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Seasonal incidence of *Helicoverpa armigera* (Hubner) and *Exelastis atomosa* (Walsingham) on different cultivars of pigeonpea

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Abstract
The experiment was conducted at Experimental Research Farm Dept. of Agril. Entomology, VNMKV, Parbhani, during the *Kharif*-2017. The present study revealed that the incidence of *H. armigera* on cultivar, BDN-711 was first noticed in 39th MW (0.25 larvae/plant). Whereas, the maximum incidence 4.34 larvae/plant was noticed at 43rd MW. On BSMR-736 it was noticed in 40th MW 0.40 larvae/plant. Whereas, the maximum incidence 5.00 larvae/plant was noticed in 45th MW. On cultivar BSMR-853 was first noticed in 40th MW 0.32 larvae/plant. Whereas, the maximum incidence 5.12 larvae/plant was noticed in 45th MW. In case of BSMR-716 was first noticed in 40th MW 1.45 larvae/plant. Whereas, the maximum incidence 5.00 larvae/plant was noticed in 44th MW. During first five weeks of observation (38th to 42nd MW) the infestation was not found. However first incidence of *E. atomosa* on pigeonpea cultivar BDN-711 was observed in 43rd MW (1.00 larvae/plant). The highest larval population of 4.00 larvae/ plant was observed in 48th MW. On BSMR-736 it was observed in 46th MW (1.00 larvae/plant). The highest larval population of 3.12 larvae/ plant was observed in 50th MW. On BSMR-853 it was noticed in 46th MW (1.25 larvae/plant). The highest larval population of 3.36 larvae/ plant was observed in 50th MW. In 46th MW (1.42 larvae/plant) was found with the highest larval population of 3.22 larvae/ plant was observed in 49th MW on cultivar BSMR-716. The selected weather parameters indicated 70.00 percent and 60.2 percent on BDN-711. On BSMR-736 it was 61.5 percent on and 66.1 percent. On BSMR-853 it was 59.7 percent and 64.00 percent. On cultivar BSMR-716 it was 60.3 percent and 69.4 percent variation on the population of *H. armigera* and plume moth, respectively.

Keywords: Seasonal incidence, *H. armigera*, *E. atomosa*, different cultivars of pigeonpea

Introduction
India has virtual monopoly in pigeonpea production accounting to 90 percent of world's total production and occupies an area of 3.88 million ha with a production of 3.29 million tonnes (Anonymous, 2014) [3]. Pigeon pea (*Cajanus cajan*) is one of the major pulse crops grown in India. As many as 250 insect species have been recorded to attack pigeon pea (*C. cajan*) (Upadhyay *et al.,* 1998) [13]. However, the most damaging pests of this crop are pod-borers which attack the reproductive parts of the plant. Amongst the pod borers, the pod fly, *Melanagromyza* which is a severe pest of pigeon pea is accountable for some of the major damage to the pods knowledgeable during winter and spring (Akhauri *et al.,* 1994; Shanower *et al.,* 1998) [1, 12].

Over 250 species of insect pests belonging to 8 orders and 61 families have been reported by several workers (Davies and Lateef, 1977**;** Sekhar, *et al*., 1991; Khokhar and Singh, 1984) [5, 11, 8]. It is attacked by several insect pests from seedling to pod harvesting. These important pests infecting pigeonpea crop are pod borer, *Helicoverpa armiger*a (Hubner) and plume moth, *Exelastis atomosa* (Walsingham). Pod borer complex is a major cause for low yields such as, 77.04 percent pod damage and 68.70 percent grain damage (Awasthi and Bhatnager, 1983) [4]. According to Yadav and Chaudhary (1993) [14] around 14 and 10 percent pigeonpea pods were damaged by *H. armigera* and *M. obtusa*. Similarly pigeonpea pod damage due *H. armigera* and *E. atomosa* varied from 7.6 to 31.0 percent (Lal, *et al*, 1997) [9]. Under these circumstances, the scientific investigations for the effective management of *H. armigera* and *E. atomosa* in pigeonpea ecosystem needed to be further strengthened. Before developing insect pest management programme for specific agro ecosystem, it is necessary to have basic information on abundance and distribution of pest in relation to weather parameters as it helps in determining appropriate time of action and suitable effective method of control Hence, an

attempt has been made to study the incidence and population density of *H. armigera* and *E. atomosa* on different cultivars of pigeonpea with respect to some abiotic factors in Maharashtra particular to Marathwada pigeonpea growing region.

Materials and Methods

To study the seasonal incidence of *H. armigera* and *E. atomosa* on different cultivars of pigeonpea, *viz.* BDN-711, BSME-736, BSMR-853 and BSME-716. field experiments were conducted at experimental farm of the Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra) during *Kharif* 2017-18. The pigeonpea each cultivar was grown in plots of 10 m X 10 m and the crop fields were kept free from pesticide sprays. Five plants were selected randomly from each plot and weekly observations of the respective pests were taken through plant inspection Method (PIM) starting from 50 percent flowering stage to till maturity of the crop. The observations were recorded as number of larvae per plant. Influence of weather parameters on population build up of *H. armigera* and *M. obtusa* were also worked out. For this, the data were subjected to correlation and regression analysis with weather parameters *viz*., maximum and minimum temperatures, morning and evening relative humidity, sunshine hours, wind velocity and evaporation in respect of the corresponding standard week. The meteorological data for the above analysis were obtained from the meteorological observatory VNMKV, Parbhani university. Significance of simple correlation was estimated by using *t*-test and the regression equations were derived by using the formula as suggested by Panse and Sukhatme 1967 [10].

Result

Incidence pattern of *H. armigera* and *E. atomosa* on different cultivars of pigeonpea

The data pertaining to seasonal incidence pattern during 2017 are presented in Table 1 and Fig 1 & 2.

Helicoverpa armigera (Hubner)

The incidence of *H. armigera* on cultivar, BDN-711 was first noticed in 39th MW (0.25 larvae/plant). Whereas, the maximum incidence 4.34 larvae/plant was noticed at 43rd MW. On BSMR-736 it was noticed in 40th MW 0.40 larvae/plant. Whereas, the maximum incidence 5.00 larvae/plant was noticed in 45th MW. On cultivar BSMR-853 was first noticed in 40th MW 0.32 larvae/plant. Whereas, the maximum incidence 5.12 larvae/plant was noticed in 45th MW. In case of BSMR-716 was first noticed in 40th MW 1.45 larvae/plant. Whereas, the maximum incidence 5.00 larvae/plant was noticed in 44th MW.

Exelastis atomosa (Walsingham)

During first five weeks of observation (38th to 42nd MW) the infestation was not found. However first incidence of *E. atomosa* on pigeonpea cultivar BDN-711 was observed in 43rd MW (1.00 larvae/plant). The highest larval population of 4.00 larvae/ plant was observed in 48th MW. On BSMR-736 it was observed in 46th MW (1.00 larvae/plant). The highest larval population of 3.12 larvae/ plant was observed in 50th MW. On BSMR-853 it was noticed in 46th MW (1.25 larvae/plant). The highest larval population of 3.36 larvae/ plant was observed in 50th MW. In 46th MW (1.42 larvae/plant) was found with the highest larval population of 3.22 larvae/ plant was observed in 49th MW on cultivar BSMR-716.

Impact of abiotic factors on *H. armigera* population

The data pertaining to simple correlation and regression during 2017 are presented in Table 2 and 3.

Simple correlation studies

H. armigera population with maximum temperature, minimum temperature, bright sunshine hours and morning relative humidity were positively non-significant whereas, remaining weather parameters were negatively non-significant on BDN-711. In case of BSMR-736 bright sunshine hours and maximum temperature were positively non-significant whereas, remaining parameters were negatively non-significant. On BSMR-853 bright sunshine hours, maximum temperature and morning relative humidity were positively non-significant. Whereas remaining factors correlated negatively non-significant. On BSMR-716 wind velocity was negatively significant. Whereas, bright sunshine hours, maximum and minimum temperature and morning relative humidity were positively non-significant and remaining factors correlated negatively non-significant.

Correlation of *E. atomosa* population with maximum and minimum temperature, evaporation, rainfall, morning and evening relative humidity were negatively non-significant. Whereas bright sunshine hours showed positively non significant reaction with cultivar BDN-711. On BSMR-736 maximum and minimum temperature, morning relative humidity and evening relative humidity were negatively significant. The non-significant correlation was observed between remaining weather parameters. On BSMR-853 maximum temperature, minimum temperature and morning and evening relative humidity were negatively significant but evaporation and rainfall was negatively non-significant and positively non-significant with bright sunshine hours and wind velocity. On BSMR-716 evaporation, rainfall, maximum temperature, morning and evening relative humidity were negatively non-significant with minimum temperature was negatively significant.

Multiple regression studies

The selected weather parameters indicated 70.00 percent and 60.2 percent on BDN-711. On BSMR-736 it was 61.5 percent on and 66.1 percent. On BSMR-853 it was 59.7 percent and 64.00 percent. On cultivar BSMR-716 it was 60.3 percent and 69.4 percent variation on the population of *H. armigera* and plume moth, respectively.

The above findings are supported by the findings of Deshmukh *et al*. (2003) [6] who stated that the peak population of *E. atomosa* was recorded on pigeonpea in the second week of November (45th MW). Akhilesh and Paras (2003) [2] observed that tur plume moth *E. atomosa* appeared on 8th November (45th MW) when pod formation started and disappeared after 23rd December (52nd MW) when the crop matured for harvesting. The data on population of *H. armigera* infesting pigeonpea are in pursuant to the observations recorded by Gotarkar (2002) [7] who observed two peaks of I and III instar larvae *H. armigera*, first in 46th MW and second in 48th MW. Deshmukh *et al*. (2003) [6] recorded peak population of *H. armigera* on pigeonpea in 47th MW.

Table 1: Seasonal incidence of H. armigera and *E. atomosa* in relation to weather parameters on different cultivars of pigeonpea

Sr. No.	SW	BDN- 711		BSMR-736		BSMR-853		BSMR-716		Weather parameters							
		H. armigera	*E. atomosa*	*H. armigera*	*E. atomosa*	*H. armigera*	*E. atomosa*	*H. armigera*	*E. atomosa*	EP	BSS	RF	WS	MAX	MIN	RHI	RH2
1	38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	6.03	6.60	3.14	31.54	22.29	87	61
2	39	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.20	8.47	0.00	3.39	34.16	22.51	77	48
3	40	0.44	0.00	0.40	0.00	0.32	0.00	1.45	0.00	5.43	7.00	57.60	3.39	33.20	21.59	82	65
4	41	1.35	0.00	1.20	0.00	1.36	0.00	2.26	0.00	3.29	5.27	111.20	2.47	31.19	22.16	89	69
5	42	2.36	0.00	2.00	0.00	2.10	0.00	3.35	0.00	4.66	6.51	1.40	2.19	32.61	20.24	79	46
6	43	4.34	1.00	4.50	0.00	4.55	0.00	4.55	0.00	4.29	8.89	0.00	2.01	32.61	16.43	77	32
7	44	3.22	1.45	4.86	0.00	4.95	0.00	5.00	0.00	4.54	9.20	0.00	2.64	30.91	14.50	78	31
8	45	3.10	1.55	5.00	0.00	5.12	0.00	3.25	0.00	4.84	9.57	0.00	3.36	30.79	12.20	79	31
9	46	3.00	1.96	4.12	1.00	4.31	1.25	3.00	1.42	4.69	8.74	0.00	2.90	31.40	14.36	76	32
10	47	2.68	2.46	4.00	1.12	4.00	1.36	2.55	2.75	4.46	7.37	0.00	2.41	32.04	16.99	77	42
11	48	2.22	4.00	3.82	2.55	3.86	2.66	1.34	2.99	3.86	9.17	0.00	2.86	29.87	10.23	77	31
12	49	2.00	3.95	2.15	2.61	2.32	2.75	1.12	3.22	4.50	7.39	0.00	4.70	30.41	14.41	75	42
13	50	0.55	1.20	1.00	3.12	1.12	3.36	0.85	2.95	4.71	8.60	0.00	2.81	31.01	12.53	78	31
14	51	0.00	0.00	0.80	3.00	0.85	3.12	0.25	2.54	4.04	8.44	0.00	3.84	29.29	7.91	75	27
15	52	0.00	0.00	0.22	2.95	0.00	2.75	0.00	1.00	3.36	8.26	0.00	2.74	25.55	6.14	67	19
16	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93	8.60	0.00	2.60	29.59	9.21	76	32

Table 2: Correlation of pod borer complex with weather parameters on cultivar BDN-711 and BSMR-736 of pigeonpea

Sr. No.	Parameters	BDN-711		BSMR-736		BSMR-853		BSMR-716	
		H. armigera	*E. atomosa*	*H. armigera*	*E. atomosa*	*H. armigera*	*E. atomosa*	*H. armigera*	*E. atomosa*
		'r' Value	'r' Value	'r' Value	'r' Value	'r' Value	'r' Value	'r' Value	'r' Value
1	EVP	-0.088	-0.111	-0.034	-0.346	-0.082	-0.320	-0.042	-0.243
2	BSS	0.188	0.367	0.467	0.239	0.312	0.241	0.230	0.215
3	Rainfall	-0.118	-0.336	-0.248	-0.300	-0.175	-0.307	-0.003	-0.333
4	W. V.	-0.219	0.259	-0.236	0.379	-0.208	0.381	-0.520*	0.365
5	Max. Temp	0.238	-0.106	0.130	-0.621*	0.159	-0.576*	0.291	-0.351
6	Min. Temp	0.090	-0.337	-0.131	-0.663**	-0.028	-0.643**	0.098	-0.554*
7	AM	0.030	-0.249	-0.085	-0.567*	0.004	-0.544*	0.109	-0.412
8	PM	-0.096	-0.317	-0.346	-0.527*	-0.202	-0.516*	-0.122	-0.405

Table 3: Regression of *H. armigera* and *E. atomosa* with weather parameters on different cultivars of pigeonpea

Pest	EVP (x_1)	BSS (x_2)	RF (x_3)	WV (x_4)	Temperature ºC		Humidity (%)		EVP (x_1)	BSS (x_2)	RF (x_3)	WV (x_4)	Temperature ºC		Humidity (%)	
					Max. (x_5)	Min. (x_6)	AM (x_7)	PM (x_8)					Max. (x_5)	Min. (x_6)	AM (x_7)	PM (x_8)
BDN-711									**BSMR-853**							
H. armigera									***H. armigera***							
Bi	-3.997	1.443	-0.011	1.123	0.736	0.510	-0.121	-0.042	-4.297	1.832	-0.013	1.231	0.718	0.571	-0.017	-0.076
SE	1.040	0.713	0.019	0.652	0.433	0.240	0.134	0.109	1.579	1.083	0.029	0.990	0.658	0.365	0.203	0.166
T values	3.841	2.023	-0.606	1.723	1.697	2.119	-0.909	-0.388	-2.720	1.691	-0.443	1.243	1.090	1.561	-0.087	0.456
N=13	B_0=-14.656		F Value=2.630		R^2=0.700		SEY=1.141		B_0=-23.462		F Value=1.669		R^2=0.597		SEY=1.732	
E. atomosa									***E. atomosa***							
Bi	-3.212	1.432	-0.042	0.838	0.736	-0.124	-0.185	0.207	0.146	-1.006	0.010	0.870	0.280	-0.180	-0.006	-0.101
SE	1.449	0.933	0.027	0.898	0.527	0.358	0.172	0.170	1.280	0.814	0.022	0.691	0.456	0.257	0.149	0.126
T values	-2.216	1.535	-1.540	0.933	1.396	-0.347	-1.075	1.218	0.114	-1.236	0.469	1.258	0.614	-0.701	-0.041	-0.806
N=13	B_0=-12.644		F Value=1.137		R^2=0.602		SEY=1.358		B_0=4.339		F Value=1.556		R^2=0.640		SEY=1.200	
BSMR-736									**BSMR-716**							
H. armigera									***H. armigera***							
Bi	-3.153	1.393	-0.000	0.945	0.623	0.477	0.042	-0.128	-1.731	0.510	0.017	0.049	0.568	0.344	0.044	-0.152
SE	1.866	1.866	0.032	1.008	0.665	0.375	0.217	0.183	1.691	1.089	0.032	1.048	0.615	0.418	0.201	0.199
T values	-1.689	1.173	-0.025	0.937	0.937	1.273	0.195	-0.697.	-1.023	0.468	0.544	.046	0.922	0.822	0.223	-0.765
N=13	B_0=-22.531		F Value=1.402		R^2=0.615		SEY=1.749		B_0=-15.078		F Value=1.143		R^2=0.603		SEY=1.585	
E. atomosa									***E. atomosa***							
Bi	0.163	-0.910	0.010	0.810	0.176	-0.149	-0.016	-0.093	-0.954	-0.496	-0.022	0.342	0.952	-0.591	-0.102	0.117
SE	1.203	0.764	0.021	.649	0.429	0.241	0.140	0.118	1.228	0.791	0.023	0.761	0.490	0.303	0.146	0.144
T values	0.135	-1.191	0.489	1.247	0.411	-0.617	-0.116	-0.785	-0.776	-0.627	-0.975	0.450	2.130	-1.947	-0.704	0.811
N=13	B_0=-6.834		F Value=1.710		R^2=0.661		SEY=1.127		B_0=-8.485		F Value=1.706		R^2=0.694		SEY=1.151	

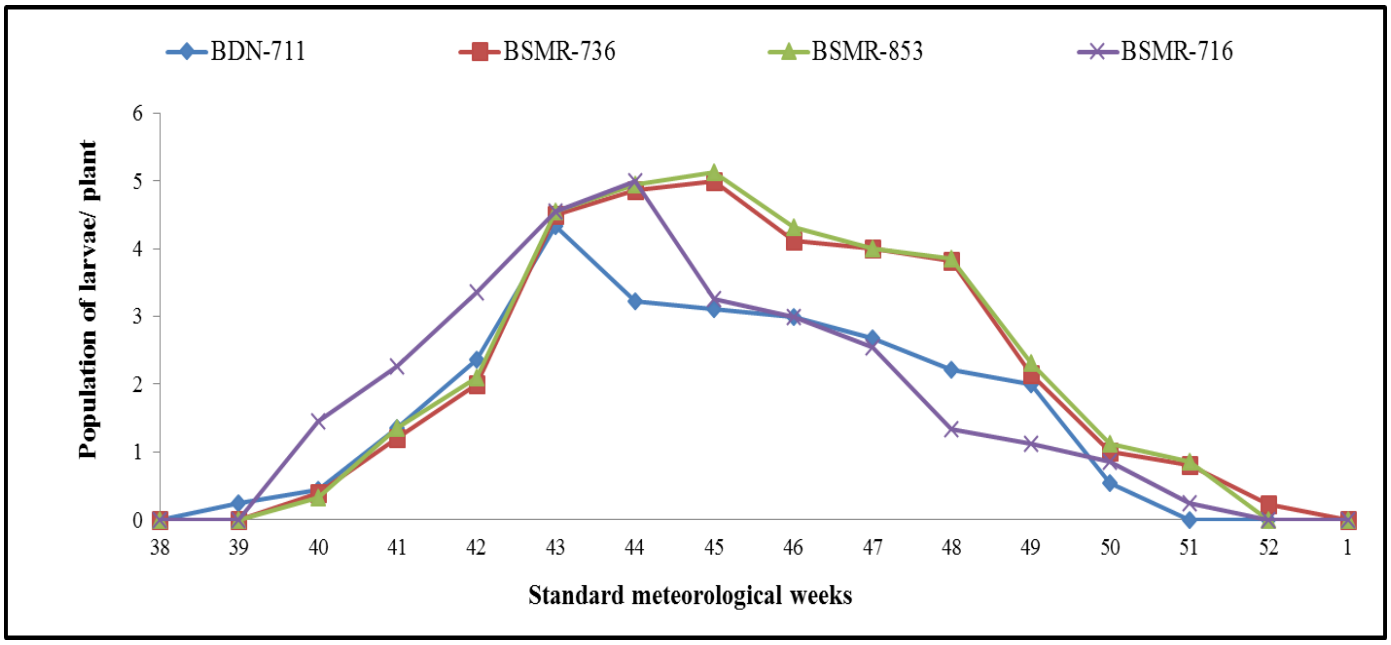

Fig 1: Seasonal incidence of *H. armigera* on different cultivars of pigeonpea

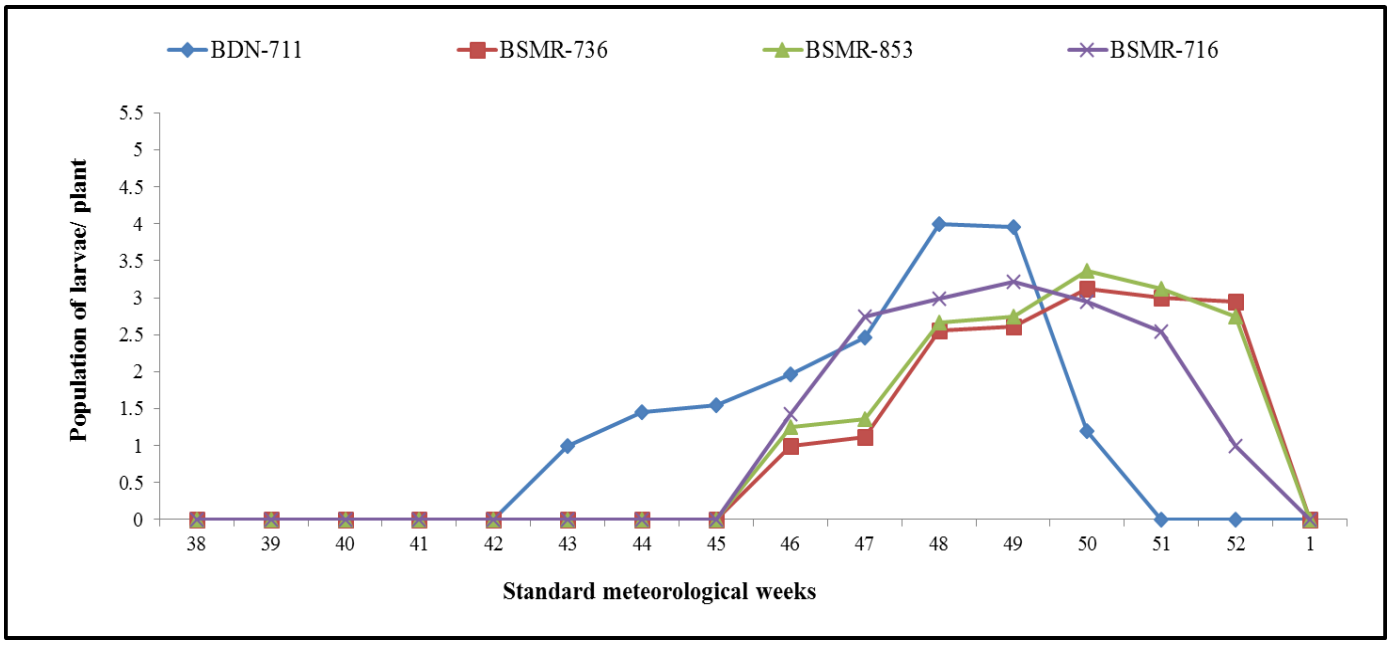

Fig 2: Seasonal incidence of *E. atomosa* on different cultivars of pigeonpea

Conclusion

From the present study, it can be concluded that *H. armigera* and *E. atomosa* are the two major insect-pests infesting different cultivars of pigeonpea in Marathwada region of Maharashtra, India. Different weather parameters determine seasonal activity and phenology of these insect-pests on pigeonpea. The information generated in present study gives an indication about the importance of the different weather parameters in developing weather based forecasting models for successful implementation of the pest management strategies against these pests.

References

1. Akhauri RK, Sinha MM, Yadav RP. Population build-up and relative abundance of pod borer complex in main season pigeonpea, *Cajanus cajan* (L.) Millsp. J Ent. Res. 1994; 18:217-222.
2. Akhilesh Kumar, Paras Nath. Pest complex and their population dynamics on an early variety of pigeonpea UPAS-120 at Varanasi. Indian Journal of Entomology, 2003; 65(4):453-460.
3. Anonymous, Agricultural statistics at a glance, Department of Agriculture and Cooperation, Ministry of Agriculture, GOI, 2014, 97.
4. Awasthi JK, Bhatnagar. A note on damage caused by pod borer complex in pigeonpea, Bulletin of Entomology, 1983; 24(1):37-40.
5. Davis JC, Lateef SS. Pulse entomology, Annual Report (1975-76). Part A. pigeonpea entomology, ICRISAT, Hyderabad (A.P), India, 1977.
6. Deshmukh AK, Khan MI, Khande D. Seasonal incidence of pigeopea pod borer under Akola condition (Maharashtra). Insect Environment. 2003; 9(3):127-128.
7. Gotarkar SB. Life table study of *Helicoverpa armigera* (Hubner) on pigeonpea. M.Sc. (Agri.) dissertation submitted to Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.), India, 2002.

8. Khokar KS, Singh Z. Insect pest associated with pigeonpea at Hissar, India. International pigeonpea Newsletter. 1984; 1:30-31.
9. Lal SS, Katti G. Pod fly, *Melanagromyza obtusa* Malloch. A key pest of pigeonpea. Ind. Ins. of Pulses Res. IARI, 1997, 26.
10. Panse VG, Sukhatme PV. Statistical methods for Agricultural workers. ICAR, New Delhi, 1967.
11. Sekhar JC, Singh KM, Singh RN, Singh Y. Succession of insects on pigeonpea cultivars of different maturity. Indian Journal of Entomology. 1991; 53(2):316-319.
12. Shanower TG, Lal SS, Bhagwat VR. Biology and management of *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae). 1998; 17:249-263.
13. Upadhyay RK, Mukerji KG, Rajak RL. IPM system in Agriculture, 4 pulses, New Delhi, 1998, 99.
14. Yadav LS, Chaudhary JP. Estimation of losses due to pod borer in pigeonpea. Indian Journal Entomology. 1993; 55(4):375-379.