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Research Article

Biology and Morphology of *Bactrocera dorsalis* and *Bactrocera zonata* on Guava under Laboratory Conditions

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ABSTRACT

The oriental fruit fly, Bactrocera dorsalis and peach fruit fly, Bactrocera zonata are the important pest of various horticultural crops especially guava in the world. These can cause 80-100% crop losses during favorable environmental conditions or in rainy season. In the current study the biology and morphology of B. dorsalis and B. zonata on guava was recorded under controlled conditions. The embryonic period of B. zonata and B. dorsalis was 4.54±0.11 and 4.76±0.23 days, respectively. The number of B. dorsalis and B. zonata pupae per fruit were 43-47 and 42-46, respectively. The male of both species was short lived than female. The maggot length and width of B. zonata were 6.87±0.04 and 1.12±0.05 mm, respectively while length and width of B. zonata pupae were 3.54±0.03 and 1.00±0.01 mm, respectively. The study showed that maggots are the most destructive stage of pest which cause the huge crop losses. The current study results will prove fruitful in the adaptation of effective tools against this pest.

Keywords: *Fruit flies, Bactrocera dorsali, Bactrocera zonata, Horticultural crops, Agricultural crops, Quarantine pest.*

INTRODUCTION

Fruit flies (Diptera: Tephritidae) are the major pest of horticultural crops such as pear, mango, guava, citrus, melon, bear, peach and apple etc. throughout the globe.

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Several species of fruit flies have been recorded by many researchers in various countries including Pakistan, Nepal, Egypt, India and Southeast Asia. More than 325 species belong to 79 genera have been reported by David and Ramani (2011) only from India. 4000 species have been reported which mostly distributed in tropical, temperate and subtropical areas of the world.

The most dangerous species of fruit fly causing huge economic crop losses are guava fruit fly, *Bactrocera correcta*; peach fruit fly, *B. zonata* and Oriental fruit fly, *B. dorsalis* (Ekesi & Mohamed, 2011). Sharma et al. (2011) had reported that only *B. dorsalis* has caused 61.0, 78.0, 87.0 and 100.0 percent fruit damage of pear, peach, mango and guava, respectively while other scientist had reported significant fruit losses in Kinnow (Singh, 2010).

The different management approaches are applied to control this noxious pest on various crops including horticultural and agricultural (Murtaza et al., 2019). The complete or satisfy results of tested approaches cannot obtain due to its various hosts, high adult mobility, fecundity, multivoltine and polyphagous nature. The developmental stages of pest are unexposed which is the main failure of applied approaches (Sharma et al., 2011).

There is need to check the biological aspects of *B. dorsalis and B. zonata* on their hosts under laboratory conditions which prove effective for adopting best strategies against this dangerous pest. The current study was conducted to check the comparative biology of two species including *B. zonata* and *B. dorsalis* on guava fruit under controlled conditions. The results of the current study will prove fruitful in the adaptation of proper control measures against this pest in the country.

MATERIALS AND METHODS

An experimental study on comparative biology of two *Bactrocera* spp. on guava was carried out in the Department of Entomology, University of Agriculture, Faisalabad under controlled conditions. Ten infested guava fruits were collected from the nearby fruit markets. The collected fruits were brought to laboratory and placed individually into glass jars and jars were covered with muslin cloth to avoid the pest escape and observation of developmental stages. After 10 days of collections, each fruit was dissected for counting the maggots feeding in the fruit. The biological parameters (incubation period, larval period, pupal period and adult period) of both species were recorded during the whole study period. The emerged maggots were further kept in plastic jars (15 cm × 6 cm) for pupation and adult emergence. Morphological parameters including width, length and weight of pupae and maggots were observed and noted by randomly selected 10 individuals from each treatment. The emerging adults were identified to species level before use in experiment.

RESULTS AND DISCUSSION

Family Tephritidae is the largest family of Diptera. Fruit flies are the major pest of horticultural crops all over the world. The various horticultural crops especially guava is highly attacked by several species of fruit flies. *B. dorsalis* and *B. zonata* are the most destructive species of fruit fly. The female of these species can puncture the fruits and oviposit the eggs by long ovipositor. Singh and Sharma (2013) had reported that 19.5±0.56 number of eggs puncture in guava. They concluded that maggots require minimum time to emerge out from infested fruits of guava as compared to others fruits such as kinnow, pear and peach. Our current study findings are in line with them that incubation period of *B. zonata* and *B. dorsalis* was 4.54±0.11 and 4.76±0.23 days, respectively.

It was observed that high number of *B. zonata* maggots per fruits were counted as compared to *B. dorsalis* (**Table 1**). The pupal duration of *B. zonata* and *B. dorsalis* was 5-8 and 6-8 days, respectively. During the current study, the significant difference beween the longevity of male andit was observed that female was long lived than male. The observations on longevity of adult are similar

to various previous findings (Vera et al., 2014; & Dias et al., 2019). They concluded the similar findings that male was short lived and die earlier as compared to female.

A study was conducted by Singh (2008) to check the preferable host of fruit fly. He reported that guava is most preferable host plant of fruit flies (*B. zonata* and *B. dorsalis*) infestation while Joachim et al. (2010) had reported that orange is not suitable for pest growth and development. The low emergence percentage, high longevity and longer life period has observed during the study. It was recorded that host plant has direct effect on pest developmental period like incubation period, larval and pupal period, adult fecundity and longevity. The high difference was recorded between morphological and biological parameters of both tested species, *B. zonata* and *B. dorsalis*. *B. dorsalis* was given a greater number of eggs on daily basis as compared to *B. zonata* on guava. The fecundity of *B. zonata* was low as compared to *B. dorsalis*. The guava was found more preferable food for B. dorsalis than *B. zonata*.

Table 1: Biological aspects of *B. zonata* and *B. dorsalis* on guava

Stages	***B. zonata***		***B. dorsalis***	
	Mean±SE	**Range**	**Mean±SE**	**Range**
Eggs				
Incubation period	4.54±0.11	2-3	4.76±0.23	1-3
Maggots				
Number of maggots per fruit	23.61±0.82	20-25	21.97±0.54	21-24
Pupae				
Number of pupae per fruit	42.86±0.66	42-46	45.7±0.54	43-47
Pupal duration	7.45±0.31	5-8	7.54±0.33	6-8
Adults				
Number of adult emerged	2.78±1.98	2-4	2.99±1.79	2-6
Longevity				
Male	43.51±1.40	40-47	45.43±1.48	43-50
Female	48.43±1.46	50-56	52.58±1.37	51-58
Fecundity				
Mean number of eggs/female/day	9.99±1.20	4-18	11.12±1.78	5-20
Total number of eggs per female	230.65±5.32	229-251	234.81±6.33	230-258
Ovipositional periods				
Pre oviposition (days)	15.76±2.00	12-25	16.98±2.17	14-30
Oviposition (days)	27.41±1.20	29-31	26.54±0.99	27-34
Post oviposition (days)	3.99±0.78	3-8	4.17±0.56	4-10

Table 2: Morphological aspects of maggots and pupae of *B. zonata B. dorsalis* on guava

B. zonata					
Maggots or larvae			Pupae		
Length (mm)	Width (mm)	Weight (mg)	Length (mm)	Width (mm)	Weight (mg)
6.87±0.04	1.12±0.05	9.89±0.11	3.54±0.03	1.00±0.01	10.10±0.23

The length and width of *B. zonata* maggots were 6.87±0.04 and 1.12±0.05 mm, respectively while weight was 9.89±0.11 mg. The length and width of *B. zonata* pupae were 3.54±0.03 and 1.00±0.01 mm, respectively while weight was 10.10±0.23 mg (**Table 2**). The current study findings are in line with previous researchers findings (Nakahara et al., 2000; 2002; & Drew et al., 2008).

Table 3: Morphological aspects of maggots and pupae of *B. dorsalis B. dorsalis* on guava

B. dorsalis					
Maggots or larvae			Pupae		
Length (mm)	Width (mm)	Weight (mg)	Length (mm)	Width (mm)	Weight (mg)
5.55±0.03	1.23±0.04	8.97±0.24	3.02±0.01	1.03±0.00	11.04±0.35

The length and width of *B. zonata* maggots were 5.55±0.03 and 1.23±0.04 mm, respectively while weight was 8.97±0.24 mg. The length and width of *B. zonata* pupae were 3.02±0.01 and 1.03±0.00 mm, respectively while weight was 11.04±0.35 mg (**Table 3**). The various abiotic factors such as temperature and humidity can also affect the biology and morphology of pests. The change in location, food and various others factors are also involve in the growth and development of pest. All these factors can highly influence the developmental parameters of fruit flies. Sarwar et al. (2014) had reported the similar findings about environmental factors.

There are different hosts of fruit flies which badly attached by these in rainy season (Akbar et al., 2019; Naserzadeh et al., 2019; & Novotny et al., 2005). There is need to check the biology and morphology of fruit flies on other host plants except guava. The different management strategies such as biological, chemical, cultural and physicals have applied under close and open fields all over the world (Ramzan et al., 2021; Garcia et al., 2020; Dias et al., 2018; Vargas et al., 2012; & Bokonon-Ganta et al., 2007). The current study can prove effective tool to adopt best strategy against this pest and provide basic informations of this pest. These informations can help in managing this pest at timely.

Conflict of interest

Authors declare no conflict of interest.

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