www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(10): 696-699

www.thepharmajournal.com
Received: 17-08-2021
Accepted: 21-09-2021

Vijay Pal Meena
Department of Entomology, Sri Karan Narendra College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

SK Khinchi
Department of Entomology, Sri Karan Narendra College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

KC Kumawat
Department of Entomology, Sri Karan Narendra College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

Suresh Choudhary
Department of Entomology, Sri Karan Narendra College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

Corresponding Author
Vijay Pal Meena
Department of Entomology, Sri Karan Narendra College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

Seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) and spotted pod borer, *Maruca testulalis* (Geyer) on greengram in relation to weather parameters

Vijay Pal Meena, SK Khinchi, KC Kumawat and Suresh Choudhary

Abstract
A field experiment was conducted to seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) and spotted pod borer, *Maruca testulalis* (Geyer) on greengram variety of IPM-02-03. The initial population of gram pod borer and spotted pod borer were 0.50 larvae/ 10 plants and 0.66 larvae/10 plants, respectively. The population gradually increased and reached the peak population was 8.50 larvae/ 10 plants and 9.66 larvae/ten plants, respectively in 36th standard meteorological week, when the minimum, maximum temperature and relative humidity was 22.9 ^{0}C, 30.5 ^{0}C and 81.00 per cent, respectively. The correlation coefficient worked out that the infestation of gram pod borer and spotted pod borer on greengram crop showed that the negatively significant correlation with maximum temperature (r = -0.79 and -0.78), respectively. The population of spotted pod borer showed positive significant correlation with relative humidity (r = 0.71). The population of both insects showed non-significant correlation with minimum temperature, and rainfall at 5 per cent level of significance.

Keywords: Greengram, *Helicoverpa armigera*, *Maruca testulalis* and seasonal incidence

Introduction
Greengram *Vigna radiata* (L.) Wilczek (family: Leguminosae) is one of the most important *Kharif* pulse crop grown in Rajasthan. It is cultivated across seasons in different environments and in variable soil conditions in the South and South-East Asia, Africa, South America and Australia (Parihar *et al.* 2017) [12]. It is one of the most widely cultivated pulse crop after chickpea and pigeonpea (Ved *et al.* 2008, Swaminathan *et al*., 2012) [23, 19]. In India, during 2018-19 the total area and production of pulses is 29.03 million hectares, 23.39 million tonnes but greengram occupied 47.56 thousand hectares, 2339.75 thousand tones. In Rajasthan, the total area and production of pulses is 5.90 million hectares, 3.67 million tonnes but greengram occupied 2466.21 thousand hectares, 1220.29 thousand tonnes (Anonymous 2018-19) [2]. India is the largest producer and consumer of greengram in the world which accounts about 10-12 per cent of the total pulse production in the country. The major producing states in India being Andhra Pradesh, Orissa, Maharashtra, Madhya Pradesh and Rajasthan accounting for about 70 per cent of total production. In Rajasthan the major greengram growing districts are Jaipur, Sikar, Jhunjhunu and Nagaur. It has the unique ability to fix atmospheric nitrogen (58-109 kg/ha) in symbiotic association with *Rhizobium* bacteria, which not only enables it to meet its own nitrogen requirement but also benefits the succeeding crops (Ali, 1992) [1]. It is used as a green manure crop. It is also used as cattle feed along with roughage crops.

The area under greengram has increased in the last two decades mainly because of the availability of short duration cultivars but multitude of pest still creating bottleneck in higher productivity due to infestation from germination to maturity of the crop. The insect pests execising heavy toll of greengram crop include pod borer complex *viz*, gram pod borer, *Helicoverpa armigera* (Hubner), blue butter fly, *Lampides boeticus* L., spotted pod borer, *Maruca testulalis* (Geyer), pod bug, *Riptortus spp*. are major pests of greengram (Sundararajan and Chitra 2017) [18]. The effect of weather parameters on the incidence of insect pests provide suitable know how about the friendly weather conditions for development of insect pests, thus immensely helpful in formulating the management strategy against them (Tamang *et al*. 2017) [20]. Gram pod borer, *H. armigera* is a polyphagous pest of sporadic nature and inflicts losses of various magnitudes to cotton, pigeonpea, sorghum and other crops of economic importance. It is widely distributed throughout India and has been recorded feeding on 181 cultivated and

uncultivated plant species belonging to 45 families (Manjunath *et al*. 1989) [8]. Gram pod borer, *H. armigera* is one of the most devastating crop pest worldwide (Sigsgaard *et al*., 2002) [17]. Sixty cultivated and sixty-seven wild host plants attacked by *H. armigera* have been recorded from India (Karim, 2000) [7]. Spotted pod borer, *M. testulalis* is the most formidable and potential pest cause extensive damage to greengram under field conditions. The low yield of greengram is attributed to the regular outbreaks of spotted pod borer, because of its extensive host range and destructiveness, it became a persistent pest in greengram. It is reported that 20–30 per cent pod damage in greengram is caused due to spotted pod borer (Zahid *et al*., 2008) [25] and most damaging pest during flower bud and also the post flowering stage (Nair, 1986 [11] and Yadav and Yadav, 1983) [24], Atachi and Djihou 1994) [3]. The study aimed in order to find out the correlation of gram pod borer, *H. armigera* and spotted pod borer, *M. testulalis* in greengram ecosystem with the weather parameters. Suitable understanding of the seasonal incidence of gram pod borer and spotted pod borer pests is important due to variation in weather conditions and changing pod borer complex scenario on the greengram crop.

Materials and Methods

The experiment was conducted at Agronomy Farm, S.K.N. College of Agriculture, Jobner (Rajasthan) on greengram crop during *Kharif*, 2018. The greengram of variety IPM-02-03 were sown in separate plots of 3 m x 2.5 m size, keeping row to row and plant to plant distance of 30 cm and 10 cm, respectively. The observations on population of pod borers *H. armigera* and *M. testulalis* on ten plants per plot were randomly selected and tagged. The larval population was recorded at weekly interval on ten tagged plants from the beginning of incidence till harvesting of the crop. The simple correlation was work out between computed between pod borers *H. armigera* and *M. testulalis* and abiotic factors *viz*., maximum and minimum temperature, relative humidity and rainfall.

The following formula was used for calculating correlation coefficient:

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{N\sum x^2 - (\sum x)^2 . N\sum y^2 - (\sum y)^2}}$$

Where,
r = Simple correlation coefficient
x = Independent variables *i.e.* abiotic components
y = Dependent variables *i.e.* pests
N = Number of observations

The observation on population of pod borers were recorded soon after their appearance. All the observations were recorded early in the morning.

Result and Discussion

Gram Pod borer, *H. armigera*

It is evident from Table- 1 that the population of gram pod borer, *H. armigera* appeared in the 31st standard meteorological week (0.50 larvae/ ten plants). The population gradually increased and reached the peak (8.50 larvae/ ten plants) in 36th standard meteorological week when the minimum temperature, maximum temperature and relative humidity was 22.9^0 C, 30.5^0 C and 81 per cent, respectively. Thereafter the population gradually declined. Umbarkar *et al*. (2010) [21] observed the population of gram pod borer, *H. armigera* started appearing at pod formation stage of the crop with population density of 0.34 larvae per plant during 31st standard meteorological week and the pest population increased fast during succeeding week, and peak density was 3.42 larva/ plants in 36th standard meteorological week. After reaching the peak, the gram pod borer population declined rapidly with the maturity of the greengram, which partially corroborates with the present findings. The present finding also get support from the finding of Varini (2000) [22] who observed the gram pod borer on blackgram from 6th week after sowing and the highest population was found during 10th week after sowing. Kanhere *et al*. (2013) [6] recorded data on the seasonal incidence of *H. armigera* and showed that appearance of larvae commenced after 37th day after sowing. Rathore *et al*. (2017) [14] also observed the *H. armigera* appearing 32nd standard meteorological week on pigeonpea crop, who reported the similar activities of the gram pod borer, *H. armigera*. The correlation coefficient worked out revealed that the gram pod borer infestation greengram crop showed negative significant correlation with maximum temperature (r = -0.79) and negative non-significant correlation with minimum temperature (-0.28) and positive non-significant correlation with relative humidity (r = 68) and rainfall (r = 0.51). Jakhar *et al*. (2016) [5] observed that the maximum temperature had negative significant correlation in four years and also found non-significant correlation with minimum temperature, relative humidity and rainfall supported that non-significant correlation with minimum temperature, relative humidity and rainfall at 5 per cent level of significance.

Spotted pod borer, *M. testulalis*

The population of spotted pod borer, *M. testulalis* appeared in the 31st standard meteorological week (0.66 larvae/ ten plants). The population gradually increased and reached the peak (9.66 larvae/ ten plants) in 36thstandard meteorological week when the minimum temperature, maximum temperature and relative humidity was 22.9^0 C, 30.5^0 C and 81 per cent, respectively. The population of spotted pod borer, *M. testulalis* started appearing at pod formation stage of the crop with population density of 0.75 larvae per plant during 32nd standard meteorological week and the pest population increased fast during succeeding week, and peak density was 3.81 larva/ plants in 34th Standard Meteorological Week (Umbarkar *et al*., 2010) [21]. After reaching the peak, the spotted pod borer population declined rapidly with the maturity of the greengram. Similar trend of pest population was also recorded by Saxena *et al*. (1984) [16], Pithava (1996) [13], Varini (2000) [22] and Hinsu (2005) [4] in *kharif* season of various pulse crops. The correlation coefficient was worked out between mean gram spotted pod borer, *M. testulalis* population and weather parameters, *viz*., maximum and minimum temperature, relative humidity and rainfall. The correlation coefficient worked out revealed that the spotted pod borer, infestation on greengram crop showed negative significant correlation with maximum temperature, (r = -0.78), negative non-significant correlation with minimum temperature (-0.22) and positive significant correlation with relative humidity (r= 0.71). Meragana Sreekanth *et al* (2015) [9] and Tamang *et al*. (2017) [20], Reddy *et al*. (2017) [15] supported that the maximum temperature had negative significant correlation in both years (r = -0.46) and (r= -0.34) and also observed that the positive significant correlation with relative humidity (r= 0.129).

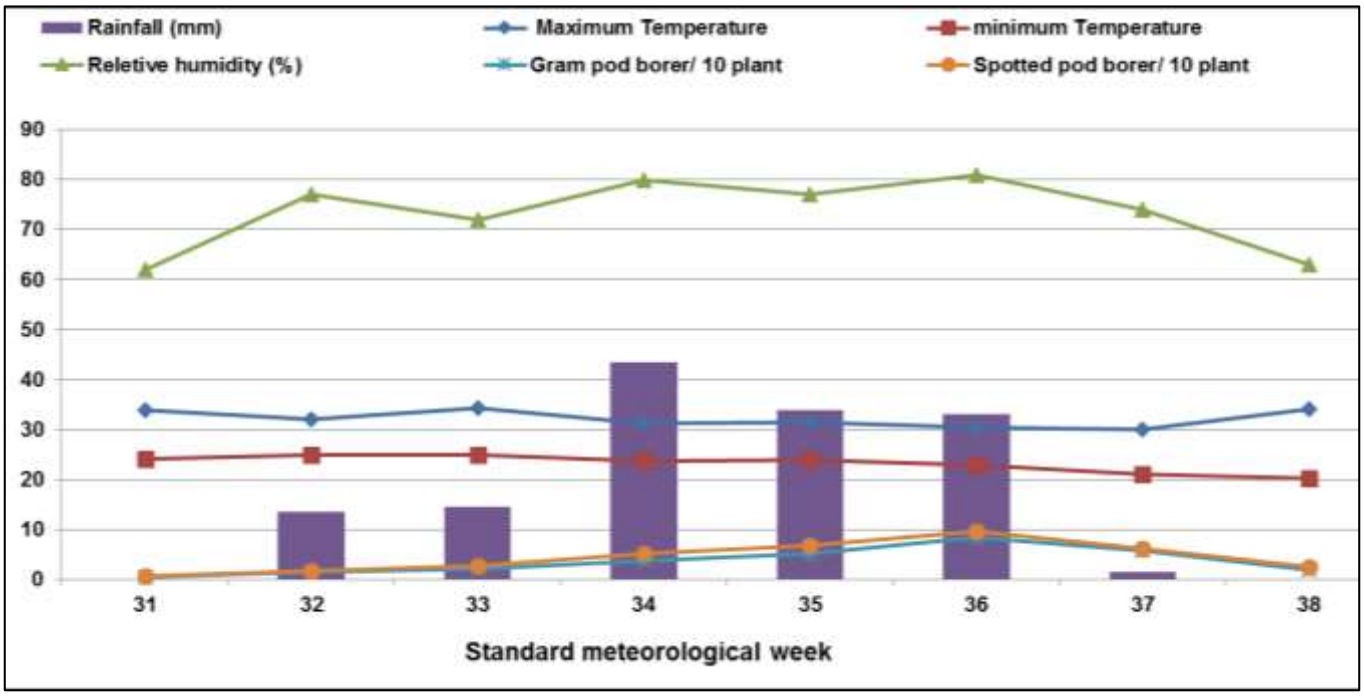

Fig 1: Seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) and spotted, *Maruca testulalis* (Geyer) on green gram

Table 1: Seasonal incidence of *Helicoverpa armigera* (Hubner) and *Maruca testulalis* (Geyer) on greengram during *kharif* season.

S. No.	SMW	Date of observation	Temperature (°C)		Relative humidity (%)	Rainfall (mm)	Mean larval population/ ten plants	
			Maximum	Minimum			*H. armigera*	*M. testulalis*
1	31	5.08.2018	34.0	24.2	62	00.0	0.50	0.66
2	32	12.08.2018	32.8	24.9	77	13.6	1.50	1.83
3	33	19.08.2018	34.4	24.9	72	14.6	2.16	2.66
4	34	26.08.2018	31.2	23.8	80	43.4	3.83	5.16
5	35	02.09.2018	31.5	24.0	77	34.0	5.16	6.83
6	36	09.09.2018	30.5	22.9	81	33.0	8.50	9.66
7	37	16.09.2018	30.0	21.0	74	01.6	5.83	6.16
8	38	23.09.2018	34.2	20.2	63	00.0	2.0	2.5
Maximum temperature							-0.79*	-0.78*
Minimum temperature							-0.28	-0.22
Relative humidity							0.68	0.71*
Rain fall							0.51	0.62

*Significant at 5% level

Conclusion

The population of gram pod borer, *H. armigera* and spotted pod borer, *M. testulalis* showed that the negative significant correlation with maximum temperature, while non-significant correlation with minimum temperature and rainfall. The population of spotted pod borer, *M. testulalis* showed positive significant correlation with relative humidity.

Acknowledgement

The authors are highly thankful to Dean, Sri Karan Narendra College of Agriculture, Jobner, Rajasthan for providing the facilities.

References

1. Ali M. Weeds are great threat to kharif pulses. Indian Farming 1992;42:29-30.
2. Anonymous. Government of India, Ministry of Agriculture and Farmer Welfare. Department of Agriculture, Cooperation and Farmer Welfare. Directorate of Economic and Statistics. Agriculture statistics at a Glance 2018.
3. Atachi P, Djihou ZC. Record of host plants of *Maruca testulalis* (Geyer) (Lepidoptera: Pyralidae) in the republic of Benin. Annales dela Society Entomologique de France 1994;30:169-174.
4. Hinsu MK. M.Sc. (Agri.) Thesis, Junagadh Agriculture University, Junagadh 2005, 108.
5. Jakhar BL, Singh N, Venilla S, Patel MH, Vekaria MV, Patel DB. Panickar B. Influence of climate change on *Helicoverpa armigera* (Hubner) in pigeonpea. Journal of Agriculture and Ecology 2016;2:25-31.
6. Kanhere RD, Patel VN, Umbarkar PS. Kakde AM. Impact of weather parameters on population of pod borer, *H. armigera* (Hubner) infesting cowpea. Insect Environment 2013;19(2):96-97.
7. Karim S. Management of Helicoverpa armigera. Pakistan Journal of Biological Science 2000;3:1213-1222.
8. Manjunath TM, Bhatnagar VS, Panwar CS. and Sithananthan S. Economic Importance of *H. armigera* in india and assessment of their natural enemies and host plant 1989, 197-228.
9. Meragana S, Mekala R, Movva S, Koteswara Y, Edara N. Population build-up and seasonal abundance of spotted pod borer, *Maruca vitrata* (Geyer) on pigeonpea

(*Cajanus cajan* (L) Millsp.) Journal of Applied Biology & Biotechnology 2015;3(04):043-045.
10. Mogotsi KK, Brink M, Belay G. *Vigna radiata* (L.) Wilczek. (Eds) Record from Protabase. PROTA 1 (Plant Resources of Tropical Africa): Cereals and pulses, Wageningen, Netherlands. http://database.prota.org/search.htm 2006.
11. Nair MRGK. Insects and Mites of Crops in India. I.C.A.R., New Delhi 1986, 48-69.
12. Parihar AK, Basandrai AK, Sirari A, Dinakaran D, Singh D, Kannan K. Assessment of mungbean genotypes for durable resistance to Yellow Mosaic Disease: Genotype × Environment interactions. Plant Breed. 2017;36:94-100. Doi: 10.1111/pbr.12446.
13. Pithava BB. M.Sc. (Agri.) Thesis, Gujarat Agriculture University, Sadar Krushinagar 1996, 88.
14. Rathore HK, Vyas AK, Ahir KC, Saini A, Kumar P. Population dynamics of major insect pests and their correlation with weather parameters in pigeonpea, (*Cajanus cajan* [L.]) Millsp). The Biosca 2017;12(1):01-04.
15. Reddy SS, Reddy CN, Rao AM, Reddy SN. Studies on Population Dynamics of Spotted Pod Borer *Maruca vitrata* in Dolichos Bean, *Lablab purpureus* (L). and their Relation with Abiotic Factors. International Journal of Pure Applied Bioscience 2017;5(4):1232-1239.
16. Saxena AK. Blackgram in South Coastal Region of Orissa with notes on their seasonal activity. Indian Journal of Plant Protection 1984;12:25-29.
17. Sigsgaard L, Greenstone MH, Duffield SJ. Egg cannibalism in *Helicoverpa armigeraon* sorghum and pigeon pea. Biological Control 2002;47:151-165.
18. Soundararajan RP, Chitra N. Field evaluation of mungbean *Vigna radiata* L. germplasm for resistance against pod borer complex. Legume Research 2017;40(4):768-772.
19. Swaminathan R, Singh K, Nepalia V. Insect pests of greengram (*Vigna radiata* (L.) Wilczek) and their management. Agricultural Science. Godwin Aflakpui (Ed.), Tech Publications, Croatia 2012, 197-222.
20. Tamang S, Venkatarao P, Moulita C, Chakraborty G. Population dynamics of major insect pests of mung bean (*Vigna radiata* L.) and correlation with abiotic factors under terai agromatic zone of west Bengal. The Biascan 2017;12(2):893-897.
21. Umbarkar PS, Parsana GJ, Jethva DM. Seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) on green gram. Legume Research 2010;33:148-149.
22. Varini VR. Ph.D. Thesis, Gujarat Agriculture University, Sadar Krushinagar 2000, 183.
23. Ved R, Massod A, Misra SK, Upadhyay RM. Studies on sulphur, zinc and bio fertilizers on yield and yield attributes and nutrient content at different growth stages of mungbean. Journal of Food Legumes 2008;21(4):240-242.
24. Yadav LS, Yadav PR. Pest complex of cowpea (*Vigna sinensis* Savi) in Haryana Bulletin of Entomology 1983;24:57-58.
25. Zahid MA, Islam MM, Begum MR. Determination of economic injury levels of *Maruca vitrata* in Greengram. Journal of Agricultural Rural Development 2008;6(1-2):91-97.