



# EFFECT OF VARIOUS PUPATION DEPTHS ON ADULT'S EMERGENCE OF *BACTROCERA ZONATA*

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**Abstract:** The depth of pupation varied from 0.5 cm to 4.7 cm ( $Av.2.54 \pm 1.40$  cm) in the soil. The percentage of adult emergence varied from 0 to 100 when pupae were buried at different depths (0.00 to 23.00 cm) in soil. The adult emergence was not observed from the pupae buried beyond the depth of 17 cm in the soil.

**Index terms:** *Bactrocera zonata*, Pupation, adult and emergence

## INTRODUCTION:

Mango (*Mangifera indica*) occupies a pride place amongst fruits grown in the country. The mango which belongs to family Anacardiaceae is an important tropical and sub-tropical fruit crop. It is grown in India for more than 4000 years (Candolle, 1904). It can be grown in almost all part of country except in temperate zone. Among the fruits of universal importance, mango is one of the top, because of its sweet fragrance, attractive colour, high palatability, taste and quality being rich in sugar, Vitamins (Vitamin –A and Vitamin-C) and minerals. It is rightly referred as “KING OF FRUITS”.

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. Kapoor (1970) listed 128 species of fruit flies and out of these, eight species are found infesting mango fruit in India. These species are *Bactrocera zonata* (Saunders), *Bactrocera dorsalis* Hendel, *Bactrocera correctus* (Bezzi), *Bactrocera diversa* (Coquillet), *Bactrocera hageni* De majiere, *Bactrocera cucurbitae* (Coq.), *Dacus incisus* Walker and *Dacus tau* (Walker).

The adult female fruit flies insert the ovipositor inside the fruits and eggs are deposited in clusters. Dark puncture caused due to the oviposition. Maggots on hatching, feed on the 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. Pupation took place in soil.

Looking to the apparent importance of the pest the investigation was carried out to study depth of pupation and emergence of adult fruit flies from different depth of soil.

**REVIEW OF LITERATURE:**

The full grown maggot of *Bactrocera zonata* stopped feeding and came out of the fruit and become inactive before pupation. The prepupal period of *B. zonata* as reported by Srivastava (1997) was 18 hours to 48 hours.

As regard the colour, shape and size of the pupa, Srivastava (1997) reported that the pupa was cylindrical in shape and dull deep reddish yellow to ochraceous in colour and measured about 4 to 5 mm in length and 2 mm in width.

The pupal period of *B. zonata* is about 7 days (Atwal, 1976; Butani, 1979 and Srivastava, 1997). According to Rana *et al.* (1992), the pupal period of *B. Zonata* ranged from 7 to 10 days at the temperature of 26 °C to 30 °C and relative humidity of 70 to 75 per cent at Haryana. In Pakistan, the pupal period of *B. zonata* varied from 7.03 to 40.9 days at the temperature ranging from 15 to 30 °C (Mohamed, 2000).

Narayan and Batra (1960) reported that pupation of *D. dorsalis* was takes place 7.62 cm to 17.18 cm below the soil surface. Whereas, according to Atwal (1976) the maggot of *D. zonatus* reach to the suitable place by jumping habit for pupation in soil at the depth of 2.54 cm to 7.62 cm. Singh (1997) reported that pupation of *Bactrocera* Spp. takes place at 7 to 18 cm deep in the moist soil.

In Gujarat, Patel (1989) reported that the adults of *D. Cucurbitae* were not emerged from the pupae buried beyond the depth of 15 cm. As per the report of Patel and Patel (1998), ninety to ninety five percent emergence of adult flies of *D. cilitus* was noticed from the pupae buried beyond the depth of 16 cm. The adult emergence of *B. dorsalis* was 65 per cent when pupae buried at 10 cm depth (Singh, 1997).

**MATERIAL AND METHODOLOGY:**

A stage, when full grown maggot ceased feeding and become inactive was considered as prepupal stage. Each last instar maggot was transferred with food to a glass jar (Height 19.5 cm; Breadth 11.5 cm) having 5 cm of moist soil at bottom to facilitate the pupation. Observation on colour, shape and size of prepupal stage was recorded. The length and breadth of prepupal stage was also measured under microscope. 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 pupae were studied for their colour, shape and size. The length and breadth was also measured by using ocular and stage micrometer.

To study the depth of pupation, 10 fully developed maggots were released in a glass jar (Height 19.5 cm; Breadth 11.5 cm) containing 5 cm thick layer of sieved moist soil. Such five jars were prepared for the study. These jars were covered with muslin cloth duly tightened with rubber bands. Measurement of depth at which the maggots pupated was taken separately after 2 days by scrapping the soil carefully.

To determine the percent adult emergence from different depth of the soil, the pupae were buried at different depths (00.00 to 23.00 cms) in dry sandy loam loose soil taken in square jars (Height 23 cm; Breadth 11.5 cm) and jars were covered with white muslin cloth duly tightened with rubber bands. Such 23 jars were taken for observation and percentage adult emergence was counted based on number of adult emerged out of buried 10 pupae in each jar.

**RESULTS AND DISCUSSION:**

In the laboratory, pupation took place usually in the soil. Narayanan and Batra (1960), Atwal (1976) and sing (1977a) have also recorded similar observations.

The data presented in Table 1, indicated that the depth of pupation varied from 0.5 cm to 4.7 cm ( $Av. 2.54 \pm 1.40$  cm) in the soil. As per the report of Atwal (1976), the depth of pupation varied from 2.54 cm to 7.62 cm which is in the range of present findings.

The data presented in Table 2 revealed that the percentage of adult emergence varied from 0 to 100, when pupae were buried at different depths (0.00 to 23.00 cm) in soil. The adult emergence was not observed from the pupae buried beyond the depth of 17 cm in the soil. Further, the adult emergence was found decreasing, if the pupae were buried beyond the depth of 7 cm. These observations showed that fruit fly preferred to pupate in the soil upto the depth of 7 cm and this was the most suitable condition for 90 to 100 per cent fruit fly adult emergence from the pupae. Patel (1989) reported that the adults of *D. cucurbitae* and *D. ciliatus* were not emerged from the pupae buried beyond the depth of 15 cm. While, Patel and Patel (1998) observed 90 to 95 per cent adult emergence of *D. cilitus* when buried upto depth of 7 cm but adult emergence was not observed from the pupae buried beyond the depth of 16 cm. Singh (1997) observed 65 per cent adult emergence when pupae buried at 10 cm depth. Thus the above findings are in accordance with the reports of the above workers.

**Table: 1 Depth of pupation by *B. zonata* in the soil**

Sr.No.	Depth of Pupation (cm)	Sr.No.	Depth of Pupation (cm)
1.	1	26.	1.7
2.	1.3	27.	2.4
3.	1.4	28.	4.1
4.	1.5	29.	4.1
5.	2.2	30.	4.2
6.	3.4	31.	0.5
7.	4.7	32.	0.5
8.	4.7	33.	1.0
9.	4.8	34.	1.0
10.	4.8	35.	1.0
11.	1.5	36.	2.0
12.	2.3	37.	2.5
13.	2.3	38.	3.8
14.	2.3	39.	3.8
15.	2.5	40.	3.9
16.	2.5	41.	0.8
17.	2.6	42.	0.8
18.	2.6	43.	2.5
19.	3.5	44.	2.5
20.	3.5	45.	2.6
21.	0.5	46.	4.1
22.	0.5	47.	4.1
23.	0.5	48.	4.1
24.	1.5	49.	4.6
25.	1.5	50.	4.6
	Min.		0.5
	Max.		4.7
	Av. ± S.D.		2.54±1.40

**Table: 2 Per cent adult emergence of *B. zonata* from different depth of soil.**

Depth at which Pupae buried in the soil (cm)	Number of Pupae burried	Number of adults emerged	Per cent Adults emerged
0.00	10	10	100
1.00	10	10	100
2.00	10	10	100
3.00	10	10	100
4.00	10	10	100
5.00	10	10	100
6.00	10	9	90.00
7.00	10	9	90.00
8.00	10	8	80.00
9.00	10	8	80.00
10.00	10	7	70.00
11.00	10	5	50.00
12.00	10	5	50.00
13.00	10	4	40.00
14.00	10	5	50.00
15.00	10	4	40.00
16.00	10	2	20.00
17.00	10	1	10.00
18.00	10	0	0.00
19.00	10	0	0.00
20.00	10	0	0.00
21.00	10	0	0.00
22.00	10	0	0.00
23.00	10	0	0.00

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