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## Assessment of losses caused by *Carpomyia vesuviana* Costa on ber

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### Abstract

The experiment was carried out at SKRAU, Bikaner (Raj.) in the year 2015-16. In the present study a significant difference was found between number of healthy fruits, number of infested fruits, level of infestation in fruits on number and weight basis and marketable yield of protected and unprotected plots. The average fruit yield per tree of protected plots was 36.41 kg per tree while the average fruit yield of unprotected plots was only 15.68 kg per tree. The loss in yield caused by ber fruit fly, *Carpomyia vesuviana* was 56.93 per cent in unprotected trees as compared to protected trees.

**Keywords:** *Carpomyia vesuviana*, protected, unprotected, Marketable yield

### Introduction

The ber (*Zizyphus mauritiana*) is an important fruit crop for arid and semi arid regions in tropical and sub tropical regions. It belongs to the family Rhamnaceae. It is mainly grown in India and other countries in central Asia, China and Taiwan. Its origin is in India. It is a hardy tree that copes with extreme temperature and thrives under rather dry conditions. Fruit quality is best under hot, sunny and dry conditions, but there should be a rainy season to support growth and flowering, leaving enough soil moisture to carry the fruit to maturity. It is known for its ability to withstand adverse conditions, such as salinity, drought and water logging. It is being cultivated in the state of Rajasthan, Haryana, U.P., Gujarat, M.P., Bihar, Maharashtra, A.P. and T.N. It occupied an area of 8.7 Lac ha with an annual production of 8.9 Lac tones in India<sup>[1]</sup>. The weight of the fruit varies from 20 to 50g. Although, the Ber is called as poor man's fruit, it is nutritious and delicious and is usually eaten fresh. Chattopadhyay (2007)<sup>[4]</sup> reported that fruit contains 80-100 mg of ascorbic acid per 100g of pulp, 5.4-10.5g of sugar with TSS of 12-18° brix, protein (0.8 g), energy (24.76 KJ), carbohydrate (17g), thiamine (Vit.B1) (0.02-0.024 mg), riboflavin(Vit.B2) (0.02-0.038 mg), niacin (Vit.B3)(0.7-0.873 mg), calcium (25.6 mg), iron (0.76-1.8 mg), phosphorus (26.8mg).

Ber growers, however, are not able to exploit the full potential of this tree because of certain constraints leading to yield and quality reduction. One of the major impediments contributing to low yield is the attack of insect pests. Over 100 species of insect- pests are reported as pest of ber<sup>[11]</sup> which include fruit fly, fruit borer, leaf-eating caterpillars, mealy bug, scale insect and thrips. Among them ber fruit fly, *Carpomyia vesuviana* Costa is a most serious one<sup>[12, 13]</sup> and found everywhere in India where ber is grown. It is the monophagous pest of ber. The pest contributes to low yield and poor quality of fruits and causing loss up to 80 per cent under severe infestation<sup>[3, 9]</sup>. Incidence of *C. vesuviana* reduce the yield from 13 to 20 per cent per plant<sup>[2]</sup> but in severe condition it may damage up to 90 to 100 per cent<sup>[7]</sup>.

### Materials and Methods

The present investigation was conducted at the Precision Farming Development Centre (PFDC), Agriculture Research Station, Beechwal, SKRAU, Bikaner, Rajasthan. The field experiments were conducted during ber season 2015-16. All the ber trees in the orchard were 5 years old and in good bearing condition.

To know the assess losses due to ber fruit fly, *Carpomyia vesuviana* Costa five twigs were selected randomly from different direction at the similar height of plant from protected and unprotected trees. The fruits plucked from these twigs were taken to the laboratory in separate polythene bags for further studies. A fruit was considered infested by the presence of external characters such as oviposition punctures on fruit surrounded by small circular area deformity

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of fruit shape and larval exit hole. The actual amount of avoidable loss inflicted by this naturally occurring ber fruit fly together with their effect on various yields affecting plant characters viz., the number of healthy fruits, number of infested fruits and infestation of fruit fly on number and weight basis were recorded separately.

### Results and discussion

Actual amount of avoidable loss inflicted by this naturally occurring ber fruit fly together with their effect on various yield affecting plant characters viz., the number of healthy fruits, number of infested fruits and infestation of fruit fly on

number and weight basis were recorded separately (Table 1 to 4).

### Number of healthy fruits

It is evident from the table 1 that there was a significant difference in the number of healthy fruits per twig between protected and unprotected trees. The average numbers of healthy fruits per twig of protected and unprotected trees were 151.20 and 65.40 respectively. Further minimum and maximum number of healthy fruits in protected branch ranged from 146.00 to 156.00 while in unprotected trees from 63.33 to 67.67 per twigs, respectively.

**Table 1:** Number of healthy fruits in protected and unprotected trees

S. No. of twigs	Protected				Unprotected			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average
1	140	148	162	150.00	65	72	62	66.33
2	138	145	155	146.00	60	75	58	64.33
3	145	158	165	156.00	70	65	68	67.67
4	140	150	162	150.67	78	55	63	65.33
5	143	151	166	153.33	68	70	52	63.33
Average				151.20				65.40
Tcal	43.19							
Ttab	2.77							

Significant at 5% level

### Number of infested fruits

The data presented in table 2 indicated that there was a significant difference in number of infested fruits per twig between protected and unprotected trees. The average number of infested fruits in protected and unprotected twigs was 13.27

and 64.20 respectively. Further minimum and maximum number of infested fruits in protected branches ranged from 12.00 to 14.00 while in unprotected trees from 61.67 to 66.67 per branch, respectively.

**Table 2:** Number of infested fruits in protected and unprotected trees

S. No. of twigs	Protected				Unprotected			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average
1	12	11	13	12.00	65	67	68	66.67
2	14	13	11	12.67	70	65	54	63.00
3	15	13	14	14.00	68	53	72	64.33
4	11	16	15	14.00	50	75	60	61.67
5	11	14	16	13.67	60	67	69	65.33
Average				13.27				64.20
Tcal.	11.67							
Ttab	2.77							

Significant at 5% level

It was revealed that a significant difference was found in number of healthy fruits per branch between protected and unprotected trees. The average numbers of healthy fruits in protected and unprotected trees was 151.20 and 65.40 respectively. Further minimum and maximum number of healthy fruits in protected twigs ranged from 146.00 to 156.00 while in unprotected twigs from 63.33 to 67.67 at the same time the average number of infested fruits in protected and unprotected branches was 13.27 and 64.20 respectively. The minimum and maximum number of infested fruits per twig in protected branches ranged from 12.00 to 14.00 while in

unprotected it ranged from 61.67 to 66.67, respectively.

### Fruit infestation on number basis

The observation on infestation of fruits on a number basis in protected and unprotected trees are presented in table 3 showed that there was a significant difference in infestation of fruits per twig. The average infestation of fruits in protected and unprotected twigs was 8.06 and 49.53 respectively. Further minimum and maximum per cent infestation of fruits in protected twigs ranged from 7.41 to 8.50 while in unprotected twigs it ranged from 48.56 to 50.78 per cent.

**Table 3:** Infestation of *C. vesuviana* in protected and unprotected trees (number basis)

S. No. of twigs	% infestation in protected trees				% infestation in unprotected trees			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average
1	7.89	6.92	7.43	7.41	50.00	48.20	52.31	50.13
2	9.21	8.23	6.63	7.98	53.85	46.43	48.21	49.48
3	9.38	7.60	7.82	8.24	49.28	44.92	51.43	48.74
4	7.28	9.64	8.47	8.50	39.06	57.69	48.78	48.56
5	7.14	8.48	8.79	8.18	46.88	48.91	57.02	50.78
Average				8.06				49.53
Tcal.	15.01							
Ttab	2.77							

Significant at 5% level

The observation on infestation of fruits on number basis in protected and unprotected trees revealed that there was a significant difference in per cent infestation per twig between protected and unprotected trees. The average per cent infestation in protected and unprotected branches was 8.06 and 49.53 respectively. Further minimum and maximum per cent infestation in protected twig ranged from 7.41 to 8.24 while in unprotected trees from 48.56 to 50.78, respectively.

#### Fruit infestation on weight basis

It is evident from the table 4 that there was a significant difference in per cent infestation of fruits per twig between protected and unprotected trees on weight basis. The infestations of fruits per twig in protected and unprotected were 8.22 and 49.67 respectively. Further minimum and maximum infestation of fruits in protected twigs ranged from 7.47 to 9.02 while in unprotected trees from 48.33 to 50.65 per twigs, respectively.

**Table 4:** Infestation of *C. vesuviana* in protected and unprotected trees (weight basis)

S. No. of twigs	% infestation in protected trees				% infestation in unprotected trees			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Average
1	9.12	8.1	6.15	7.79	50.15	46.55	48.28	48.33
2	8.12	6.48	7.82	7.47	52.12	48.52	49.24	49.96
3	7.05	9.46	9.15	8.55	53.25	48.26	50.44	50.65
4	8.1	7.15	9.5	8.25	48.33	51.26	49.18	49.59
5	7.85	10.12	9.1	9.02	47.23	48.12	54.14	49.83
Average				8.22				49.67
Tcal.	22.15							
Ttab	2.77							

Significant at 5% level

Further, a significant difference was recorded on per cent infestation per branch on weight basis between protected and unprotected trees. The average per cent infestation in protected and unprotected twigs was 8.22 and 49.67 respectively. Further minimum and maximum per cent fruit infestation in protected branches ranged from 7.47 to 9.02 while in unprotected trees from 48.33 to 50.65 per twigs, respectively. The present investigations have not been traced in the literature, therefore, the results of these could not be compared however a significant losses in the ber production due to attack of fruit fly was recorded by number of workers like Cherian and Surandram (1941) [5], Bagle (1992) [2], Kapoor (2005) [8] and Karuppaiah (2014) [10] support the present findings.

#### Marketable yield and avoidable losses on ber tree

A perusal of data in table 5 revealed a marked difference in marketable yield between protected and unprotected ber trees. The average marketable yield of protected trees was 36.41 kg while the average marketable fruit yield of unprotected trees was only 15.68 kg.

Evidently this shows that the ber fruit fly was responsible for reducing the marketable yield of ber fruits under the prevailing natural conditions at Bikaner (Rajasthan). Consequently, the actual avoidable loss calculated on the basis of the difference in yield from protected and unprotected plots in ber season 2015-16, with 56.93 per cent loss in marketable yield.

The present study revealed a marked difference in marketable yield between the protected and unprotected ber trees. The average fruit yield of protected plots was 36.41 kg per tree while the average fruit yield of unprotected trees was only 15.68 kg. Evidently this shows that the ber fruit fly was responsible for reducing the yield of ber fruits under the prevailing natural conditions at Bikaner (Rajasthan). Consequently, the actual avoidable loss calculated on the basis of difference obtained in marketable yield in protected and unprotected plots, the avoidable loss in ber trees was 56.93 per cent. The present results are in conformity with that of Farrar *et al.* (2004) [6] who carry out a study in Iran and observed that ber fruit fly *Carpomyia vesuviana* Costa caused yield loss varying from 30 to 70 per cent in unprotected condition Further, Karuppaiah *et al.* (2010) [9] reported that *Carpomyia vesuviana* and other pests were caused loss up to 80 per cent under sever infestation in unprotected plots, support the present findings.

#### Conclusion

In the present study there was a marked difference between number of healthy fruits, number of infested fruits, level of infestation in fruits on number and weight basis and marketable yield of protected and unprotected plots. The average marketable fruit yield of protected plots was 36.41 kg per tree while the average marketable fruit yield of unprotected plots was only 15.68 kg per tree. The loss in yield caused by ber fruit fly was 56.93 per cent.

**Table 5:** Assessment of losses in marketable yield of ber fruits caused by *C. vesuviana* during 2015-16

Plot number	Yield of marketable fruits (kg/tree)		Difference (X <sub>1</sub> -X <sub>2</sub> )	Deviation from the mean of difference (d)	Square of deviation from the mean of difference (d <sup>2</sup> )	t value at 5 %		Per cent reduction in unprotected plots
	Protected (X <sub>1</sub> )	Unprotected (X <sub>2</sub> )				Calculated	Tabulated	
1.	36.8	15.8	21	0.27	0.07			
2.	35.85	16.44	19.41	1.32	1.74	29.7	4.30	56.93
3.	36.58	14.8	21.78	1.05	1.10			
Sum	109.23	47.04	62.19					
Mean	36.41	15.68	20.73					

Observations based on per plot/tree yield  
Three trees for each treatment

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