

Original Research Article

Seasonal incidence of sucking pests and their natural enemies on moth bean [*Vigna aconitifolia* (Jacq.) Marechal]

ABSTRACT

A field experiment was conducted at the College of Agriculture, NAU, Bharuch (Gujarat) to study the seasonal incidence of sucking pests and their natural enemies and their correlation with weather parameters on moth bean during *kharif* -2023. The studies on seasonal incidence indicated that jassid infestation began in the 1st week of August (31st SMW) and peaked during the 1st week of September (35th SMW). Whitefly infestation also began in the 1st week of August. The studies on seasonal incidence indicated that the incidence of jassid was commenced from 1st week of August (31st SMW) and achieved its peak during 1st week of September (35th SMW). Whitefly infestation commenced from 1st week of August (31st SMW) achieved its peak during 2nd week of September (36th SMW). The population of thrips began to increase in the 1st week of August (31st SMW) and reached its peak during 2nd week of September (36th SMW). The population of ladybird beetle population was first observed appeared from in the 2nd week of August (32nd SMW) and achieved its peak during 2nd week of September (36th SMW). Similarly, the population of *Ce*hrysope~~l~~*ra* was appeared appeared from 2nd week of August (32nd SMW) and achieved peak population during 2nd week of September (36th SMW). Among the different environmental factors, morning relative humidity had a showed significant positive impact influence on the jassid and whitefly population. Additionally, the population of bright sunshine hours positively showed positive significant influenced the population of thrips and whitefly population. However no significant correlation was found observed between natural enemies and weather parameters.

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Keywords: *Moth bean, seasonal incidence, sucking pests, ladybird beetle, Ce*hrysope~~l~~*ra*

1. INTRODUCTION

Moth bean, *Vigna aconitifolia* (Jacq.) Marechal commonly known as "moth" is one of the important pulse crops, and well suited for arid and semi-arid regions of the country. Among *kharif* pulses, it has the maximum drought tolerance capacity. Plants cover large area on the surface, conserve moisture and protect soil from erosion. Moth bean belongs to family *Leguminosae*, sub-family *Papilionaceae*. Moth bean is an annual plant. Its tap roots go deeper in soil which can extract moisture from lower horizons in the soil. Stem is branched with plant height of about 30 to 35 cm. Leaves are trifoliolate and leaflets are lobed and divided in 3 to 5 parts. Flowers are papilionaceous and mostly self-pollinated (Kukvaya et al., 2018). In India, moth bean occupies an area of 9.68 lakh ha with production of 3.21 lakh tonnes and productivity of 332 kg/ha whereas in Gujarat, it occupies an area of 0.12 lakh ha with production of 0.05 lakh tonnes and productivity of 462 kg/ha during year 2019 – 2020 (Anon., 2021). Jassids and whiteflies also act as vector of yellow mosaic virus apart from causing direct damage by desapping (Satyavir et al., 1984). Termites, galerucid beetles, mites and surface grass hoppers are minor pests, while jassid, whitefly, thrips, black weevil, pulse beetle and white grubs are major pests of moth bean (Bhathesar et al., 2021).

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2. MATERIAL AND METHODS

A field experiment was conducted at College of Agriculture, NAU, Bharuch (Gujarat) to study the seasonal incidence of sucking pests and their natural enemies and their ~~co~~relation with weather parameters on moth bean during *kharif* -2023. For this, moth bean var. GMO-2 was sown at a distance of 45 cm x 10 cm in a plot of 20 m x 20 m and the crop was raised successfully by adopting recommended agronomical practices. The crop was kept free from the insecticidal application throughout the season. Whole plot was divided into five sectors and five plants were selected randomly from each sector. Populations of sucking pests were recorded from the 5 tagged plants at weekly intervals from germination of crop till harvesting of the crop. The population of adults and nymphs of jassid [*Empoasca motti* (Pruthi.)], whitefly [*Bemisia tabaci* (Genn.)] and thrips [*Caliothrips indicus* (Bagnall)] were recorded from three leaves (upper, middle and lower) of each randomly selected plants and mean pest population was worked out. Population of natural enemies such as ladybird beetle and ~~chrysope~~*Chrysoperla* were also recorded from selected plants and the mean value was calculated.

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3. RESULTS AND DISCUSSION

1. Jassid, *E. motti*

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The data represented in the Table-1 shows that jassid population commenced from the 2nd week after sowing (31st SMW) with 2.12 jassid/3 leaves. The population shows an increasing trend from the 3rd WAS (32nd SMW) and achieved its peak during 6th WAS (35th SMW) with 8.72 jassid/3 leaves. Thereafter, the population declined from the 7th to 12th week after sowing (36th to 44th SMW) in the range from 0.52 to 5.36 jassid/3 leaves.

Patel et al. (2021) reported jassid population started during 31st SMW and peak population found during 36th SMW in green gram. Thus, present findings are more or less in confirmation with earlier findings.

Correlation

The data presented in Table-2 indicated that jassid population had positive significant correlation with morning relative humidity ($r = 0.589$). Minimum temperature ($r =$

0.142), evening relative humidity ($r = 0.050$), bright sunshine hours ($r = 0.204$), wind speed ($r = 0.142$) and evaporation ($r = 0.150$) had positive ~~non-significant~~ correlation with the jassid population. However, maximum temperature ($r = -0.172$), rainfall ($r = -0.353$) and rainy days ($r = -0.242$) had negative ~~non-significant~~ correlation with the jassid population.

Vikrant and Bajapai (2013) reported that jassid population had positive significant correlation with morning relative humidity. Bhatthesar et al. (2021) found that jassid population non significantly and negatively correlated with maximum temperature. Thus, present findings are in confirmation with earlier work.

Table 1: Incidence of sucking pests and their natural enemies in moth bean

WAS	SMW	Mean population per three leaves			Mean no. of predators per plant	
		Jassid	Whitefly	Thrips	Ladybird beetle	Chrysope Chrysope
1	30	0.00	0.00	0.00	0.00	0.00
2	31	2.12	2.48	2.40	0.00	0.00
3	32	2.52	4.88	3.16	0.56	2.04
4	33	3.36	5.48	5.56	1.20	2.36
5	34	4.44	6.28	6.40	1.32	3.56
6	35	8.72	7.84	6.04	1.60	4.00
7	36	5.36	9.04	8.48	2.40	4.76
8	37	3.52	5.64	4.24	2.08	3.28
9	38	2.28	3.52	3.24	1.44	2.00
10	39	1.52	2.56	3.04	1.16	1.24
11	40	0.64	1.72	1.52	0.76	0.92
12	41	0.52	1.24	1.16	0.52	0.68

SMW: Standard Meteorological Week, WAS: Weeks After Sowing

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Table 2: Correlation (r) between weather parameters and sucking pests as well as natural enemies in moth bean

Weather parameters	Jassid	Whitefly	Thrips	Ladybird beetle	Chrysope Chrysope
Maximum temperature ($^{\circ}\text{C}$)	-0.172	0.582*	0.007	-0.003	0.046
Minimum temperature ($^{\circ}\text{C}$)	0.543	0.567	0.551	0.110	0.428

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Morning relative humidity (%)	0.589*	0.642*	0.281	0.415	0.201	
Evening relative humidity (%)	0.050	0.042	0.038	-0.110	-0.018	
Bright Sunshine hours (h/day)	0.204	0.620*	0.636*	0.334	0.247	
Rainfall (mm)	-0.353	-0.363	-0.286	-0.148	-0.277	
Rainy days	-0.242	-0.146	-0.155	0.019	-0.128	Formatted: English (United States)
Wind speed (km/hr)	0.142	0.101	0.049	-0.296	-0.090	
Evaporation mm/day)	0.150	0.084	0.058	0.005	0.092	Formatted: English (United States)
Note: *Significant at 0.05 level						Formatted: English (United States)

2. Whitefly, *B. tabaci*

The data represented in ~~the~~ Table-1 shows that ~~the~~ whitefly population commenced from the 2nd week after sowing (31st SMW) with 2.48 whitefly/3 leaves. The population shows an increasing trend from the 3rd WAS (32nd 32nd SMW) and achieved its peak during 7th WAS (36th SMW) with 9.04 whitefly/3 leaves. Thereafter, the population declined from the 8th to 12th week after sowing (37th to 41st 41st SMW) in the range from 1.24 to 5.64 whitefly/3 leaves.

Bhathesar et al.(2021) also recorded highest population of whitefly at 36th SMW after sowing in moth bean which is in complete agreement with present findings.

Correlation

The data presented in Table -2 indicated that ~~the~~ whitefly population had ~~a~~ positive significant correlation with maximum temperature ($r = 0.582$), morning relative humidity ($r = 0.642$) and bright sunshine hours ($r = 0.620$). Minimum temperature ($r = 0.567$), evening relative humidity ($r = 0.042$), wind speed ($r = 0.101$) and evaporation ($r = 0.084$) had positive ~~non-significant~~ correlation with the whitefly population. However, evening rainfall ($r = -0.363$) and wind rainy days ($r = -0.146$) had negative ~~non-significant~~ correlation with the whitefly population.

Biswas and Banerjee (2019) reported that ~~the~~ whitefly population had ~~a~~ positive significant correlation with maximum temperature and positive ~~non-significant~~ correlation with wind speed. Ojha et al. (2022) found that whitefly population significantly and positively correlated with maximum temperature. Thus, present findings are more or less similar to the earlier findings.

3. Thrips, *C. indicus*

The data represented in ~~the~~ Table -1 shows that ~~the~~ thrips population commenced from the 2nd week after sowing (31st SMW) with 2.40 thrips/3 leaves. The population shows an increasing trend from the 3rd WAS (32nd 32nd SMW) and achieved its peak during 7th WAS (36th SMW) with 8.48 thrips/3 leaves. Thereafter, the population declined from the 8th to 12th week after sowing (37th to 41st 41st SMW) in the range from 1.16 to 4.24 thrips/3 leaves.

Ojha et al.(2022) reported ~~the~~ highest population of thrips at 35th SMW in green gram which is more or less in agreement with present findings.

Correlation

The data presented in Table-2 indicated that the thrips population had a positive significant correlation with bright sunshine hours ($r = 0.636$). Maximum temperature ($r = 0.007$), minimum temperature ($r = 0.551$), morning relative humidity ($r = 0.281$), evening relative humidity ($r = 0.038$), wind speed ($r = 0.049$), and evaporation ($r = 0.005$) had positive ~~non-significant~~~~non-significant~~ correlation with the thrips population. However, rainfall ($r = -0.286$) and rainy days ($r = -0.155$) had negative ~~non-significant~~~~non-significant~~ correlation with the thrips population.

Soratur et al. (2017) reported that among various weather parameters morning relative humidity and evening relative humidity had a positive ~~non-significant~~~~non-significant~~ correlation with the thrips population. Ojha et al. (2022) found that the thrips population had a negative ~~non-significant~~~~non-significant~~ correlation with rainfall. So ~~above~~~~the above~~ report is more or less confirmative with result of present findings.

4. Ladybird beetle

The data presented in Table-1 ~~indicates~~~~showed~~ ladybird beetle was first observed in the was appeared from 3rd WAS (32th32nd SMW) and persisted till the 12th WAS (41th41st SMW) in the range between 0.52 to 0.56 ladybird beetle/plant. The ladybird beetle population achieved peak during 7th (36th SMW) with 2.40 ladybird beetle/plant.

The present finding is in agreementagrees with Singh et al. (2019) who reported peak population of ladybird beetle during 37th SMW while, Choudhary et al. (2023) reported maximum population of ladybird beetles in 36th SMW. The variation in present finding may be due to different date of sowing and prevailing weather parameters.

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Correlation

The data presented in Table-2 indicated that the ladybird beetle population had a positive ~~non-significant~~~~non-significant~~ correlation with minimum temperature ($r = 0.110$), morning relative humidity ($r = 0.415$), bright sunshine hours ($r = 0.334$), rainy days ($r = 0.019$) and evaporation ($r = 0.005$) had a positive ~~non-significant~~~~non-significant~~ correlation with the ladybird beetle population. However, maximum temperature ($r = -0.003$), evening relative humidity ($r = -0.110$), rainfall ($r = -0.148$) and wind speed ($r = -0.296$) had a negative ~~non-significant~~~~non-significant~~ correlation with ladybird beetle population.

Choudhary et al. (2023) reported that among various weather parameters minimum temperature, morning relative humidity and bright sunshine hours had positive ~~non-significant~~~~non-significant~~ correlation with the ladybird beetle population which is in agreementagrees with present findings.

5. *Chrysoperla*~~Chrysoperla~~

The data represented in ~~the~~ Table-1 showed that the ~~chrysoperla~~~~Chrysoperla~~ was appearedhad appeared from 3rd WAS (32th32nd SMW) and persisted till the 12th WAS (41th41st SMW) in the range between 0.68 to 2.04 ~~chrysoperla~~~~Chrysoperla~~/plant. The

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Chrysoperla population achieved peak during 7th (36th SMW) with 4.76 *Chrysoperla* plant.

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The present finding is in complete agreement with Choudhary et al. (2023) who also reported peak population of *Chrysoperla* during 36th SMW.

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Correlation

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The data presented in Table-2 indicated that the *Chrysoperla* population had a positive non-significant correlation with maximum temperature (r = 0.046), minimum temperature (r = 0.428), morning relative humidity (r = 0.201), bright sunshine hours (r = 0.247) and evaporation (r = 0.092) had positive non-significant correlation with the *Chrysoperla* population. However, evening relative humidity (r = -0.018), rainfall (r = -0.277), rainy days (r = -0.128) and wind speed (r = -0.090) had a negative non-significant correlation with the *Chrysoperla* population.

Choudhary et al. (2023) reported that among various weather parameters maximum temperature, minimum temperature and morning relative humidity had a positive non-significant correlation with the *Chrysoperla* population which is more or less similar to present findings.

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4. CONCLUSION

Jassid was commenced from 1st week of August (31st SMW) and achieved its peak during 1st week of September (35th SMW). Whitefly infestation commenced from 1st week of August (31st SMW) achieved its peak during 2nd week of September (36th SMW). The population of thrips commenced from 1st week of August (31st SMW) achieved its peak during 2nd week of September (36th SMW). The population of ladybird beetle was appeared had appeared from 2nd week of August (32nd SMW) and achieved its peak during 2nd week of September (36th SMW). The population of *Chrysoperla* was appeared had appeared from 2nd week of August (32nd SMW) and achieved peak population during 2nd week of September (36th SMW). Among the different environmental factors, morning relative humidity showed significant positive influence on jassid and whitefly population. Bright sunshine hours showed positive significant influence on thrips and whitefly population. However no significant correlation was found between natural enemies and weather parameters.

COMPETING INTERESTS:

NIL

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