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RESEARCH ARTICLE :

Seasonal incidence of pigeonpea pod borers in relation to weather parameters

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SUMMARY : A experiment was conducted at Experimental Research Farm Department of Agril. Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, to study the seasonal incidence of *H. armigera*, *E. atomosa* and *M. obtusa* on pigeonpea with three unprotected plots of three different cultivars such as BDN-711, BSMR-716, BSMR-736 in non replicated design of plot size 10 m x 10 m. The studies revealed that the incidence of *H. armigera*, *E. atomosa* and *M. obtusa* on pigeonpea ranged from 0.6 to 4.08, 0.19 to 3.87 and 1.84 to 3.20 larvae per quadrat, respectively in one the generations during *Kharif* 2016. However, the maximum population noticed during 45th, 49th and 50th standard meteorological weeks, respectively. The larval population of *H. armigera* and *E. atomosa* was non-significantly correlated with maximum and minimum temperature, morning and afternoon relative humidity and rainfall where larval population *M. obtusa* has negative correlation with maximum temperature.

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KEY WORDS :
Seasonal incidence, Pod borer complex, *Helicoverpa armigera* , *Erias atomosa*, *M.obtusa*

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BACKGROUND AND OBJECTIVES

The pigeonpea [*Cajanus cajan* (L.) Millsp.] belonging to family *Fabaceae* is originated from India. It is the second most important pulse crop grown in India after chickpea. As a legume it occupies important position in the diet of vegetarian people living in the subcontinent and has its own unique position in Indian agriculture. It is commonly known as arhar, red gram or tur and a rich source of protein. It may be consumed in the form of split pulse or Dal by human being; for livestock, the leaves and reminant after threshing is a good source of nutritive fodder while dried stalks are used as fuel and also used for basket making. Being a leguminous crop, symbiotic bacteria in root nodules fix atmospheric nitrogen improving soil fertility (Nene and Sheila, 1990). In India pigeonpea is cultivated on 3.853 lakh ha area while production is 7.36 lakh tonnes with the national productivity of 729 kg per hectare during 2014. Out of total per cent of pulse production pigeonpea contributes 22 per cent of production. In India it is extensively grown in Maharashtra, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Karnataka, Andhra Pradesh, Gujarat and Tamil Nadu. In Maharashtra, during 2014, it was grown on

an area of 1.21 lakh hectares, productivity obtained was 600 kg per hectare with total production of 7.36 lakh tons. In Marathwada, the area under pigeonpea was 3.99 lakh hectares with production and productivity to the tune of 1.01 lakh tonnes and 247 kg/ha (Anonymous, 2015). Pod borer complexis serious constraint to the production and productivity in India. They contribute a major cause for low yields such as, 77.04 per cent pod damage and 68.70 per cent grain damage (Awasthi and Bhatnager, 1983). According to (Yadav and Chaudhary 1993) around 14 and 10 per cent pigeonpea pods were damaged by *H. armigera* and *M. obtusa*. Pigeonpea pod damage due to different insect pests including *H. armigera* and *E. atomosa* varied from 7.6 + 31.0 per cent (Lal *et al.*, 1997). *H. armigera* caused 27 per cent damage to pigeonpea pod during 2001-02. The crop suffered heavy field losses due to pod borers (Bhuvaneshwari and Balagurunathan, 2002).Therefore studies on seasonal incidence are aimed at providing an understanding of the causes of fluctuation in population density and of the determination of damage potential of insect pest. Seasonal incidence helps in planning need based application of insecticides as it clearly reveals the insect peak activity as well as insect free period during crop growth. Hence, seasonal incidence of major insect pests of pigeonpea was carried out.

RESOURCES AND METHODS

The field experiment was conducted during *Kharif* 2016-17 at the experimental farm of the Department of Agril. Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra).

The experiment was conducted in three unprotected plots of three different cultivars.

The details of experiment are given below-

- Design : Non-replicated
- Plot size : 10 m X 10 m
- Spacing : 120 cm X 30 cm
- Variety : BDN-711, BSMR-716, BSMR-736
- Season : *Kharif* 2016
- Date of sowing : 27 June, 2016

The observations were recorded in respect of first appearance of eggs or neonate larvae of pigeonpea pod borers by visiting the field frequently. Five plants from each plots of different cultivars were tagged and observed at each meteorological week from sowing upto harvest and infestation of pests notice. The population of *H. armigera, E. atomosa and M. obtusa* infesting pigeonpea was studied in different meteorological weeks. The incidence of *H. armigera, E. atmosa* and *M. obtusa* as influenced by weather factors was analyzed by working out correlation, regression analysis according to Panse and Sukhatme (1967).

OBSERVATIONS AND ANALYSIS

The seasonal incidence of major insect pests of pigeonpea was studied during *Kharif* season 2016. During the course of investigation the weather parameters *viz.*, maximum temperature, minimum temperature, morning relative humidity, afternoon relative humidity, rainfall and number of rainy days varied from 25.9°C to 32.3°C, 6.9°C to 16.1°C, 24 per cent to 37 per cent, 66 to 78 per cent, 0 mm and 0 day, respectively. The data pertaining to the larval population of pigeonpea pod borers infesting pigeonpea in relation to weather parameters during *Kharif* season 2016 are presented in Table 1.

The incidence of *H. armigera* on pigeonpea was first noticed in 43rd standard meteorological week 0.60 larvae/plant. Whereas, maximum incidence 4.08 (larvae/ plant) was noticed in 45th standard meteorological week. At maximum level of pest population the prevailing weather factors *viz.*, maximum temperature, minimum temperature, morning relative humidity, afternoon relative humidity, rainfall and number of rainy days were 30.6°C, 11.0°C, 26 per cent, 74 per cent, 0 mm and 0 day, respectively (Table 1). The data on population of *H. armigera* infesting pigeonpea are in pursuant to the observations recorded by Gotarkar (2002). Who observed two peaks of I and III instar larvae *H. armigera*, first in 46th standard meteorological week and second in 48th standard meteorological week. Deshmukh *et al.* (2003) recorded peak population of *H. armigera* on pigonpea in 47th standard meteorological week.

During first four weeks of observation (43 to 46 SMW) the infestation was not found. The first incidence of *E. atomosa* on pigeonpea was observed in 47th standard meteorological week (1.17 to 3.87 larvae/plant). The highest larval population of 3.87 larvae/ plant was observed in 49thstandard meteorological week. The weather factors *viz.*, maximum temperature, minimum temperature, morning relative humidity, afternoon relative humidity, rainfall and number of rainy days were 30.0°C, 11.9°C, 36 per cent, 74 per cent, 0 mm and 0 day,

respectively (Table 1). Deshmukh *et al*. (2003) stating that the peak population of *E. atomosa* was recorded on pigeonpea in the second week of November. Kumar and Nath (2003) observed that tur plume moth *E. atomosa* appeared on 8th November when pod formation started and disappeared after 23rd December when the crop matured for harvesting. Kumar *et al*. (2003) observed the larval population of pod borer species on pre-*Rabi* season pigeonpea and reported that the activity of *M. obtusa* and *H. armigera* started in late February (7th and 8th MW, respectively).

The first incidence of *M. obtusa* on pigeonpea was recorded in 49th standard meteorological week 1.84 with its peak population (3.20) in 50th standard meteorological week. At maximum level of pest population prevailing weather factors *viz*., maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity, rainfall and number of rainy days were 29.7°C, 12.7°C, 30 per cent, 74 per cent, 0 mm and 0 day, respectively (Table 1). The present finding on peak population *M. obtusa* on pigeonpea in relation to weather parameters are in line with the data reported by Yadav *et al*. (2011) who suggested that the maximum temperature below 30°C and minimum temperature between 8.1 and 17.0°C and average relative humidity around 60 to 70 per cent was favourable for population

Table 1 : Seasonal incidence of major pests of pigeonpea in relation to weather parameter

Months	Standard meteorological weeks	Temperature ^{0}C		Relative humidity (%)		Rainfall (mm)	Number of rainy days	Mean number of larvae/plant		
		Minimum	Maximum	Morning	After noon			*H. armigera*	*E. atomosa*	*M. obtusa*
October	43	16.1	32.3	31	74	0.0	0	0.6	0	0
November	44	14.4	31.2	32	75	0.0	0	2.76	0	0
	45	11.0	30.6	26	74	0.0	0	4.08	0	0
	46	12.1	30.3	32	76	0.0	0	3.48	0	0
	47	9.6	30.3	25	77	0.0	0	3.23	1.17	0
December	48	10.1	31.5	25	77	0.0	0	3.08	2.75	0
	49	11.9	30.0	36	74	0.0	0	2.5	3.87	1.84
	50	12.7	29.7	30	74	0.0	0	2.4	2.7	3.20
	51	8.8	29.6	24	75	0.0	0	1.87	2.18	3.14
	52	6.9	25.9	25	66	0.0	0	1.46	1.84	3.09
January	01	8.5	29.2	26	78	0.0	0	0.9	0.98	2.97
	02	7.6	27.6	36	77	0.0	0	0	0.19	2.40
	03	11.5	28.8	37	75	0.0	0	0	0	0

Table 2 : Simple correlation and regression between weather parameters for *H. armigera*

Sr. No.	Parameters	2016		
		Intercept (a)	Slope (b)	'r' Value
1.	Max. Temp.	-8.283	0.346	0.432
2.	Min. Temp.	1.180	0.078	0.154
3.	Morning	5.499	-0.117	-0.415
4.	After noon	0.506	0.020	0.045
5.	Rainfall	2.028	0	0
6.	Rainy days	2.028	0	0

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Regression co-efficient values 2016

Pest	Temperature ^{0}C		Humidity (%)		Rainfall	Rainy days
	Max.	Min.	Morning	After noon		
Helicoverpa armigera						
Bi	0.925	-0.328	-0.017	-0.206	0.000	0.000
S.E.±	0.746	0.436	0.141	0.231	0.000	0.000
T value	-0.753	-0.753	-0.122	-0.892	65535	65535
N= 13	B_0= -6.05	F Value = 1.265		R^2= 0.559		SEY= 1.262

build-up of pigeonpea pod fly. The present finding also coincide with those of Yadav *et al.* (1983) who showed that there were no peaks of larval population of *H. armigera* in the month of December to January. Ankhuri *et al*. (1994) reported that *M. obtusa* was the predominant species throughout the reproductive phase of the crop in both years with two peaks once in the second week of February and another in the first week of March. The results obtained in respect of seasonal abundance of *E. atomosa* on pigeonpea are well supported by Deshmukh *et al.* (2003).

Simple correlation and Multiple regression studies:

The correlation of *H. armigera* population with maximum temperature, minimum temperature and after noon relative humidity were positively non-significant whereas, morning relative humidity negatively non-significant. Were the co-efficient of multiple regression was non-significant in all weather parameters (Table 2). The selected weather parameter indicated 55.9 per cent variation in the infestation of *H. armigera*. The resultant multiple regression equation was derived and expressed as: $Y= -6.05+0.925X_1-0.328X_2-0.017X_3-0.206X_4+0X_5$

Table 3 : Simple correlation and regression between weather parameters for *E. atomosa*

Sr. No.	Parameters	2016		
		Intercept (a)	Slope (b)	'r' Value
1.	Max. temp.	3.299	-0.0703	-0.088
2.	Min. temp.	2.399	-0.110	-0.218
3.	Morning	2.890	-0.057	-0.202
4.	After noon	7.080	-0.079	-0.175
5.	Rainfall	1.206	0	0
6.	Rainy days	1.206	0	0

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Regression co-efficient values 2016

Pest	Temperature ^{0}C		Humidity (%)		Rainfall	Rainy days
	Max.	Min.	Morning	After noon		
Exelastis atomosa						
Bi	0.898	-0.571	0.102	-0.298	0	0
SE	0.770	0.450	0.145	0.238	0	0
T value	1.167	-1.270	1.167	0.700	65535	65535
N= 13	B_0= - 0.10	F Value = 1.102		R^2= 0.524		SEY= 1.303

Table 4 : Simple correlation and regression between weather parameters for *M. obtusa*

Sr. No.	Parameters	2016		
		Intercept (a)	Slope (b)	'r' Value
1.	Max. temp.	18.210	-0.569	-0.644*
2.	Min. temp.	4.583	-0.304	-0.546
3.	Morning	2.846	-0.053	-0.170
4.	After noon	12.041	-0.144	-0.289
5.	Rainfall	1.28	0	0
6.	Rainy days	1.28	0	0

* and ** indicate significant of values at P=0.05 and 0.01, respectively

Regression co-efficient values 2016

Pest	Regression coefficient values 2016					
	Temperature ^{0}C		Humidity (%)		Rainfall	Rainy days
	Max.	Min.	Morning	After noon		
Melanagromyza obtusa						
Bi	-1.125	0.315	-0.150	0.177	0	0
SE	0.756	0.442	0.143	0.234	0	0
T value	-1.487	0.712	-1.054	0.754	65535	65535
N= 13	B_0= 22.59	F Value = 1.67		R^2= 0.62		SEY= 1.28

$+0X_{6.}$

The correlations of *E. atomosa* population with maximum temperature, minimum temperature, after noon relative humidity and before noon relative humidity were negatively non-significant. Were the co-efficient of multiple regression was non-significant in all weather parameters except (Table 3). The selected weather parameters indicated 52.4 per cent variation in the infestation of *H. armigera*. The resultant multiple regression equation was derived and expressed as: $Y= -1.102+ 0.898X_1-0.571X_2+ 0.102X_3-0.298X_4+0X_5+X_{6.}$

The correlations of *M. obtusa* population with maximum temperature were negatively significant. Minimum temperature, morning and afternoon relative humidity were negatively non-significantly. Were the co-efficient of multiple regression was non-significant in all weather parameters expect maximum temperature (Table 4). The selected weather parameter indicated 62.4 per cent variation in the infestation of *M. obtusa*. The resultant multiple regression equation was derived and expressed as: $Y= 22.59-1.125X_1+0.315X_2-0.150\ X_3 + 0.177X_4+0X_5+0X_{6.}$

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