



## Biology and morphometry of *Bactrocera dorsalis* and *Bactrocera zonata* on different fruit crops

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Fruit flies belong to family Tephritidae and David and Ramani (2011) reported their 325 species, of which 243 families in 79 genera are from India alone. From the economic point of view; Oriental fruit fly, *Bactrocera dorsalis* (Hendel), guava fruit fly, *Bactrocera correcta* (Bezzi) and peach fruit fly, *Bactrocera zonata* (Saunders) are very important pests and are recognized worldwide as the most important threat to horticulture (Ekesi and Mohamed 2011). *Bactrocera dorsalis* is reported to cause 100.0, 87.0, 78.0 and 61.0% fruit damage in rainy season guava, mango, peach and pear, respectively (Sharma *et al.* 2011), whereas Singh (2010) reported significant losses in Kinnow due to fruit flies.

Fruit flies are very difficult pests to manage due to the fact that these are polyphagous, multivoltine, adults have high mobility and fecundity, and all the developmental stages are unexposed (Sharma *et al.* 2011). Thus due to continuous availability of different host plants for the development of *B. dorsalis* and *B. zonata*, the present investigations were planned to study the comparative biology of these species on peach, pear, guava and Kinnow fruits under ambient conditions.

The experiment on biological and morphometric parameters of *Bactrocera* spp. on peach, pear, guava and Kinnow was conducted in the Fruit Entomology Laboratory, Department of Fruit Science, Punjab Agricultural University, Ludhiana under ambient conditions (28-38°C) during 2010-2011. Twenty infested fruits each of peach, pear, guava and Kinnow were collected from the orchard of University Seed Farm, Ladhawal, Ludhiana (30°54'N and 75°48'E). The fruits were kept individually in glass jars covered with muslin cloth for the observation of developmental studies of fruit flies. The studies were started at colour break stage of each crop, i.e. first week of May, June, July and August, respectively for peach, pear, guava and Kinnow. The eggs on

the day of collection were considered as 0-day old.

Ten fruits of each crop were dissected 10 days after collection for counting the number of maggots present in each fruit. Biological parameters such as number of egg punctures per fruit, days taken by maggots for coming out of fruit, number of maggots and pupae per fruit, pupal duration (days), number of adults emerged, sex ratio and proportion of *Bactrocera* spp. were observed in each crop. The composition of species was ascertained/ identified on each fruit crop by taking 25 adults. The maggot emerging out of the infested fruits were further kept in battery jars (15 cm × 6 cm) for pupation and emergence of adults. Morphometric parameters like length, width and weight of maggots, pupae and adults were recorded by taking 20 individuals in each treatment. Weight and wing expanse of 20 male and female adult fruit flies was also recorded separately. Length and width of maggots and wing expanse of adult flies was measured by using digital caliper (Digimatic-Plate I). The fruit fly species emerged from infested fruits of different crops were identified from Insect Biosystematics Laboratory, Division of Entomology, IARI, New Delhi.

The results on biological parameters of fruit flies, *Bactrocera* spp. on various fruit crops (Table 1) under ambient conditions indicated that number of egg punctures in peach (9.6±0.56) and Kinnow (8.5±0.45) were less to that of pear (18.1±0.73) and guava (19.5±0.56). The egg punctures on fruits between peach and Kinnow as well as between pear and guava were non-significant. The number of days taken by maggots for coming out of fruits were minimum in guava (8.0±0.26) followed by pear (13.0±0.33), peach (14.6±0.34) and Kinnow (15.6±0.31). Similarly, the number of maggots, pupae and adults per fruit were maximum in guava followed by pear, Kinnow and peach (Table 1). These observations indicated that guava was the most preferred host followed by pear, Kinnow and peach. Average weight of 100 pupae was also maximum in pear followed by peach and guava, whereas adult emergence was maximum in pear followed by guava and peach. Singh (2008) reported guava to be the most

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Table 1 Biological parameters of *Bactrocera* spp. on different fruit crops under ambient conditions during 2010 and 2011\*

Fruit crop	Temperature range (°C)	Number of egg punctures/ fruit	Number of maggot/ fruit	Number of pupae/ fruit	Pupal duration (days)	Number of adults emerged	Sex ratio (♂:♀)		Per cent <i>Bactrocera</i> spp.**	
							<i>B. zonata</i>	<i>B. dorsalis</i>	<i>B. zonata</i>	<i>B. dorsalis</i>
Peach	28-38	9.6±0.56	14.6±0.34	24.8±0.70	23.2±0.26	10.8±0.34	1:1.23	1:1.28	30.4±0.53	69.6±0.53
Pear	25-36	18.1±0.73	13.0±0.33	41.7±0.55	39.3±0.45	9.89±0.30	1:1.15	1:1.27	32.8±1.02	67.2±1.02
Guava	24-29	19.5±0.56	8.0±0.26	47.5±1.14	45.7±0.54	7.67±0.27	1:1.15	1:1.30	19.2±0.58	80.8±0.58
Kinnow	22-28	8.5±0.45	15.6±0.31	35.3±0.73	33.5±0.54	11.7±0.42	1:1.18	1:1.25	34.4±0.35	65.6±0.40
LSD	-	0.22	0.16	0.19	0.20	0.14	-	-	0.72	0.95
CV	-	6.29	4.77	3.38	3.65	4.79	-	-	3.95	2.95

\*Mean ±SE of 10 fruits/treatment and 20 individuals; \*\*mean of 25 adults; †punctures recorded before the start of experiment

Table 2 Morphometric parameters of *Bactrocera* spp. on different fruit crops under ambient conditions during 2010 and 2011\*

Fruit crop	Temperature range (°C)	Maggot				Pupa				Adults					
		Length (mm)	Width (mm)	Weight (mg)	Length (mm)	Width (mm)	Weight (mg)	Weight (mg)		Wing expanse (mm)					
								<i>B. zonata</i>	<i>B. dorsalis</i>	<i>B. zonata</i>	<i>B. dorsalis</i>				
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female				
Peach	28-38	6.75±0.02	1.81±0.04	10.4±0.6	4.72±0.03	2.11±0.06	11.7±0.3	4.34±0.06	4.60±0.06	4.50±0.07	4.69±0.03	11.88±0.4	12.13±0.4	11.94±0.5	12.76±0.6
Pear	25-36	7.14±0.07	1.83±0.06	10.9±0.4	4.73±0.06	2.12±0.04	12.0±0.2	4.35±0.03	4.62±0.04	4.53±0.05	4.71±0.07	11.94±0.2	12.43±0.2	11.98±0.3	12.93±0.6
Guava	24-29	7.35±0.06	1.79±0.02	11.1±0.2	4.77±0.08	2.15±0.02	12.3±0.9	4.38±0.07	4.64±0.03	4.58±0.09	4.73±0.06	11.96±0.8	12.62±0.2	12.02±0.7	12.97±0.7
Kinnow	22-28	7.17±0.09	1.86±0.06	10.6±0.6	4.75±0.07	2.12±0.03	12.0±0.7	4.40±0.02	4.62±0.09	4.54±0.02	4.71±0.02	11.77±0.9	12.34±0.3	11.97±0.6	12.94±0.9
LSD		0.002	0.004	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.004	0.003
CV		0.10	0.33	0.42	0.10	0.12	0.10	0.11	0.12	0.10	0.10	0.12	0.11	0.10	0.11

\*Mean±SE of 20 individuals

preferred host of *B. dorsalis* and *B. zonata* in Punjab. According to Joachim *et al.* (2010), larvae reared on orange had longer life cycle, low emergence percentage and smaller adults. The pupal duration (days) was minimum on guava ( $7.67 \pm 0.27$ ) followed by pear ( $9.89 \pm 0.30$ ), peach ( $10.8 \pm 0.34$ ) and Kinnow ( $11.7 \pm 0.42$ ), whereas the sex ratio of both the species, i.e. *B. zonata* and *B. dorsalis* was almost similar on all the fruit crops.

Based on the adult counts, *B. zonata* was maximum in Kinnow ( $34.4 \pm 0.35$ ) followed by pear ( $32.8 \pm 1.02$ ), peach ( $30.4 \pm 0.53$ ) and guava ( $19.2 \pm 0.58$ ) but that of *B. dorsalis* was reverse to that of *B. zonata*. However, the proportion of *B. dorsalis* was significantly high as compared to *B. zonata* on all the fruit crops. These studies indicated that host plant had a direct impact on biological parameters and guava was most preferred host followed by pear, Kinnow and peach though the duration of maggots and pupae were more on Kinnow. The temperature seemed to have little or no effect on the developmental parameters as it varied from 28-38, 25-36, 24-29 and 22-28°C in peach, pear, guava and Kinnow, respectively. The morphometric parameters of *Bactrocera* spp. on different fruit crops (Table 2) revealed that pattern of length, width and weight of maggots and pupae, and weight and wing expanse of adults (both male and female) of *B. zonata* and *B. dorsalis* was numerically high in guava followed by Kinnow, pear and peach. Thus, the host plant has been found to influence the growth and development of the fruit flies. Campos *et al.* (2011) found that wing area of males and females of adults of *Ceratitidis capitata* (Wiedemann) varied significantly with temperature during larval development but were larger at the lowest temperature. Adult size was also significantly different depending on the host fruit in which larvae developed. It was concluded in the present study that the development of *B. dorsalis* and *B. zonata* varied with the host fruit species.

#### SUMMARY

Studies on the biology of fruit flies, *B. dorsalis* and *B. zonata* on fruit crops indicated that number of egg punctures in peach and Kinnow were less to that of pear and guava. The number of days taken by maggots for coming out of fruits

was minimum in guava followed by pear, peach and Kinnow, but maggots, pupae and adults were maximum in guava as compared to other fruits. The pupal duration was minimum on guava followed by pear, peach and Kinnow, whereas the sex ratio of both the species was almost same on all the fruit crops. The population of *B. zonata* was maximum in Kinnow followed by pear, peach and guava but that of *B. dorsalis* was reverse to that of *B. zonata*. However, the proportion of *B. dorsalis* was significantly high as compared to *B. zonata* on all the fruit crops. The morphometric parameters of *Bactrocera* spp. on different fruit crops were numerically high in guava to that of Kinnow, pear and peach. Thus, guava was the most suitable host of fruit flies followed by Kinnow, pear and peach.

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