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Short Communication

Seasonal abundance of pigeon pea pod borers in relation to meteorological parameters in North Gujarat

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Pigeon pea, *Cajanus cajan* (L) Mill. is one of the most important grain legume crops of semi-arid tropical and subtropical farming systems. Being rich source of protein (18 to 26 %), it is the second most important pulse crop grown in the country next to chickpea. Gujarat contributes only 3.69 lakh tonnes of pigeon pea grains from an area of 3.34 lakh hectares (Anon., 2017). Among several factors confining its potential production, damage incurred by insect pests is predominant in pigeon pea. Pod borer complex *viz*., *Helicoverpa armigera* (Hubner), *Maruca vitrata* Fabricius and pod fly, *Melanagromyza obtusa* Malloch are considered as the primary biotic constraints to pigeon pea production (Jat *et al.* 2017). The information regarding influence of abiotic factors on pod borers is scanty under North Gujarat climatic conditions. Therefore, an investigation was conducted to study the seasonal incidence of pigeon pea pod borers in relation to weather parameters in North Gujarat.

A field cum laboratory experiment was conducted at Centre of Excellence for Research on Pulses, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during the *kharif* 2011-12 and 2012-13. Pigeon pea variety GT 101 was sown during 2nd fortnight of July in plot size 20 m × 20 m and spacing 60 cm × 30 cm following all the agronomic operations as per the recommendation in vogue. The experimental plot was kept free from the spraying of any insecticides. Observations regarding weather parameters *viz.,* maximum and minimum temperature, morning relative humidity and evening relative humidity, morning vapour pressure and evening vapour pressure, bright sunshine hours and rainfall were recorded from the Meteorological observatory, Department of Meteorology, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar.

For recording observations on seasonal abundance of pod borers, each plot was divided into five quadrates and five plants from each quadrate were selected randomly and tagged. Eggs and larval population of *H. armigera* were recorded from tagged plants in each quadrate at weekly interval right from flowering to harvesting of the crop. Larval population of *M. vitrata* from the same tagged plants was also carried out by methodology followed as in case of *H. armigera*.

The incidence of pigeon pea pod fly, *M. obtusa* was recorded on the basis of per cent pod damage. For this purpose, 100 pods were collected periodically at pod formation stage till harvesting of the crop. Damaged pods were sorted out by detecting the presence of maggot or pupa, tunnelled grains inside the pod and small pin-like hole. The per cent pod damage was calculated by using the formula suggested by Naresh and Singh (1984):

$$\text{Per cent pod damage} = \frac{\text{No. of infested pods}}{\text{Total number of pods}} \times 100$$

Seasonal incidence of pod borer (H. armigera)

The activity of *H. armigera* commenced from 47th standard meteorological week (SMW) with 0.55 egg and 0.44 larva per plant during *kharif* season (Table 1). The population of *H. armigera* gradually increased and reached to peak level (3.55 eggs and 1.20 larvae/ plant) in 52nd SMW. Pod borer population declined thereafter and remained in the crop till 5th SMW (0.58 larva/ plant). All the weather parameters had negative influence on *H. armigera* except impact of morning relative humidity on egg and larval population, whereas evening relative humidity on larva (Table 2). Among the parameters, maximum temperature ($r = -0.653^*$ and $r = -0.781^{**}$), minimum temperature ($r = -0.682^*$ and $r = -0.808^{**}$), morning vapour pressure ($r= -0.704^{**}$ and $r = -0.640^*$), evening vapour pressure ($r = -0.659^*$ and $r = -0.829^{**}$) and bright sunshine hours ($r = -0.726^{**}$ and $r = -0.744^{**}$) had significant effect on the egg and larval population of *H. armigera*, respectively.

Table 1: Seasonal abundance of pigeon pea pod borers during *kharif* (mean of 2011-12 and 2012-13)

Standard Meteorological Week (SMW)	*H. armigera*/ plant Egg(s)	Larva(e)	*M. vitrata* larva(e)/ plant	Pod damage (%) due to *M. obtusa*
45	0.00	0.00	0.00	0.0
46	0.00	0.00	0.00	0.0
47	0.55	0.44	0.10	0.0
48	0.84	0.66	0.63	2.0
49	1.75	0.70	0.83	4.5
50	2.33	1.03	0.98	11.0
51	2.60	1.13	1.08	17.0
52	3.55	1.20	1.55	25.5
1	2.90	1.20	1.57	24.0
2	2.88	1.00	1.40	18.5
3	1.95	0.75	0.99	12.5
4	1.05	0.89	0.70	8.0
5	0.00	0.58	0.05	0.0

Table 2: Correlation between pod borer infestation and weather parameters

Weather parameters	*H. armigera*		*M. vitrata*	*M. obtusa*
	Eggs	Larvae	(larvae)	(Pod damage)
Maximum temperature (T_{max})	-0.653*	-0.781**	-0.742**	-0.734**
Minimum temperature (T_{min})	-0.682*	-0.808**	-0.738**	-0.769**
Morning relative humidity (RH_1)	0.334	0.067	0.256	0.260
Evening relative humidity (RH_2)	-0.267	0.044	-0.211	-0.275
Morning vapour pressure (VP_1)	-0.704**	-0.640*	-0.735**	-0.777**
Evening vapour pressure (VP_2)	-0.659*	-0.829**	-0.712**	-0.740**
Bright sunshine hours (BSS)	-0.726**	-0.744**	-0.732**	-0.611*

* Significant at 5 per cent ** Significant at 1 per cent

Kaushik *et al*. (2008) and Jat *et al*. (2017) observed variable influence of abiotic factors on the population of *H. armigera* in pigeon pea owing to time of sowing, time of flowering and crop types (short and long duration).

Seasonal incidence of spotted pod borer, M. vitrata

The data on seasonal abundance of *M. vitrata* in pigeon pea (Table 1) indicated that infestation of *M. vitrata* started during 47th SMW and remained active on pigeon pea till harvest. The larval population of *M. vitrata* increased up to 1st SMW (1.57 larvae/ plant), thereafter the population showed a gradual decrease till harvest. Meteorological parameters *viz*., maximum temperature (r = -0.742**), minimum temperature (r = -0.738**), morning vapour pressure (r = -0.735**), evening vapour pressure (r = -0.712**) and bright sunshine hours (r = -0.732**) were associated with population build-up of *M. vitrata* in a significantly negative manner (Table 2). Chaitanya *et al*. (2012) observed *M. vitrata* in 1st fortnight of November which peaked during 2nd week of December and remained on crop till crop maturity (end of January).

Seasonal incidence of pod fly, M. obtusa

The abundance of pod fly, *M. obtusa* recorded in terms of per cent pod damage on pigeon pea are presented in Table 1. The activity of *M. obtusa* commenced from 48th SMW (2.0% pod damage) and remained till 4th SMW (8.0% pod damage). Initially, two per cent pod damage was

observed in pigeon pea which followed an increasing trend and reached to maximum (25.5%) during 52nd SMW (last week of December). Thereafter, the activity of *M. obtusa* gradually decreased and remained in the crop till 4th SMW. Correlation between abiotic factors and pest infestation indicated that maximum and minimum temperature (r = -0.734** and r = -0.769**, respectively) as well as morning and evening vapour pressure (r = -0.777** and r = -0.740**, respectively) had highly significant negative impact on pod damage caused by pod fly during the cropping season (Table 2). Further, bright sunshine hours (r = -0.611*) also established significantly negative correlation on pod fly infestation. Similar results are reported by Kumar and Nath (2004).

Hence, it can be concluded that the pod borers *viz*., *H. armigera*, *M. vitrata* and pod fly, *M. obtusa* commenced on the crop during flowering (47th to 48th Standard Meteorological Week) and remained active till maturity, peak population being recorded between December (49th SMW) to January (2nd SMW). The meteorological parameters indicated that temperature, vapour pressure and bright sunshine hours played crucial role in population build- up of pigeon pea borers.

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