Journal of Agrometeorology 19 (3) : 255-258 (September 2017)

Effect of weather parameters on seasonal incidence of pod borer complex in pigeonpea

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ABSTRACT

Field experiments were conducted at CCS Haryana Agricultural University, Hisar during *kharif* season of 2013 and 2014 to determine the effect of weather parameters on the incidence of pod borer complex on early maturing pigeonpea varieties. The study revealed that the infestation of *Helicoverpa armigera* and *Maruca vitrata* started with the onset of bud initiation and reached its peak at flowering stage. The maximum *H. armigera* larval population (1.83 larvae plant^{-1}) was recorded in 1st week of July sown crop, whereas, the maximum incidence of *M. vitrata* (21.17 webs plant^{-1}) was recorded in 2nd week of July sown crop. The larval population of *H. armigera* was significantly and positively correlated with the maximum temperature, followed by minimum temperature.Incidence of *M. vitrata* was negatively correlated with evening relative humidity and wind speed which was significant at $p \leq 0.05$ level of significance.

Keywords: Weather parameters, seasonal incidence, *Helicoverpa armigera, Maruca vitrata*

Pigeonpea [*Cajanuscajan*(L.) Millspaugh]is one of the major pulse crops grown between 30˚N and 30˚S in the semi-arid tropics and is the second most important pulse crop of India, after chickpea. In Haryana, pigeonpea is grown under 15.1 thousand hectares with an annual production of 16.4 thousand tones leading to a productivity of 1086 kg ha^{-1}.

A large number of insect pests (more than 300 species) has been reported which attack pigeonpea crop. The most important pests those attack at flowering and podding stage of the crop are pigeonpea pod borer, *Helicoverpa armigera* and spotted pod borer, *Maruca vitrata* (Fabricius). Damage to pods due to the borer complex was reported to be 20 to 72 per cent. In long duration varieties *H. armigera* infestation of 15.6 per cent was recorded, whereas, *M. vitrata* infestation was upto 16.4 per cent in short duration varieties. In Haryana, the pod damage by pod borers was as high as 10 to 35 per cent (Chauhan, 1992).

According to Akhauri (1992), the population buildup of pod borer, *M. vitrata* varied remarkably in different parts of the country probably due to differences in agro climatic conditions and crop types. The larval population of *M. vitrata* was significantly influenced by average temperature and relative humidity at Hisar (Naresh and Singh, 1984).

MATERIALS AND METHODS

To study the incidence of pod borer complex and effect of abiotic factors on their population fluctuation, an experiment was conducted at Pulses Farm, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar, Haryana during the *kharif* seasons of 2013 and 2014 with six pigeonpea varieties (Manak, Paras, Pusa-992, AL-201, PAU-881 and H03-41) raised on four dates (D_1 - 3rd week of June, D_2 - T 1stweek of July, D_3 - T 2nd week of July and D_4 - T 3rdweek of July), in plot size of 4 rows of 4 m length with spacing of 45 cm x 15 cm keeping three replications in randomized complete block design. All the recommended agronomic practices were followed for raising the crop.The plots were kept without insecticidal umbrella to allow pod borer complex to multiply throughout the cropping season.The visual observations on the incidence of *H. armigera* and *M. vitrata* were taken when the pest appeared in the field till crop maturity. The larvae of the pod borer, *H. armigera* and webs of spotted pod borer, *M. vitrata* were recorded at fortnight intervals from 5 tagged plants from each plot per replication.The seasonal population of pod borer complex was correlated with the meteorological weather parameters *viz*., maximum temperature (Tmax), minimum temperature (Tmin), rainfall, morning relative humidity (RH_M), evening relative humidity (RH_E), morning vapor pressure (VP_M), evening vapor pressure (VP_E), bright sunshine hours (BSS), wind speed (WS) and evapotranspiration (EP) using standard statistical procedure as suggested by Steel and Torrie (1980).

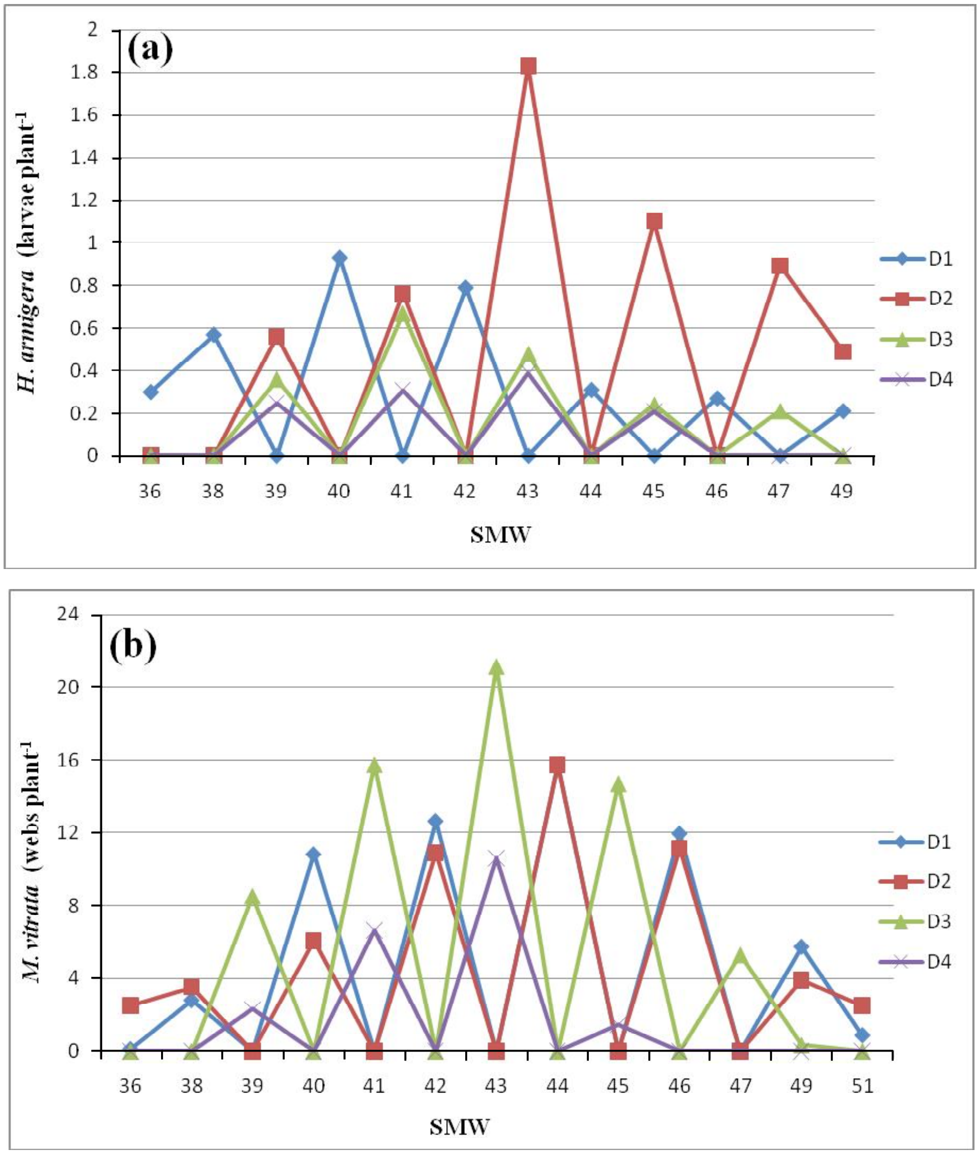

Fig. 1 : Incidence of pigeonpea pod borer (a) *H. armigera*and (b)*M. vitrata* in different dates of sowing D_1(3rd week of June); D_2(1st week of July);D_3(2nd week of July); D_4(3rd week of July)
SMW = Standard Meteorological Week

RESULTS AND DISCUSSION

Population dynamics

***H. armigera*:** The data on incidence of pod borer complex in pigeonpea was pooled for the years 2013 and 2014 and are presented in (Fig. 1a). The results revealed that the larval population of *H. armigera* in D_1(3rd week of June) sown crop was started in 36thSMW (1st week of September) (0.30 larvae plant^{-1}) and gradually increased (0.93 larvae plant^{-1}) up to 40thSMW. Thereafter the larval population decreased.The late sown crop experience less incidence of *H. armigera*. Gowda *et al*. (2012) have reported that pigeonpea crop sown in July II fortnight resulted in higher incidence of pod borer as compared to early sowing in June I fortnight. Kabaria *et al*.(1993) also suggested that early sowing of the pigeonpea crop during the first week of June avoid pod borer damage.

***M.vitrata*:** The data on incidence of *M. vitrata* (Fig. 1 b) revealed that the *M. vitrata* incidence in D_1 (3rd week of June) sown crop commenced in 36thSMW (1st week of September) and reached its peak of 15.74 webs plant^{-1} in 44thSMW and the incidence declined thereafter. In D_2 (1st week of July), D_3 (2nd week of July) and D_4 (3rd week of July) sown crops the incidence of *M. vitrata* commenced in 39thSMW (4th week of September) with 2.52, 8.54 and 2.31 webs plant^{-1}, respectively with the maximum pest incidence

Table 1: Correlation coefficient of *H. armigera* and *M. vitrata* population with abiotic factors in different sowing dates (Pool of seasons, 2013 & 2014)

Weather Parameters	*H. armigera*				*M. vitrata*			
	D1	D2	D3	D4	D1	D2	D3	D4
Tmax	0.626**	0.162	0.743*	-0.248	0.146	-0.200	0.704*	-0.340
Tmin	0.537*	0.160	0.574	-0.067	-0.175	-0.653*	0.476	-0.179
VP_M	0.518*	0.087	0.500	0.019	-0.255	-0.688*	0.414	-0.104
VP_E	0.384	0.042	0.374	0.111	-0.405	-0.762**	0.312	-0.017
RH_M	-0.345	-0.038	-0.245	0.330	-0.139	0.274	-0.399	0.422
$RH\text{-}_E$	0.118	-0.092	0.080	0.912**	-0.671**	-0.586*	-0.564	0.906*
WS	0.109	-0.189	0.389	-0.087	-0.533*	-0.829**	0.149	-0.160
BSS	0.476	-0.228	0.090	-0.278	0.163	0.091	0.496	-0.384
EP	0.420	-0.136	0.414	-0.196	-0.164	-0.374	0.392	-0.289
Rainfall	-0.059	-0.377	0.829**	0.186	-0.552*	-0.454	0.282	0.219

D_1 (3^{rd} week of June); D_2 (1^{st} week of July); D_3 (2^{nd} week of July); D_4 (3^{rd} week of July)

of 15.72, 21.17 and 10.60 webs plant^{-1}. The incidence of *M. vitrata* was less under late sown condition, similar to that observed in case of *H. armigera* (Fig. 1). Sujithra and Chander (2014) reported that the incidence of *M. vitrata* infestation was maximum in late sown pigeonpea crop.

Correlation with weather parameters

***H. armigera*:** The correlations between weather parameters and larval population of *H. armigera* under different sowing dates (Table 1), revealed that the significant and positive association with Tmax (r = 0.626**), Tmin (r = 0.537*) and VPm (r = 0.518*) under early sown crops (D_1).None of the other weather parameters had significant association with the larval population under D_1 and D_2. Under D_3 sown crop only Tmax (r = 0.743*) and rainfall (r = 0.829**) had significant correlations. In late sown crop (D_4) significant and positive correlation (r = 0.912**) was observed with evening relative humidity (VP_E) (Table 1).

Borah and Dutta (2004) had also reported a positive and significant correlation of *H. armigera* larvae with the maximum and minimum temperatures.

***M. vitrata*:** The correlation between weather parameters and incidence of *M. vitrata* revealed that in early sown crop (D_1) RH_E (r = -0.671*), rainfall (r = -0.552*) and WS (r = -0.533*) showed significant and negative association with the *M. vitrata* web. Under second date of sowing most of the weather parameters had negative correlation, however, the significant were with wind speed (r = -0.829**), followed by VP_E (r = -0.762**), Tmin (r = -0.653*) and rainfall(r = -0.583*). Pest incidence in 3^{rd} and 4^{th} dates of sowing was significantly and directly associated with maximum temperature and relative humidity. *M. vitrata* web incidence showed differential response to weather parameters under different sowing environments.

Sahoo and Behera (2001) had reported a positive correlation between populations of *M. vitrata* and the minimum and maximum temperatures and relative humidity, whereas, population of pod borers was adversely affected by the intensity of rain fall. Kalola *et al*. (2017) also reported a negative association between pink bollworm catches in cotton growing area and minimum temperature in Gujarat.

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Received : July 2016 ; Accepted : May 2017