

A Study on the Incidence, Varietal Preference and Biology of the Ber Fruit Fly in Madhya Pradesh

by

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Introduction: *Carpomyia vesuviana* Costa (Tephritidae : Diptera) is a serious pest of Ber (*Zizyphus* spp.), rendering upto 80% fruits unfit for human consumption during its peak period of activity and thus giving a set back to the orchardists in Madhya Pradesh.

The fly derives its specific name from the fact that it was first discovered on the slopes of Mount Vesuviana damaging *Zizyphus sativa* in Italy. Fletcher (1917) reported this pest damaging *Z. jububa* in India. The biology and control of this pest have been reported mainly from South India and North-West India (Cherian & Sundaram, 1940, 1941; Shah *et al.*, 1948; Basha, 1952; Pruthi & Batra, 1960, Narayanan & Batra, 1960). Syed and Qureshi (1961) reported some parasites of the pest from West Pakistan. Since scanty information is available on the incidence and almost nil on varietal preference, these aspects along with biology were studied at Gwalior, Rewa and Jabalpur in Madhya Pradesh for about four years i.e., 1955-57 to 1958-59 and 1963-64. The results are reported in this paper.

Materials and Methods: All the stages of the pest were reared at room temperature. The flies, on their emergence, were confined in pairs for breeding inside glass chimneys and were fed on 30% glucose solution. Semi ripened fruits were also provided for egg laying. Incidence, food preference, life and seasonal history and natural enemies were studied by making fortnightly, each of 500 ber fruits (50 fruits from each of 10 random ber trees from different orchards) dropped by a bamboo throughout the fruiting season at Gwalior during 1956-58. Varietal preference was studied at Rewa during 1958-59 in thirteen varieties. 100 fruits per variety from 3-4 different trees were collected at 10 to 15 days interval during the fruiting season and the percentage infestation of fruits was worked out. Assorted observations were also recorded at Jabalpur during 1963-64.

Results and Discussion: *Incidence & damage:* The trees start fruiting during August-September. The infested fruits become distorted in shape showing punctures which look dark and later on a reddish circle also develops around each puncture when the fruit starts rotting. Old infested fruits show circular exit holes of maggots. The data on incidence are summarised in Table 1.

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TABLE 1. *Monthwise incidence*

S. No.	Month	Mean percentage infestation of fruits		Maggots per damaged fruit (range)	
		1956—57	1957—58	1956—57	1957—58
1.	September	0.0	0.00	—	—
2.	October	0.0	0.00	—	—
3.	November	4.4	6.72	0—1	0—1
4.	December	12.4	17.86	0—1	0—2
5.	January	52.5	48.73	1—7	1—5
6.	February	80.0	78.84	1—12	1—10
7.	March	54.6	48.81	1—9	0—8
8.	April	13.6	9.52	0—4	0—4
9.	May	0.0	2.30	—	—

The incidence starts from November and reaches its peak (80% fruits) during February and declines afterwards. Upto 100% fruits have been reported infested by Cherian and Sundaram (1940, 1941), 72-77% (in November & December) by Basha (1952) and upto 80% by Narayanan & Batra (1960) who recorded upto 18 larvae and 11 punctures in a single fruit at Delhi.

Varietal and food preference: The present findings reveal that thin skinned, soft-fleshy and sweet ber fruits are most preferred by the pest and sour ber fruits are least preferred. Sweet round fruits are comparatively more damaged. Bush ber fruits are least damaged. Narayanan and Batra (1960) also reported that the fleshy fruits are preferred to non-fleshy ones and the fruits of *Z. nummularia* (bush ber) are not preferred for feeding and oviposition. The data are reported in Table 2.

TABLE 2. *Varietal preference during the season (1958—59)*

S. No.	Variety	Mean percentage of infested fruits
1.	Pamdi	36.06
2.	Hyderabad	35.94
3.	Banaras Gola	35.88
4.	Katha	33.48
5.	Badami	32.88
6.	Amraoti	29.50
7.	Dodhia	28.46
8.	Banaras Narma	26.10

TABLE 2 — (Contd.)

S. No.	Variety	Mean percentage of infested fruits
9.	Desi Gola	25.02
10.	Desi Long	22.98
11.	Kanduri	20.46
12.	Wild ber	19.08
13.	Bush ber	8.02

'F' test

Highly significant

C.D. (p=0.01) 9.42

The differences in varietal preference are highly significant. Varieties from serial No. 1 to 7 stand at par in one group, 4 to 9 in second group, 6 to 11 in third group, 7 to 12 in fourth group and 13 in fifth group in descending order of preference. The findings reveal that the varieties Pamdi, Hyderabad and Banaras gola are most preferred and the bush ber is least preferred. Taking an over all picture it is inferred that the fruits of grafted varieties (1 to 7) are more susceptible due to their pulpy, soft, sweet and early ripening qualities. The only other records on varietal preference are those of Shah *et al.* (1948) who reported the "Kabuli" variety to be most preferred in North-West-Frontier Province and of Narayanan & Batra (1960) who reported the bush ber (*Z. nummularia*) to suffer negligible damage.

Life History: Life history observations relate to the period from November to April.

Egg: The eggs are very small, spindle shaped and creamy white. The egg period ranged from 3 to 8 days and the viability of eggs varied from 38.2 per cent during November and March-April to 68.8 per cent during December to February.

Maggot: The maggots are creamy white with pointed anterior end and truncated broad posterior end. The larval period varied from 6 to 14 days.

Pupa: The pupae are barrel shaped, tapering at both ends, light brown in colour changing to dark brown. Pupation usually takes place 1-3 inches deep in the soil. In the absence of loose soil the pupation also occurs on the surface of the soil beneath the fallen fruits. Both short and long cycle pupae are found. The prepupal and pupal periods varied from 3 to 5 days and 18 to 35 days respectively, in case of short cycle, and the pupal period including the prepupal period, ranged from 146 to 201 days in long cycle. Upto 68% pupae completed short cycle and 16.4% long cycle. The rest failed to complete the development.

Life Cycle: The total developmental period of one life cycle from egg to adult varied from 30 to 62 days (short cycle) and 155 to 223 days (long cycle).

Adult: Mating commenced 1 to 3 days after emergence and was repeated frequently. One act of copulation lasted from 35 minutes to 5½ hours. The eggs are deposited singly. The preoviposition, oviposition and post oviposition periods varied from 5 to 12, 1 to 5 and 0 to 8 days, respectively. The fecundity ranged from 28 to 167 eggs and it was not affected by the frequency of mating. Cherian & Sundaram (1940) reported the length of one life cycle to range from 23 to 320 days in South India and Narayanan & Batra (1960) reported it to range from 23 to 313 days in North India, whereas in M.P. it ranged from 30 to 223 days.

Longevity: The longevity data as studied during 1963-64 on 10, 20, 25, 30, 35 and 40 per cent glucose solutions, water soaked raisins and under starvation under laboratory conditions are tabulated in Table 3.

TABLE 3. *Adult longevity*

S. No.	Food condition	Mean longevity in days	
		Male	Female
1.	10% Glucose solution	3.7	4.5
2.	20% " "	5.2	5.6
3.	25% " "	10.6	13.5
4.	30% " "	12.8	18.6
5.	35% " "	10.7	12.8
6.	40% " "	12.5	13.2
7.	Soaked raisins	30.4	42.6
8.	Under starvation	2.1	3.2

The above table shows that under all feeding conditions female longevity was more than the male longevity and that longevity of both sexes was longest on soaked raisins followed by that on 30% glucose solution. Narayanan & Batra (1960) reported the male and female longevity on soaked raisins to be 67 and 70 days respectively in North India.

Sex ratio: During September - October the males out-numbered the females but during January-February the females outnumbered the males. During November-December and March-April the sex ratio was unity.

Seasonal History: The flies started emerging from pupae under diapause during August but they did not survive long and could not breed for want o

suitable food as during this time only bush ber fruits are available which are least suitable. After diapause during summer though the activity started from autumn the infestation of fruits was seen to start from November and to reach its peak during February. The pest passed 3-4 overlapping generations during the fruiting season (November to April). These findings corroborate those of Narayanan & Batra (1960). Other records are 4-5 broods (Cherian & Sundaram, 1941) and 5-6 overlapping generations (Basha, 1952), both from South India.

Natural enemies: During the course of investigations *Bracon fletcheri* Silv. was recorded as larval parasite; and *Opius carpomyiae* Silv. and *Omphale* sp. were recorded as larval-pupal parasites. These parasites, however, were not found effective in keeping the pest under check in Madhya Pradesh. Basha (1952), Pruthi and Batra (1960) and Narayanan and Batra (1960) have also reported that the parasites are active from the very beginning but they have not been found effective in South India, North West India and Delhi. Shah, *et al* (1948), however, reported that the damage was held in check during May, September and October in North-West-Frontier Province due to the activity of parasites. Syed & Qureshi (1961) stated that upto 65% larvae of *C. vesuviana* were parasitized by *Opius* sp. in West Pakistan.

Summary: Results of four years' studies conducted in Madhya Pradesh on the incidence, varietal and food preference and bionomics of the ber fruit fly, *Carpomyia vesuviana* Costa as studied in M.P. have been reported. The activity of the pest started from August but the noticeable damage started from November and reached peak during February when upto 80% fruits were infested. Thin skinned, pulpy, soft and sweet ber fruits were most preferred as food and sour ber fruits were least preferred. Out of the thirteen varieties tested for the varietal preference Pamdi, Hyderabad and Banaras gola were found most preferred and bush bers least preferred. The total developmental period from egg to adult varied from 30 to 62 days (short cycle) and 155 to 223 days (long cycle). The adult longevity of both sexes was found maximum (30.4 days in male and 42.6 days in female) on soaked raisins followed by that on 30% glucose solution. The pest passed summer under diapause in pupal stage. The pest passed 3-4 overlapping generations during one year. *Bracon fletcheri* was recorded as larval parasite; *Opius carpomyiae* and *Omphale* sp. were recorded as larval-pupal parasites.

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Pre-fabricated Soil, Cement Tiled Lining for Irrigation Channels

by

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Introduction: A considerable quantity of water is lost by percolation through the unlined irrigation channels affecting the farmer by increased cost in lifting water. No doubt the lining of channels by cement concrete is a permanent measure; but a small land holder cannot easily adopt this, as the cost of such lining is prohibitive. Therefore, there is imperative need for evolving cheap lining materials.

Investigation: A number of cheap lining materials like (i) soil, rice bran and sand in a ratio of 10:2:1, (ii) clayey soil, paddy husk and cowdung in a ratio of 9:3:1, (iii) clay, sand, cement in a proportion of 10:1:1, (iv) soil cement in the proportion of 8:1, (v) asphaltic mixture and (vi) polythylene lining have been experimented upon in different soils. The soil-cement lining was found to be effective and the average loss worked out 5%. But, in the soil-cement lined channels, weeds penetrated the lined channel and minor cracks developed. To overcome this problem, it was experimented to pre-fabricate

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