SEASONAL INCIDENCE OF INSECT PESTS ON MUNG BEAN, VIGNA RADIATA L. AND THEIR CORRELATION WITH WEATHER PARAMETERS

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SUMMARY

In the present study, the seasonal incidence of major insect pests on mung bean and their correlation with weather parameters was studied on two varieties (MH 421 and MH 1142) at CCS Haryana Agricultural University, Hisar, Haryana during *kharif*, 2022. The results revealed that insect-pests namely, *Bemisia tabaci*, *Empoasca kerri*, *Nezara viridula*, *Clavigrella gibbosa*, *Riptortus pedestris*, *Phyllotreta* spp., *Trichoplusia ni* and *Maruca vitrata*, and natural enemies including *Coccinella septumpuctata* and spiders were observed in mung bean crop wherein whitefly, *B. tabaci* was found to be the major pest infesting crop from 31st to 37th SMW (1.20 to 16.80 adults/3 trifoliate leaves) with its peak population in 34th SMW. Population of *B. tabaci*, *T. ni*, *Phyllotreta* spp. and coccinellid exhibited a significant and positive correlation with sunshine hours, whereas relative humidity (evening) exhibited a significantly negative correlation with coccinellids. However, pod bugs (*C. gibbosa* and *R. pedestris*) and *M. vitrata* showed highly significant positive and significant positive correlations with wind speed and maximum temperature, respectively.

Key words: Insect pests, natural enemies, seasonal incidence, Vigna radiate, weather factors

Mung bean, *Vigna radiata* (L.) Wilczek, is a vital leguminous crop widely cultivated across various regions, particularly in Asia. In addition to high protein and dietary fiber content, mung beans are valued for their capacity to fix atmospheric nitrogen, which improves soil fertility and crop rotation sustainability (Bhowmik *et al.*, 2019). It is one of the most important legume crops which occupies third position, behind chickpea and pigeon pea covering almost 16% of the nation's overall pulse area (Kaur and Aulakh, 2021). India is the world's largest mung bean producer in terms of world's acreage and global production contributing 65% and 54%, respectively (Jayappa and Devamani, 2017).

Despite the importance of mung beans, their cultivation is threatened globally by various insect pests, including aphids, whiteflies, thrips, and other sap-sucking insects that can significantly reduce crop yields. More than 60 species of insects found attacking this crop during different stages of crop growth (Lal, 1985). Under severe infestations, these pests can result in significant financial losses of 20% to 50% of the whole output. Environmental elements that might foster the growth of pests, such as temperature, humidity, and precipitation, have an impact on the seasonal occurrence of these pests. The population of insect pests fluctuates with various weather factors, and change in climate imposes a remarkable impact on the rise and fall of insect populations as well as their survival, growth, multiplicative potential and tritrophic interactions (Bale et al., 2002; Tomar, 2010). Understanding of this relationship is critical for developing effective pest management strategies. Also, information on seasonal incidence is essential for developing resistance screening techniques and estimating economic thresholds. Hence, keeping above facts in view, the present investigation was aimed to study the seasonal incidence of important insect-pests of mung bean, their natural enemies and the correlation with weather parameters during kharif, 2022. Ultimately, enhancing the understanding of the interaction between environmental conditions and insect pest dynamics will contribute to the sustainable production of mung beans, safeguarding both agricultural productivity and economic stability.

MATERIALS AND METHODS

The present investigation on seasonal incidence of insect pests on green gram was carried out during kharif, 2022 at Experimental Farm, Department of Entomology, CCS Haryana Agricultural University, Hisar, Haryana. To study the seasonal incidence of insect pests on mung bean, two genotypes viz., MH 1142 and MH 421 were selected and sown on 20th July, 2022 in a plot size of 500 m² each. Major insect pests viz., whitefly (B. tabaci), leafhopper (E. kerri), pod bug (C. gibbosa, R. pedestris), stink bug (N. viridula) semilooper (T. ni), spotted pod borer (M. vitrata), flea beetle (Phyllotreta spp.), gram pod borer (H. armigera) and natural enemies (coccinellids and spiders) were recorded from fifteen randomly selected and tagged plants in each genotype (MH 1142 and MH 421). Sucking pests population (whitefly adult and leafhopper nymphs) was counted by observing population on top, middle and bottom of trifoliate leaves of tagged plant and other important insect pests (C. gibbosa, R. pedestris, M. vitrata, H. armigera, T. ni, N. viridula and flea beetle) and natural enemies were recorded visually from tagged plants. The data on weather parameters viz., maximum temperature, minimum temperature, relative humidity (morning), relative humidity (evening), average wind speed (AWS), sunshine hours (h) and rainfall (mm) were collected from Department of Agricultural Meteorology, CCS Haryana Agricultural University, Hisar. The correlation of population of important insect pests and natural enemies with weather parameters was also estimated.

RESULTS AND DISCUSSION

Data presented in Table 1 indicate that whitefly, B. tabaci, leafhopper, E. kerri, pod bug, C. gibbosa, R. pedestris, semilooper, T. ni, spotted pod borer, M. vitrata, flea beetle, Phyllotreta spp., stink bug (N. viridula) and natural enemies (coccinellids and spiders) were recorded during the course of study. Population buildup of different insect-pests and natural enemies are also depicted in Figures 1-4. Whitefly prevailed in the field from 31st SMW (2.86 and 2.46 adult/3 trifoliate leaves) to 37th SMW (2.86 and 1.20 adult/3 trifoliate leaves) and attained its peak in 34th SMW with adult population of 15.6 and 16.8 per three trifoliate leaves on varieties, MH 1142 and MH 421, respectively. Slight increase (31st, 32nd, 33rd and 34th SMW) and decrease (35th, 36th and 37th SMW) in whitefly population was observed in MH 1142 and MH 421 (Fig. 2). The present results are more or less in corroboration with Yadav and Singh (2015) and Gehlot and Prajapat (2021) who observed whitefly population from 32^{nd} to 40^{th} SMW and 32^{nd} SMW to 41st SMW, respectively. Leafhopper population remained scanty (0.20 to 0.80/3 trifoliate leaves) and attained its peak in 32nd SMW (0.40 and 0.80 nymphs/ 3 trifoliate leaves on MH 1142 and MH 421, respectively).

Population of stink bug, semilooper, flea beetle





Fig. 1 & 2. Population buildup of whitefly, leafhopper, pod bug, stink bug and flea beetle during different SMW.

Fig. 3 & 4. Population buildup of semilooper, spotted pod borer and natural enemies (coccinellids & spiders) during different SMW.

and pod bug commenced during 32nd SMW and continued till 36th SMW except for pod bug (37th SMW). Peak of pod bug and stink bug were observed in 37th (1.47 and 1.27 bugs/plant) and 34th SMW (1.60 and 1.20 bugs/plant) on MH 1142 and MH 421, respectively. The flea beetle population peaked in 34th SMW on both the varieties, while semilooper attained peak in 34th (MH 1142) and 35th SMW (MH 421). In similar studies, Yadav and Kumar (2021) also reported the occurrence of stink bug from 31st SMW to 36th SMW.

Spotted pod borer, *M. vitrata* commenced during 35th SMW on MH 1142 and MH 421. The present findings are in accordance with those of Yadav and Singh (2015), Bairwa and Singh (2017), Bhuva and Patel (2022) who reported the commencement of spotted pod borer in 35th, 33rd and 34th SMW, respectively. Coccinellids and spiders were among the major natural enemies which were recorded during the period of study. Population of coccinellids and spiders remained on the crop from 31st to 37th SMW and ranged from 0.07 to 1.67 and 0.20 to 0.60 per plant.

Weather parameters *viz.* sunshine hour showed significant and positive correlation with the population of whitefly adult (r=0.755), semilooper (r=0.797), flea beetle (r=0.630) and coccinellids (r=0.692). Pod bug (0.893) and spotted pod borer (0.640) exhibited highly significant and significant positive correlation with wind speed and maximum temperature, respectively. Coccinellids population exhibited significant and negative correlation with evening relative humidity (Table 2). The present findings are more or less similar to Duraimurugan and Tyagi (2014) and Patel *et al.* (2021) who revealed that sunshine had significant and positive effect on whitefly population.

Studies on seasonal incidence of these insect pests is needed for the development of management practices relevant to the control of these insect pests to detect the vulnerable phase of their life cycle during which suppression of their population buildup is easy and economical. During the experiments, peak incidence of these insect pests was noticed in *kharif* crop. Therefore, detailed investigations on the impact of weather on insect pest population in mung bean ecosystems assume practical importance.

TABLE 1

Seasonal incidence of important insect pests and natural enemies on mung bean, Vigna radiata L.

SMW	Insect pests and natural enemies per plant																	
	Whitefly/3 trifoliate leaves		Leafhoppers/3 trifoliate leaves		Pod bugs		Stink bug		Semi looper		Flea beetle		Spotted pod borer		Coccinellids		Spider	
	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421	MH 1142	MH 421
31	2.86	2.46	0.20	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.20	0.20	0.40
32	7.27	8.60	0.40	0.80	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.40	0.00	0.00	0.60	0.40	0.20	0.26
33	5.60	4.67	0.00	0.00	1.20	0.73	0.60	0.80	0.00	0.00	0.20	0.00	0.00	0.00	0.80	0.40	0.40	0.20
34	15.60	16.80	0.33	0.60	0.26	0.33	1.67	1.20	0.40	0.60	1.27	1.40	0.00	0.00	0.00	0.80	0.07	0.60
35	12.07	13.67	0.00	0.00	0.60	0.40	0.03	0.13	0.33	0.80	1.00	1.20	0.20	0.67	0.80	1.00	0.33	0.40
36	10.60	10.40	0.20	0.20	0.20	0.20	0.20	0.20	0.40	0.60	0.40	0.20	0.20	0.40	1.67	1.20	0.20	0.33
37	2.93	1.20	0.00	0.00	1.47	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.40	0.20	0.07	0.46

TABLE 2

Correlation between incidence of insect pests and natural enemies of mung bean with weather parameters

Weather parameters	Insect pests and natural enemies										
	Whitefly	Leaf hopper	Pod bugs	Stink bug	Spotted pod borer	Semilooper	Flea beetle	Coccinellids	Spider		
Max. Temp. (°C)	0.399	-0.342	0.190	-0.116	0.640*	0.626	0.260	0.794*	0.010		
Min. Temp. (°C)	-0.556	0.208	0.438	-0.255	-0.421	-0.627	-0.463	-0.575	-0.181		
R.H. (M) (%)	-0.214	0.242	-0.425	0.168	-0.440	-0.357	-0.070	-0.600*	0.093		
R.H. (E) (%)	-0.446	0.368	-0.306	0.013	-0.610*	-0.612	-0.291	-0.758*	-0.010		
Wind Speed(km/h)	-0.167	-0.363	0.893**	0.335	-0.211	-0.338	-0.111	-0.106	-0.030		
Sunshine (h)	0.755*	-0.203	0.133	0.384	0.548	0.797*	0.630*	0.692*	-0.100		
Rainfall (mm)	-0.566	-0.036	-0.286	-0.205	-0.360	-0.595	-0.470	-0.473	0.020		

*Significant at 5%.

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