Biological Forum – An International Journal **15(10): 1698-1701(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Seasonal Incidence of Major Insect Pests of Green gram in relation to Biotic and Abiotic factors in North Western Plain Zone of Rajasthan

Devendra Saini[1*], Roop Singh Meena[2], Udai Pal Singh[1], Sudhir Pratap Singh[3] and Ashok Sakharam Chandar[4]
[1]Department of Entomology, SKRAU, Bikaner (Rajasthan), India.
[2]Assistant Professor, Department of Entomology, SKRAU, Bikaner (Rajasthan), India.
[3]Department of Entomology, SHUATS, Prayagraj (Uttar Pradesh), India.

(Corresponding author: Devendra Saini)*
(Received: 21 July 2023; Revised: 19 August 2023; Accepted: 20 September 2023; Published: 15 October 2023)
(Published by Research Trend)

ABSTRACT: The investigation on "Seasonal incidence of major insect pests of green gram in relation to biotic and abiotic factors in North Western Plain Zone of Rajasthan'' was carried out at Agricultural Research Station, Sriganganagar during *Kharif*-2022. Whitefly and thrips were appeared soon after crop germination (second week of August) of crop. The peak population of whitefly with 63.78 whiteflies/ 3 trifoliate leaves was recorded in the fourth week of August. While, thrips attained their peak in third week of August with 14.57 thrips/ 3 trifoliate leaves. The maximum population of spotted pod borer i.e. 3.40 larvae/ 5 plant with heights pod damage 33.80 per cent was observed in second week of September. The minimum temperature and minimum-maximum relative humidity had positive correlation with whitefly and thrips population, whereas maximum temperature had negative correlation with thrips and whitefly. The total rainfall exhibited negative influence on whitefly and positive on thrips population. The spotted pod borer population and per cent pod damage had negative correlation with minimum temperature, minimum maximum relative humidity and total rainfall and positive with maximum temperature, respectively. The activity of green lacewing, *Chrysoperla carnea* Step., started with the infestation of whitefly and thrips in third week of August (33rd standard meteorological week). The *Chrysoperla carnea* Step., *Cheilomenes sexmaculata* Fab. and spider were major natural enemies of insect pest on crop and became active with the appearance of insect pest. The natural enemies' population had positive correlation with minimum-maximum temperature, relative maximum humidity and pest population and negative minimum relative humidity and total rainfall.

Keywords: Seasonal, correlation, infestation, natural enemies.

INTRODUCTION

Grain legumes are protein and energy rich dry seeds which are called pulses belonging to family *Fabaceae* (*Leguminosae*). Among the pulses, green gram [*Vigna radiata* (L.) Wilczek] or mung bean is an important pulse crop due to its adaptability in diverse agro-ecological nitches. Mung bean is cheap source of plant-based nutritious proteins, vitamins and minerals. It is used as fresh green pods, dry seeds as vegetables due to presence of protein, vitamin and mineral (Das *et al*., 2014). India is the largest producer of mung bean and account 54% of the world production and covers 65% of the world acreage. Various factors have been affected the mung bean production like adverse climate, poor quality water, seeds, diseases, insects pests and others. The losses due to insect and non-insect pests to pulses are one of the major single factor responsible for low yields. Mung is attacked by 64 different species of insect pests (Nair, 1986) and of these 25 species cause enormous loss at different stages of crop growth (Lal, 1985) in India. The economically important insect pests are aphid, (*Aphis craccivora* C.L. koch), jassid (*Empoasca motti* Pruthi), thrips (*Caliothrips indicus* Bagnall), whitefly (*Bemisia tabaci* Genn.), semilooper (*Plusia orichalcea* Fab.), Blue butterflies (*Lampides boeticus; Catochrysops* spp), cutworm (*Agrotis ipsilon*), galerucid beetle (*Madurasia obscurella* Jacoby), tortricid moth (*Cydiapty chora* Meyr), spotted pod borer (*Maruca testulalis* Geyer), pod borer (*Helicoverpa armigera* Hubner), tobacco caterpillar (*Spodoptera litura* J.C Fabricius), Bihar hairy caterpillar (*Spliosoma obliqua* walker), Red hairy caterpillar (*Amsacta moorei* Butler), stem fly (*Ophiomyia phaseoli* Tryon.), Pod bug (*Claivgralla gibbose*) and green bug (*Nezara viridula* Linn.) (Kumar *et al*., 2004; Nitharwal*et al*., 2013). It attacks the crop right from the pre flowering to pod maturing stage causing huge yield loss. Sucking pests *viz*; black aphid, *Aphis craccivora* Koch, leaf hopper, *Empoasca kerri* Pruthi, whitefly, *Bemisia tabaci*, thrips, *Megaleuro thrips distalis* Karny attack on mung bean caused yield loss. Similarly due to the insect pests infestation 30 per cent yield losses reported in green gram (Soundararajan *et al.*, 2011) and urd bean and green gram (Gailce *et al*., 2015). Whereas, Duraimurugan and Tyagi (2014)

recorded 32.97 percent yield losses due to insect pest on mung bean. Keeping all these facts in view, present investigation entitled "Studies on Major Insect-Pests of Green gram [*Vigna radiata* (L.) Wilczek] in North Region of Rajasthan" was conducted with the objectives to study major insect pests of green gram in relation to biotic and abiotic factors.

METHOD AND MATERIAL

The experiment was conducted at Agricultural Research Station, Sriganganagar (Swami Keshwanand Rajasthan Agricultural University, Bikaner) during *Kharif*-2022. The field was laid out in randomized block design having plot size 4.0 m × 3.0 m (12.0 sq. m.) for each replication. The seed of variety "MH-421" was sown in the field on 20 July 2022 using 16 kg seed per hectare maintaining row to row and plant to plant spacing 30 cm and 10cm, respectively.

Seasonal incidence study was conducted on insect pests of green gram by counting the population of insect pests on five randomly selected and tagged plants in three plots each measuring 6m × 6m. Population of whiteflies (*Bemisia tabaci* Genn.), thrips (*Calothrips indicus* Bag.) and spotted pod borer (*Maruca testulalis* Geyer) were recorded at weekly intervals.

1. Whitefly (*Bemisia tabaci* Genn.). Three trifoliate leaves on each from the upper, middle and lower position of each of tagged plant were selected randomly and population was recorded. The base of leaf was held between finger and thumb and twisted gently nymphs and adults were counted quickly and carefully with least disturbance.

2. Thrips (*Calothrips indicus* Bag.). The nymphs and adults were counted from upper, middle and bottom trifoliate leaves of selected plants. The population of nymphs and adults were counted by holding the base of leaves and twisted gently, with least disturbance.

3. Spotted pod borer (*Maruca testulalis* Geyer). To work out per cent pod damage 50 pods were picked randomly from tagged plants, at weekly interval examined 19 critically for per cent damage of pod based on number of damaged pods out of total number of pods.

RESULT

1. **Whitefly (*Bemisia tabaci* Genn.).** The data on whitefly presented in Table 2 revealed that the incidence of whitefly commenced in the second week of August (32nd meteorological week). Number of whitefly increased with the crop growth and touched its peak (63.78 whiteflies/ 3 trifoliate leaves) in the fourth week of August (34th meteorological week), when the prevailing maximum-minimum temperature, maximum-minimum relative humidity and rainfall were 34.37ºC, 27.09ºC, 82.71%, 62.57% and 5.50 mm, respectively (Table-1). Thereafter, the population gradually decreased. The correlation and regression coefficient between meteorological factors and pest population revealed that the correlation between maximum temperature (r = -0.460) and whitefly population was negative and non significant, whereas, it's positive and non-significant with minimum temperature (r = 0.267). However, the relative maximum humidity (r = 0.743) showed positive and significant influence on pest population, minimum relative humidity (r = 0.426) exhibited positive and non significant correlation with whitefly population. The rainfall (r = -0.096) was negative and non-significantly correlated with pest population (Table 3).

2. **Thrips (*Calothrip sindicus* Bag.).** The data presented in Table 2 indicated that the population of thrips appeared in second week of August (32nd meteorological week) and disappeared in last week of September (39th meteorological week). Peak incidence of thrips (14.57 thrips/ 3 trifoliate leaves) was recorded during 33rd meteorological week, when maximum-minimum temperature, maximum-minimum relative humidity and rainfall were 33.43 ºC, 27.03 ºC, 79.57%, 64.14%, and 21.0 mm, respectively (Table 1). The thrips population had negative and significant correlation with maximum temperature (r= -0.535), while, its showed positive and non-significant correlation with minimum temperature (r = 0.283) and maximum relative humidity (r = 0.159).

Table 1: Mean weekly meteorological observations recorded during crop seasons, *Kharif* 2022.

SWM	Period	Temperature (ºC)		R.H.(%)		Rainfall(mm)/Week	R. Days
		Max.	Min.	8.30 hours	17.30 hours		
29	16.07.22 -22.07.22	35.84	25.57	73.00	69.71	15.30	01
30	23.07.22 -29.07.22	33.77	26.03	63.57	59.14	68.10	02
31	30.07.22 -05.08.22	33.70	25.40	83.71	72.71	30.80	03
32	06.08.22 -12.08.22	35.01	27.70	70.29	69.86	101.70	03
33	13.08.22 -19.08.22	33.43	27.03	79.57	64.14	21.00	02
34	20.08.22 -26.08.22	34.37	27.09	82.71	62.57	5.50	01
35	27.08.22 -02.09.22	37.03	26.87	79.29	51.57	0.00	00
36	03.09.22 -09.09.22	38.20	27.19	69.43	46.29	0.00	00
37	10.09.22 -16.09.22	35.31	27.47	75.86	58.86	27.00	01
38	17.09.22 -23.09.22	36.09	26.56	73.57	51.00	0.00	00
39	24.09.22 -30.09.22	33.71	24.44	79.71	58.86	2.50	00
40	01.10.22 -07.10.22	36.21	25.14	80.57	47.29	0.00	00

Table 2: Incidence of major insect pests of green gram during kharif-2022.

Sr. No.	Standard week	Whitefly/3leaves	Thrips/ 3leaves	Spotted pod borer/plant	Pod damage due to SPB	Natural enemies		
						Crysoperlla	*Coccinela*	Spider
1	32	34.27	9.53	0.00	0.00	0.00	0.00	0.00
2	33	57.23	14.57	0.00	0.00	0.80	0.00	1.40
3	34	63.78	5.67	0.60	0.00	1.40	0.60	1.60
4	35	45.33	4.33	1.80	15.80	1.20	0.20	1.80
5	36	31.11	2.44	2.80	24.60	0.60	0.40	1.40
6	37	43.33	1.89	3.40	33.80	0.80	0.00	1.20
7	38	26.76	3.00	2.60	31.40	0.40	0.20	0.80
8	39	32.87	2.89	2.20	29.80	0.20	0.00	0.20

Table 3: Correlation between key abiotic factors and insect pests of green gram during *kharif*-2022.

Insect pests	Relative humidity (%)			Temperature (ºC)			Rainfall (mm)
	Max.	Min.	Mean	Max.	Min.	Mean	
Whitefly	0.7426*	0.4265	0.6857*	-0.4600	0.2672	-0.2209	-0.0961
Thrips	0.1585	0.6639*	0.5901*	-0.5349*	0.2833	-0.2696	0.4593
Spotted pod borer	-0.2503	-0.7428*	-0.6951*	0.5280*	-0.2208	0.2932	-0.5106
Pod damage due to SPB	-0.2387	-0.6571	-0.6233	0.3686	-0.4101	0.0868	-0.4606
Crysoperlla	0.6366*	-0.1836	0.1623	0.0942	0.2688	0.1943	-0.5158
Coccinela	0.1503	-0.3633	-0.2095	0.3760	0.1909	0.3691	-0.4439
Spider	0.3844	-0.4328	-0.1514	0.3447	0.3545	0.4211	-0.5918

The minimum relative humidity (r = 0.664) had positive and significant influence on thrips population, whereas total rainfall (r = 0.459) exhibited negative and non-significant impact on pest population (Table 3).

3. **Spotted pod borer (*Maruca testulalis* Geyer).** The spotted pod borer, *Maruca testulalis* Geyer occurrence was recorded through the crop growth period from fourth week of August (34th meteorological week) to last week of September (39th meteorological week). The population gradually increased and touched its peak (3.40 larvae/ plant) during 37th standard week and after that started declining gradually. The maximum-minimum temperature, maximum-minimum relative humidity and rainfall were 35.31ºC, 27.47ºC, 75.86%, 58.86%, and 27.0 mm, respectively (Table 1). The spotted pod borer population had significant and positive correlated with maximum temperature (r = 0.528) and negative and non significant correlation with minimum temperature (r = - 0.221). The pod borer showed negative and non-significant correlation with maximum relative humidity (r= -0.250), while, it was significant and negatively correlated with minimum relative humidity (r = -0.743) and total rainfall (r = -0.511) exhibited negative and significant correlation with pest population (Table 3).

4. **Incidence of Spotted pod borer (per cent pod damage basis).** The Incidence of Spotted pod borer on crop in term of percent pod damage. During the season pod borer appeared with 15.80 per cent pod damage from 35th standard week to 39th standard week (last week of September). However, its maximum infestation was 33.80 per cent pod damage recoded during the second week of September (37th meteorological week). The maximum-minimum temperature, maximum-minimum relative humidity and rainfall were 35.31ºC, 27.47ºC, 75.86%, 58.86%, and 27.0 mm, respectively (Table 1). The infestation based on per cent pod damage had non-significant and positive correlated with maximum temperature (r = 0.369) and negative and non-significant correlation with minimum temperature (r = - 0.410). The per cent pod damage due to pod borer infestation exhibited non significant and negative correlation with maximum relative humidity (r= -0.239), while, it was significant and negatively with minimum relative humidity (r = -0.657). The total rainfall (r = -0.461) had negative and significant correlation with infested pod per cent (Table 3).

5. **Green lacewing (*Chrysoperla carnea* Step.).** The green lacewing, *Chrysoperla carnea* Step., appearance was commenced with the infestation of whitefly and thrips in third week of August (33rd meteorological week) and remained active up to crop maturity (39thmeteorological week). However, *Chrysoperla carnea* population increased with infestation of insect pest and touched its peak (1.40 *Chrysoperla* per 5 plant) in the fourth week of August (34th meteorological week), when the prevailing maximum-minimum temperature, maximum-minimum relative humidity and rainfall were 34.37ºC, 27.09ºC, 82.71%, 62.57%, and 5.50 mm, respectively (Table 1). Thereafter, the population gradually decreased. The correlation and regression coefficient between meteorological factors and *Chrysoperla* population revealed that the correlation between maximum temperature (r =0.094), minimum temperature (r = 0.269) and *Chrysoperla* population was positive and non-significant, whereas, relative maximum humidity (r = 0.637) showed positive and significant influence on *Chrysoperla* population, minimum relative humidity (r = 0.426) exhibited negative and non-significant correlation with *Chrysoperla* population. The rainfall (r = -0.516) was negative and significantly correlated with *Chrysoperla* and influence the insect pest population (Table 3).

6. Zigzag lady bird beetle (*Cheilomenes sexmaculata* Fab.). The observations (Table 2) showed that the *Cheilomenes sexmaculata* appeared in fourth week of August (34th meteorological week) with 0.60 *Cheilomenes* / 5 plant, thereafter gradually decreased, when maximum-minimum temperature, maximum-minimum relative humidity and rainfall were 34.37°C, 27.09°C, 82.71%, 62.57% and 5.50 mm, respectively (Table 1). The *Cheilomenes* showed positive and non-significant correlation with maximum temperature (r= -0.376), minimum temperature (r = 0.283), maximum relative humidity (r = 0.191). The correlation between *Cheilomenes* population, minimum relative humidity (r = -0.363) and rainfall (r = 0.444) was negative and non-significant. *Cheilomenes* positively influence the pest population (Table 3).

CONCLUSION

The peak incidence of whitefly was noticed in the fourth week of August and thrips attained their peak in third week of August. The whitefly and thrips population had positive correlated with all abiotic factors except maximum temperature, whereas rainfall negatively influenced the whitefly population. However, maximum incidence of spotted pod borer, *Maruca testulalis* Geyer with highest pod damage was observed in second week of September and negatively correlated with all abiotic factors except maximum temperature. The *Chrysoperla carnea* Step, *Cheilomenes sexmaculata* Fab and spider reported as major natural enemies of insect pest on crop and became active with the appearance of insect pest.

REFERENCES

Das, D., Chen, A. F. T., Martins, N., Schneider and Smith, N. A. (2014). Frame-semantic parsing. *Computational Linguistics*, *40*(1), 9-56.

Duraimurugan, P. and Tyagi, K. (2014). Pest spectra, succession and its yield losses in mungbean and urdbean under changing climatic scenario. *Legume Research*, *37*(2), 212-222.

Gailce, L. J. C., Anandhi, P. and Jawahar, D. (2015). Management of major insect pests of blackgram under dryland conditions. *Journal of Entomology and Zoology Studies*, *3*(1), 115-121.

Kumar, R., Razvi, S. M. S. and Ali, S. (2004). Seasonal and varietal variation in the population of whitefly (*Bemisia tabaci* Genn.) and 93 incidence of yellow mosaic virus in urd and mungbean. *Indian Journal of Entomology*, *66*(2), 155-15.

Lal, S. S. (1985). A review of insect pests of mungbean and their control in India. *Tropical Pest Management*, *31*(2), 105-114.

Nair, M. R. K. G. (1986). Insects and mites of crops in India. Indian Council of Agriculture Research, New Delhi, pp 47–69.

Nitharwal, M., Kumawat, K. C. and Choudhary, M. (2013). Population dynamics of insect pests of Green gram, *Vignaradiata* in semi-arid zone of Rajasthan. *Journal of Insect Science* (India), *26*(1), 90-92.

Soundararajan, R. P., Chitra, N. and Geetha, S. (2011). Host plant Resistance to insect pests of grain legumes. *Agriculture Reviews*, *34*(3), 176-187.

How to cite this article: Devendra Saini, Roop Singh Meena, Udai Pal Singh, Sudhir Pratap Singh and Ashok Sakharam Chandar (2023). Seasonal Incidence of Major Insect Pests of Green gram in relation to Biotic and Abiotic factors in North Western Plain Zone of Rajasthan. *Biological Forum – An International Journal, 15*(10): 1698-1701.