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POPULATION DYNAMICS OF INSECT PESTS OF PEA

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ABSTRACT

The seasonal incidence of major insect pests on pea *Pisum sativum* at different growth stages has been assessed in this study. Major pests observed include gram pod borer *Helicoverpa armigera* (Hubner), blue butterfly *Lampedes boeticus* (L.), pea leaf miner *Chromatomyia horticola* Goureau and pea aphid *Acyrthosiphon pisum* (Harris). These results revealed that peak incidence of *H. armigera* (7.80 larvae/ plant) and *L. boeticus* (8.60 larvae/ plant) was during the 8th and 9th SMW, respectively; while for *C. horticola* (5.50 larvae/ leaf) and *A. pisum* (94.1 aphids/ plant) it was 5th SMW. *Helicoverpa armigera* incidence revealed a significant negative correlation with minimum temperature (r= -0.628) while for *L. boeticus* it was positive one with maximum temperature (r= 0.604). The incidence of *C. horticola* was observed to be significantly negatively correlated with minimum temperature and rainfall (r= -0.826 and r= -0.584, respectively); while *A. pisum* revealed a significant negative correlation with minimum temperature (r= -0.806).

Key words: Field pea, *Pisum sativum*, insect pests, seasonal incidence, *Helicoverpa armigera*, *Lampedes boeticus*, *Chromatomyia horticola*, *Acyrthosiphon pisum*, weather parameters, correlation, pod borers

Pea *Pisum sativum* L., belonging to the family Fabaceae, is an important vegetable grown in the Indian subcontinent, in the milder temperate zones. It is cultivated on 0.64 million ha in India, with production of 0.88 mt and productivity of 1375 kg/ ha (Anonymous, 2020) It serves as a cheap source of digestible protein, carbohydrates, fat, vitamins, and minerals (Tiwari et al., 2019). Losses due to insect pests are a handicap for its maximum yield. From seedling to harvest, 24 insect pests have been reported (Bijjur and Verma, 1995). Of these, the gram pod borer *Helicoverpa armigera* (Hubner), blue butterfly *Lampides boeticus* (L.), pea pod borer *Etiella zinckenella* (Treitsshke), pea aphid *Acyrthosiphon pisum* (Harris), pea leaf miner *Phytomyza horticola* (Goureau), pod fly *Melanogromyza obtuse* (Malloch), pea stem fly, *Melanagromyza phaseoli* (Tryon) and thrips *Caliothrips indicus* (Bagnall) cause serious losses (Mittal and Ujagir, 2007; Yadav et al., 2015). The correlation studies between seasonal insect pest occurrence and succession patterns helps to understand how changing plant communities and habitats influence pest populations. For an effective IPM, knowledge on the seasonal incidence and abundance of pests, and their population dynamics is required and hence the present study.

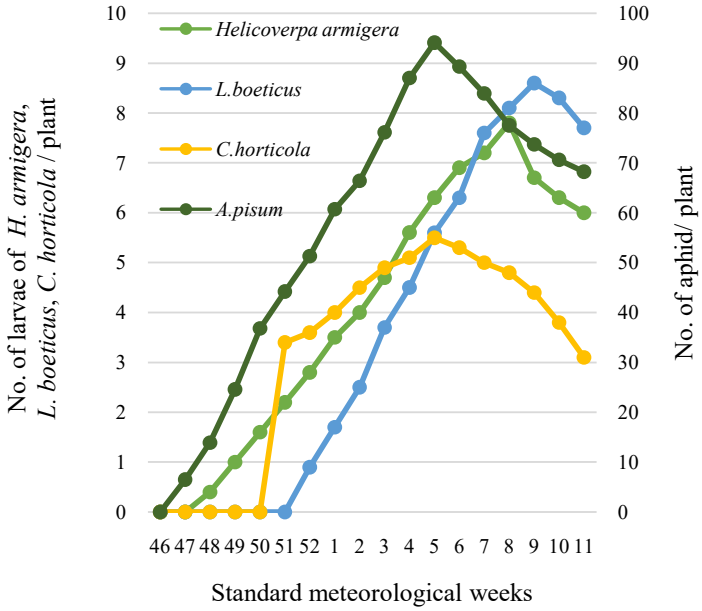
MATERIALS AND METHODS

A field experiment was carried out during rabi, 2020-21 at the Agricultural Research Farm, Rafi Ahmed Kidwai College of Agriculture, Sehore (23°12”N, 77°05”E). The field was prepared using standard packages and practices and a non–replicated trial was laid out in the field with a plot size of 50 m^2 having row to row distance of 30 cm and plant to plant distance of 10 cm, with vegetable pea variety ‘Arkel’. The experimental plot was kept free from insecticidal spray, and data on seasonal incidence were recorded at weekly intervals starting from the appearance of respective pest till harvesting. For the pod borer complex, number of larvae were counted from ten randomly selected plants/ plot; number of larvae of leaf miners were recorded from 3 leaves, one each from the upper, middle, and lower canopy. The incidence of the *A. pisum* were recorded by counting their number from the tender parts of ten randomly selected plants. Weekly data on maximum and minimum temperature, relative humidity, and rainfall were obtained from the meteorological observatory of the Rafi Ahmed Kidwai College of Agriculture, Sehore. These were used to work out a simple correlation with data on incidence using MS Excel.

RESULTS AND DISCUSSION

During rabi, 2020-21, four major insect pests viz., *H. armigera*, *L. boeticus*, *C. horticola* and *A. pisum* were observed at different stages of growth. Larvae of *H. armigera* started to appear from the 48th Standard Meteorological Week (SMW) (29th November to 05th December) with 0.4 larvae/ plant (Fig. 1); it continued to increase from 49th to 7th SMW (2nd week of December to the 3rd week of February), which varied from 1.00 to 7.20 larvae/ plant, with peak incidence during 8th SMW (24th February) with 7.80 larvae/ plant; this continued till maturity of the crop during 11th SMW (14th to 20th March). The correlation analysis showed that there was significant negative correlation of minimum temperature with larval incidence(r= -0.628), while others were non-significant. These findings are in agreement with those of Dubey et al. (1993) on *H. armigera,* with its peak activity beginning in February and lasting until March. Prasad et al. (1997) also found that the adults of *H. armigera* reached maximum during late March. Pandey et al. (2002) observed a significant positive linear relationship with maximum temperature (0.64), minimum temperature (0.62) and evaporation (0.60). Yadav et al. (2019) also found that *H. armigera* larval incidence starts increasing during third week of December to first week of March. *Lampides boeticus* started appearing during flowering and pod formation stage and continued up to the full maturity of the crop (Fig. 1); it first appeared during 52nd SMW (27th Decemberto 02nd January- 0.9 larvae/ plant), continued to increase from 1st to 8th SMW (1st week of January to the 4th week of February), and peak was during 9th SMW (26th February to 4th March- 8.60 larvae/ plant). Its incidence continued till maturity with 7.70 larvae/ plant during 11th SMW (14th to 20th March). A statistically significant and positive association was found between the larval incidence and the maximum temperature (r=0.604). These findings are partially in accordance with Kaushik and Singh (1982).

The incidence of *C. horticola* commenced during 51st SMW (4th week of December- 3.4 larvae/ leaf), and then continued to increase from 52nd to 4th SMW (27th



Insect pests	Weather parameters						
	Maximum temperature (°C)		Minimum temperature (°C)		Rainfall (mm)		Relative humidity (%)
	r	b_{yx}	r	b_{yx}	r	b_{yx}	r
H. armigera	0.357	-	-0.628*	-0.70	-0.465	-	-0.260
L. boeticus	0.604*	0.50	-0.382	-	-0.441	-	-0.345
C. horticola	-0.097	-	-0.826*	-0.73	-0.584*	-3.76	-0.055
A. pisum	0.061	-	-0.806*	-9.85	-0.447	-	-0.092

*Significant at p= 0.05

Fig. 1. Population dynamics of *H. armigera*, *L. boeticus*, *C. horticola* and *A. pisum* in pea (rabi, 2020-21)

December to 30th January- 3.6 to 5.1 larvae/ leaf) with peak being during 5th SMW (4th February- 5.50 larvae/ leaf). It continued till the maturity (3.1 larvae/ leaf- 11th SMW -14th to 20th March). The incidence revealed a significant negative correlation with both minimum temperature and rainfall (r= -0.826 and r= -0.584, respectively). These results are partially in accordance with Singh et al. (2013). The incidence of *A. pisum* started during 4th week of November (47th SMW- 6.5 aphids/ plant), and continued to increase from 48th to 4th SMW (29th November to 30th January- 13.9 to 87.0 aphids/ plant); and during 5th SMW (4th February) it was at its peak of 94.1 aphids/ plant, and it continued till maturity. Its incidence showed a significant negative correlation with minimum temperature (r= -0.806). Melesse and Singh (2012) found similar results with temperature and rainfall. Patel et al. (2023) found that aphid incidence had a negative correlation with minimum and maximum temperature and morning relative humidity, while it was positive with rainfall and relative humidity.

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AUTHOR CONTRIBUTION STATEMENT

S T and N K conceived, designed research and conducted experiments. S T and N contributed to analytical tools. S T wrote the manuscript. All authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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