*Short Communication*

# Seasonal abundance and population fluctuation of pea leaf miner, *Chromatomyiahorticola* (Goureau) infesting pea

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## Abstract

**Seasonal abundance and population fluctuation of pea leaf miner was studied by carrying out survey at experimental farms of Department of Entomology, CSKHPKV, Palampur and in farmer's fields at different locations *viz.,* Kangra, Kullu and Karsog during *Rabi* 2022-23. The data revealed highest mean leaf infestation (60.38%, 51.23%) and mean larval & pupal population (65.12, 54.16 larvae & pupae/ plant)during 13th SMW, 2023 at Kangra and Palampur, respectively. At Kullu the highest mean infestation of 60.13% and 65.37 mean larval & pupal population were recorded during 14th SMW, whereas at Karsog it was recorded during 16th SMW, 2023 with 60.13% mean infestation and 65.37 larvae & pupae/ plant. Correlation coefficients between pea leaf miner infestation, larval & pupal population and weather parameters indicated that temperature (max. and min.) exerted significant positive correlation in all surveyed locations except Karsog, where maximum temperature exerted non- significant positive correlation. Relative humidity showed non- significant positive correlation in all the surveyed locations except Kangra. Rainfall resulted in non- significant positive correlation in all surveyed locations except Kullu.**

**Key words:** Pea leaf miner, *Chromatomyia horticola,* Seasonal abundance

Garden pea (*Pisum sativum* L.) is one of the most important legume crops belonging to leguminaceae family and grown on commercial scale around the world (Sharma *et al*. 2022). The crop is cultivated for use as vegetable and mature dry pods to use as a pulse. It provides diverse nutrient profile of health building substances like vitamins, minerals and lysine, a limiting amino acid in cereals (Sharma *et al*. 2007). The productivity of pea is low because of numerous biotic and abiotic causes. Among the biotic constraints,large numbers of insect pests attack different parts of the plant at different growth stages, from seedling to harvest. As many as 24 insect species have been reported infesting the pea crop at different stages (Bijjur and Verma 1995). Among themagromyzid leaf miner*, Chromatomyia horticola* (Goureau) is the most serious pests in both the temperate and tropical regions. The activity and population dynamics of different insect pests are also

closely related to a number of abiotic environmental conditions. Abundance of different insect-pests depends on various climatic conditions of the area. Singh and Saravanan (2008) noted that infestation of pea leaf miner increased with increase in maximum temperature. It has been reported that weather parameters were the major regulatory factors for the leaf miner infestation under field conditions. Venkateshwarlu *et al*. (2011) observed that green and succulent foliage combined with moderate temperature and humidity range were favourable for the infestation of the pest. Leaf miner is also known to transmit plant diseases (Parrella *et al.* 1985; Parrella 1987). The larvae of pea leaf miner feed on mesophyll of leaf by making mines between the leaf surfaces that reduce photosynthetic ability of plants, hereby reducing flower production and seriously affecting crop quality. In case of severe attack 86-93 per cent of the leaves are found affected by leaf minerTariq *et al.*

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1991). Keeping in view these facts an attempt was made here to study seasonal abundance and population fluctuation of pea leaf miner.

Pea growing areas of Palampur, Kangra, Kullu and Karsog were surveyed after 10-15 days of crop emergence till harvesting of the crop in the farmer's fields of these areas to know about the incidence and larval & pupal population of pea leaf miner in these locations. Five villages from each location and three fields from each village were selected to record the seasonal incidence of the pest except Palampur where three experimental farms were selected with two replications each. Twenty plants were randomly selected in each field. For leaf infestation and population count, five compound leaves-one terminal, two each from middle and lower canopy were examined from each selected plant. The infested as well as total number of leaflets were counted and per cent leaf infestation was worked out using the following formula:

$$\text{Per cent leaf infestation} = \frac{\text{Number of infested leaflets}}{\text{Total number of leaflets}} \times 100$$

To establish the relationship between leaf infestation, larval and pupal population and weather parameters, the leaf infestation and population (larvae and pupae) of a particular period was correlated with weather parameters like maximum temperature, minimum temperature, rainfall and relative humidity, prevailing during same period. The meteorological data were obtained from the Department of Agronomy, CSKHPKV, Palampur and data for different surveyed locations were obtained from the agro met observatories installed at KVK's of surveyed locations.Correlation coefficients were worked out between weekly averages of pest incidence and averages of weather parameters prevailing during preceding week.

It is evident from Table 1 that the pest appeared in the fields during 52nd standard meteorological week (SMW) *i.e.*, last week of December, 2022 both at Kangra and Palampur. The infestation commenced from the lower leaves of the plants, thereafter the leaf infestation and larval and pupal population started increasing and reached at its peak after that followed a decreasing trend. The mean leaf infestation varied from 0.91 to 60.38 per cent at Kangra and 0.47 to 51.23 per cent at Palampur. The pooled mean larval & pupal population at both these locations varied from 0.14 to 65.12 and from 0.19 to 65.37, respectively during entire crop period. The highest mean leaf infestation of 60.38 and 51.23 per cent and pooled mean larval &

**Table 1. Population build-up of *Chromatomyia horticola* on pea at Kangra and Palampur (*Rabi* 2022-23)**

| SMW | Mean leaf infestation (%) | | Mean population (larvae & pupae/ plant) | |
|---|---|---|---|---|
| | Kangra | Palampur | Kangra | Palampur |
| 52 | 0.91 | 0.47 | 0.14 | 0.06 |
| 1 | 2.52 | 1.64 | 0.36 | 0.27 |
| 2 | 3.49 | 2.78 | 0.57 | 0.59 |
| 3 | 5.23 | 3.99 | 0.97 | 1.17 |
| 4 | 6.78 | 4.67 | 1.65 | 1.86 |
| 5 | 9.02 | 6.41 | 3.39 | 2.21 |
| 6 | 11.35 | 8.40 | 5.11 | 3.73 |
| 7 | 15.10 | 10.78 | 14.69 | 5.39 |
| 8 | 17.69 | 14.47 | 20.34 | 13.01 |
| 9 | 22.64 | 17.57 | 34.12 | 20.14 |
| 10 | 34.53 | 19.21 | 49.54 | 20.65 |
| 11 | 50.11 | 25.69 | 62.61 | 33.80 |
| 12 | 58.62 | 42.23 | 63.03 | 46.74 |
| 13 | 60.38 | 51.23 | 65.12 | 54.16 |
| 14 | 57.72 | 44.93 | 61.35 | 49.27 |
| 15 | 50.24 | 43.52 | 55.12 | 45.17 |

SMW- Standard meteorological week

pupal population of 65.12 and 54.16 were recorded during 13th SMW, 2023 followed by 12th SMW, 2023 in case of former location and 14th SMW, 2023 in case of latter location.

It was found that in Kullu, the pest appeared in fields during 2nd SMW, where as at Karsog, the pest appeared during 8th SMW, 2023 (Table 2). The mean leaf infestation varied from 1.47 to 60.13 per cent in Kullu and1.10 to 46.01 per cent at Karsog. The mean larval & pupal population varied from 0.19 to 65.37 in Kullu and 0.14 to 51.68 at Karsog during entire crop period. The highest mean leaf infestation of 60.13 per cent and mean larval and pupal population of 65.37 were recorded during 14th SMW followed by 16th SMW of 2023 in Kullu, whereas at Karsog the highest mean leaf infestation of 46.01 per cent and mean larval & pupal population of 51.68 were recorded during 16th SMW followed by 18th SMW of 2023.

The present findings regarding the mean leaf infestation and mean larval and pupal population are in consonance with the results obtained by Sood (1992)

who reported that the population of leaf miner reached at its peak in April and maximum number of larvae and pupae per plant were recorded on 5th April and 21st March in 1991 and 1992, respectively. Also, the present findings lend support from the results of Guleria (2022) who reported that pea leaf miner incidence ranged from 0.00 to 60.86 per cent during 2021-22 and peak infestation was recorded in the 4th week of March (60.86%) followed by 1st week of April (56.42%). The per cent infestation was highest on April 26, 1991 and April 11, 1992, respectively.

**Correlation between pea leaf miner infestation/ larval & pupal population and weather parameters**

Correlation coefficients between pea leaf miner infestation and weather parameters (Table 3) revealed that at Kangra, significant positive correlation was observed with maximum temperature (r= 0.792), minimum temperature (r= 0.860) and relative humidity (r= 0.731) while rainfall (r= 0.258) showed non-significant positive correlation. Same trend was followed with correlation between mean larval & pupal

**Table 2. Population build-up of *Chromatomyiahorticola* on pea in Kullu and Karsog (*Rabi* 2022-23)**

| SMW | Mean leaf infestation (%) | | Mean population (larvae & pupae/ plant) | |
|---|---|---|---|---|
| | Kullu | Karsog | Kullu | Karsog |
| 2 | 1.47 | - | 0.19 | - |
| 4 | 3.52 | - | 0.81 | - |
| 6 | 6.05 | - | 2.34 | - |
| 8 | 10.02 | 1.10 | 7.31 | 0.14 |
| 10 | 18.60 | 3.71 | 23.94 | 0.91 |
| 12 | 40.91 | 8.50 | 52.23 | 4.30 |
| 14 | 60.13 | 27.96 | 65.37 | 35.94 |
| 16 | 55.89 | 46.01 | 60.24 | 51.68 |
| 18 | 46.97 | 44.28 | 51.33 | 49.70 |
| 20 | - | 38.80 | - | 44.11 |

SMW- Standard meteorological week

**Table 3. Correlation coefficients between pea leaf miner infestation and weather parameters at different locations**

| Factor | Pea leaf miner infestation | | | |
|---|---|---|---|---|
| | Kangra(n= 16) | Palampur(n= 16) | Kullu(n= 9) | Karsog(n= 7) |
| $T_{max}$(°C) | 0.792** | 0.590* | 0.770* | 0.639 NS |
| $T_{min}$(°C) | 0.860** | 0.718** | 0.894** | 0.781* |
| Rainfall (mm) | 0.258 NS | 0.364 NS | 0.802** | 0.579 NS |
| Relative humidity(%) | 0.731** | 0.190 NS | 0.127 NS | 0.315 NS |

**Significant at 1% level; *Significant at 5% level; NS- Non-significant; n- number of observations; $T_{max}$-Maximumtemperature; $T_{min}$-Minimum temperature

population and weather parameters (Table 4) i.e., significant positive correlation was observed with maximum (r= 0.844), minimum temperature (r= 0.905) and relative humidity (r= 0.716). However, rainfall showed non- significant positive correlation (r= 0.215) with mean larval and pupal population. At Palampur also significant positive correlation was observed with maximum (r= 0.590) and minimum temperature (r= 0.718).The relative humidity (r= 0.190) and rainfall (r= 0.364) showed non- significant but positive correlation. Same trend was followed with correlation between mean larval and pupal population and weather parameters (Table 4) i.e., significant positive correlation was observed with maximum (r= 0.596) and minimum temperature (r= 0.724). The relative humidity (r= 0.230) and rainfall (r= 0.382) showed non- significant but positive correlation.

At Kullu significant positive correlation was observed between leaf miner infestation andmaximum temperature (r= 0.770), minimum temperature (r= 0.894) and rainfall (r= 0.802) while relative humidity showed non- significant positive (r= 0.127) correlation. Same trend was followed with correlation between mean larval and pupal population (Table 4) and weather parameters i.e., significant positive correlation was observed with maximum (r= 0.777), minimum temperature (r= 0.910) and rainfall (r= 0.745) while relative humidity (r= 0.077) showed non-significant but positive correlation with mean larval and pupal population. At Karsog, significant positive correlation was noticed between leaf miner infestation with minimum temperature (r= 0.781) while maximum temperature (r= 0.639), rainfall (r= 0.579), relative humidity (r= 0.315) was non- significant but positively correlated. Same trend was followed with

correlation between mean larval and pupal population (Table 4) and weather parameters i.e., significant positive correlation was observed with minimum temperature (r= 0.722) while maximum temperature (r= 0.631), rainfall (r= 0.552) and relative humidity (r= 0.270) showed non- significant but positive correlation.

These results pertaining to correlation studies between weather parameters and abundance of *C. horticola,* are in close conformity to those of Guleria (2022) who reported that per cent incidence of pea leaf miner was significantly and positively correlated with average maximum temperature (r= 0.905) and average minimum temperature (r= 0.878). Average rainfall was negatively and non-significantly correlated (r= -0.208) with leaf infestation, whereas average relative humidity was negatively and significantly correlated with infestation (r = -0.536). Also, Pathania (2020), reported that leaf miner infestation on pea under different farming practices was having significant positive correlation with maximum and minimum temperature during the two seasons. Earlier, Sood (1992) had reported significant positive correlation between average number of larvae per plant and average maximum temperature, minimum temperature. Relative humidity was negatively non-significant during 1990-91 and positively non-significant during 1991-92. However, it showed non-significant negative correlation with total rainfall during both the years.

## Conclusion

The results revealed that the highest pooled mean infestation and larval and pupal populationwas recorded during 13$^{th}$ SMW of 2023 at Kangra and Palampur whereas at Kullu and Karsog it was recorded

**Table 4. Correlation coefficients between pea leaf miner population and weather parameters at different locations**

| Factor | Pea leaf miner (larval & pupal) population | | | |
|---|---|---|---|---|
| | Kangra | Palampur | Kullu | Karsog |
| | (n= 16) | (n= 16) | (n= 9) | (n= 7) |
| $T_{max}$ (°C) | 0.844** | 0.596* | 0.777* | 0.631$^{NS}$ |
| $T_{min}$ (°C) | 0.905** | 0.724** | 0.910** | 0.722* |
| Rainfall (mm) | 0.215$^{NS}$ | 0.382$^{NS}$ | 0.745* | 0.552$^{NS}$ |
| Relative humidity (%) | 0.716** | 0.230$^{NS}$ | 0.077$^{NS}$ | 0.270$^{NS}$ |

**Significant at 1% level; *Significant at 5% level; NS- Non-significant; n- number of observations; $T_{max}$-Maximumtemperature; $T_{min}$-Minimum temperature

during 14th and 16th SMW of 2023, respectively. The influence of weather factors on pea leaf miner infestation and larval and pupal population revealed that temperature (max. and min.) had significant positive correlation in all the surveyed locations except Karsog, where maximum temperature exerted non- significant positive influence. Relative humidity showed non- significant positive correlation in all surveyed locations except Kangra. Rainfall resulted in non- significant positive correlation in all surveyed locations except Kullu.

**Conflict of interest:** The authors declare that there is no conflict of interest in this research paper.

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