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Studies on Seasonal Incidence of Lablab Bug, *Coptosoma cribraria* (Fabricius) in Dolichos Bean, *Lablab purpureus* L. and their Relation with Weather Parameters

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ABSTRACT

The present study was carried out to find the correlation between seasonal incidence of lablab bug Coptosoma cribraria with weather variables during kharif 2015-16 and kharif 2016-17 respectively. The results on the seasonal incidence of major insect pests revealed that the incidence of lablab bug, Coptosoma cribraria was recorded from second week of October during 41st standard week to 4th standard week in kharif 2015 – 16. The highest incidence of C. cribraria population was observed with two peaks i.e., at 47th standard week (3rd week of November) and 49th standard week (1st week of December) with 5.3 and 5.1 bugs per plant, respectively while, the population of Coptosoma increased gradually from third week of October during 42nd standard week to 4th standard week in kharif 2016-17 and the highest incidence of Coptosoma population were recorded during 47th, 50th and 1st standard weeks with 4.9, 4.4 and 4.4 bugs per plant, respectively. The relationship between the C. cribraria bug population with preceding one week (one week lag) weather parameters during kharif 2015-16 revealed that there was a significant negative correlation with maximum temperature (-0.590) and sunshine hours (-0.546*) at 5 % level of significance while, Positive significant correlation with evening relative humidity (0.576*) at 5% level of significance and wind speed (0.645**) at 1 % level of significance were recorded. During kharif 2016-17, maximum temperature (-0.554*) and minimum temperature (-0.578*) were negatively significant with C. cribraria population at 5% level of significance whereas mean temperature (-0.645**) was negatively correlated at 1% level of significance.*

Key words: *Lablab bug, C. cribraria, Seasonal incidence, Correlation, Multiple regression*

INTRODUCTION

Pulse crops belong to the family Leguminosae and subfamilies Papilionoideae, Caesalpinoideae and Mimosoideae. They were narrated as the jewels of Indian agriculture, in view of their unique capacity to fill the dietary requirements of protein to population of rural India, besides their sustainable character through replenishing soil fertility. The average protein content varies from 18 to 26 per cent.

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The field bean, *Lablab purpureus* (L.) Sweet, fresh pods are acceptable and liked by all, especially during winter season under South Indian conditions and it is rich in nutritive value as it is a rich source of carbohydrates, minerals, vitamins, such as vitamin A, vitamin C, fat and fiber. The protein content of field bean is quite high varying from 20.0 to 28.0 per cent[1].

The primary cause attributed for lower yields of field bean can be due to the heavy infestation of an array of pest complex. As many as 55 species of insects and a species of mite feeding on the crop from seedling stage to the harvest of the crop in Karnataka[2]. Among them, the pod borers were considered to be most important and they appeared regularly causing crop loss to the tune of 80 to 100 per cent[3]. Pod borers were the key impediments for the low productivity in India which sometimes incur the loss to a tune of nearly 54 per cent in field beans[4]. The major yield loss was inflicted by the pod feeders which include both the pod borers and pod bugs. Among the sucking pests, lablab bug, *Coptosoma cribraria* (Fabricius) and leaf footed bug, *Riptortus pedestris* (Fabricius) occur commonly and found in large numbers throughout the cropping period[2]. The adults and nymphs of bugs infest later stages of crop growth by congregating on tender vines and sucking sap resulting in fading of vines and shoots[5]. Understanding the population dynamics in relation with seasonal incidence pattern of the pod borers and sucking insects will yield valuable information in strategizing the management practices. Devising effective management options is crucial in keeping the pest population below threshold level and realizing the good yields. Losses due to pod damage were estimated to be 11.1 to 36.4 per cent in different parts of India[6]. Hence to know the insect pest scenario and population dynamics on the crop, the present studies have planned.

MATERIAL AND METHODS

To study the population dynamics of lablab bug, *Coptosoma cribraria* (Fabricius) on the field bean crop was grown by raising 100 m^2 crop with a spacing of 90 x 20cm. The study was carried out during *Kharif* 2015 and 2016 at open filed located at horticulture garden, College of Agriculture, Rajendranagar, Hyderabad, PJTS Agricultural University. All the recommended routine agronomic practices except plant protection measures were followed for raising the crop. From the date of germination onwards, observations were made in the bulk plots in ten selected plants for infestation of the insects at weekly interval. The incidence of pod bugs were observed during the flowering and pod formation phase. The observations were taken on randomly selected ten plants in the bulk plot. The counts of number of pod bugs per randomly selected ten plants were recorded on the inflorescence and pods at weekly intervals. The mean of the data for each week was calculated. The status of the pest was considered based on number of insects occurred on plants. The data obtained in the seasonal incidence of *Coptosoma cribraria* F. on field bean were subjected to correlation and multiple regression with various weather parameters *viz*., maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall, sunshine hours, evaporation *etc*[7].

RESULTS AND DISCUSSION

The seasonal incidence data pertaining to lablab bug, *C. cribraria* (Plate 1a and 1b) was collected at weekly intervals from randomly tagged ten field bean plants from an unprotected crop raised during *kharif* 2015-16 and 2016-17. The standard week wise data pertaining to mean *C. cribraria* population per plant from germination to harvest during *kharif* 2015-16 and 2016-17 were presented in table 3.1 and 3.2, respectively (Figure 3.1).

Kharif 2015-16

The incidence of lablab bug, *C. cribraria* on field bean was commenced from the second week of October (41st standard week) with 2.8 bugs per plant. Lablab bug reached its peak population (5.3 bugs/plant) during 3rd week of November (47th standard week) and second peak (5.1 bugs/plant) was observed during 1st week of the December (49th standard week).The bug population decreased gradually from 1st week of December (50th standard week) to 1st week of January (1st standard

week) and again a raise in *C. cribraria* population (4.5 bugs/plant) was observed at last week of January (04th standard week) during *kharif* 2015-16 (Table 3.1).

***Kharif* 2016-17**

The incidence of lablab bug, *C. cribraria* on field bean was commenced from 3rd week of October (42nd standard week) with 0.6 bugs per plant. Later, *C. cribraria* reached its peak (4.9 bugs per plant) during 4th week of November (47th standard week) and a sharp fall of bug population was observed during 48th standard week (2.4 bugs/ plant). The second peak (4.4 bugs per plant) was observed during 2nd week of the December (50th standard week) and similar trend of 4.4 bugs/plant (Table 3.2) was observed during 1st week of January (1st standard week). The bug population decreased gradually upto last week of January (4th standard week). The incidence of pod bug was seen throughout the flowering season of the crop.

The incidence of *C. cribraria* in field bean from September to December with peak infestation from October to December. The infestation of *C. cribraria* was moderate to high during the study period[8] and the present results were the same with the discussed. The occurrence of high populations of pod bug, *Megacopta cribraria* during September to December and the populations were low during January-February[9&10].

In contrary to the present results *C. cribraria* incidence started from late June and reached its peak (6.50) during July[11]. The population of bugs ranged from 2.0-6.5 bugs per plant in field bean. The incidence of bugs during June and July with the population ranging from 3.5-8.0 bugs per plant[2 &12]. The variation of the results from the findings may be due to change in sowing dates and also change in location.

Effect of abiotic factors between *C. cribraria* population and weather parameters during *kharif* 2015-16 & 2016-17

The correlation studies conducted between the *C. cribraria* bug population on field bean crop and weather parameters of one week lag during *kharif* 2015-16 and 2016-17 was presented in table 3.3. Multiple Regression model developed for the population of *C. cribraria* with preceding one week weather parameters (one week lag) during *kharif* 2015-16 and *kharif* 2016-17 was presented in table

***Kharif* 2015-16**

The correlation studies between the seasonal incidence of C. cribraria with the preceding one week weather parameters (one week lag) during kharif 2015-16 revealed that, maximum temperature (-0.590*) and sunshine hours (-0.546*) shown significant negative correlation (p=0.05) with the bug population of C. cribraria. The wind speed showing significant positive correlation (0.645**) at p=0.01 level and evening relative humidity (0.576*) had significant positive correlation at p=0.05 level with *C. cribraria* bug population (Table 3.3). Whereas, minimum temperature (-0.099), morning relative humidity (-0.154), rainfall (-0.008), rainy day (-0.023), evaporation (-0.246) and mean temperature (-0.145) were negatively non significant correlation with bug population of *C. cribraria*.

Regression analysis revealed that, all weather parameters collectively influenced the *C. cribraria* bugs population to the extent of 89.22 per cent (R^2 =0.89%) on field bean. Multiple regression equation was developed for *C. cribraria* bugs population with preceding one week weather parameters (one week lag) was presented in Table 3.4 which indicated that increase in one unit of maximum temperature, minimum temperature, morning relative humidity, rainy days, wind speed and mean evaporation resulted in the increase of *C. cribraria* bugs population by 3.02, 10.40, 0.58, 5.12, 0.07 and 0.47 units, respectively. Further, with one unit increase in, evening relative humidity, rainfall, mean sunshine hours and mean temperature the bug population was decreased by 0.06, 5.24, 0.06 and 12.97 units, respectively in field bean.

***Kharif* 2016-17**

The correlation studies between the seasonal incidence of *C. cribraria* with the preceding one week weather parameters (one week lag) during *kharif* 2016-17 revealed that, maximum temperature (-0.554*) and minimum temperature (-0.578*) shown significant negative correlation (p=0.05) with the bug population of *C. cribraria*. Whereas the mean temperature showing significant negative

correlation (-0.645**) at p=0.01 level with *Coptosoma* bug population. However, morning relative humidity (-0.303), evening relative humidity (-0.204) rainfall (-0.470), rainy days (-0.485) and evaporation (-0.246) were reflected negatively non significant correlation with bug population of *C. cribraria*. Lastly, the sunshine hours (0.101) and wind speed (0.095) were shown positive non significant correlation with the lablab bug population (Table 3.3).

Regression analysis revealed that, all weather parameters collectively influenced the *C. cribraria* bug population to the extent of 86.25 per cent (R^2 =0.86%) on field bean.

Multiple regression equation was developed for *C. cribraria* bugs population with preceding one week weather parameters (one week lag) was presented in table 4.4 which indicated that increase in one unit of maximum temperature, minimum temperature, evening relative humidity and rainy days resulted in the increase of *C. cribraria* bugs population by 2.02, 9.99, 0.34 and 8.17, respectively. Further, with one unit increase in morning relative humidity, rainfall, mean sunshine hours, wind speed, mean evaporation and mean temperature shown decrease in the bug population was decrease by 0.27, 8.64, 0.62, 0.51, 0.01 and 12.02 units, respectively in field bean (Table 3.4).

The *Riptortus* and *Clavigralla* were significant and negatively correlated with maximum and minimum temperature [11] and the present results were proved to be the same. The lablab bug, *Coptosoma cribraria* exhibited significant negative correlation with relative humidity[8].

Table 1: Seasonal incidence lablab bug, *Coptosoma cribraria* (Fabricius) population in field bean during *kharif* 2015-16

SMW	Date of observation	*C.cribraria* bug population*	Temperature ^{0} (C)		Mean Relative Humidity (%)		Rainfall (mm)	Rainy Days	Mean Sunshine (hrs day^{-1})	Wind speed (km hr^{-1})	Mean evaporation (mm day^{-1})	Mean Temp ^{0} (C)
			Max.	Min.	I	II						
41	11/10/2015	2.8	33.4	19.6	88.4	37.4	0.0	0	7.9	0.1	4.5	26.5
42	18/10/2015	2.9	32.8	19.1	91.7	42.0	0.0	0	8.4	0.6	4.5	26.0
43	25/10/2015	2.7	32.4	18.1	89.3	43.6	0.0	0	8.9	1.8	4.7	25.3
44	01/11/2015	4.1	31.3	20.7	91.7	50.9	18.3	1	7.3	1.3	3.6	26.0
45	08/11/2015	3.8	31.3	17.4	90.6	73.6	0.0	0	7.3	2.3	4.4	24.3
46	15/11/2015	4.9	30.0	15.8	85.1	52.9	0.0	0	6.7	2.4	4.0	22.9
47	22/11/2015	5.3	29.4	19.1	83.0	53.9	0.8	0	6.6	1.4	3.9	24.2
48	29/11/2015	4.9	30.4	17.8	87.4	47.0	0.0	0	7.7	0.6	3.8	24.1
49	06/12/2015	5.1	29.4	14.4	91.7	36.7	1.4	0	7.0	0.4	3.5	21.9
50	13/12/2015	4.0	32.2	17.0	90.0	37.0	0.0	0	7.6	0.7	3.9	24.6
51	20/12/2015	2.9	32.4	15.7	92.9	35.3	0.0	0	8.9	0.9	4.2	24.1
52	27/12/2015	2.5	30.0	11.1	73.3	24.6	0.0	0	8.8	0.8	3.9	20.6
1	03/01/2016	2.8	30.4	11.8	84.1	26.0	0.0	0	9.6	0.9	3.9	21.1
2	10/01/2016	2.6	29.2	11.0	78.4	25.6	0.0	0	9.1	1.2	3.9	20.1
3	17/01/2016	4.0	29.1	16.6	76.6	36.4	0.0	0	6.8	1.6	3.7	22.9
4	24/01/2016	4.5	29.1	15.6	79.4	37.3	0.0	0	7.2	1.6	3.8	22.4

SMW- Standard Meteorological Week

***Mean no. of insects from 10 plants per plot**

Table 2: Seasonal incidence lablab bug, *Coptosoma cribraria* Fabricius) population in field bean during *kharif* 2016-17

SMW	Date of observation	*C.cribraria* bug population*	Temperature (^{0}C)		Mean Relative Humidity (%)		Rainfall (mm)	Rainy Days	Mean Sunshine (hrs day^{-1})	Wind speed (km hr^{-1})	Mean evaporation (mm day^{-1})	Mean Temp (^{0}C)
			Max.	Min.	I	II						
41	11/10/2015	0.0	29.9	20.8	94.4	50.9	27.8	3	5.3	0.0	3.1	25.3
42	18/10/2015	0.6	30.6	14.6	92.7	34.1	0.0	0	9.2	0.0	4.0	22.6
43	25/10/2015	0.9	30.2	15.1	91.9	38.3	0.0	0	8.8	0.0	4.1	22.7
44	01/11/2015	1.1	30.9	19.9	84.0	47.1	0.0	0	7.0	0.0	3.6	25.4
45	08/11/2015	1.6	30.1	12.3	88.0	28.7	0.0	0	8.5	0.0	3.8	21.2
46	15/11/2015	3.6	29.8	15.7	88.7	44.9	0.0	0	6.5	0.0	3.3	22.8
47	22/11/2015	4.9	29.7	9.8	89.7	28.1	0.0	0	8.7	0.0	3.6	19.8
48	29/11/2015	2.4	30.8	10.0	90.9	31.4	0.0	0	8.3	0.0	3.3	20.4
49	06/12/2015	3.0	29.1	14.0	92.6	42.3	0.0	0	7.4	0.0	3.1	21.5
50	13/12/2015	4.4	27.9	13.1	86.3	51.3	2.0	0	6.7	0.0	3.1	20.5
51	20/12/2015	4.1	29.4	9.5	88.3	24.0	0.0	0	9.1	0.0	3.6	19.5
52	27/12/2015	4.0	29.4	8.9	91.4	31.0	0.0	0	9.0	0.0	3.5	19.2
1	03/01/2016	4.4	29.1	9.7	89.6	29.7	0.0	0	8.8	0.0	3.4	19.4
2	10/01/2016	3.5	29.3	13.2	84.0	38.0	0.0	0	7.6	0.8	3.4	21.25
3	17/01/2016	3.3	28.2	11.4	89.1	31.7	0.0	0	7.7	1.2	3.6	19.8
4	24/01/2016	3.0	29.9	14.7	85.9	38.4	0.0	0	7.6	3.0	4.3	22.3

SMW- Standard Meteorological Week

***Mean no. of insects from 10 plants per plot**

Table 3: Correlation coefficients (r) between lablab bug *Coptosoma cribraria* F. and weather parameters (one week lag) in field bean during *kharif* 2015-16 and *kharif* 2016-17

Weather parameters	Correlation coefficients (r)	
	Kharif 2015-16	*Kharif* 2016-17
Maximum temperature	-0.590*	-0.554*
Minimum temperature	-0.099	-0.578*
Morning relative humidity (RH I %)	-0.154	-0.303
Evening relative humidity (RH II %)	0.576*	-0.204
Rainfall (mm)	-0.008	-0.470
Rainy days (R.D)	-0.023	-0.485
Sunshine hours (S.S.H)	-0.546*	0.101
Wind speed (W.S) Km/h	0.645**	0.095
Evaporation (E. pan) (mm)	-0.246	-0.456
Mean temperature	-0.145	-0.645**

* Significant at 5 % level
* * Significant at 1 % level

Table 3.4 Multiple regression between bug population of *C. cribraria* with weather parameters at one week lag in field bean during *kharif* 2015-16 & 2016-17

Season	Multiple regression equation	Coefficient of determination (R^2)
Kharif 2015-16	$Y = 22.50 + 3.02\ X_1 + 10.40\ X_2 + 0.58\ X_3 - 0.06\ X_4 - 5.24\ X_5 + 5.12\ X_6 - 0.06\ X_7 + 0.07\ X_8 + 0.47\ X_9 - 12.97\ X_{10}$	0.89
Kharif 2016-17	$Y = 50.22 + 2.02\ X_1 + 9.99\ X_2 - 0.27\ X_3 + 0.34\ X_4 - 8.64\ X_5 + 8.17\ X_6 - 0.62\ X_7 - 0.51\ X_8 - 0.01\ X_9 - 12.02\ X_{10}$	0.86

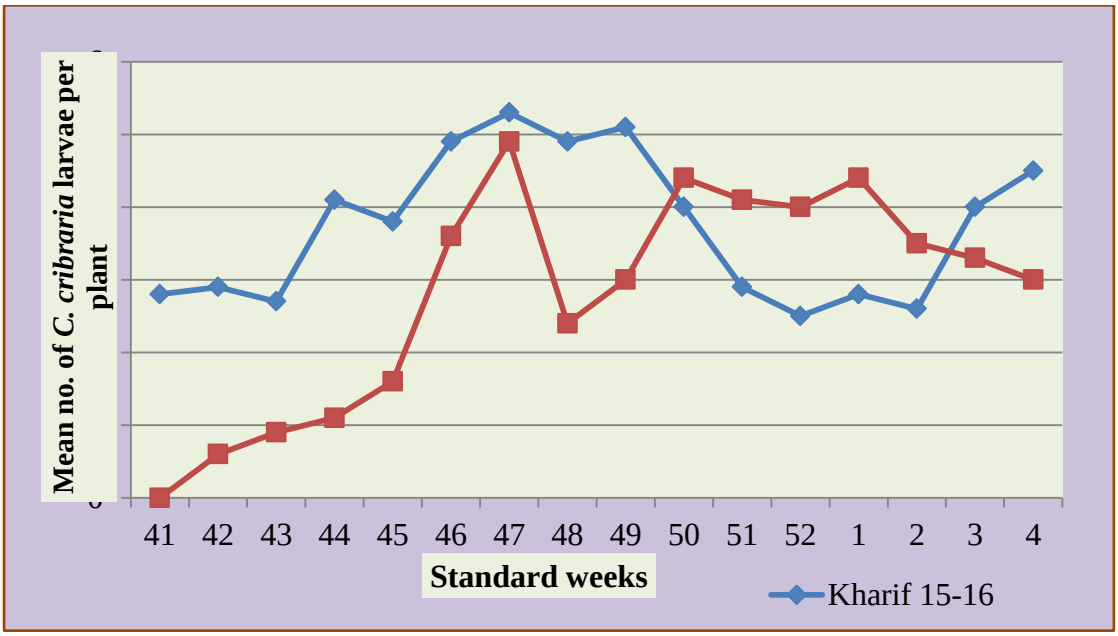

Fig. 1: Seasonal incidence of *Coptosoma cribraria* on field bean during *kharif* 2015-16 and 2016-17

Plate 1a. *Coptosoma cribraria* egg mass

Plate 1b. *Coptosoma cribraria* adult feeding on green pods

Plate 1. *Coptosoma cribraria* infestation in field bean

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REFERENCES

1. Schaaffhausen, R.V., Dolichos lablab or Hyacinth bean, its use for feed, food and soil improvements. Economic Botany. **17:** 146-153 (1963).
2. Govindan, R., Insects of the field bean, *Lablab purpureus* var. lignosus medikus with special reference to the biology and ecology of the pod borer, *Adisura atkinsoni* Moore (Leipdoptera: Noctuidae). *M. Sc. Thesis*. University of Agricultural Sciences, Bangalore, pp 1-3 (1974).
3. Katagihallimath, S.S and Siddappaji, C. 1962, Observations on the incidence of lepidopteran pod borers of *Dolichos lablab* and the results of preliminary insecticidal trials to control them. *2nd All India Congress of Zoology*. *p* 59.
4. Naik, M.I., Tejaswi, L., Sridhara, S., Manjunath, M and Pradeep, S., Yield loss and economic injury level for pod borers of field bean (*Lablab purpureus* L.). *Environment and Ecology*. **27 (3):** 1044-1047 (2009).
5. Ayyar, T.V.R. 1963, *Hand Book of Economic Entomology for South India*. Government Press, Madras. pp 516.
6. Ahmad, R. and Rai, A.B., *25 years of research on Helicoverpa at IIPR*. Indian Institute of Pulses Research, Kanpur. p 54 (2005).
7. Panse, V.G. and Sukhatme, P.V., Statistical methods for Agricultural Workers. *ICAR, publication*, New Delhi.*p*.359 (1967).
8. Parvathy, V., Ecological perspectives and host plant resistance studies of pod feeders in field bean, *Lablab purpureus* (L.) Sweet. *M.Sc. (Ag.) Thesis*. Acharya N.G.

Ranga Agricultural University, Rajendranagar, Hyderabad (2011).

9. Kailash Chandra and Sandeep Kushwaha, Record of hemipteran insect pest diversity on *Lablab purpureus* L: An economically important plant from Jabalpur, Madhya Pradesh. *Research Journal of Agricultural Sciences*, **4 (1):** 66-69 (2013).
10. Rekha, S and Mallapur, C.P., Studies on insect pests of dolichos bean in northern Karnataka. *Karnataka Journal of Agricultural Sciences*. **20 (2):** 407-409 (2007).
11. Thejaswi, L., Naik, M.L. and Manjunatha, M., Studies on population dynamics of pest complex of field bean (*Lablab purpureus* L.) and natural enemies of pod borers. *Karnataka journal of Agricultural Sciences*. **21(3):** 399-402 (2008).
12. Thippeswamy, C., Studies on the Heteropteran bugs infesting field bean *Lablab purpureus* var. *Lignosus medikus*) with special reference to biology, loss estimation and chemical control of *Coptosoma cribraria* Faricius (Heteroptera : Plataspidae) *M. Sc. (Agri.) Thesis*. University of Agricultural Sciences, Bangalore, pp. 01-113 (1990).