Research Paper

ADVANCE RESEARCH JOURNAL OF
CROP
IMPROVEMENT
Volume 5 | Issue 1 | June, 2014 | 11-14

Effect of abiotic factors on population dynamics of leafhopper, *Amrasca biguttula biguttula* (Ishida) in okra

e ISSN-2231-640X
Open Access-*www.researchjournal.co.in*

■ M.V. DABHI AND D.J. KOSHIYA[1]

AUTHORS' INFO

Associated Co-author :
[1]Directorate of Research, Anand Agricultural University, ANAND (GUJARAT) INDIA

Author for correspondence :
M.V. DABHI
Sheth M.C. Polytecnhnic in Agriculture, Anand Agricultural University, ANAND (GUJARAT) INDIA
Email: mdabhi2003@gmail.com

ABSTRACT : A field experiment was conducted at Anand Agricultural University, Anand, Gujarat to study the impact of weather variables on population dynamics of leaf hopper, *A.biguttula biguttula* in summer and *Kharif* okra for two consecutive years (2005-06 and 2006-07). Peak activity of leafhopper population was found during 16^{th}, 18^{th}, 24^{th} and 33^{rd} meteorological standard week (MSW) in summer and *Kharif* season, respectively for both the crops (organically and inorganically grown crop). Temperature (maximum and minimum), vapour pressure (morning and evening), evening vapour pressure deficit and wind speed had significant positive effect on population of leafhopper, while temperature range showed significant negative impact of this pest during summer season in both the crops. Bright sunshine hours showed significant positive impact with the population of leaf hopper, while evening vapour pressure showed significant negative impact to this pest during *Kharif* season.

Key Words : Abiotic factors, Correlation, Leafhopper, Okra, Regression

How to cite this paper : Dabhi, M.V. and Koshiya, D.J. (2014). Effect of abiotic factors on population dynamics of leafhopper, *Amrasca biguttula biguttula* (Ishida) in okra. *Adv. Res. J. Crop Improv.*, **5** (1) : 11-14.

Paper History : Received : 06.01.2014; **Revised :** 26.04.2014; **Accepted :** 05.05.2014

Abiotic factors are very important for the survival, development and reproductive capacity of insects. Their activities are mostly dependent on the environmental factors for maintenance. Prolonged periods of low or high temperatures or sudden change in humidity and rainfall adversely affect the insect development on the crop (Prasad and Logiswan, 1997). Okra is an annual vegetable crop of tropical and subtropical regions. It is rich in vitamins, calcium, potassium and other mineral matters and has wide usage in culinary purpose, paper industry and medicine. It is widely grown in Bihar, Orissa, West Bengal, Andhra Pradesh, Madhya Pradesh, Karnataka, Maharashra and Gujarat. The crop is grown in summer as well as *Kharif* season for obtaining higher market value. In Gujarat, it is mainly grown in Vadodara, Surat, Junagadh, Banaskantha, Bhavnagar, Valsad, Gandhinagar, Kheda and Anand districts. Such an important crop attacked with eleven insect pest species have been recorded in Gujarat (Patel *et al.*, 1970) of these, leafhopper is the destructive pest of okra (Singh *et al*., 1993; Dhandapani *et al*., 2003). It is a serious pest of okra throughout India which sucks cell sap from the leaves of plant and reduces the vitality and vigour of plant. Timings of the management activities are crucial for the implementation of pest management tactics. Therefore, the present study was initiated to workout relation of *Amrasca biguttula biguttula* Ishida with prevailing weather factors, so that this information can be utilized in formulating pest management programme.

Research Procedure

The experiment was carried out for two consecutive years (2005-06 and 2006-07) on organically and inorganically cultivated okra (Gujarat Okra-2). The okra crop was raised organically and inorganically, each in area of 20 x 10 m with a spacing of 45 x 30 cm and 60 x 30 cm for summer and *Kharif* season, respectively at Anand Agricultural University, Anand. In order to maintain the organic conditions, FYM @ 12 ton/ha was applied in the plot, whereas in other plot N: P: K @ 100: 50 :50 kg/ha (basal application N: P: K @ 50: 50 :50 kg/ha and split application at flowering stage N: P: K @ 50: 0 : 0 kg/ha) was applied to create the inorganic condition. The experimental plots (organic and inorganic) were divided into 10 equal quadrates and 25 plants were randomly selected in each quadrate to record observations on leafhopper population on three leaves (top, middle and bottom) per plant at weekly interval starting from germination to harvest of the crop. The data on leafhopper population were correlated with weather parameters following meteorological standard weeks (MSW).

RESEARCH ANALYSIS AND REASONING

The incidence of *A. biguttula biguttula* on okra crop commenced at 8th and 23rd MSW (2nd WAS) and continued almost throughout the crop period in summer and *Kharif* okra, respectively (Table 1). The pest population fluctuated during early part of crop growth, increased gradually from 10th MSW

Table 1: Population fluctuation of leafhopper, *A. biguttula biguttula* on okra grown under organic and inorganic conditions

MSW		WAS	Leafhopper per leaf			
			Summer		*Kharif*	
Summer	*Kharif*		Organic	Inorganic	Organic	Inorganic
8	23	2	3.61	5.11	4.78	6.28
9	24	3	2.73	4.23	6.19	8.97
10	25	4	2.90	4.35	5.23	6.22
11	26	5	3.87	4.97	4.14	4.91
12	27	6	5.63	8.38	1.77	3.06
13	28	7	8.67	10.27	2.23	2.86
14	29	8	6.89	10.06	3.78	4.29
15	30	9	10.17	12.17	4.07	4.51
16	31	10	14.19	16.35	2.69	3.37
17	32	11	12.07	13.67	1.64	2.46
18	33	12	15.24	17.04	7.29	9.22
19	34	13	12.85	14.68	6.72	7.85
20	35	14	11.36	13.55	3.93	5.17
Seasonal mean			8.47	10.37	4.19	5.32

WAS = Weeks after sowing, MSW = Meteorological standard week

Table 2: Correlation co-efficient between weather parameters and leafhopper population in okra

Sr. No.	Weather parameters	Season			
		Summer		*Kharif*	
		Organic crop	Inorganic crop	Organic crop	Inorganic crop
1.	Bright sunshine hour (BSS)	0.521	0.536	0.579*	0.641*
2.	Maximum temp. (Max T)	0.927**	0.952**	0.406	0.466
3.	Minimum temp. (Min T)	0.931**	0.942**	0.124	0.186
4.	Morning relative humidity (RH_1)	0.151	0.118	-0.341	-0.449
5.	Evening relative humidity (RH_2)	0.481	0.447	-0.414	-0.480
6.	Morning vapour pressure (VP_1)	0.871**	0.869**	-0.408	-0.534
7.	Evening vapour pressure (VP_2)	0.839**	0.823**	-0.544	-0.628*
8.	Morning vapour pressure deficit (VPD_1)	0.373	0.383	0.197	0.279
9.	Evening vapour pressure deficit (VPD_2)	0.726**	0.744**	0.198	0.284
10.	Wind speed (WS)	0.694**	0.696**	-0.325	-0.155
11.	Rainfall (RF)	--	--	-0.659*	-0.655
12.	Temperature Range (TR)	- 0.648*	- 0.639*	0.492	0.546

n=13, *Significant 'r' value at 5% level = 0.553, **Significant 'r' value at 1% level = 0.684

(5th WAS) and attained its peak at 16th and 18th MSW (10th and 12th WAS) in summer crop. During *Kharif* season, relatively more number of leafhoppers was observed during early and later part of crop. This pest attained its peak activity in 24th and 33rd MSW (3rd and 12th WAS). The trend of its occurrence was more or less same in organic and inorganic crops. These findings are in agreement with the report of Narangalkar (2003) and Senapathi and Khan (1978).

Positive association between leafhopper population and sunshine hours (Table 2) was noticed (r = 0.521 and 0.536 for organic and inorganic crop, respectively) during summer season and same trend was observed for the *Kharif* season (r = 0.579 and 0.641* for organic and inorganic crop, respectively). More or less same trend was observed for maximum and minimum temperature in organic and inorganic crop during both the seasons. However, temperature (maximum and minimum) showed highly significant positive impact with this pest during summer season. Relative humidity did not show any notable influence on leafhopper incidence in summer as well as *Kharif* season. The highly significant positive relationship was found between the summer leafhopper population and vapour pressure (morning and evening) in both the crops (organic and inorganic) during summer. Vapour pressure deficit influenced positively on occurrence of leafhopper during summer as well as *Kharif* season. Wind speed showed highly significant positive relationship with leafhopper population during summer season in organic as well as inorganic crops. Significant negative correlation was established between leafhopper population and temperature range in organic as well as inorganic crops during summer season.

The regression equation was computed based on the goodness of fit by taking leafhopper population (Y) as dependent variable and weather parameters as independent variables. The regression equation fitted was: $Y = -24.342 + 1.719^{**}$ Max T $- 0.655^{**}$ TR $- 1.775^{**}$ BSS ($R^2 = 0.983$) for inorganic crop and $Y = -13.967 + 1.465^{**}$ Min T $- 1.727^{*}$ WS ($R^2 = 0.919$) for organic crop during summer season, while $Y = 6.989 - 1.90^{*} E-02$ RF ($R^2 = 0.429$) for inorganic crop and $Y = 5.546 - 1.54^{*} E-02$ RF ($R^2 = 0.437$) during *Kharif* season where, Y = Leafhopper population, Max T = Maximum temperature, Min T = Minimum temperature, TR = Temperature range, WS = Wind speed, BSS = Bright sunshine hours and RF = Rainfall. These findings are in correspondence with the findings of Bishnol *et al*. (1996) and Umar *et al*. (2003) who reported that maximum temperature played an important role to increase the leafhopper population during the crop season. The similar type of observation were recorded by Tariq *et al*. (2002) who reported that mean maximum minimum temperature and sunshine hours positively correlated while rainfall showed negative correlation with leafhopper population in brinjal.

From the above study and investigation, it can be concluded that population of leafhopper, *A. biguttula biguttula* recorded in two different types of okra crops (organic and inorganic) indicated that incidence of the pest commenced from fifteen days after sowing and continued more or less throughout the crop period in both the crops and seasons. Population of leafhopper showed its peak activity during 16th and 18th MSW and 24th and 33th MSW, WAS in summer and *Kharif* season, respectively (inorganically and organically grown crop). Maximum and minimum temperature, morning and evening vapour pressure, evening vapour deficit and wind speed showed significant positive relationship with leafhopper population during summer season. However, bright sunshine hours had significant positive impact with this pest during *Kharif* season. It might be due to leaf hopper is a phototropic in nature and also more active during the high temperature period of the season and cause damage to the crop.

LITERATURE CITED

Bishnol, O.P., Singh, M., Raq, V.U.M., Niwas, R. and Sharma, P.D. (1996). Population dynamics of cotton pests in relation to weather parameters. *Indian J. Entomol.,* **58**: 103-107.

Dhandapani, N., Shelkar, U.R. and Murugan, M. (2003). Bio-intensive pest management (BIPM) in major vegetable crops: an Indian perspective. *Fd. Agric. Environ*., **1** (2) : 333-339.

Narangalkar, A.L. (2003). Population dynamics and management of pest complex of okra [*Abelmoschus esculentus* (L.) Moench]. Ph.D. Thesis, Gajarat Agriucultual University, Sardarkrushinagar, GUJARAT (INDIA) .

Patel, H.K., Patel, V.C. and Patel, J.R. (1970). Catalogue of crop pests of Gujarat State. *Tech. Bull*., **6** : 17-18.

Prasad, S.G. and Logiswaran, G. (1997). Influence of weather factors on population fluctuation of insect pest of brinjal at Madurai, Tamil Nadu. *Indian J. Ent*., **59** (4) : 385-388.

Senapati, B. and Khan, S.R. (1978). A note on population fluctuation of *Amrasca biguttula biguttula* (Ishida) on okra at Bubaneshwar. *Indian J. Agric. Res*., **12** : 97-98.

Singh, J., Sohi, A.S., Dhaliwal, Z.S. and Mann, H.S. (1993). Comparative incidence of *Helicoverpa armigera* (Hub.) and other pests on okra and sunflower intercrops in cotton under Punjab conditions. *J. Insect Sci*., **6** (1) : 137-138.

Tariq, M., Sves, L. H., Khalid, M. K., Gulam, J. and Mukhatar, M. (2002). Population dynamics of leaf hopper (*Amrasca biguttula biguttula*) on brinjal and effect of abiotic factors on its dynamics. *Asian J. Pl. Sci*., **1** (4): 403-404.

Umar, M.S., Arif, M.J., Murtaza, M.A., Gogi, M.D. and Salman, M. (2003). Effect of abiotic factors on thepopulation fluctuation of whitefly, *Bemisia tabaci* (Genn.) in nectaried and nectariless genotypes of cotton. *Internat. J. Agric. Biol.*, **5** (3) : 362-368.

5th Year
★★★★★ of Excellence ★★★★★