Indian Journal of Entomology 85(4): 1020-1022 (2023) DoI. No.: 10.55446/IJE.2021.351

POPULATION DYNAMICS OF MAJOR INSECT PESTS OF INDIAN BEAN

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ABSTRACT

The incidence of aphid *Aphis craccivora* Koch in Indian bean *Lablab purpureus* (L.) reached its peak during 2nd week of January (2nd SMW) with 25.27 aphids/ twig of 10 cm. Maximum incidence of jassid *Empoasca kerri* Pruthi (8.20/ leaf) and whitefly *Bemisia tabaci* (Gennadius) (7.12/ leaf) was observed during 4th week of December (52nd SMW). The thrips *Megalurothrips distalis* Karny started appearing from 4th week of November (48th SMW) reaching its peak (10.35/ flower) during 1st SMW. Maximum larval counts of *Helicoverpa armigera* (Hubner) (5.79/ plant) was observed during 2nd week of January (2nd SMW), while in case of *Maruca vitrata* Geyer (7.21/ plant) it was during 2nd week of January (2nd SMW). Maximum and minimum temperature showed significant negative influence on the incidence of all these pests; and morning relative humidity showed significant negative effect on all except *M. distalis.* While morning vapour pressure showed significant negative influence on the incidence of all pests except *E. kerri* and *B. tabaci.*

Key words: *Lablab purpureus*, *Empoasca kerri, Bemisia tabaci*, *Megalurothrips distalis*, *Helicoverpa armigera, Maruca vitrata,* seasonal incidence, weather factors, correlation coefficients

Indian bean *Lablab purpureus* (L.) is an important pulse cum vegetable crop in India and it is also used as cattle feed. The protein content of field bean is quite high varying from 20.0 to 28.0% (Reddy et al., 2017). Insect pests are the major constraints for the productivity of Indian bean, as it is attacked by a number of insect pests viz. aphid *Aphis craccivora* Koch.; jassids *Empoasca fabae* (Harris); *E. krameri* Ross & Moore and *E. kerri* Pruthi; pod borers *Etiella zinckenella* (Treit.), *Maruca vitrata* Geyer and *Helicoverpa armigera* (Hubner); whitefly *Bemisia tabaci* (Genn.); stem fly *Ophiomyia phaseoli* (Tryon); Bihar hairy caterpillar *Spilosoma obliqua* (Wlk.) (Jakhar et al., 2017; Reddy et al., 2017). For development of successful IPM strategies, detailed information on the population buildup in particular the influence of weather factors is of great significance. This information will be helpful in preferring predictive models in forecasting the pest outbreaks. Hence, this study on the population dynamics of major pests of Indian bean.

MATERIALS AND METHODS

Study was carried out at the College Farm, N M College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during 2019-20. The Indian bean variety GNIB-22 was sown on 22nd October 2019 in 400 m^2 area. All the recommended post-sowing agronomical practices were followed except the plant protection. Observations were recorded at an interval of seven days starting from one week after germination till harvesting from five randomly selected plants from each of five quadrates. Aphid population was recorded on three randomly selected twigs (about 10 cm long) from each tagged plant and mean number of aphids/ twig were counted. Jassid and whitefly were counted from three leaves (from top, middle and bottom), while that of thrips was assessed by shaking flowers with twigs over a white paper and counting thrips fallen on the paper piece. Number of pod borer *H. armigera* and *M vitrata* larvae were recorded and mean number of larvae/ plants was calculated. The data on weather parameters obtained from the Agricultural Meteorological observatory, Department of Meteorology, Navsari Agricultural University, Navsari were utilized for computing correlation coefficients.

RESULTS AND DISCUSSION

The results obtained revealed that the incidence of aphid *Aphis craccivora* commenced from 2nd week after sowing (WAS) i.e. 2nd week of November (46th SMW) and persisted till 1st week of February (6th SMW, 14th WAS); and ranged from 1.94 to 25.27 aphids/ twig of 10 cm, and their incidence increased from 8th WAS to reach its peak during 10th WAS (2nd SMW- 25.27 aphids/ twig) (Fig. 1). The relationship with weather factors revealed that maximum temperature (r=-0.782**),

minimum temperature (r=-0.726**), morning vapour pressure (r=-0.775**) and evening vapour pressure (r=-0.738**) exhibited highly significant negative correlation; while, wind speed (0.546*) had a significant positive correlation and morning relative humidity- RH (-0.539*) had a significant negative correlation (Table 1). These results agree with those of Chaudhary et al. (2016) on the seasonal incidence. Dalwadi et al. (2007) stated that minimum and mean temperature and vapour pressure showed significant negative association with aphids, while RH, sunshine hours and wind speed correlated positively.

The activity of jassid *E. kerri* started from of 2nd WAS i.e. 2nd week of November (46th SMW) and persisted till 1st week of February (6th SMW, 14th WAS) with peak (8.20 jassids/ leaf) during 4thweek of December (52nd SMW, 8th WAS). There was a significant negative correlation with maximum temperature (r= -0.632*), minimum temperature (r=-0.556*) and morning RH (r=-0.537*) (Fig. 1; Table 1). Dalwadi et al. (2007) reported that RH had significant negative correlation with jassids. Singh et al. (2019) revealed that jassid, *Empoasca motti* incidence had a negative correlation with maximum and minimum temperature, RH and rainfall. With whitefly *B. tabaci*, the incidence was found to commence from of 2nd WAS i.e., 2nd week of November (46th SMW) and persisted till 1st week of February (6th SMW, 14th WAS) with peak (7.12 whiteflies/ leaf) during 4th week of December (52nd SMW, 8th WAS). Correlation coefficients with weather parameters showed significant negative correlation with maximum temperature (r= -0.594*) and morning RH (r=-0.541*) (Fig. 1; Table 1). Marabi et al. (2017) observed that whitefly exhibited significant positive correlation with maximum and minimum temperature, morning and evening vapour pressure and evaporation in soybean; whereas, negative correlation was observed with morning RH % during rabi season. The activity of thrips *M. distalis* started from of 4th WAS i.e. 4th week of November (48th SMW) and persisted till 2nd week of February (6th SMW, 14th WAS) with peak (10.35 thrips/ flower) during 1st SMW (9th WAS). Its incidence

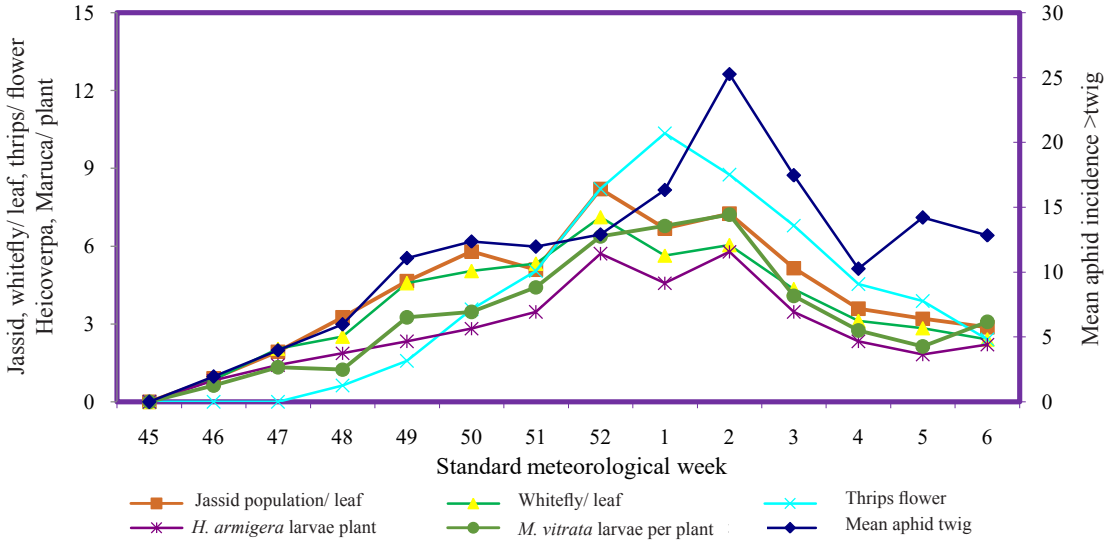

Fig. 1. Population dynamics of insect pests on Indian bean

Table 1. Correlation coefficient(r) between weather parameters and pests on Indian bean

Weather factors	Aphid	Jassid	Whitefly	Thrips	*H. armigera*	*M. vitrata*
Maximum temperature (^{0}C)	-0.782**	-0.632*	-0.594*	-0.830**	-0.644*	-0.701**
Minimum temperature (^{0}C)	-0.726**	-0.556*	-0.505	-0.727**	-0.553*	-0.570*
Morning relative humidity (%)	-0.539*	-0.537*	-0.541*	-0.296	-0.535*	-0.534*
Evening relative humidity (%)	-0.444	-0.051	0.001	-0.096	-0.097	-0.113
Bright Sunshine(h/ day)	0.084	-0.379	-0.430	-0.189	-0.328	-0.281
Wind speed (km/ hr)	0.546*	0.188	0.209	0.126	0.159	0.288
Morning vapour pressure (mm)	-0.775**	-0.474	-0.349	-0.669**	-0.543*	-0.593*
Evening vapour pressure (mm)	-0.738**	-0.406	-0.349	-0.565*	-0.427	-0.480

**Significant at p=0.01 (r=±0.66); *Significant at p=0.05 (r=± 0.53)

exhibited a highly significant negative correlation with the maximum temperature (r=-0.830**), minimum temperature (r=-0.727*) and morning vapour pressure (r=-0.669*), ehile, evening vapour pressure (r=-0.565*) showed significant negative correlation (Fig. 1, Table 1).

The larvae of *H. armigera* appeared starting 2nd week of November (46th SMW, 2nd WAS) with 0.83 larva/ plant and remained on the crop till 1st week of February (6th SMW, 14th WAS); maximum counts were during 2nd week of January (2nd SMW) i.e. 5.80 larvae/ plant. Maximum temperature (r= -0.644*), minimum temperature (r= -553*), morning RH (r=-0.535*) and morning vapour pressure (r=- 543*) were found to exhibit a significantly negative correlation with *H. armigera* (Fig. 1; Table 1). These results are in agreement with those of Rashmi et al. (2019), who reported that the highest infestation of this pest was found during the month of December and January and reported a significant negative association with maximum temperature. Chavan et al. (2020) and Dindor et al. (2020) revealed that *H. armigera* exhibited significant negative correlation with RH. *Maruca vitrata* incidence was observed from 2nd week of November (46th SMW, 2nd WAS) with 0.63 larva/ plant and remained till 1st week of February (6th SMW, 14th WAS); maximum counts were observed during 2nd week of January (2nd SMW- 7.21/ plant; the incidence was showing a highly significant negative correlation with maximum temperature (r= -0.701**), while, minimum temperature (r=-570*), morning RH (r=-0.534*) and morning vapour pressure (r=-593*) exhibited a significantly negative correlation (Fig. 1, Table 1). These results are in agreement with those of Rashmi et al. (2019), who observed that *M. vitrata* was found in large numbers during December and January; and maximum temperature, minimum temperature and evaporation showed significant negative correlation.

ACKNOWLEDGEMENTS

The authors thank the Navsari Agricultural University, Gujarat for providing facilities.

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(Manuscript Received: June, 2021; Revised: November, 2021;
Accepted: December, 2021; Online Published: March, 2022)
Online First in www.entosocindia.org and indianentomology.org Ref. No. e21142