M. Occurrence and seasonal abundance of fruit fly, *Bactrocera zonata* Saunders (Diptera: Tephritidae) in relation to meteorological factors. *Pakistan Journal of Zoology*. 2017; 49(3):999-1003.
7. Kumar U, Prasad CS, Vaibhav V, Saran S. Population dynamics of mango fruit fly species caught through methyl eugenol traps at different locations of Western plain zone of Uttar Pradesh. *Journal of Pharmacognosy and Phytochemistry*. 2018; 7(2):2167-2168.
8. Laskar N, Chatterjee HIRAK. The effect of meteorological factors on the population dynamics of melon fly, *Bactrocera cucurbitae* Coq. (Diptera: Tephritidae) in the foot hills of Himalaya. *Journal of Applied Sciences and Environmental Management*. 2010; 14(3):53-58.
9. Nair N, Bhattacharjee T. Species composition of dacine fruit flies (Diptera: Tephritidae: Dacinae: Dacini) associated with cucurbits in Tripura, a north eastern state of India. *Journal of entomology and zoology studies*. 2017; 5(3):330-335.
10. Negi SS. Mango Production in India. *Acta Hort*. 2000; 509:69-78.
11. Patel KB, Saxena SP, Patel KM. Fluctuation of fruit fly oriented damage in mango in relation to major abiotic factors. *Hort Flora Research Spectrum*. 2013; 2:197-201.
12. Siddiq M, Brecht JK, Sidhu JS. *Handbook of Mango Fruit: Production, Post harvest Science, Processing Technology and Nutrition*. John Wiley & Sons. New Jersey, US, 2017, 354.
13. Stanley J, Gupta JP, Rai D. Population dynamics of fruit flies, *Bactrocera* spp. in North Western Himalaya. *Indian Journal of Entomology*. 2015; 77(3):21-220
14. Tan KH, Seriti M. Adult population dynamics of *Bactrocera dorsalis* (Diptera: Tephritidae) in relation to host phenology and weather in two villages of Penang Island, Malaysia. *Environmental Entomology*. 1994; 23(2):267-275.
15. Verghese A, Jayanthi PDK. Integrated pest management in fruits. In: *Pest Management in Horticultural Ecosystems*, Ed. Parvatha Reddy P, Verghese A, Krishna Kumar NK, Capital Publishing Company, New Delhi, 2001, 1-23.
16. Verghese A, Sudhadevi K. Relationship between trap catches of *Bactrocera dorsalis* Hendel and abiotic factors. *Proceedings of National Symposium on Pest Management in Horticultural Crops*, In. *Advances in IPM for Horticultural Crops*. Association for Advancement of Pest Management in Horticultural Ecosystems, Bangalore. 1998, 15-18.
17. Bheemanna M, Prabhuraj A. Diversity of fruit flies in different agro-climatic zones of Karnataka, *Journal of entomology and zoology studies*, 2017; 5(6):1163-1167.
18. Jalaluddin S, Natrajan S, Sadakathulla S. Population fluctuation of guava fruit fly *Bactrocera correcta* in relation to hosts and abiotic factors. *J expt. Zool*. 2001; 4(2):323-327.
19. Boopathi SB, Ramakrishnan Y. Influence of weather factors on the incidence of fruit flies in chilli (*Capsicum annum* L.) and their prediction model. *Pest management in horticultural ecosystems*. 2013; 19(2):194-198.
20. Qureshi ZA, Siddiqui H, Hussain. Field evaluation of various dispensers for methyl eugenol, an attractant of *Dacus zonatus* (Diptera; Tephritidae). *Journal of applied entomology*. 1992; 113(5):365-367