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SEASONAL ABUNDANCE OF MAJOR INSECT PESTS IN MUNGBEAN, *VIGNA RADIATA L.* AND THEIR CORRELATION WITH WEATHER PARAMETERS

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SUMMARY

This study investigated the seasonal incidence of major insect pests and their correlation with the weather parameters in three mungbean varieties (MH 421, MH 1142 and MH 1762) at CCS Haryana Agricultural University, Hisar, during *kharif*, 2024. A diverse insect pest complex was identified during the study, including *Bemisia tabaci, Empoasca kerri, Clavigralla gibbosa, Riptortus pedestris, Maruca vitrata, Campylomma livida, Nezara viridula, Helicoverpa armigera, Trichoplusia ni* along with natural enemies *viz. Coccinella septumpunctata* and spiders. *B. tabaci* population remained from the early vegetative stage i.e. 31st Standard Meteorological Week to harvesting stage (39th SMW) of the crop and attained peak in 34th (MH 421 and MH 1762) and 35th SMW (MH 1142). Infestations of pod bugs (*C. gibbosa, R. pedestris*), *C. livida* and *N. viridula* began during the 32nd SMW which synchronized with the crop's flowering and pod initiation phases, continuing until 39th SMW, *N. viridula* disappeared by 38th SMW. *H. armigera* populations exhibited two distinct peaks for MH 421 at 34th and 37th SMW, whereas MH 1142 and MH 1762 exhibited peak at 37th SMW. *M. vitrata* activity started in 35th SMW and attained peak in 36th SMW. *E. Kerri* population exhibited highly significant and positive correlation with rainfall (r = 0.809**). Larval population of *M. vitrata* exhibited significant and negative correlation with sunshine hours (r = -0.726*). *C. livida* population had a non-significant and negative correlation with maximum temperature (r = -0.645), wind speed (r = -0.455), sunshine hours (r = -0.386), and rainfall (r = -0.255). *T. ni* population showed significant and negative correlation with maximum temperature (r = -0.697*). Coccinellids population showed highly significant and positive correlation with minimum temperature (r = 0.919**).

Key words: Seasonal incidence, Weather parameters, Insect pests, Natural enemies, Correlation

Mungbean (*Vigna radiata* (L.) Wilczek) is one of the most important *Kharif* pulse crop and referred to by different names across India; *i.e.*, *Pesalu* in Telugu, *Hesarukalu* in Kannada, *Pasi Payaru* in Tamil and *Mung Sabut* in Hindi. Mungbean is a powerhouse of nutrients (24% protein, 59.9% carbohydrates and an iron content: 40 to 70 ppm), an excellent food for maintaining a balanced and healthy diet (Selvi *et al.*, 2006; Vairam *et al.*, 2016) and being utilized as green manure crop to enrich the soil condition by fixing atmospheric nitrogen (30-40 kg/ha) into the soil (Prasad *et al.*, 2014). Mungbean is a cheap source of dietary protein for the poor, with high levels of folate and iron compared with many other legumes (Keatinge *et al.*, 2011). Mungbean is grown throughout Southern Asia including India, Pakistan, Burma, Bangladesh, Burma, Indonesia Sri Lanka, Thailand, Vietnam, Malaysia, China and Philippines. Globally, mungbean production is approximately 5.3 million tonnes, occupying roughly 7.3 million hectares of land (FAOSTAT, 2023). In India, pulses are grown in 27.62 million hectares with annual production and productivity of 25.54 million tonnes and 914 kg per hectare, respectively (Anonymous, 2025). India accounts for the topmost producer of the mungbean all over the world occupying an area of 5.57 hectare with production and productivity of 4.24 million tonnes and 762 kg per hectare (Anonymous, 2025). In India, mungbean is primarily grown in the states of Rajasthan, Maharashtra, Andhra Pradesh, Madhya Pradesh and Bihar (Rani *et al.*, 2024). Pod bugs also inflict significant yield reduction in this crop. Mirid bug attack in mungbean has also been reported in the last few years that result in the abortion of buds, flowers and small pods due to the presence of pectinase enzyme in its saliva ultimately causing direct yield loss (Colebatch *et al.*, 2002). Annual yield losses of about 30 percent (Patidar, 2015), 36.41 percent (Umbarkar

et al., 2011) and 9 to 84 percent (Choragudi *et al.,* 2014) has been estimated in mungbean due to insect pests complex, pod borer complex and *M. vitrata*, respectively. Statistical analysis indicated a significant positive correlation between sunshine hours and several insect groups, namely whiteflies, semiloopers, flea beetles and coccinellids. Moreover, pod bug incidence was highly significant and positively correlated with wind speed, just as spotted pod borer numbers were significantly and positively associated with maximum temperature (Sharma *et al.,* 2025).

In a healthy agro-ecosystem, insect pests are naturally kept in check by their predators and other natural enemies. To effectively reduce the impact of major pest infestations, it is crucial to have a thorough understanding of the diversity of the insect population. The complex of insect pests is always changing, influenced by factors like shifts in climate, patterns of insecticide use and the introduction of new crop varieties. Understanding the seasonal incidence patterns of these insect pests is crucial for developing effective pest management strategies.

MATERIALS AND METHODS

The studies on seasonal incidence of insect-pests in mung bean were conducted at Pulse Research Farm, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar during *kharif,* 2024. Three mungbean varieties *viz*.-MH 421, MH 1142 and MH 1762 were sown first fortnight of July, 2024 in plot size of 225 m^2 for each variety. The crop was successfully raised by adopting all recommended package of practices except the insecticidal spray. Major insect pests *viz*., whitefly (*B. tabaci)*, leafhopper (*E. kerri)*, tur pod bug (*C. gibbosa)*, bean bug (*R. pedestris)*, mirid bug (*C. livida)*, cabbage looper (*T. ni)*, bean pod borer (*M. vitrata)*, stink bug (*N. viridula*), gram pod borer (*H. armigera)* and natural enemies (coccinellids and spiders) were recorded in each variety at weekly interval starting from 15 days after sowing (DAS) till harvesting of the crop. Insect pests population was recorded from twenty randomly selected and tagged plants in each plot. *C. gibbosa R. pedestris, C. Livida, N. Viridula, M. vitrata, H. armigera, T. ni* and natural enemies were recorded visually from tagged plants. The weather data was obtained from the Department of Agricultural Meteorology, CCS Haryana Agricultural University, Hisar and populations of insect pests and natural enemies were correlated with weather parameters.

RESULTS AND DISCUSSION

The major insect pests and their natural enemies recorded on different mungbean (MH 421, MH 1142 and MH 1762) varieties are predicted in Table 1. Whitefly (*B. tabaci*) adult population start appearing on all the varieties in 31st SMW coinciding with vegetative stage and remained in the field till 39th SMW *i.e.* crop harvesting stage (2.55, 2.75 and 2.95 adult/ 3 trifoliate leaves) with their initial level of 2.80, 2.95 and 2.70 adult per three trifoliate leaves on varieties, MH 421, MH 1142 and MH 1762, respectively. Whitefly adult population attained peak on varieties, MH 421 and MH 1762 (15.25 and 15.30 adults/3 trifoliate leaves) in 34th SMW, whereas, on variety, MH 1142 it attained peak (14.55 adults/3 trifoliate leaves) during 35th SMW (Fig.1). These findings are in close conformity with Chaman *et al.,* (2021) and Patel *et al.,* (2021), who reported the occurrence of whitefly on mungbean from vegetative to reproductive transition phase (August-September). Similarly, Yadav and Singh (2013) observed maximum whitefly activity during the 34th - 35th SMW in North India, which aligns with the present study.

Leafhoppers population commenced from 31st SMW and remained scanty (0.10 to 0.70 leafhoppers/3 trifoliate leaves) in all the varieties that attained peak (0.60, 0.70 and 0.60 nymphs/3 trifoliate leaves) during 31st, 32nd and 38th SMW on varieties, MH 1762, MH 421 and MH 1142, respectively (Fig.1). The present findings are in corroboration with Lal (2006) and Singh *et al.,* (2022), who reported that *E. kerri* remains active throughout the crop growth period with peak activity during August. Nitharwal and Kumawat (2009) also recorded the peak population of leafhoppers on mungbean during the first week of September, supporting the current observations. Pod bug (*C. gibbosa*, *R. pedestris*), mirid bug and stink bug presence on mungbean varieties (MH 421, MH 1142, MH 1762) were found in the 32nd SMW and persisted until the 39th SMW (except stink bug: 38th SMW) coinciding with the flowering and pod initiation stage of mungbean (Fig. 2). These results are in agreement with Duraimurugan and Tyagi (2014), who reported that hemipteran pod sucking pests are most active during the reproductive phase of the crop. Similarly, Yadav and Kumar (2021) reported the occurrence of stink bugs from 31st to 36th SMW.

The gram pod borer (*H. armigera*) recorded two distinct peaks on variety, MH 421 during 34th and 37th SMW (0.35 larvae/ plant) and one peak (0.40 larva/ plant) on varieties, MH 1142 and MH 1762 during 37th

TABLE 1
Seasonal incidence of insect pest and natural enemies on mungbean varieties MH 421, MH 1142 and MH 1762 (*Kharif*, 2024)

SMW	Mean population of insect pests/plant														
	Whitefly*			Leafhopper*			Pod bug			Mirid bug			Stink bug		
	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762
31	2.80	2.95	2.70	0.55	0.50	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	8.35	7.25	8.15	0.70	0.45	0.55	0.20	0.45	0.15	0.15	0.20	0.10	0.15	0.15	0.20
33	5.70	6.85	5.95	0.25	0.20	0.40	0.80	1.05	0.95	0.35	0.45	0.25	0.25	0.25	0.70
34	15.25	14.20	15.30	0.50	0.45	0.35	0.55	0.30	0.25	1.15	1.30	0.95	1.10	1.30	0.20
35	13.05	14.55	14.45	0.00	0.50	0.40	0.55	0.40	0.45	1.65	1.85	1.45	0.15	0.25	0.10
36	10.05	10.25	10.90	0.45	0.50	0.45	0.35	0.35	0.40	1.40	1.55	1.20	0.25	0.25	0.20
37	8.75	8.80	8.55	0.35	0.20	0.30	0.70	0.85	0.75	0.85	0.95	0.75	0.25	0.15	0.20
38	4.85	4.65	2.55	0.10	0.60	0.15	0.10	0.15	0.10	0.30	0.40	0.25	0.00	0.05	0.00
39	2.55	2.75	2.95	0.25	0.25	0.25	0.10	0.10	0.10	0.10	0.15	0.05	0.00	0.00	0.00

contd...

TABLE 1 Contd.

SMW	Mean population of insect pests/plant									Mean population of natural enemies/plant					
	Spotted Pod Borer			Cabbage looper			Gram Pod borer			Spider			Coccinellids		
	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762	MH 421	MH 1142	MH 1762
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.65	0.40
32	0.00	0.00	0.00	0.10	0.20	0.10	0.15	0.00	0.10	0.00	0.25	0.20	0.45	0.50	0.30
33	0.00	0.00	0.00	0.10	0.15	0.15	0.25	0.15	0.25	0.40	0.20	0.40	0.75	0.25	0.65
34	0.00	0.00	0.00	0.45	0.30	0.40	0.35	0.35	0.30	0.15	0.60	0.55	0.25	0.70	0.75
35	0.10	0.15	0.15	0.50	0.35	0.20	0.20	0.30	0.35	0.35	0.10	0.15	0.20	0.35	0.80
36	0.20	0.30	0.35	0.40	0.40	0.50	0.25	0.30	0.30	0.20	0.20	0.15	0.20	0.15	0.25
37	0.25	0.20	0.25	0.35	0.10	0.20	0.35	0.40	0.40	0.30	0.15	0.30	0.50	0.20	0.20
38	0.10	0.05	0.10	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.10	0.10	0.15	0.10	0.10
39	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.15

*Per three trifoliate leaves.

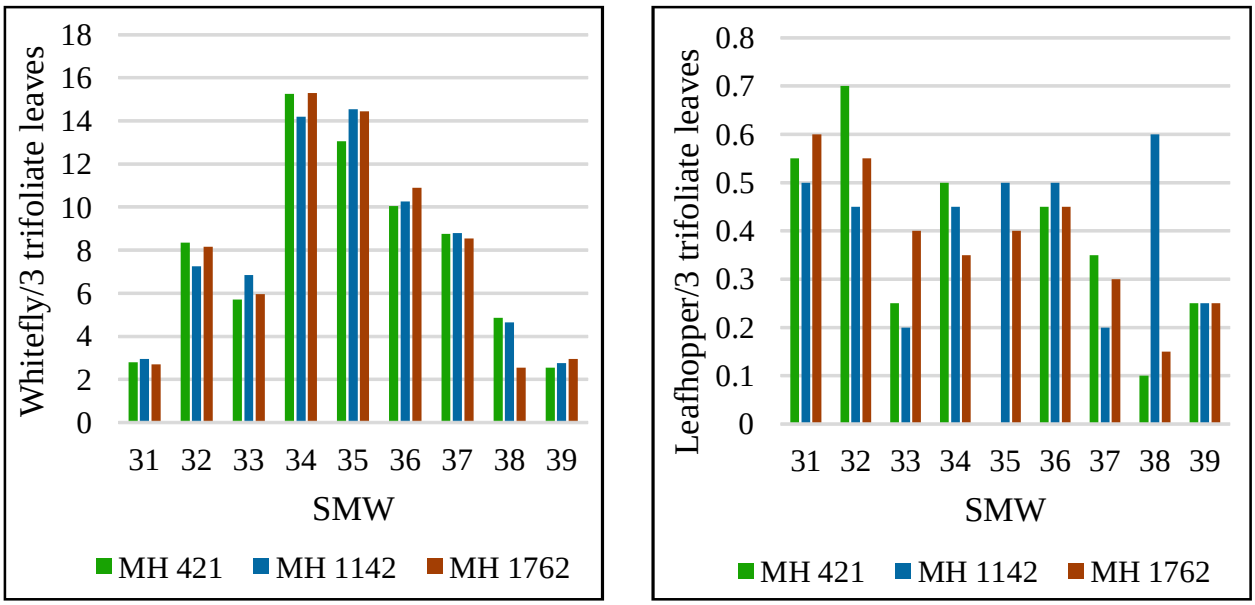

Fig. 1. Population dynamics of whitefly and leafhopper on mungbean varieties during different SMW (kharif, 2024).

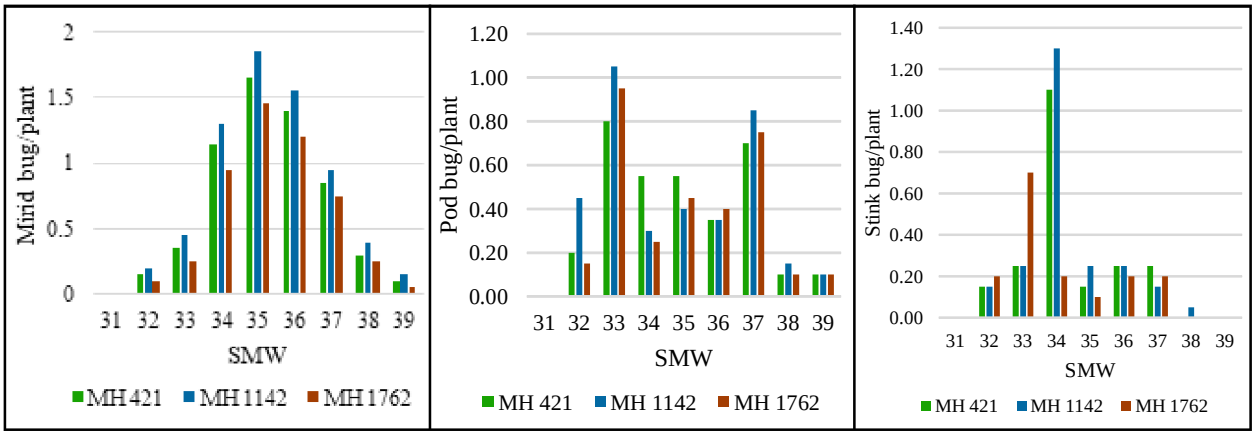

Fig. 2. Population dynamics of pod bug, mirid bug and stink bug on mungbean varieties during different SMW (kharif, 2024).

SMW (Fig.3). The present findings are more or less in accordance with those of Umbarkar *et al.* (2010) who reported the peak of *H. armigera* during the 36th SMW.

Spotted pod borer, *M. vitrata* activity commenced later (35th SMW) and reached at peak in 36th SMW coinciding with the pod maturation/ formation stage. The present studies support the findings of Sreekanth *et al.*, (2015) and Yadav and Kumar (2021), who reported that borer incidence commences with the onset of flowering and peaks during pod formation.

Cabbage looper population commenced from 32nd SMW and was prevalent until 38th SMW (MH 1142 and MH 1762) and its population peaked in 35th SMW (0.50 larvae/plant: MH 421) and 36th SMW (MH 1142: 0.40, MH 1762: 0.50 larva/ plant) (Fig. 3). Yadav and Singh (2015) also recorded the peak activity of semi-loopers on green gram during the 35th SMW, which corroborates the findings of the present investigation.

Spiders and Coccinellids were identified as the major natural enemies. Spider population persisted from 32nd (MH 1142 and MH 1762) to 39th SMW (all varieties) and ranges from 0.05 (MH 421: 38th SMW) to 0.60 spider per plant (MH 1142: 34th SMW). Coccinellids population started from 31st SMW and lasted until 39th SMW ranging between 0.1 to 0.8 adults beetle per plant. Peak population of coccinellids were recorded during 33rd, 34th and 35th SMW on varieties MH 421 (0.70 beetles/plant), MH 1142 (0.75 beetles/ plant) and MH 1762 (0.80 beetles/plant), respectively (Fig.5). Nitharwal and Kumawat (2009) and Yadav and Singh (2013) also observed a similar pattern of natural

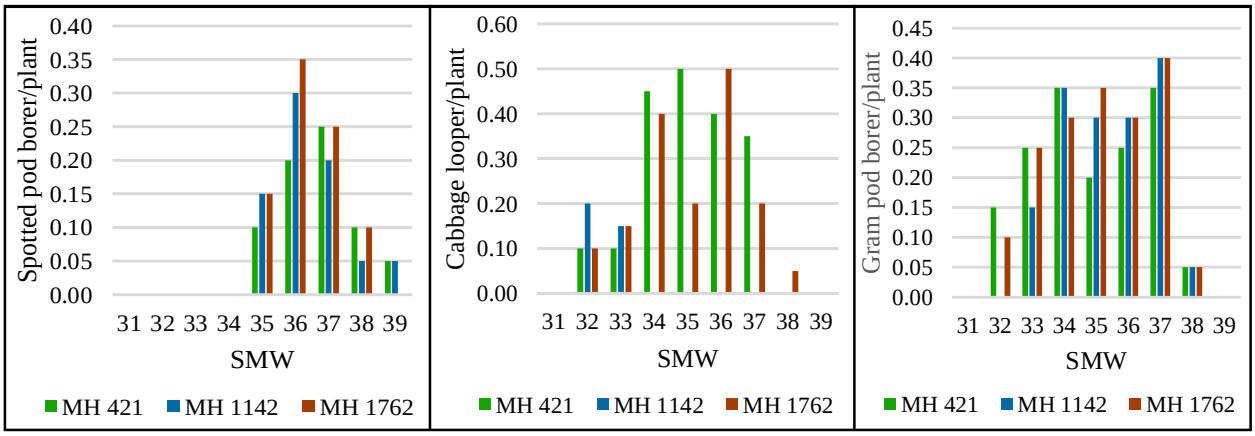

Fig. 3. Population dynamics of spotted pod borer, cabbage looper and gram pod borer on mungbean varieties during different SMW (kharif 2024).

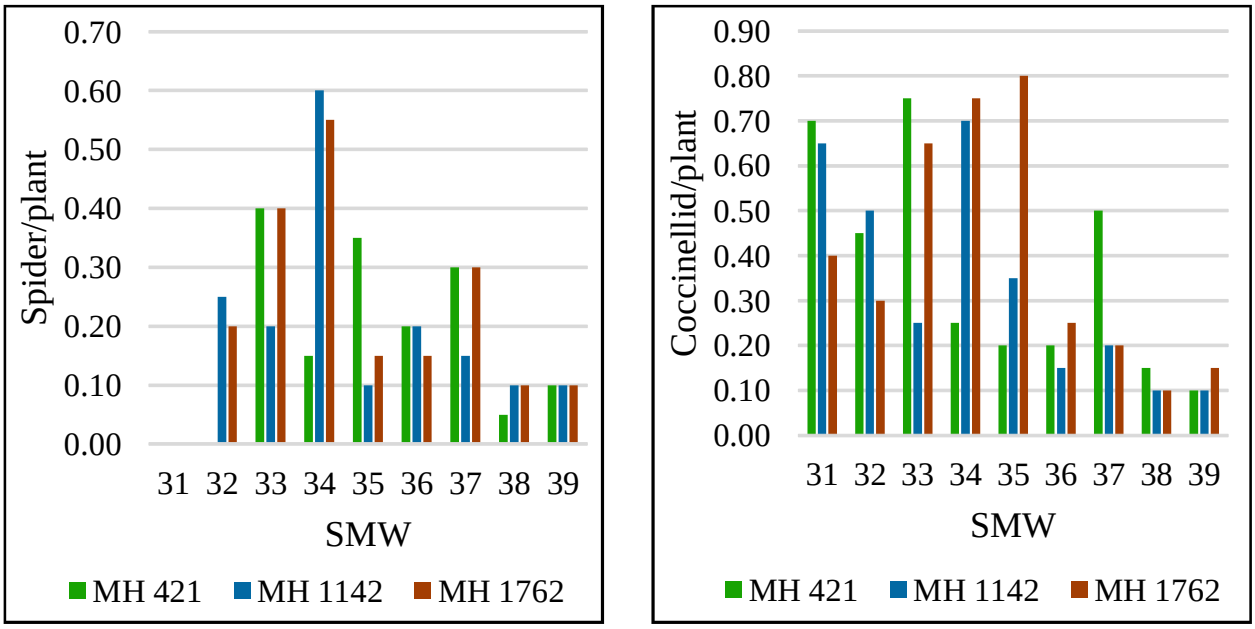

Fig. 4. Population dynamics of natural enemies on mungbean varieties during different SMW (kharif, 2024).

enemy populations with the availability of their hosts (whitefly and jassids) in the mungbean cropping system.

Whitefly population exhibited a non-significant positive (minimum temperature, relative humidity: morning and evening), while negative and non-significant with maximum temperature, wind speed, sunshine hours and rainfall.

These findings are more or less in conformity with Yadav and Singh (2013) and Choudhary *et al.* (2017), who also reported a non-significant correlation of whitefly population with temperature and relative humidity in mungbean. Leaf hopper population exhibited highly significant and positive correlation with rainfall (r = 0.809**). This indicates that rainfall played a crucial role in the population buildup of this pest during the wet season. The present findings are in strong agreement with Manju and Mehra (2016), who reported a significant positive correlation between leafhopper population and rainfall. Pod bugs exhibited non-significant positive correlation with minimum temperature (r = 0.050) and relative humidity (morning and evening), while negative and non-significant with maximum temperature, wind speed, sunshine hours and rainfall. Betawadkar *et al.* (2021) reported that minimum temperature and morning relative humidity positively influenced the pod bug population, which partially supports the current positive trend with humidity. The mirid bug population had a non-significant and negative correlation with maximum temperature (r = -0.645), wind speed (r = -0.455), sunshine hours (r = -0.386), and rainfall (r = -0.255).

TABLE 2
Correlation of weather parameters with insect pests population in mungbean varieties MH 421, MH 1142 and MH 1762 (kharif, 2024)

Weather parameters	Insect pests population									
	Whitefly	Leaf hopper	Pod bug	Mirid bug	Stink bug	Spotted pod borer	Cabbage looper	Gram Pod borer	Spider	Coccinellid
Max. Temp. (°C)	-0.505	-0.028	-0.426	-0.645	-0.109	-0.642	**-0.697***	-0.523	-0.258	0.196
Min. Temp. (°C)	0.135	0.599	0.050	-0.123	0.390	-0.587	0.049	-0.042	0.198	**0.919****
R.H. (M) (%)	0.197	-0.262	0.502	0.339	-0.233	0.467	0.269	0.288	0.049	-0.267
R.H. (E) (%)	0.452	0.589	0.199	0.457	0.171	0.321	0.620	0.332	0.126	0.282
Wind Speed (km/h)	-0.264	0.566	-0.441	-0.455	-0.365	-0.458	-0.432	-0.498	-0.503	0.382
Sunshine (h)	-0.075	-0.264	-0.047	-0.386	0.245	**-0.726***	-0.417	-0.201	0.231	0.238
Rainfall (mm)	-0.030	**0.809****	-0.173	-0.255	-0.173	-0.208	-0.062	-0.241	-0.277	0.319

These results align with the observations of Bairwa and Singh (2017), who found that weather parameters often have a non-significant but observable influence on the seasonal incidence of *Creontiades biseratense* species of mirid bugs.

Stink bug population exhibited non-significant positive correlation with minimum temperature, relative humidity (evening) and sunshine hours, while negative and non-significant with maximum temperature, relative humidity (morning), wind speed and rainfall. The present findings are in accordance with those of Singh *et al.,* (2020) who also reported non-significant (positive and negative) association of weather parameters with stink bug.

Larval population of spotted pod borer exhibited significant and negative correlation with sunshine hours (r = -0.726*). Spotted pod borer showed non-significant positive correlation with relative humidity (morning and evening), while negative and non-significant with maximum temperature, minimum temperature, wind speed and rainfall. These findings are in partial agreement with Umbarkar *et al.* (2010), who reported a negative correlation between *M. vitrata* incidence and bright sunshine hours.

Gram pod borer exhibited non-significant positive (relative humidity: morning and evening), and negative (maximum temperature, minimum temperature, wind speed, sunshine hours and rainfall) correlation with weather parameters. The present results are in accordance with Choudhary *et al.* (2021), who reported that weather parameters did not significantly influence the population of *H. armigera* on mungbean.

Coccinellids population showed highly significant and positive correlation with minimum temperature (r = 0.919**). Coccinellids exhibited non-significant positive correlation with maximum temperature, relative humidity (evening), wind speed, sunshine hours and rainfall, while negative and non-significant with relative humidity in morning (r = -0.267). These findings are supported by Yadav and Singh (2015), who emphasized the significant role of temperature variables in the abundance of natural enemies in the mungbean ecosystem.

CONCLUSION

Mungbean is attacked by a complex of insect pests, predominantly whitefly, mirid bugs, pod bugs and pod borers, which reach their peak activity during the reproductive stages of the crop (34th to 37th SMW). Weather parameters, particularly rainfall and temperature, play a significant role in influencing the seasonal incidence or pest population dynamics. The study of seasonal incidence of insect pests is essential for understanding their population dynamics and the extent of crop damage. This information helps in developing and implementing timely pest management strategies. Furthermore, analysing the relationship between pest populations and weather parameters provides valuable insights for predicting pest incidence and improving the effectiveness of control measures.

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