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Biology of fruit fly *Bactrocera zonata* on mango

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Abstract
The average incubation period of fruit fly *Bactrocera zonata* was recorded as 1.58 ± 0.43 days. The average total development period of maggot was 7.68 ± 0.74 days. The prepupal period was 19.45 ± 2.16 hours. Pupation took place in soil and average pupal period recorded as 8.16 ± 0.42 days. The total life period was found to be 53.05 to 61.35 days with an average of 57.53 ± 3.02 days in male and from 66.27 to 72.92 days with an average of 68.96 ± 2.57 days in female.

Keywords: *Bactrocera zonata*, prepupal, pupal, incubation period, life period

Introduction

Fruit fly is an important pest of mango belongs to family Tephritidae and order Diptera. These are commonly called "Fruit Fly" due to their close association with fruits. These are mostly dominant in tropical and sub-tropical areas. Kapoor (1970) [4] listed 128 species of fruit flies and out of these, eight species are found infesting mango fruits in India. These species are *Bactrocera zonata* (Saunders), *Bactrocera dorsalis* Hendel, *Bactrocera correctus* (Bezzi), *Bactrocera diversa* (Coquillet), *Bactrocera hageni* de Meijere, *Bactrocera cucurbitae* (Coq.), *Dacus incisus* Walker and *Dacus tau* (Walker).

The adult female fruit fly inserts the ovipositor inside the fruits and eggs are deposited in clusters. Dark puncture caused due to the oviposition. Maggots on hatching, feed on pulp and brown patches appear on the fruit surface. Later on the fermenting organisms like bacteria and fungi gain entry through the oviposition puncture and fruit start rotting. Due to this, mesocarp become dirty brown and finally fruit drop down.

Materials and Methodology

For the study of incubation period and hat; the mango slice was kept in the petri dish (Diameter 10cm, Height 2cm) which contain the cotton soaked with water. Eggs were kept in mango slice by making small holes with the help of sharp pointer and observe daily in the morning and evening till hatching. Mango slices was changed in every morning by keeping fresh one and average incubation period was calculated.

To study the duration of different maggot instars, freshly emerged maggots were reared individually and observed daily under the microscope till pupation. The full grown maggot was identified by the help of their jumping habit.

A stage, when full maggot ceased feeding and become inactive was considered as prepupal stage. The prepupal period was recorded individually from inactive stage to complete pupal formation.

Pupal period was calculated from date of formation of pupa and the date of emergence of adult from the pupa. The longevity of male and female was calculated separately from the date of emergence and date of death of the adults.

Results and Discussion

Table 1: Life cycle of fruit fly, *B. zonata* on mango

Sr. No.	Particulars	Range (Av. ± S.D.)
1.	Egg period (days)	1 - 2.5 (1.58 ± 0.43)
2.	Total maggot period (days)	6.3 - 9.2 (7.58 ± 0.74)
3.	Prepupal period (hours)	16 - 23 (19.45 ± 2.16)
4.	Pupal period (days)	7.4 - 8.8 (8.16 ± 0.42)
5.	Adult period (days) : Male Female	 37 - 42 (39.4 ± 1.82) 48 - 55 (51.0 ± 2.65)
6.	Total life period (days) : Male Female	 53.05 - 61.35 (57.53 ± 3.02) 66.27 - 72.92 (68.96 ± 2.57)
7.	Temperature (°C)	26.00 - 31.00 (28.60 ± 2.39)
8.	Relative Humidity (%)	70.00 - 83.50 (76.60 ± 4.88)

Incubation period varied from 1 to 2.5 days (Av. 1.58 ± 0.43 days) during the course of the study at an average temperature of 28.60 ± 2.39°C and at average relative humidity of 76.60 ± 4.88 per cent. (Table 1) more or less similar observation was also reported by Atwal (1976), Rana *et al*. (1992) and Kapoor (2000) [1, 5, 7].

In the laboratory condition, it was observed that total maggot period of *B. zonata* varied from 6.3 to 9.2 days (Av. 7.68 ± 0.74 days), when the average temperature and relative humidity were 28.60 ± 2.39°C and 76.60 ± 4.88 per cent, respectively (Table 1). Earlier, Atwal (1976) [1] reported that the total maggot period of *B. zonata* was 4 to 16 days, while it was 7 days (Butani, 1979, Srivastava, 1997 and Kapoor, 2000) [2, 5, 8] in summer, 7 to 13 days (Rana *et al*., 1992) [7] at the temperature ranging from 26 to 30°C and 6.13 to 21.17 days (Mohamed, 2000) [6] at 15 to 30°C temperature on guava, which is more or less in accordance with the present findings.

The full grown maggots stop feeding and left the fruit and reach to the quiescent stage before pupation. The maggot remained stationary, become sluggish and stops feeding and

assumed spiral form assuming prepupal stage. The prepupal stage varied from 16 to 23 hours with an average of 19.45 ± 2.16 hours (Table 1). These findings are more or less in agreement with that of Srivastava (1997) [8] who reported the prepupal period as 18 to 48 hours.

It can be seen from the table 1 that the pupal period varied from 7.4 to 8.8 days (Av. 8.16 ± 0.42 days) when reared with an average temperature of 28.00 ± 2.39°C and with an average relative humidity of 76.60 ± 4.88 per cent. The present investigation on pupal period was in the range of that reported by Atwal (1976), Butani (1979), Rana *et al*. (1992), Srivastava (1997) and Mohamed (2000) [1, 2, 6, 7, 8].

It can be seen from the data (Table 1) that male adult period varied from 37 to 42 days (Av. 39.4 ± 1.82 days), while it was 48 to 55 days (Av. 51.00 ± 2.65 days) in case of female when reared at an average temperature of 28.60 ± 2.39°C and an average relative humidity of 76.60 ± 4.88 per cent. Rana *et al*. (1992) [7] reported that the adult period of male and female of *B. zonata* varied from 35 to 53 days and 47 to 72 days respectively, when reared at 28 ± 2°C temperature and 70 to 75 per cent relative humidity. The above reports are agreed closely with the present findings.

From the table 1, it is evident that total life period (from egg to death of adult) of males was 53.05 to 61.35 day (Av. 57.53 ± 3.02 days) when the temperature ranged from 26.00 to 31.00°C (Av. 28.60 ± 2.39°C) and relative humidity ranged from 70 to 83.50 per cent (Av. 76.60 ± 4.88 per cent) while the total life period of female varied from 66.27 to 72.92 days (Av. 68.96 ± 2.57 days) at the temperature ranged from 26.00 to 31.00°C (Av. 28.60 ± 2.39°C) and relative humidity ranged from 70 to 83.50 per cent (Av. 76.60 ± 4.88 per cent).

According to Rana *et al.* (1992) [7] the total life cycle of male of *B. zonata* varied from 56.4 to 73.4 days while the life cycle of female completed in about 67.00 to 92.4 days when reared at an average temperature of 28 ± 2°C and relative humidity of 70 to 75 per cent on guava fruits. The present investigation of total life period is within the range of above mentioned worker.

Conclusion

The present study revealed that the developmental stages of *Bactrocera zonata* were significantly influenced under laboratory conditions at an average temperature of 28.60 ± 2.39°C and relative humidity of 76.60 ± 4.88%. The incubation, larval, prepupal, and pupal periods averaged 1.58 days, 7.68 days, 19.45 hours, and 8.16 days, respectively. Female adults exhibited greater longevity (51.00 days) than males (39.40 days). The total life cycle averaged 57.53 days in males and 68.96 days in females. The findings are in close agreement with earlier reports and provide useful information on the biology and life history of *B. zonata*, which may aid in developing effective management strategies against this important fruit pest.

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