



## RESEARCH NOTE

# Host Range and Parasitoid Associations of the Fruit Fly *Bactrocera caryeae* (Kapoor) (Diptera: Tephritidae)

JAYANTHI MALA B. R.

Division of Crop Protection, ICAR-Indian Institute of Horticultural Research Institute, Hesaraghatta Lake Post, Bengaluru, Karnataka, India

\*E-mail: entjaya@gmail.com

**ABSTRACT:** The fruit fly *Bactrocera caryeae* (Kapoor) (Diptera: Tephritidae) is an economically important pest of several tropical and subtropical fruit crops. Understanding its host range and natural enemy complex is critical for effective pest management and quarantine risk assessment. The present study investigated the host plant range of *B. caryeae* and documented its parasitoid assemblage through systematic field surveys and fruit rearing studies. A total of 23 fruit species belonging to 12 plant families were recorded as hosts, with Avocado (*Persea americana*), Karonda (*Carissa carandus*), Malayan apple (*Syzygium malaccense*) and Amtekayi (*Spondias dulcis*) identified as major hosts. A hymenopteran parasitoid *Diachasmimorpha longicaudata* was recovered from *B. caryeae* pupae, as dominant species with 100 % parasitisation. The findings highlight the ecological adaptability of *B. caryeae* and emphasize the role of parasitoids in regulating its populations, providing valuable insights for integrated pest management and biological control programs.

**Keywords:** *Bactrocera caryeae*, host plants, fruit infestation, parasitoids, biological control, Tephritidae

The humid tropical belt is characterized by consistently high temperatures, high relative humidity and substantial annual rainfall, conditions that favor continuous fruiting of host plants and enable year round survival of tephritid fruit flies. Such environments support rapid population build up, multiple overlapping generations and stable host pest associations (Bateman, 1972; Clarke *et al.*, 2022). Fruit flies (Diptera: Tephritidae) are among the most destructive pests of horticultural crops globally, causing severe yield losses and posing serious quarantine challenges. Species of the genus *Bactrocera* are particularly notorious due to their broad host range, high reproductive potential and ability to infest both cultivated and wild fruit species. In India and other tropical regions, infestations by *Bactrocera* spp. result in substantial economic losses and impose restrictions on the international trade of fresh produce (Verghese *et al.*, 2022).

*Bactrocera caryeae* (Kapoor) (Diptera: Tephritidae) is a polyphagous fruit fly species reported to infest a wide range of fruit crops. Infestation leads to direct losses through larval feeding and indirect losses arising from secondary microbial infections, premature fruit drop and reduced market acceptability. The species is predominantly confined to the humid tropical regions of South and Southeast Asia, where climatic conditions

and host plant diversity are highly conducive to its development and reproduction (Kapoor, 1993; Drew, 1994).

*Bactrocera caryeae* exhibits strong ecological adaptation to warm and humid environments and is rarely reported from arid, semi-arid, or temperate regions. High relative humidity enhances egg hatchability and larval survival, while limited temperature extremes permit continuous breeding cycles, contributing to its restricted distribution and localized dominance within the humid tropical belt. In South India, *B. caryeae* has been reported to be confined to a narrow coastal corridor along the western coast, a region that falls within the tropical rainforest climate zone of Köppen's classification and is predominantly characterized by coconut- and rice-based cropping systems. In India its distribution was reported from Western Ghats of Karnataka, Kerala and Tamil Nadu from South India (Verghese *et al.*, 2006).

Despite its economic significance, comprehensive information on the host plant range and parasitoid complex of *B. caryeae* remains fragmented. Host range studies are essential for understanding pest ecology, predicting outbreak dynamics and formulating effective management strategies as wild and alternate host plants often act as reservoirs that sustain fruit fly populations

during off-seasons. Furthermore, parasitoids play a crucial role in the natural regulation of fruit fly populations and constitute an important component of biological control and integrated pest management programmes. Therefore, the present study was undertaken to systematically document the host plant range of *B. caryeae* and to characterize its associated parasitoid fauna in the humid tropical region.

To understand the host ranges of *B. caryeae* fruit fly infested fruits from the experimental fields of Central Horticultural Experiment Station (CHES) Chettalli, (Latitude: 12.380N ; Longitude: 75.640E; Altitude: 609 MSL) Kodagu, Karnataka, India were collected to rear the fruit fly species. A total of 1445 fruit samples were collected from 23 plant species in 12 botanical families. From these a total of 1324 pupae and 1265 adult fruit flies were recovered. Among the fruit fly species documented, *B. caryeae* was the predominant species, accounting for the highest number of adult emergences ( $n = 1030$ ), followed by *B. dorsalis* ( $n = 225$ ), *B. correcta* ( $n = 11$ ), and *B. zonata* ( $n = 2$ ).

The relative abundance of tephritid fruit fly species recorded in the humid tropical region of Kodagu, Karnataka. *Bactrocera caryeae* was the predominant species, accounting for 81% of the total fruit fly population, indicating its dominance and strong adaptation to the local agroclimatic conditions. *Bactrocera dorsalis* constituted 18% of the population, representing a secondary but significant species in the region. In contrast, *B. correcta* was present at a very low level (1%), while *B. zonata* was either absent or recorded at negligible levels (0%) (Fig. 1). Overall, the distribution

pattern highlights the dominance of *B. caryeae* in the humid tropics of Kodagu and suggests that this species is the principal fruit fly pest in the region, with other *Bactrocera* species occurring only sporadically. Across all host fruit collections, the highest infestation by *B. caryeae* was recorded in avocado (*Persea americana*), with 100% infestation. This was followed by *Spondias dulcis* (96.80%), Malayan apple (*Syzygium malaccense*) (95.00%), Pummelo (*Citrus grandis*) (94.38%), Karonda (*Carissa carandas*) (92.78%), Bael (*Aegle marmelos*) (78.57%), Egg fruit (*Pouteria campechiana*) (68.96%), White sapota (*Casimiroa edulis*) (60.00%) and Coorg mandarin (*Citrus reticulata*) (24.00%) (Table 1; Fig. 2).

Among all the fruit species sampled, parasitoid emergence was observed exclusively in pupae collected from *Spondias dulcis* (Anacardiaceae family). *Spondias dulcis* is commonly referred to as pickle weed, the fruits are widely used in the preparation of preserves and as flavoring ingredients in sauces, soups, and stews. This indicates that parasitization of *B. caryeae* pupae was restricted to this wild host, highlighting its potential role as a reservoir for natural enemies. Further, complete parasitization of all *B. caryeae* pupae was noticed, indicating 100% parasitism. The parasitoid identified as *Diachasmimorpha longicaudata* (Hymenoptera: Braconidae: Opiinae) and was confirmed as a larval-pupal parasitoid, as oviposition occurs in the larval stage while adult emergence takes place from the pupal stage. This was corroborated by the fact that the infested fruits contained only larval stages at the time of collection, with no pupae present within the fruits. Parasitized pupae were distinctly blackened, whereas healthy pupae retained their normal coloration (Fig.3).

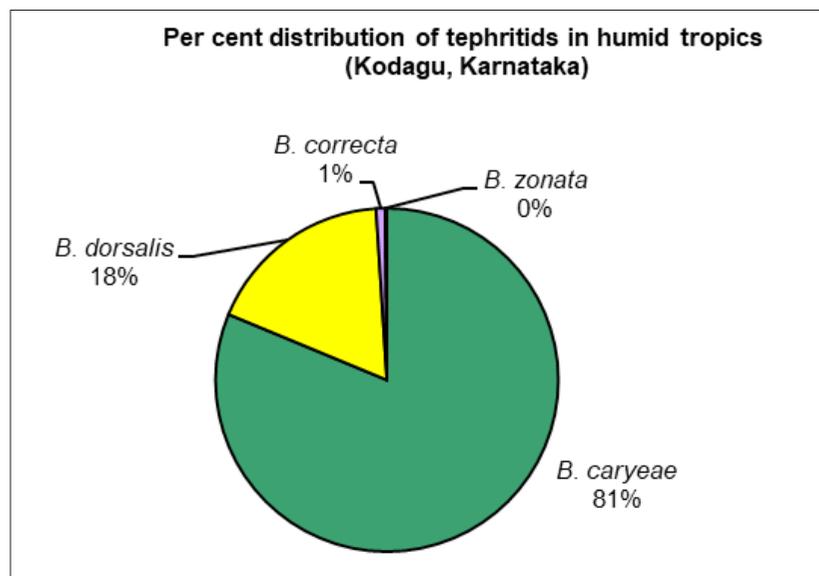


Fig. 1. Relative abundance of fruit fly species in Kodagu, Karnataka

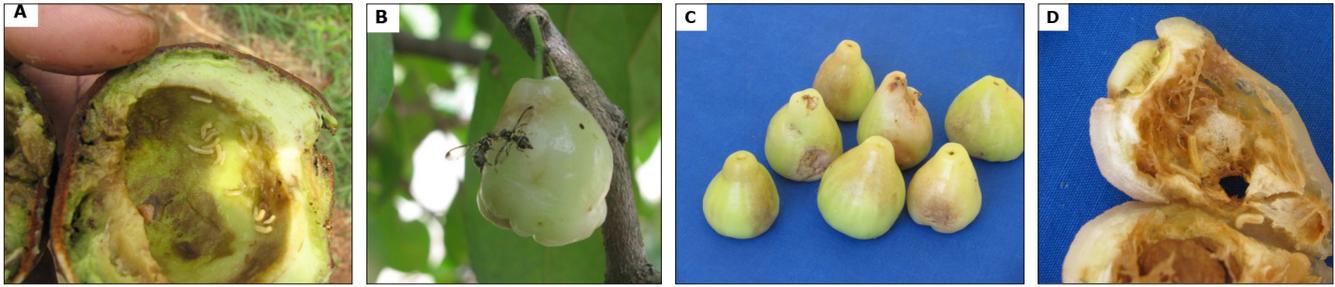
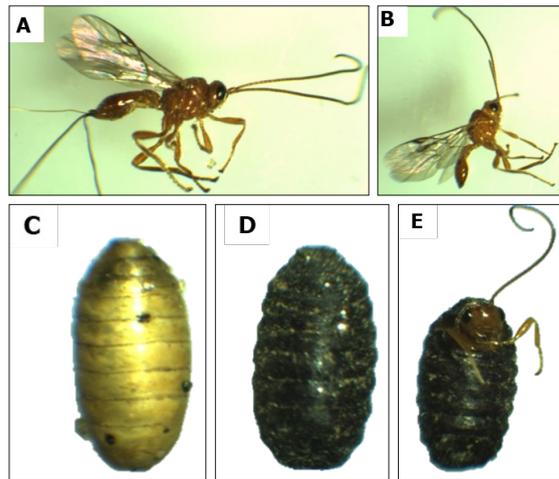


Fig. 2. (A) Fruit fly infestation in avocado and (B, C&D): malayan apple, showing adult fruit flies and maggot damage within fruits

Table.1: Comparative host range of *Bactrocera caryeae* on different fruit crops

Sl. No	FRUIT	SCIENTIFIC NAME	FAMILY	<i>B. caryeae</i>	<i>B.dorsalis</i>
1	Carambola	<i>Averrhoa carambola</i>	Oxalidae	0.00	0.00
2	West Indian Cherry	<i>Malpighia emarginata</i>	Euphorbiaceae	0.00	0.00
3	Karonda	<i>Carissa carandus</i>	Apocynaceae	<b>92.78</b>	<b>5.15</b>
4	Mango	<i>Mangifera indica</i>	Anacardiaceae	65.00	35.00
5	Papaya	<i>Carica papaya</i>	Caricaceae	0.00	0.00
6	Passion fruit	<i>Passiflora edulis</i>	Passifloraceae	0.00	0.00
7	Sapota	<i>Manilkara zapota</i>	Sapotaceae	0.00	0.00
8	Litchi	<i>Litchi chinensis</i>	Sapindanceae	0.00	0.00
9	Egg fruit	<i>Pouteria campechiana</i>	Sapotaceae	<b>68.96</b>	<b>29.3</b>
10	Avocado	<i>Persea americana</i>	Lauraceae	<b>100.00</b>	0.00
11	Coorg mandarin	<i>Citrus reticulata</i>	Rutaceae	<b>24.00</b>	<b>6.00</b>
12	Guava	<i>Psidium guajava</i>	Myrtaceae	26.00	15.00
13	Cashew	<i>Anacardium occidentale</i>	Anacardiaceae	0.00	0.00
14	Jamun	<i>Syzygium cumini</i>	Myrtaceae	0.00	0.00
15	White sapota	<i>Cosimiroa edulis</i>	Rutaceae	<b>60.00</b>	<b>10.00</b>
16	Bael	<i>Aegle marmelos</i>	Rutaceae	<b>78.57</b>	<b>12.63</b>
17	Pummelo	<i>Citrus grandis</i>	Rutaceae	<b>94.38</b>	<b>5.6</b>
18	Malayan apple	<i>Syzygium malaccense</i>	Myrtaceae	<b>95.00</b>	<b>5.00</b>
19	Garcinia	<i>Garcinia indica, Garcinia gummigatta</i>	Ulmaceae	0.00	0.00
20	Amtekayi	<i>Spondias dulcis</i>	Anacardiaceae	<b>96.8</b>	<b>0.00</b>
21	Sweet orange	<i>Citrus sinensis</i>	Rutaceae	0.00	0.00
22	Citrumelo	<i>Citrumelo (× Citroncirus spp.)</i>	Rutaceae	0.00	0.00
23	Citrange	<i>Citrus × insitorum.</i>	Rutaceae	0.00	0.00



**Fig. 3:** Parasitoid (*D. longicaudata*) associated with fruit fly showing (A) adult female and (B) male, (C) healthy fruit fly pupa, (D) parasitized pupa, and (E) adult parasitoid emerging from fruit fly pupa

The present study clearly demonstrates that *B. caryeae* was the predominant fruit fly species in the humid tropical region of Kodagu which exhibits a wide host range, infesting both cultivated and wild fruit species, indicating its strong adaptability and potential to persist across diverse agroecosystems. Variation in infestation levels among different host fruits suggests differential host preference and suitability, which may play a significant role in the seasonal population buildup of the pest.

The recovery of the larval-pupal parasitoid *D. longicaudata* from *B. caryeae* infested fruits confirms its natural association with this fruit fly species and highlights its potential as an effective biological control agent. Parasitism observed indicates the ability of *D. longicaudata* to successfully exploit *B. caryeae* populations in different ecological niches. Overall, the findings emphasize the importance of understanding host range dynamics and parasitoid associations in designing sustainable fruit fly management strategies. Conservation and augmentation of *D. longicaudata*, along with host-based management approaches, could significantly contribute to integrated pest management (IPM) programs targeting *B. caryeae*.

#### ACKNOWLEDGEMENT

The author expresses her sincere gratitude to the **Director, ICAR-Indian Institute of Horticultural Research (IIHR), Bengaluru**, for providing the necessary facilities, institutional support.

#### AUTHOR CONTRIBUTIONS

JM- Entire work has been carried out

#### CONFLICT OF INTEREST

Not Applicable

#### REFERENCES

- Bateman, M. A. 1972. The ecology of fruit flies. *Annual Review of Entomology*, **17**: 493–518.
- Clarke, A. R., Leach, P. and Measham, P. F. 2022. The fallacy of year-round breeding in polyphagous tropical fruit flies (Diptera: tephritidae): evidence for a seasonal reproductive arrestment in *Bactrocera* species. *Insects*, **13**(10): 882.
- Drew, R. A. I. 1994. The *Bactrocera dorsalis* complex of fruit flies (Diptera: Tephritidae: Dacinae) in Asia. *Bulletin of Entomological Research*, **2**: 68.
- Kapoor, V. C. 1993. *Indian fruit flies: (Insecta: Diptera: Tephritidae)* (pp. iv+228).
- Verghese, A., Jayanthi Mala, B. R. and Rashmi, M. A. 2022. Managing major insect pests of mango in the southern coastal belts of India. In *Transforming Coastal Zone for Sustainable Food and Income Security: Proceedings of the International Symposium of ISCAR on Coastal Agriculture, March 16–19, 2021* (pp. 165-180). Cham: Springer International Publishing.
- Verghese, A., Sreedevi, K., Sudha, K., Nagaraju, D. K. and Jayanthi Mala B. R. 2006. Pest Free Areas (PFA) of *Bactrocera caryeae* (Kapoor) in major mango belts of South India. *Pest Management in Horticultural Ecosystems*, **2**:75-84.

*MS Received: 24 November 2025*

*MS Acceptance: 26 December 2025*