academicJournals

Vol. 10(11), pp. 1192-1196, 12 March, 2015
DOI: 10.5897/AJAR2013.6777
Article Number: 6D427E451387
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Effect of weather parameters on activity of chiku bud borer, *Anarsia achrasella* Bradley on sapota

Thumar Rasiklal K.[1], Borad Parbhatbhai K.[1], Dabhi Manishkumar R.[2]* and Korat Dhirubhai M.[3]

[1]Department of Entomology, B. A. College of Agriculture, Anand Agricultural University, Anand-388 110 (Gujarat), India.
[2](Ag. Entomology), College of Agriculture, Anand Agricultural University, Jabugam, Chhotaudaipur, (Gujarat), India.
[3]Anand Agricultural University, Anand-388 110 (Gujarat), India.

Received 17 January, 2013; Accepted 11 March, 2015

An experiment on effect of weather parameters on activity of sapota bud borer, *Anarsia achrasella* Bradley on sapota was carried out under middle Gujarat conditions at Anand Agricultural University, Anand. The higher population (6.00 to 17.50 larvae /50 twigs) and bud damage (14.50 to 36.11%) of *A. achrasella* were found during January to May. The correlation between bright sunshine hours and larval population (r=0.500) as well as bud damage (r=0.559) was highly significant and positive. The morning relative humidity, evening relative humidity, mean relative humidity, evening vapour pressure, rainy days and rainfall were highly significant and negative with larval population of *A. achrasella* and its damage in sapota orchard. Mean temperature, morning vapour pressure, mean vapour pressure and wind speed had significant negative correlation with bud damage. Regression analysis of larval population indicated those bright sunshine hours, wind speed, mean temperature, evening vapour pressure and morning relative humidity, the partial regression coefficients were found significant except wind speed and coefficient of determination (R^2) was 0.39. Whereas regression analysis of bud damage showed that wind speed, evening vapour pressure and morning relative humidity were non-significant, the partial regression coefficients were found significant and coefficient of determination (R^2) was 0.45.

Key words: Weather parameters, *Anarsia achrasella,* activity, sapota.

INTRODUCTION

Sapota is a vital fruit crop. It is widely grown in Maharashtra, Gujarat, Karnataka, Tamil Nadu, Kerala, Punjab and Hariyana state of India (Anonymous, 2009). Of the various factors limiting the yield of fruits, damage caused by insect pests is pertinent. Sapota tree is attacked by more than 25 insect pests (Butani, 1979). For the management of sapota bud borer, *Anarsia achrasella* Bradley, it is prime need to know occurrence and economic status of insect pests. Considering the economic importance of the pest and lacunae in the information regarding activity and its relationship with different weather parameters, the present study was

*Corresponding author. E-mail: dabhimr2004@yahoo.co.in

carried out under middle Gujarat conditions.

MATERIALS AND METHODS

The study on effect of weather parameters on activity of *A. achrasella* was carried out at Anand Agricultural University, Anand (Gujarat), India for two years that is, 2007-2008 and 2008-2009. In order to study the population dynamics of *A. achrasella* five trees were randomly selected and kept free from insecticidal application. From each tree ten twigs (20 cm length) were selected randomly for recording the observations of larval population as well as number of healthy and damaged buds due to *A. achrasella*. The observations were recorded at fortnightly interval. To determine the influence of various physical factors of environment in causing population fluctuation of the pest and its damage, the larval population data were correlated with different meteorological parameters and the statistical analysis was worked out through correlation and regression analysis.

RESULTS AND DISCUSSION

Data (Tables 1 and 2, Figures 1 and 2) indicated that infestation of *A. achrasella* was found more or less throughout the year. The higher (6.00 to 17.50 larvae /50 twigs) population of larvae and its damage on buds were noticed during January to May (14.50 to 36.11%). Its activity was medium during October to December, whereas it was less active during monsoon (June to September). The pest caused as high as 31.65% infestation on buds in south Gujarat (Patel, 1981 and Jhala et al., 1986) and 35.07% in Junagadh area of Saurashtra (Anonymous, 1986). The infestation of *A. achrasella* persisted almost throughout the year with a single peak in May (Parvathi and Belavadi, 1994). The infestation of the pest on bud remained throughout the year in widely grown variety Kalipatti and remained higher during second fortnight of February to June (Desmukh, 2001). Sushil and Bhatt (2002) reported higher incidence (> 15%) of bud borer during February - May and reached its peak (27.19%) on buds during May. Thus, the present findings are almost tally with the earlier reports.

The correlation between bright sunshine hours and larval population (r=0.500) as well as bud damage (r=0.559) was highly significant and positive. The minimum temperature, morning relative humidity, evening relative humidity, mean relative humidity, evening vapour pressure, rainy days and rainfall had highly significant negative association with larval population of *A. achrasella* and its damage in sapota orchard. The mean temperature, morning vapour pressure, mean vapour pressure and wind speed had non-significant negative correlation with larval population but significant negative correlation with bud damage. Maximum temperature had non-significant positive association with larval population of *A. achrasella* and its damage on sapota orchard. The *A. achrasella* incidence on buds had significant negative correlation with minimum temperature and relative humidity (Anonymous, 1998). The infestation of *A. achrasella* had significant positive correlation with maximum temperature and significant negative correlation with relative humidity (Desmukh, 2001). Sushil and Bhatt (2002) reported that bud borer infestation had significant positive correlation with maximum temperature.

The regression equation fitted to the data by taking larval population of *A. achrasella* (Y) as dependent variable and meteorological parameters as independent variables is

$$Y = 11.2838 + 1.2435^{**} BSS + 0.5184^{ns} WS + 0.8362^{*} MT - 1.8569^{**} VP_2 - 0.5711^{**} RH_1 + 0.9435^{**} \quad (R^2 = 0.39).$$

Where, Y = Larval population, BSS = Bright sunshine hours, WS = Wind speed, MT = Mean temperature, VP_2 = Evening vapour pressure, RH_1 = Morning relative humidity

All the significant partial regression coefficients were found highly significant except the regression coefficient of mean temperature. The partial regression coefficient of wind speed was found non significant. The model was explained very low variation (39%) existing in number of larva even though the most of partial regression coefficients were found significant. Regression analysis was carried out using the stepwise regression method by taking percentage of bud damage due to *A. achrasella* (Y) as dependent variable and meteorological parameters as independent variables. The coefficient determination (R^2) was computed and resultant regression model fitted as:

$$Y = 48.2213 + 1.4030^{*} WS - 1.5122^{**} VP_2 - 0.1282^{*} RH_1 \quad (R^2 = 0.45)$$

Where, Y = Bud damage (%), WS= Wind speed, VP_2 = Evening vapour pressure, RH_1= Morning relative humidity.

Partial regression coefficients of wind speed, evening vapour pressure and morning relative humidity were found significant and coefficient of determination (R^2) was 0.45, it indicated that total variation in bud damage due to *A. achrasella* was explained about 45% variation. It was lower, even though all the partial regression coefficients were found significant.

Conclusion

The environmental factors *viz.,* bright sunshine hours and maximum temperature were played an important role on activity of *A. achrasella* larval population as well as its damage on buds of *A. achrasella* on sapota. This information generated in present study would be helpful in developing efficient pest management strategies to combat *A. achrasella* on sapota orchard and thereby

Table 1. Population fluctuation of *A. achrasella* and its damage in sapota orchard.

Month and week	Standard meteorological week	Larvae/50 twigs			Bud damage (%)		
		2007-2008	2008-2009	Mean	2007-2008	2008-2009	Mean
April I	14	11	10	10.50	30.08	33.51	31.80
II	15	10	11	10.50	32.15	29.50	30.83
III	16	12	11	11.50	29.62	37.30	33.46
IV	17	15	20	17.50	34.07	38.14	36.11
V	18	10	11	10.50	32.25	33.00	32.63
May I	19	2	18	10.00	27.44	23.30	25.37
II	20	5	17	11.00	26.52	30.18	28.35
III	21	8	14	11.00	24.02	26.20	25.11
IV	22	10	7	8.50	27.54	23.72	25.63
June I	23	4	5	4.50	21.46	14.20	17.83
II	24	8	5	6.50	27.01	8.80	17.91
III	25	1	9	5.00	18.80	19.60	19.20
IV	26	3	0	1.50	12.10	9.20	10.65
July I	27	2	2	2.00	16.66	19.40	18.03
II	28	1	0	0.50	13.20	14.10	13.65
III	29	2	1	1.50	9.90	12.00	10.95
IV	30	1	0	0.50	7.45	8.40	7.93
V	31	0	1	0.50	3.32	6.85	5.09
August I	32	3	1	2.00	7.40	6.40	6.90
II	33	1	0	0.50	5.55	5.40	5.48
III	34	0	0	0.00	6.65	2.77	4.71
IV	35	0	1	0.50	1.20	10.25	5.73
September I	36	0	0	0.00	4.80	4.34	4.57
II	37	4	8	6.00	8.55	28.24	18.40
III	38	3	7	5.00	6.33	27.29	16.81
IV	39	15	0	7.50	25.60	5.68	15.64
October I	40	14	1	7.50	29.55	12.72	21.14
II	41	13	4	8.50	27.44	10.12	18.78
III	42	14	1	7.50	33.45	12.33	22.89
IV	43	15	0	7.50	27.10	9.47	18.29
V	44	11	0	5.50	27.01	7.37	17.19
November I	45	11	6	8.50	33.51	31.39	32.45
II	46	9	2	5.50	34.80	12.84	23.82
III	47	11	1	6.00	25.37	10.29	17.83
IV	48	4	1	2.50	27.50	13.50	20.50
December I	49	10	0	5.00	22.25	6.89	14.57
II	50	18	0	9.00	27.76	7.00	17.38
III	51	20	1	10.50	28.53	6.52	17.52
IV	52	12	6	9.00	14.60	15.67	15.14
January I	1	16	7	11.50	14.40	14.70	14.55
II	2	11	14	12.50	24.50	31.92	28.21
III	3	18	15	16.50	29.60	20.14	24.87
IV	4	10	13	11.50	22.50	24.73	23.62
V	5	4	8	6.00	19.76	12.84	16.30
February I	6	11	12	11.50	14.60	21.13	17.87
II	7	10	13	11.50	16.60	33.51	25.06
III	8	6	14	10.00	38.25	29.32	33.79
IV	9	6	11	8.50	37.82	28.27	33.05
March I	10	15	12	13.50	41.71	26.06	33.89
II	11	10	14	12.00	33.73	27.94	30.84

Table 1. Contd.

III	12	10	8	9.00	31.91	20.74	26.33
IV	13	13	13	13.00	35.94	27.91	31.93

Table 2. Correlation coefficient between weather parameters and *A. achrasella* on sapota.

Weather parameter	*A. achrasella*	
	Larva	Bud damage (%)
Bright sunshine hours, hrday^{-1} (BSS)	0.500**	0.559**
Maximum temperature, °C (MaxT)	0.140	0.038
Minimum temperature, °C (MinT)	-0.259**	-0.498**
Mean temperature, °C (MT)	-0.106	-0.313**
Morning relative humidity, % (RH_1)	-0.274**	-0.321**
Evening relative humidity, % (RH_2)	-0.431**	-0.588**
Mean relative humidity, % (MRH)	-0.0421**	-.0544**
Morning vapour pressure, mm of Hg (VP_1)	-0124	-0.234*
Evening vapour pressure, mm of Hg (VP_2)	-0.419**	-0.631**
Mean vapour pressure, mm of Hg (MVP)	-0.179	-0.312**
Rainy days	-0.332**	-0.403**
Wind speed, kmhr^{-1} (WS)	-0.085	-0.229*
Rainfall, mm (RF)	-0.314**	-0.361**

*Significant at 5% level, **Significant at 1% level.

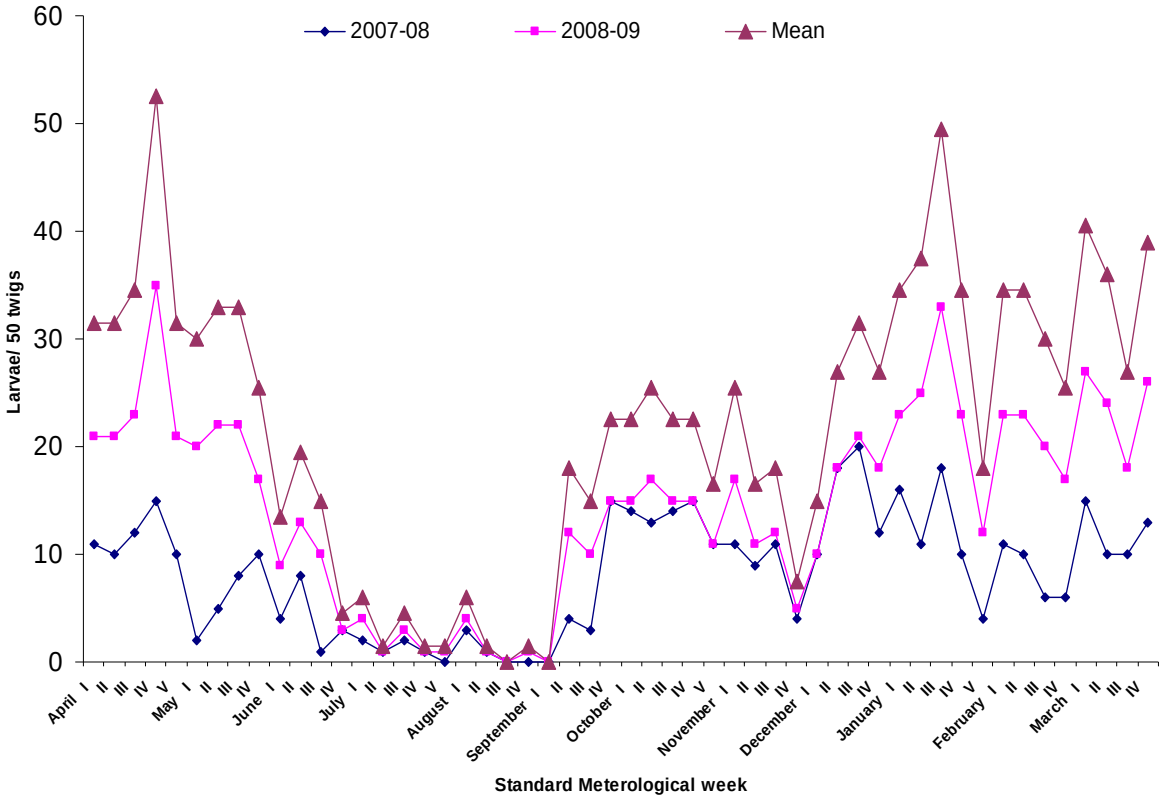

Figure 1. Population fluctuation of *A. achrasella* in sapota.

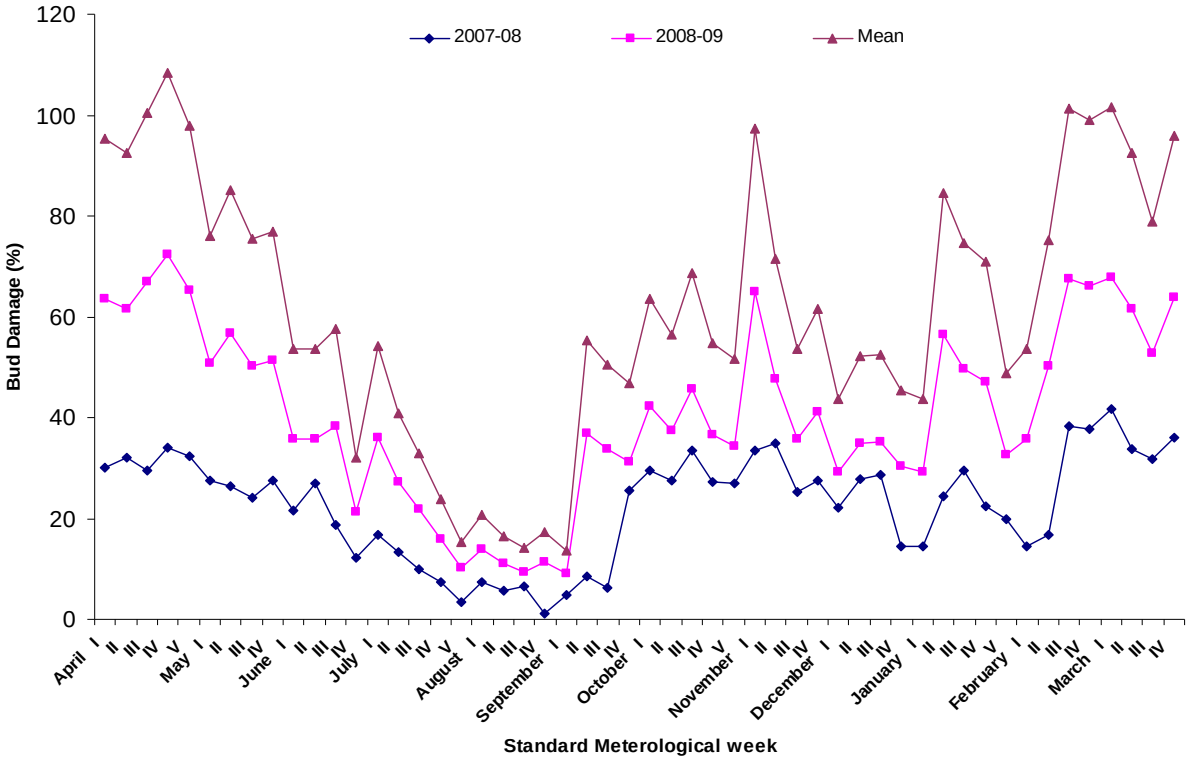

Figure 2. Bud damage by *A. achrasella* in sapota.

increase the productivity of sapota besides safety to the environment.

Conflict of Interest

The authors have not declared any conflict of interest.

REFERENCES

Anonymous (1986). The survey of important insect pests infesting chiku trees in Junagadh area. Report of Research activities of the Department of Entomology, GAU, Junagadh. Presented in XXII PPSC meeting of Agresco of GAU held on May 22-23 at Anand pp. 11-20.

Anonymous (1998). Correlation coefficient of chiku pests infestation with respect to weather parameters. Research Report (1997-98) of Fruit Research Station, GAU, Gandevi. Presented in XXXIII PPSC meeting of Agresco of GAU held on April 13-14, 1998 at Junagadh, pp. 10-11.

Anonymous (2009). Indian Horticulture Database pp. 122-129. (http://www.nhb.gov.in).

Butani DK (1979). Insects and Fruits". 1st Eds. (Periodical Expert Book Agency, Delhi) pp. 87-94.

Desmukh DV (2001). Varietal screening of sapota against pest complex, comparative biology of Anarsia acharasella Bradly and bio-efficacy of chemical insecticides against bud boring insects of sapota. M. Sc. (Agri.) thesis submitted to GAU, Sardarkrushinagar.

Jhala RC, Shah AH, Patel CB, Patel SH (1986). Population dynamics of some insect pests of chiku in south Gujarat. GAU Res. J. 11(2):69-71.

Parvathi C, Belavadi VV (1994). Seasonal incidence of Anarsia achrasella and the significance of its damage to sapota. Int. J. Pest Manage. 40(1):80-82.

Patel GT (1981). Biology and chemical control of chiku bud borer a pest of chiku. M. Sc. (Agri.) thesis submitted to GAU, Sardarkrushinagar.

Sushil K, Bhatt RI (2002). Seasonal incidence and population dynamics of major lepidopterous insect pests of sapota in relation to abiotic factors. J. Appl. Zool. Res. 13(1):6-9.