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Raushan Kumar
Department of Entomology, Birsa Agricultural University, Ranchi, Jharkhand, India

Binay Kumar
Department of Entomology, Birsa Agricultural University, Ranchi, Jharkhand, India

P Kumari
Department of Agrometeorology and Environmental Science, Birsa Agricultural University, Ranchi, Jharkhand, India

PK Singh
Department of Entomology, Birsa Agricultural University, Ranchi, Jharkhand, India

HC Lal
Department of Plant Pathology, Birsa Agricultural University, Ranchi, Jharkhand, India

Niraj Kumar
Department of Genetics and Plant Breeding, Birsa Agricultural University, Ranchi, Jharkhand, India

Corresponding Author:
Raushan Kumar
Department of Entomology, Birsa Agricultural University, Ranchi, Jharkhand, India

Effect of meteorological parameters on population dynamics of pod borer complex in pigeonpea

Raushan Kumar, Binay Kumar, P Kumari, PK Singh, HC Lal and Niraj Kumar

Abstract
Pigeonpea (*Cajanus cajan*) (L.) Millsp. is a tropical and subtropical species. Weather and pod borer complex is very important in the realization of potential yield. The present study was conducted during *kharif* 2020-21, at the Agriculture Research Farm of Birsa Agricultural University, Ranchi, Jharkhand.
The correlation coefficient revealed that maximum temperature (r=-0.72**), minimum temperature (r=-0.80**) and mean temperature (r=-0.76**) influenced the population of pod borer complex negatively, while the other abiotic factors were non-significant, with the exception of relative humidity at 7 am (r= 0.31), mean RH (r= 0.71) and HTI (r= 0.69 **), which showed a positive correlation with pod borer larval populations. Population dynamics of pod borer complex revealed that peak of the larval population was found on 1st standard week.

Keywords: Meteorological parameter, population dynamics, pod borer complex and pigeonpea

Introduction
India is a major Pigeonpea producer in the world which occupies an area of 42.3 lakh ha and production is about 38.9 lakh tones, with a productivity of 919 kg/ha. In Jharkhand it is cultivated in an area of 2.32 lakh ha and production is about 2.36 lakh tones with productivity of 1017 kg/ha (Anonymous, 2019) [1].
Inspite of having huge production, the productivity of pigeonpea is challenged by several factors. Insect pest damage constitutes one of the serious limiting factors in pigeonpea production (Ready *et al*., 2001) [3] and causes loss to the tune of 28 per cent, when completely exposed to pests (Rangaiah and Sehgal, 1984) [2]. The pod borer complex involved lepidopteran borer's *viz*., *Helicoverpa armigera* and *Exelastis atomosa* is attributed for the maximum economic injury in the pigeonpea (Singh and Yadav, 2005) [4].
The pest populations fluctuate according to the varying meteorological factors in different agro-climatic regions from year to year. Succession of insect pests and their population build-up on a crop needed to be studied continually. Such studies are very limited and no such report for Pigeonpea, especially in Jharkhand, is available. Therefore, the present study was carried out with following objectives:

1. To study the population dynamics of Pod borer complex.
2. To study the correlation between weather variables and larval density of pod borers.

Methodology
The present investigation was carried out during *Kharif* season of 2020-21 in the Agriculture Research Farm of Birsa Agricultural University Kanke, Ranchi. The Pigeonpea genotypes BAUPP 16-38, Birsa arhar-1, JKM-189, medium duration genotypes with indeterminate type growth was sown. The meteorological data were obtained from the meteorological observatory of the Department of Agro-Meteorology and Environmental Science, Birsa Agricultural University, Ranchi. Weekly observations of the larval populations of several pod borers, such as *H. armigera, M. testulalis* and *E. atomosa* were used to record pests of pigeonpea. The data were recorded on ten randomly tagged plants per plot using plant inspection method (PIM). The data on temperature, humidity and rainfall from 44th standard week, 2019 to 3rd standard week, 2020 were collected and finally correlation analysis with different species of pod borers and pod borer complex as well was done to know the correlation between weather variables and incidence of pod borers in Pigeonpea.

Results and Discussion

From the 44th to the 1st meteorological weeks of the crop season, the pod borer complex population in pigeonpea ranged from 16.5 to 47.9 larvae/10 plants. In the first meteorological week, the peak population of pod borer complex reached 47.9 larvae/10 plants, when the highest temperature, minimum temperature, RH 7am, RH 2pm, rainfall, mean RH, and mean temperature were 25.1 °C, 9.1 °C, 85.9%, 68.0%, 0.0 mm, 76.95%, and 17.1 °C, respectively (Table 1). The correlation coefficient revealed that maximum temperature (r=-0.72**), minimum temperature (r=-0.80**) and mean temperature (r=-0.76**) influenced the population of pod borer complex negatively, while the other abiotic factors were non-significant, with the exception of relative humidity at 7am, mean RH and HTI, which showed a positive correlation with pod borer larval populations (Table 2).

According to the findings, pod borers began to increase gradually from the 44th SMW and attained in population by late December, i.e. the 1st SMW (fig1). From the 1st to the 2nd SMW, a comparable drop in pest population was observed. The larval population fell as the HTI decreased, indicating that pod borers' growth and development are influenced by temperature and relative humidity. The HTI and larval population correlation analysis had a substantial positive association (r= 0.69**). This shows that, among the several meteorological criteria, the HTI index is important for regulating pod borer complex population dynamics in pigeonpea under field circumstances and creating pesticide spray schedules for timely pest management decisions.

When all three pod borer species were considered combined, forming the pod borer complex, there was a highly significant (at 1 per cent) and negative connection with the maximum and minimum temperature. Except for rainfall and HTI, which exhibited a positive link with pod borers, the remainder of the abiotic components were non-significant. Rathore *et al.* (2017) [5] revealed that the majority of pod borers had a negative connection with meteorological variables, which validated the current study. Meena and Bhatia (2014) [6] found that the larval population of pod borers showed a substantial negative connection with temperatures, which was comparable to the findings of our study.

Table 1: Seasonal abundance of pod borer complex on Pigeonpea during *kharif*, (2020-21)

Standard meteorological week	Mean larval population per 10 plants				Weather parameters								
	H. armigera	*M. Testulalis*	*E. atomosa*	Pod Borer Complex	Temp. (^{0}C) max.	Temp. (°C) min.	RH. % 7am	RH. % 2 am	S.S. (hr)	Rainfall (mm)	Mean RH.	Mean Temp.	HTI
43	11.6	7.3	0.3	19.2	28.8	17.9	83.4	68.4	61.9	0.0	75.9	23.35	3.25
44	10.2	6.3	0.0	16.5	30.0	18.7	86.0	69.6	63.5	0.0	77.8	24.35	3.19
45	13.1	7.9	1.8	22.8	28.6	13.7	84.6	69.3	61.9	0.0	76.95	21.15	3.63
46	16.2	10.1	4.2	30.5	30.7	19.4	86.3	67.6	59.9	0.0	76.95	25.05	3.07
47	14.7	9.2	3.9	27.8	27.6	16.1	85.6	68.4	49.3	10.0	77.0	21.85	3.52
48	16.9	12.7	6.1	35.5	25.4	7.2	85.7	68.6	42.8	0.0	77.15	16.3	4.73
49	18.1	13.2	5.7	37.0	26.1	6.7	85.4	68.4	65.7	0.0	76.9	16.4	4.68
50	20.9	13.9	8.2	43.0	27.0	7.9	84.1	68.0	34.3	0.0	76.05	17.45	4.35
51	21.6	14.3	7.3	43.2	20.8	3.6	85.3	67.9	50.4	0.0	76.6	12.2	6.27
52	22.3	14.7	9.1	46.1	20.3	4.1	86.3	69.0	65.9	0.0	77.65	17.2	4.51
1	24.0	15.2	8.7	47.9	25.1	9.1	85.9	68.0	58.8	0.0	76.95	17.1	4.50
2	23.7	12.3	6.7	42.7	27.3	12.3	85.9	69.3	55.4	0.0	77.6	19.8	3.91

HTI-Humid thermal index=Mean RH/Mean T, mm= millimeter, Temp- Temperature, RH- Relative humidity, SS- Sunshine hours, *H. armigera- Helicoverpa armigera, M. testulalis- Maruca testulalis, E. atomosa- Exelastis atomosa*

Table 2: Correlation co-efficient between weather variables and the larval population of different species of pod borer in Pigeonpea

Pod borer species	Weather variables								
	Temp. Max	Temp. min	RH.% 7am	RH. % 2am	S.S. (hr)	Rain (mm)	Mean RH.	Mean Temp.	HTI
H. armigera	-0.66*	-0.72**	0.32	-0.30	-0.24	-0.20	0.084	-0.69*	0.63*
M. testulalis	-0.76**	-0.87**	0.27	-0.42	-0.30	-0.22	-0.017	-0.83**	0.77**
E. atomosa	-0.73**	-0.81**	0.33	-0.37	-0.35	-0.13	-0.054	-0.75**	0.67*
Pod Borer Complex	-0.72**	-0.80**	0.31	-0.36	-0.29	-0.19	0.047	-0.76	0.69*

*****Significant at P 5%, **Significant at P 1% , HTI-Humid thermal index=Mean RH/Mean T, mm= millimeter, Temp- Temperature, RH- Relative humidity, SS- Sunshine hours, *H. armigera- Helicoverpa armigera, M. testulalis- Maruca testulalis, E. atomosa- Exelastis atomosa*

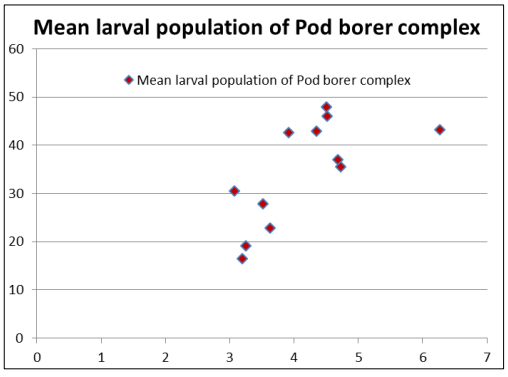

Fig 1: Relationship between Mean larval population of Pod borer complex and Humid thermal index

Conclusion

On the basis of findings of present investigation, the following conclusion is drawn, the larval population decreased when the HTI was in decreasing trend and it shows that growth and development of pod borers is dependent on temperature and relative humidity. The correlation analysis between HTI and larval population revealed a significant positive correlation (r= 0.720**). This suggests that, among the different weather parameters, HTI index plays a vital role in regulating population dynamics of pod borer complex in pigeonpea under field conditions and in formulating insecticide spray schedules for timely pest management decisions.

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References

1. Anonymous. Annual report of all India co-ordinated research on pigeionpea (2020-21), IIPR Kalayanpur, Kanpur; c2019.
2. Rangaiah P, Sehgal VK. Insect of T-21 pigeonpea and losses caused by them at Pantnagar, Northen India. International Pigeonpea Newsletter. 1984;3:40-43.
3. Reddy CN, Singh Y, Singh VS. Influence of abiotic factors on the major insect pests of pigeonpea. Indian Journal of Entomology. 2001;63(3):211-214.
4. Singh SS, Yadav SK. Bioefficacy of modern insecticides, biopesticides and their combination against pod borers in pigeonpea. Indian Journal of Entomology. 2005;67(2):133-136.
5. Rathore H, Vyas A, Ahir K, Saini A, Kumar P. Population dynamics of major insect pests and their correlation with weather parameters pigeonpea. The Bioscan. 2017;12(1):01-04.
6. Meena BS, Bhatia KN. Effect of weather parameters on population dynamics of gram pod borer (*Helicoverpa armigera*) in North West Plain Zone of Rajasthan. Journal of Agrometeorology. 2014;16(2):233.