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Population Dynamics of Sapota Bud Borer, *Anarsia achrasella* Bradley and its Correlation with Weather Parameters

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ABSTRACT

The study on population dynamics of sapota bud borer, *A. achrasella* and its correlation with weather parameters was carried out at the Jambuvadi Horticultural Farm, Junagadh Agricultural University, Junagadh during the year 2021-22. Population dynamics of sapota bud borer revealed that their damage was found throughout the year. The highest per cent infestation (21.22 %) was found during 2nd fortnight of March (12th and 13th SMW), whereas, it was recorded lowest (3.29 %) during 2nd fortnight of September (38th and 39th SMW). Among various abiotic factors of the environment during 2021-22, maximum temperature and evaporation showed highly significant and positive effect on per cent bud damage with "r" values (0.690**) and (0.891**), respectively. Evening relative humidity and mean relative humidity showed highly significant and negative effect on per cent bud damage with "r" values (-0.619**) and (-0.594**), respectively.

Keywords Population dynamics, Sapota, Bud borer (*Anarsia achrasella* Bradley), Weather parameters.

INTRODUCTION

Sapota, *Manilkara achras* (Mill.) Fosberg belongs to the family *Sapotaceae* and subfamily *Sapotoidae* and is commonly known as *chiku*, *ciku*, *dilly*, *naseberry*, *sapodilla*, *plum* and *chico* (*Purseglove* 1968 and Smith 1976). It has the unique behavior of continuous flowering and fruiting throughout the year in warm and humid climatic conditions; therefore, it is famous in Mexico, South Florida, China, India, Malaysia and Sri Lanka. The fully ripened fruits are sweet and delicious with a slight astringency flavor. The skin of the fruit can also be eaten due to its higher nutritive value than the fruit pulp. Fruits are dull brown in color, thin stain, and with yellowish light brown or red pulp and weigh about 70 to 300 g (Bose 1985). Both production and consumption of sapota in India, rank fifth next to mango, banana, citrus and grape

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(Tsomu *et al*. 2015). Sapota is largely grown on a commercial scale in Indian states of Gujarat, Andhra Pradesh, Maharashtra, Karnataka and West Bengal. In India, sapota is cultivated under 84,000 ha area with a total production of 9,06,000 MT during the year 2019-20 (Anon 2021). In Gujarat, major sapota producing districts are Navsari, Junagadh, Valsad, Surat and Bhavnagar. In Gujarat, it is grown under 26,988 ha area with a production of 2,73,866 MT during the year 2020-2021 (Anon 2022). There are about 33 pests have been reported on sapota trees in India (Patel 2002) among these, sapota bud borer is alarming one, as it damages flowering parts and cover most of the year and can thus, consider potential pest of sapota in Gujarat (Jhala *et al*. 1986). Based on the study of population dynamics of sapota bud borer, *A. achrasella* and its correlation with weather parameters, its a great need to find out the status of bud borer and its peak activity, so that farmers can take effective control measures and this way they save losses due to bud borer infestations during flowering to fruiting period.

MATERIALS AND METHODS

The study on population dynamics of sapota bud borer, *A. achrasella* and its correlation with weather parameters was carried out at the Jambuvadi Horticultural Farm, Junagadh Agricultural University, Junagadh during the year 2021-22. Ten years old plants of the variety Kalipatti planted at the spacing 8 m × 8 m were selected for the study. All the agronomic practices were followed as per recommendations.

Methodology

To study the population dynamics of sapota bud borer, *A. achrasella* and its correlation with weather parameters, twenty trees having uniform size and canopy were selected from 768 m^2 area. Eight twigs (20 cm length) per tree were selected (2 twigs from each side of the tree). Observations were recorded at fortnightly intervals throughout the year. The sapota orchard kept without spraying of insecticides throughout the experiment. Percent infestation on the flower bud of sapota due to sapota bud borer infestation was calculated with the help of following formula (Vijayaraghavendra and Basavanagoud 2016).

$$\text{Per cent infestation (\%)} = \frac{\text{Number of damaged flower buds by sapota bud borer}}{\text{Total number of sapota flower buds observed}} \times 100$$

Correlation with weather parameters

To determine the influence of various physical factors of environment in causing population fluctuation of sapota bud borer, population data were correlated with different meteorological parameters. An attempt was made to assessed the effect of bright sunshine hours (BSS), maximum temperature (MaxT), minimum temperature (MinT), mean temperature (MT), morning relative humidity (RH1), evening relative humidity (RH2), mean relative humidity (MRH), morning vapour pressure (VP1), evening vapour pressure (VP2), mean vapour pressure (MVP), rainy days (RD), wind speed (WS) and rainfall (RF) through correlation analysis. The data on various weather parameters were collected from the Agrometeorological cell at Junagadh Agricultural University, Junagadh. The data thus, obtained was correlated with various abiotic factors and a simple correlation coefficient (r) was worked out.

RESULTS AND DISCUSSION

Population dynamics of sapota bud borer, *A. achrasella*

The data on population dynamics of sapota bud borer were presented in Table 1 and its infestation graphically depicted in Fig. 1 revealed that the per cent infestation of *A. achrasella* was found throughout the year (3.29 % to 21.22 %) with its peak activity from 1st fortnight of February (5th and 6th SMW) to 2nd fortnight of June (25th and 26th SMW) and trough activity from 1st fortnight of July (29th to 31st SMW) to 2nd fortnight of January (3rd and 4th SMW). The highest per cent infestation (21.22 %) was found in 2nd fortnight of March (12th and 13th SMW), whereas, it was recorded the lowest (3.29 %) in 2nd fortnight of September (38th and 39th SMW).

The results are in close accordance with the following investigations. Deshmukh (2001) reported higher activity of bud borer in south Gujarat during

Table 1. Per cent damage caused by sapota bud borer, *A. achrasella* during the year 2021-22.

Month	Fortnight	Standard meteorological week (SMW)	Per cent bud damage by *A. achrasella*
Apr-21	II	16-17	18.47
May-21	I	18-19	16.94
	II	20-21	19.60
Jun-21	I	22-24	17.67
	II	25-26	15.46
Jul-21	I	27-28	12.18
	II	29-31	9.67
Aug-21	I	32-33	6.44
	II	34-35	4.10
Sep-21	I	36-37	4.23
	II	38-39	3.29
Oct-21	I	40-41	4.52
	II	42-43	5.42
Nov-21	I	44-46	7.69
	II	47-48	6.74
Dec-21	I	49-50	7.95
	II	51-52	8.90
Jan-22	I	1-2	10.69
	II	3-4	11.51
Feb-22	I	5-6	14.31
	II	7-8	16.85
Mar-22	I	9-11	19.06
	II	12-13	21.22
Apr-22	I	14-15	18.11

February to June on widely grown variety Kalipatti. Similarly, Kumar and Bhatt (2002) reported higher incidence (>15 %) of bud borer was during February to May in South Gujarat. Bisane *et al.* (2018) from Gandevi (Gujarat) revealed that bud borer infestation was observed throughout the year, their peak activity was initiated from February (12.26-12.40 %) with the commencement of core flowering stage, thereafter, it declined towards July with fruit development.

Correlation with weather parameters

The results presented in Table 2 revealed that among the various abiotic factors of environment during 2021-22, maximum temperature and evaporation showed highly significant and positive effect on pest activity with "r" values (0.690**) and (0.891**), respectively. Mean temperature, bright sunshine hours and wind speed showed significant and positive effect on pest activity with "r" values (0.451*), (0.475*) and (0.448*), respectively. Evening relative humidity and mean relative humidity showed highly significant and negative effect on pest activity with "r" values (-0.619**) and (-0.594**), respectively. Morning relative humidity, rainfall and no. of rainy days showed significant and negative effect on pest activity with "r" values (-0.458*), (-0.431*) and (-0.417*) respectively. While, minimum temperature, morning vapour pressure, evening vapour pressure and mean vapour pressure exhibited non-significant relationship with percent bud damage caused by *A. achrasella.*

Table 2. Correlation between weather parameters and percent bud damage caused by sapota bud borer, *A. achrasella* during the year 2021-22.

Weather parameters	Correlation coefficient (r)
Maximum temperature (Max T) (^{0}C)	0.690**
Minimum temperature (Min T) (^{0}C)	0.179
Mean temperature (MT) (^{0}C)	0.451*
Morning relative humidity (RH1) (%)	-0.458*
Evening relative humidity (RH2) (%)	-0.619**
Mean relative humidity (MRH) (%)	-0.594**
Bright sunshine hours (BSS) (hrs)	0.475*
Rainfall (RF) (mm)	-0.431*
No. of rainy days	-0.417*
Morning vapour pressure (VP1)	-0.031
Evening vapour pressure (VP2)	-0.34
Mean vapour pressure (MVP)	-0.194
Wind speed (WS) (km/hr)	0.448*
Evaporation (mm)	0.891**

*Significant at 5% level and ** at 1% level, n = 24

The results are in agreement with the following investigations. It was reported from South Gujarat that *A. achrasella* incidence on buds had a significant negative correlation with relative humidity and rainfall (Anon 1998). As per the report of Deshmukh (2001), the infestation of *A. achrasella* had a significant positive correlation with maximum temperature

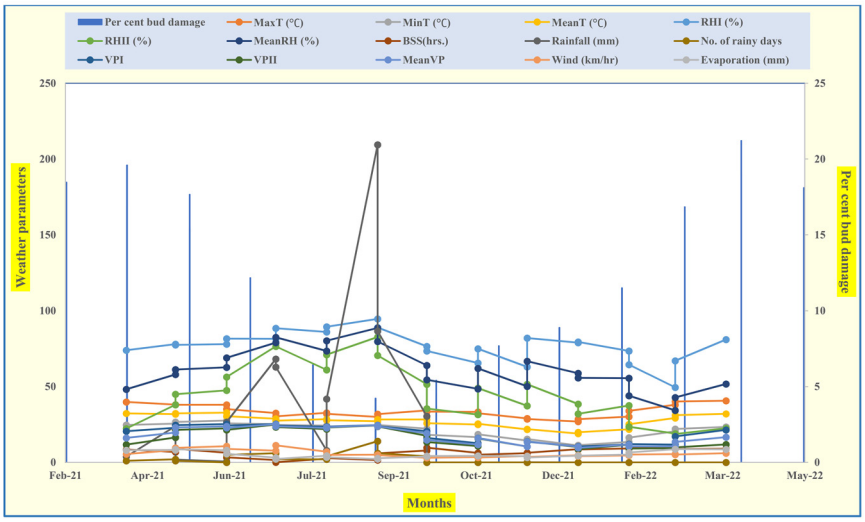

Fig. 1. Fluctuation in percent bud damage and its relationship with weather parameters.

and a significant negative correlation with relative humidity in South Gujarat. Similar results are also finding by Kumar and Bhatt (2002) in South Gujarat, whereas, Jayanthi *et al*. (2008) at IIHR (Bangalore) observed a highly significant positive correlation between borer incidence and preceding week average weather variables viz., evaporation (r = 0.56), wind speed (r = 0.55). Hajare (2018) studied the correlation between sapota bud borer and weather parameters indicated that temperature, wind velocity and sunshine hours had a positive relationship, whereas, relative humidity and rainfall showed a negative relationship with per cent bud damage. Moreover, the maximum, temperature and sunshine hours exerted highly significant positive correlation, while morning and evening relative humidity had highly significant negative impact on percent bud damage.

CONCLUSION

From the study on population dynamics of sapota bud borer, *A. achrasella* and its correlation with weather parameters, farmers are advised to monitor pest population of sapota bud borer from February to June by installing black tulsi trap in sapota orchard and apply control measures as and when required. The maximum temperature and evaporation had highly significant and positive effect on bud borer infestation, while, evening relative humidity and mean relative humidity showed highly significant and negative effect on bud borer infestation.

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