Annals of Plant and Soil Research 16(1): 57-60 (2014)

WEATHER FACTORS INFLUENCING POPULATION DYNAMICS OF JASSID, *Amrasca biguttula biguttula* (Ishida) IN *Bt* AND NON *Bt* COTTON IN MALWA REGION

T.S. PANWAR, S.B. SINGH, MANORAMA SHARMA AND R.K. CHOUDHARY

Department of Agricultural Entomology, RVSKVV, College of Agriculture Indore, Madhya Pradesh – 452 001
Received: September, 2013, Revised accepted: January, 2014

ABTRACT

The occurrence of jassid started in 31st MSW (ending 30th July) i.e. after three week of sowing and it remained throughout the crop growth period both in Bt and non Bt cotton crop. The pest population reached its peak with 1.25 and 2.5 jassids / leaf, respectively in 46th MSW (ending 12th November) in Bt and non Bt cotton crop, when the weather factors i.e. maximum temperature, minimum temperature, humidity, rainfall, wind velocity and rainy days were 28.7^{0}c, 9.4^{0}c, 81.7%, 0 mm, 1.7km/h and 0 rainy days, respectively. Not any positive and negative significant effect of all the weather factors was observed on jassid population both in Bt and non Bt cotton crop. The regression also revealed that all the weather factors did not exhibited any significant effect on jassid population in Bt and non Bt cotton crop.

Keywords: Cotton, *Amrasca biguttula biguttula* (Ishida), population dynamics and weather factors

INTRODUCTION

The cotton jassid, *Amrasca biguttula biguttula* (Ishida), is one of most limiting factors in achieving higher productivity of cotton. The jassid caused a reduction of 114 kg of seed cotton yield/ ha (Sidhu and Dhawan 1986). Both the nymphs and adults suck sap from the leaves. Injury to plants is due to the loss of sap and probably also due to the infection of toxins. The attacked leaves turn pale and then rust-red. With change in appearance, the leaves also turn downwards, dry up and fall to the ground. Owing to the loss of plant vitality, the cotton bolls also drop off resulting in yield reduction (Ramesh *et.al.* 2007). The prevalence and build up of jassid population on cotton is mostly governed by weather parameters like temperature, relative humidity, rainfall, sunshine hours, wind velocity and rainy days. Furthermore, the weather parameters vary greatly from place to place and season to season. Thus, the knowledge of the influence of weather parameters on jassid population will help to develop a forecasting system for decision making system and timely application of suitable insecticides for effective insect pests management in cotton agro-ecosystem. Therefore, the present investigation was undertaken to study the relationship between the population dynamics of jassid on *Bt* & non *Bt* cotton and the weather parameter in Malwa region.

MATERIALS AND METHODS

The experiments were conducted at farm of College of Agriculture, Indore, (M.P.) during 2011 in *kharif* season, using cotton variety TULSI-171 (BGII *Bt* and non *Bt*). The crop was sown on 10th July, 2011 in each four plots for *Bt* and non *Bt* cotton, measuring 540×520 cm having row to row and plant to plant distance of 60×45 cm, respectively. Insect population was recorded from 29th MSW (July, 2011) till 3rd MSW (January, 2012) on five tagged plants of each plot with two lower, middle and upper leaves and averaged. All the recommended agronomical practices were followed time to time to raise the crop successfully as per package of practices prescribed for the region. The jassid population was recorded at weekly interval. The weather factors i.e. maximum and minimum temperature (^{0}C), humidity (%), rainfall (mm), wind velocity (km/h) and rainy days in different meteorological standard weeks (MSW) during the crop season were recorded and their relationship with jassid population were worked out by using simple correlation and regression.

RESULTS AND DISCUSSIONS

In the present investigation, the population of jassid ranged from 0.06 to 1.25 and 0.03 to 2.5 jassids / leaf during the crop growth period in both the cotton crops (Table 1, Figure 1 and 2). The pest occurrence (both nymph and adult) started with 0.65 and 0.85 jassid /leaf in 31st MSW ending 30th July i.e. after two week of sowing and it remained throughout the crop growth periods both in Bt and non Bt cotton. The present findings are in close conformity with the findings of Soujanya *et al*, (2010) who observed that seasonal occurrence of sucking pests was similar on *Bt*, stacked *Bt* and non *Bt* cotton hybrids. The population fluctuated and reached its peak with 1.25 and 2.5 jassids / leaf, respectively in 46th MSW in *Bt* and non *Bt* cotton crop. In present investigation, the population of jassid recorded more in non *Bt* cotton (2.5 jassids / leaf) than *Bt* cotton (1.25 jassids / leaf) which is not in agreement with the findings of Soujanya *et al*, (2010) who observed that the incidence of sucking pests including jassid, was non significantly higher in stacked *Bt* compared to non *Bt* versions. This might be due to weather factors and more susceptibility of non *Bt* cotton.

Table 1: Population dynamics of jassid in *Bt* and Non *Bt* cotton

S. No.	Month	Std. week	Std. week ending	Jassid Population		Weather parameters					
						Temperature (^{0}c)		Humidity (%)	Rainfall (mm)	Wind (km/h)	Rainy days
				Bt	non *Bt*	max	min				
1	July	29	Jul-16	0.00	0.00	32.40	24.50	87.00	18.60	10.00	1.00
2		30	Jul-23	0.00	0.00	27.00	22.10	93.10	349.10	11.70	4.00
3		31	Jul-30	0.56	0.85	27.10	22.50	88.10	26.00	10.10	3.00
4	Aug	32	Aug-06	0.33	0.31	26.10	22.50	90.00	173.40	9.60	4.00
5		33	Aug-13	0.28	0.30	25.00	21.30	93.00	39.60	8.30	3.00
6		34	Aug-20	0.70	0.96	27.00	21.80	90.00	6.60	7.70	1.00
7		35	Aug-27	0.26	0.36	28.20	22.50	91.70	22.60	3.90	4.00
8	Sep	36	Sep-03	0.21	0.35	28.00	22.00	89.00	128.40	3.90	3.00
9		37	Sep-10	0.21	0.35	28.20	21.30	92.00	36.70	5.70	3.00
10		38	Sep-17	0.65	0.38	29.80	21.00	90.80	0.00	4.00	0.00
11		39	Sep-24	0.83	0.31	30.00	20.20	84.20	3.80	3.00	1.00
12	Oct	40	Oct-01	0.75	0.63	32.20	20.90	85.00	0.00	2.60	0.00
13		41	Oct-08	0.16	0.03	32.60	18.00	82.80	0.00	1.60	0.00
14		42	Oct-15	0.50	0.36	32.70	16.20	85.70	0.00	1.60	0.00
15		43	Oct-22	0.46	0.46	31.20	15.00	89.20	0.00	1.70	0.00
16		44	Oct-29	0.35	0.66	29.50	10.80	82.60	0.00	2.80	0.00
17	Nov	45	Nov-05	0.68	2.13	28.80	9.20	84.20	0.00	1.80	0.00
18		46	Nov-12	1.25	2.50	28.70	9.40	81.70	0.00	1.70	0.00
19		47	Nov-19	0.88	2.25	28.20	8.10	80.80	0.00	2.20	0.00
20		48	Nov-26	0.68	0.70	29.30	10.00	81.20	0.00	2.10	0.00
21	Dec	49	Dec-03	0.40	0.43	29.40	10.30	79.40	0.00	2.10	0.00
22		50	Dec-10	0.26	0.28	28.90	9.50	78.80	0.00	2.00	0.00
23		51	Dec-17	0.42	0.45	25.50	7.80	75.20	0.00	2.10	0.00
24		52	Dec-24	0.31	0.36	24.60	6.30	75.80	0.00	2.10	0.00
25		1	Dec-31	0.21	0.21	23.70	5.10	77.00	0.00	2.70	0.00
26	Jan	2	Jan-07	0.06	0.06	23.40	3.20	77.00	0.00	2.30	0.00
27		3	Jan-14	0.30	0.15	24.80	5.50	76.00	0.00	3.50	0.00

The lower degree of positive correlation (Table 2) was found between maximum temperature (*Bt* r = 0.229 and non *Bt* r = 0.068), and jassid population, while lower degree of negative correlation was recorded (Table 3) between minimum temperature (*Bt* r = -0.110 and non *Bt* r = -0.259), humidity (*Bt* r =-0.076 and non *Bt* r = -0.094), rainfall (*Bt* r =-0.377 and non *Bt* r =-0.240), wind velocity (*Bt* r = -0.339 and non *Bt* r =-0.255), rainy days (*Bt* r = -0.345 and non *Bt* r =-0.243) and jassid population. It was revealed (Table 2) that the not any positive and negative significant effect of all the weather factors was observed on jassid population in both the crops. The present investigations are partially in agreement with Simwat and Gill, (1992) who reported that the correlation between sunshine hours and population size of *A. biguttula biguttula* was significant and all other correlations with environmental variables were reported non significant. Such contradiction may be due to length and density of sunshine hours. Further Neelima *et al.,* (2012) supported partially to the present study as they showed negative and non significant correlation with morning relative humidity and rainfall against jassid in cotton. They also found positive but non significant correlation with maximum and minimum temperatures and evening relative humidity which was not far against the present investigation and may be due to changes in regional climatic conditions.

Table 2: Correlation Coefficient of jassid population with weather factors in *Bt* and Non *Bt* cotton

S. No.	Weather parameters	Jassid	
1	Temperature (^{0}c)	*Bt*	non *Bt*
	Max (^{0}c)	0.229	0.068
	Min (^{0}c)	-0.110	-0.259
2	Humidity (%)		
	Morning	-0.076	-0.094
3	Rainfall (mm)	-0.377	-0.240
4	Wind velocity (k/h)	-0.339	-0.255
5	Rainy days	-0.345	-0.243

***** *Significant at 5% level*

The regression revealed that the various weather factors *i.e.* maximum temperature, minimum temperature, morning humidity, rainfall, wind velocity and rainy days did not exhibited any significant effect on jassid population in both Bt and non Bt cotton crops. The regression equation further showed that all the weather factors have not any negative and positive significant impact on insect population (Table 3). Singh *et al.,* (2007) reported

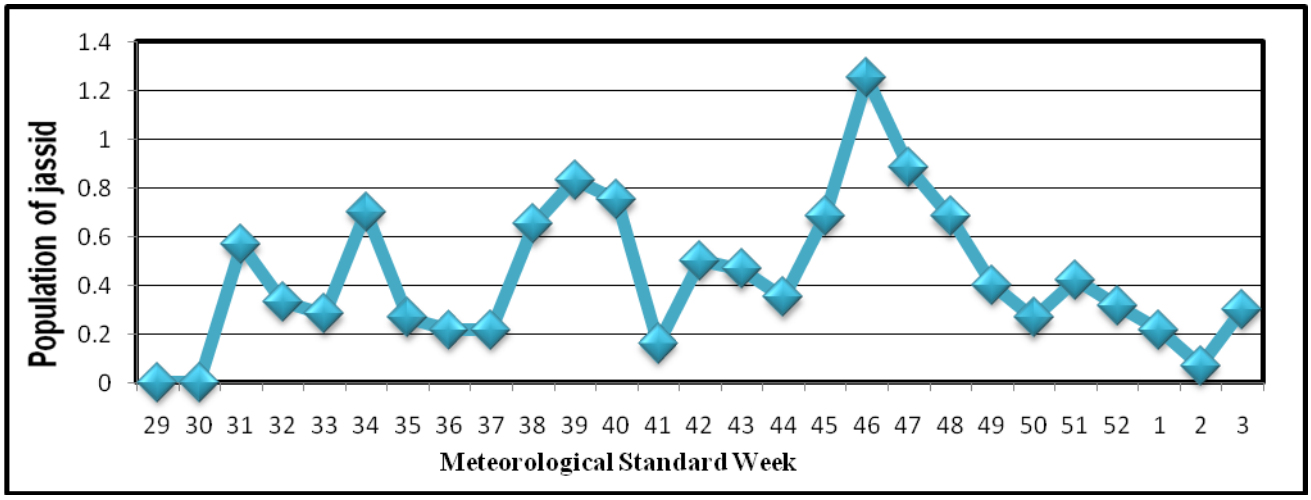

Figure 1: Population dynamics of jassid in *Bt* cotton

that the accuracy of prediction of jassid populations using regression equations was much lower when the analysis was based on maximum temperature, minimum temperature or mean temperature (up to 0.11, 0.16 and 0.21%, respectively) than when all the variables were considered (up to 84.0%), are partially in conformity with present study. The contradiction of present investigation with findings of various workers are due to variation in climatic conditions and date of sowing as reported by Shanthi *et al.*, (2009).

Table 3: Influence of Jassid populations on weather factors in *Bt* and Non *Bt* cotton

S. No.	Weather parameters	*Bt*		Non *Bt*	
		R^2 value	Re. Equation	R^2 value	Re. Equation
1	Temperature (^{0}c)				
	Max(^{0}c)	R^2 = 0.052	y = 0.025x - 0.272	R^2 = 0.004	y = 0.016x + 0.118
	Min (^{0}c)	R^2 = 0.012	y = -0.004x + 0.506	R^2 = 0.067	y = -0.024x + 0.960
2	Humidity (%)				
	Morning	R^2 = 0.005	y = -0.003x + 0.762	R^2 = 0.008	y = -0.010x + 1.499
3	Rainfall (mm)	R^2 = 0.141	y = -0.001x + 0.479	R^2 = 0.057	y = -0.002x + 0.651
4	Wind velocity (k/h)	R^2 = 0.114	y = -0.031x + 0.568	R^2 = 0.064	y = -0.053x + 0.813
5	Rainy days	R^2 = 0.118	y = -0.066x + 0.503	R^2 = 0.058	y = -0.105x + 0.695

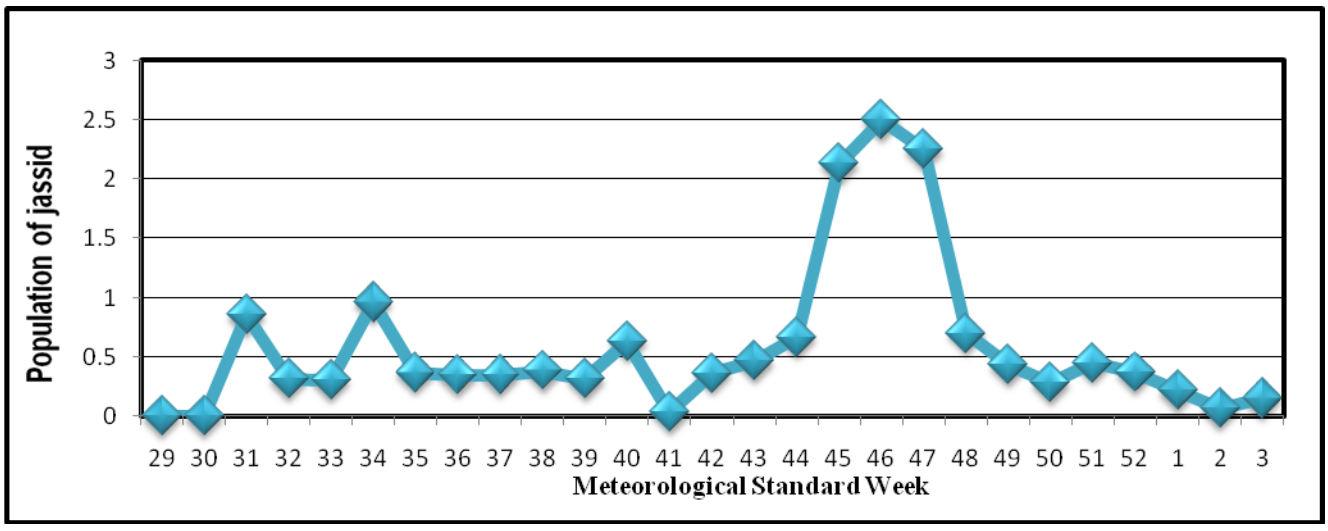

Figure 2: Population dynamics of jassid in non *Bt* cotton

RFERENSES

Arora, R., Vikas, J., Pankaj, R., Raman, K., Vikram, S. and Lajpat, B. (2007) Integrated pest management of cotton in Punjab, India. *IPM World Textbook.*online:1-2

Neelima, S., Rao, G. M. V. P., Chalam, M. S. V., and Grace A. D. G. (2012) Seasonal dynamics of leafhopper, *Amrasca devastans* Distant on cotton. *Journal of Cotton Research and Development*, 26(1): 134-136.

Shanthi, R.K., Hussain J. and Sanjayan K.P.(2009) Influence of weather on the incidence of sucking pest complex on summer-irrigated cotton crops of Tamil Nadu. *Hexapoda*, 16(1): 89-92.

Sidhu A.S. and Dhawan A.K. (1986) Estimation of lose due to the attack of cotton jassid on *Gossypium hirsutum* cotton. *Indian Journal of Plant Protection*. 14 (1):1-3

Simwat, G. S. and Gill, B. S. (1992) Population build-up of cotton jassid and white fly on *Gossypium arboreum* and its correlation with weather factors. *Journal of Research, Punjab Agricultural University*, 29(1): 70-76.

Singh, S. P., Aggarwal, N. and Dhaliwal, L. K. (2007) Effect of weather parameters on population dynamics of three important pests in cotton at Bathinda Region of Punjab. *Environment and Ecology*, 25(3): 588-590.

Soujanya, P. L., Prasad, N.V.V.S.D. and Rao, P.A. (2010) Population dynamics of sucking pests and their relation to weather parameters in *Bt*, stacked *Bt* and non *Bt* cotton hybrids. *Trends in Biosciences*, 3(1): 15-18.