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SEASONAL INCIDENCE OF MAJOR INSECT PESTS OF PEA IN MALWA REGION OF MADHYA PRADESH

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ABSTRACT

The seasonal variation or dynamics of insect pests are major constraints in the production of field pea. This study revealed that the seasonal incidence of pests in the Malwa region of Madhya Pradesh, during 2021-22 in the rabi season is related to ecological factors such as temperature, rainfall, and relative humidity. Three major pests of field pea were recorded, viz., gram pod borer (*Helicoverpa armigera* Hubner), leaf miner (*Phytomyza horticola* Goureau) and pea aphid (*Acyrthosiphon pisum* Harris). The *H. armigera* infestation occurred during the vegetative to pod-forming or reproductive stage from 50th SMW of 2021 to 12th SMW of 2022 (Standard Meteorological Week), which shows a significant negative correlation with minimum temperature (-0.637*) and was significantly influenced by *A. pisum* and *P. horticola* during the seedling to maturity stage.

Key words: *Pisum sativum*, *Helicoverpa armigera*, *Chromatomyia horticola*, *Acythosiphon pisum*, weather parameters, correlation

Field pea (*Pisum sativum* L.) belonging to the family Fabaceae, is cultivated in the winter and is an important component of sustainable cropping systems (Jensen et al., 2012). They are excellent sources of protein, dietary fiber and mineral nutrients (Grela et al., 2017). Field pea cultivation poses various abiotic as well as biotic stresses that affects its production and productivity. In the context of biotic stress, nearly 24 insect species have been reported to infest the pea crop at different growth stages (Bijjur and Verma, 1995). There are many insect pests that cause economic losses, like pod borer complex, pea pod borer (*Etiella zinckenella* Treischke) gram pod borer (*Helicoverpa armigera* Hubner), bean pod borer (*Maruca vitrata* Fabricius), blue butterfly (*Lampides boeticus* Linnaeus), pea aphid (*Acyrthosiphon pisum* Harris), field thrips (*Thrips angusticeps* Uzel), pea leaf miner (*Phytomyza horticola* Goureau and pea stem fly (*Ophiomyia phaseoli,* Tryon) (Mittal and Ujagir, 2005; Yadav and Patel, 2015; Vaibhav et al., 2018; Tare et al., 2023; Khaliq et al., 2023). Pod damage in field pea by the pod borer complex has been reported to be 13.45 to 40.38% (Dahiya and Naresh, 1993). For managing the above-mentioned insects, the population density of pests below the economic injury level is a very important aspect for earning higher production and profitability. Hence the study on pests incidence helps in identifying the peak period of pest incidence in a particular area and the number of generations in the cropping year of the concerned pest. This study helps in the decision-making and development of pests management systems.

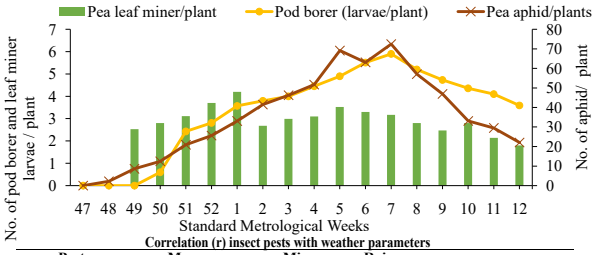
MATERIALS AND METHODS

The field experiment was conducted to study the seasonal incidence of major insect pests of the pea crop and their relation to abiotic factors during the rabi season (mid-November to mid-March) in the year 2021–22 at the Agricultural Research Farm, Rafi Ahmed Kidwai College of Agriculture, Sehore, in the Malwa region of Madhya Pradesh (23°12" N and 77°05" E). The field pea variety 'Arkel' was sown in a 50 m² plot with spacing between rows and plants maintained at 30 cm respectively. The field was prepared using standard agronomic practices without the application of insecticidal sprays. For counting the natural incidence of insect pests on pea crop, simple observations were recorded. The data on seasonal incidence was recorded during the morning hours at weekly intervals, starting from the first appearance of insect pests to till harvesting of the crop. For recording the incidence of *H. armigera*, the number of larvae were counted from different ten randomly selected plants from the plot by using the visual count method (Kharibam et al., 2022). For *A. pisum*, the number of adults and nymphs were recorded from 5 cm tender twigs of ten randomly selected plants from the plot (Roy and Banerjee,

2021). In the case of the *P. horticola*, the number of larvae were recorded from three leaves, one each from the upper, middle, and lower canopy, from each of the ten randomly selected plants from the plot (Tare et al., 2023). The meteorological data were collected from a meteorological observatory located at a research farm. Subsequently, the pest population was correlated with the weekly observed meteorological data viz., maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall. The observed data were analyzed using MS Excel and interpretwd (Patil et al., 2020).

RESULTS AND DISCUSSION

The results revealed that during 2021-22 the seasonal incidence of three major insects viz., gram pod borer (*H. armigera*, Hubner), pea leaf miner (*P. horticola* Goureau) and pea aphid (*A. pisum* Harris) were observed during different growth stages of the crop. The incidence of *H. armigera* started from the 50 SMW of 2021 with 0.60 larvae/ plant (Fig. 1); it gradually increased upto 6th SMW of 2022, which approximately reached 5.50 larvae/ plant. The peak population of *H. armigera*, was observed during the 7th SMW of 2022 with 5.90 larvae/ plant; pest population continued till crop maturity of the crop during 12th SMW (3.59 larvae/ plant) are showed in Fig. 1. The correlation study between *H. armigera* incidence with weather parameters revealed that minimum temperature was negatively correlated with larval population (r= -0.637*) while other weather parameters were showing non-significant correlation (Fig. 1). These findings are in accordance with those of Dubey et al. (1993) who found that the peak activity of *H. armigera* on pea occurs from February to March, while larval incidence increases from December to March (Yadav et al., 2019). The



Correlation (r) insect pests with weather parameters

Pest population/ plant	Max. temperature (°C)	Min. temperature (°C)	Rain fall (mm)	Morning RH (%)	Evening RH (%)
Pod borers	0.301	-0.637*	-0.428	-0.180	-0.459
Pea leaf miners	-0.178	-0.633*	0.169	-0.215	-0.089
Aphids	0.094	-0.801*	-0.324	-0.110	-0.383

*Significant at p=0.05; values without asterisk non- significant

Fig. 1. Population dynamics of field pea pests

larval population of pod borer show negative correlation with minimum temperature as revealed by Chauhan et al. (2023), Patel et al. (2023) and Tare et al. (2023).

The appearance of *P. horticola* started from the 49th SMW of 2021 with 2.53 miners or larvae/ plant and it continued to increase from 49th SMW of 2021 to 4th SMW of 2022, during which the population varied from 2.53 to 3.10 miners/ plant. The peak larval population was recorded during 5th SMW with 3.52 larvae/ plant and it was continued till the crop maturity (1.8 larvae/ plant in 12th SMW). The correlation studies between weather factors and *P. horticola* larval population showed that the minimum temperature negatively correlated with the larval population. The larval incidence is consistent with the findings of Kumar et al. (2018) who found that the peak level of *P. horticola* was observed during first and second week of February. Khaliq et al. (2023) revealed that the first incidence *P. horticola* started from 49th SMW and Tare et al. (2023) observed the peak population of *P. horticola* in 5th SMW (first week of February). Singh and Saravanan (2008) reported that the population of *P. horticola* increased with increasing maximum temperature. The present study revealed that the larval population was negatively correlated with minimum temperature (r= -0.633). Kumar et al. (2018) had also reported that minimum temperature showed negative correlation with the incidence of *P. horticola*. Naga et al. (2020) reported that the number of larvae of *Liriomyza trifolii* was negatively correlated with minimum temperature.

The incidence of *A. pisum* started from the 48th SMW of 2021 with 2.20 aphids/ plant and continuously rised from 48th SMW of 2021 to 6th SMW of 2022 and varied from 2.20 to 63.09 aphids/ plant. Peak incidence was observed in 7th SMW with 72.40 aphids/ plant. The present investigation findings are in agreement with those of Rien et al. (2021) who found that peak incidence of *A. pisum* was recorded during first and second week of February. The present study found that the minimum temperature was negatively correlated with aphid population with r= -0.801. The correlation study were confirmed with that of Chouhan et al. (2023), Chauhan et al. (2023) and Tare et al. (2023). Patel et al. (2023) also discovered a negative correlation between *A. pisum* incidence and minimum temperature and humidity.

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AUTHOR CONTRIBUTION STATEMENT

SP and NK designed research and conducted the experiment. JK and SP performed statistical analysis. SP and MG validated to analysed data and wrote the manuscript. All the authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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