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## To study the seasonal incidence of pea pod borer, *Etiella zinckenella* Treitschke during Rabi season 2020-21 and 2021-2022

**Arun Kumar, RK Dwivedi and Omendra Sharma**

### Abstract

The experiments were conducted in completely randomized block design with three replications during Rabi, seasons of 2020-2021 and 2021-2022 at Student Instruction Farm (SIF) Chandra Shekhar Azad University of Agriculture & Technology, Kanpur - 208002 (U.P.). To study the seasonal incidence of pea pod borer, *Etiella zinckenella* Treitschke, during Rabi season 2020-2021 and 2021-2022, The population was started from third week of January 2021 & 2022 (3<sup>rd</sup> standard meteorological week) to April 2021 & 2022 (15<sup>th</sup> standard meteorological week) of crop. The larval population was low during January, 2021 to fourth week of January, 2021 and varied from 1.01 to 1.92 larvae/five plants. The maximum population increased and reaches its peak (15.43 larvae/5 plants) in all control plots on 26 February, 2021 (8<sup>th</sup> standard weeks). When the maximum and minimum temperature was 28.8°C and 11.9°C, respectively, relative humidity was 57% and rainfall to the tune of nil was recorded. Second year the pest population increased and reaches its peak (16.43 larvae/five plants) on 22 February 2022 (8<sup>th</sup> standard meteorological week). and the maximum and minimum was temperature was 27.4°C and 12.3°C, respectively, relative humidity was 64.50% and the rainfall to the tune of nil was recorded.

**Keywords:** *Etiella zinckenella* Treitschke, population, peak, increased, temperature, humidity

### Introduction

Field Pea, *Pisum sativum* L. is an important leguminous vegetable crop & mostly grown in all states of the country during Rabiseason (Singh *et al.*, 2001) <sup>[6]</sup> and because of its taste, nutritive value, fast growth and high yield this crop is patronized throughout the world. It is used as vegetable purpose as well as pulse (Singh and Joshi, 1970) <sup>[5]</sup>. Pea is one of the most important food legumes being grown around the world and Canada, France, China, Russia, Ukraine, and the Western United States are the primary growers. India is the world's largest producer and the largest consumer of pulses. In the world sharing 36.6% in area and 27% in production with 0.6 tones/ha in productivity of the world. In India area under pulse cultivation is 30.20 million ha and production is estimated to 28.42 metric tons (Report of Ministry of Agriculture, Govt. of India, 2021-2022) <sup>[1]</sup>. The cultivation of pea for vegetable purpose in Kanpur district has attained grand success due to good market price particularly in the adjacent state market.

There are many abiotic and biotic factors responsible for low productivity. Among abiotic factors i.e. temperature, humidity, rainfall, soil fertility etc. play an important role on productivity of pea. Insect pest are the major constrains for the low productivity of pea under biotic factors. The high yield could not be achieved due to number of insect pests attacking. The crop is known to suffer from a series of pests. The insect pests i.e. pea pod borer, *Etiella zinckenella* Treitschke, gram pod borer, *Helicoverpa armigera* Hubner, appear in great in number during vegetative growth to pod maturation stage of pea. (Lal *et al.*, 2006) <sup>[4]</sup>. The period of insect attack in relation to plant growth, the intensity of injury, the duration of attack and the environment factors affecting both insect activities and plant growth are the factors that control the relationship between an insect infestation and its effect on yield (Kushwaha, 2002) <sup>[3]</sup>. Hence, the prevention of crop losses from pest attack is necessary for massive production of high yield potential of the new pea varieties.

The pea pod borers *Etiella zinckenella* Treitschke and *Helicoverpa armigera* Hubner are serious insect pests and often causes substantial loss to the crop. Insect pest's damage to this crop imposes severe limits in its production. The newly emerged larvae of *Etiella zinckenella* Treitschke is cosmopolitan and widely distributed in India. It is a serious pest of pea. The moths emerge in February and March.

The eggs are laid both singly and in clusters on various parts of the plants. The newly emerged larval feed on foliage for some time and later enter into the pods and feed on the green grains. The larval stages are completed in 10-27 days and pupate in the soil. Life cycle completes in 45-56 days and passes through 5 generations in one year and often causes heavy loss on pea crop especially in dry season. The young larvae of *Helicoverpa armigera* Hubner feed on the foliage and flowers for some time and later bore into the pods and feed on the developing seeds, with their bodies hanging outside. A single larvae may destroy several pods before reaching to maturity.

### Materials and Methods

The present study was carried out during the *Rabi* season of the year 2020-21 and 2021-2022. The details of materials used, experimental procedures followed & statistical analysis adopted during the course of investigation were as follows.

#### General climatic information of experimental site

Kanpur has subtropical and semi-arid climate with hot summer and severe cold winter. The winters are severe with a minimum temperature of about 2 °C with occasional ground frost. In summer the temperature often goes up to 40 to 47 °C in the month of May and June. The south-west monsoon commence generally during third week of June and cessation of it by the end of September. The mean precipitation is about 800 mm of which about 80-90 per cent is received during July to September. Few showers of cyclonic rains are also received during December to January & late spring also.

#### Soil of the experimental field and Preparation of the field

The soil of the experimental field was sandy loam with an average fertility level. Field were ploughed twice with the help of tractor mounted disc harrow. Each ploughing was followed by leveling with the help of leveler. Pre sowing irrigation was given to ensure suitable moisture in soil for good germination.

#### Layout and sowing of experiment

The field trial with field pea variety KPMR-400 in randomized block design in a plot measuring 3 X 5 m. area and 12 treatments including control with 3 replications were laid out on 25 November 2020 and 20 November 2021 in a well prepared field and the seed was sown @ 100kg/ha. The furrows were opened with the help of furrow opener adjusted at a row distance of 30 cm and plant to plant of 5 cm apart. The furrows were covered with soil and field was made smooth after completing the total sowing.

#### Fertilizer application

Recommended dose of 20 kg/ha N, and 40 kg/ha P<sub>2</sub>O<sub>5</sub> were applied for good crop production. Total dose of the nitrogen as starter dose which can meet plant requirement before the formation of nodules and total quantity of phosphorus were applied as basal at the time of final field preparation. All the

fertilizers are drilled in furrows at a depth of 7-10 centimeters.

#### Weeding

First weeding was done at 15 days after germination with the help of “*Khurpi*” and second weeding was done when the crop was 35 days old.

#### Counting of larval population

Experiments were laid out with KPMR-400 grown promising variety of field pea for the study of seasonal incidence of pod borer, *Etiella zinckenella* Treitschke in relation to abiotic factors. Pea pod borer, *Etiella zinckenella* Treitschke are specific borers pest of field pea, hence the initial seasonal incidence of the borers pest is to be appeared earliest at the time of flowering and pod formation of the crop. The population of tested insect is to be monitored closely as soon as it appears on the plant. The data regarding the population of borer's pest will be recorded on 5 randomly selected plants at weekly intervals till the harvesting of the crop. At the same time the meteorological data of the crop period will be collected from the observatory, department of Agronomy, C. S. Azad University of Agriculture and Technology Kanpur. The existence of the seasonal incidence of borer's pest will be analyses statistically and correlate with these data accordingly.

### Result and Discussion

#### Year-2020-2021

The pea pod borer, *Etiella zinckenella* Treitschke population was started from the flowering stage during 3<sup>rd</sup> SMW and continued till 15<sup>th</sup> SMW, of the harvest stage. The observations were recorded from germination of the crop to harvest of the crop at weekly interval.

The observations on larval population of pea pod borer, *Etiella zinckenella* Treitschke recorded from third week of January 2021 (3<sup>rd</sup> standard meteorological week) to April 2021 (15<sup>th</sup> standard meteorological week) of crop. The pest population recorded as number of larvae ranged from 1.01 to 15.43 larvae/five plants during *Rabi* season 2020-2021. (Table 1) The larval population was low during January, 2021 to fourth week of January, 2021 and varied from 1.01 to 1.92 larvae/five plants. The pest population increased and reaches its peak (15.43 larvae/five plants) on 26 February, 2021 (8<sup>th</sup> standard meteorological week) when the maximum and minimum temperature *i.e.* 28.8 °C and 11.9 °C, respectively, relative humidity *i.e.* 57% and rainfall to the tune of nil was recorded. When the maximum and minimum temperature was *i.e.* 28.8 °C and 11.9 °C, respectively, relative humidity was *i.e.* 57% and rainfall to the tune of nil was recorded. The correlation matrix indicated a significant positive correlation with maximum temperature ( $r = 0.563^*$ ) with pea pod borer infestation. However, significant positive correlation was observed with minimum temperature ( $r = 0.536^*$ ) and total rainfall ( $r = 0.091$ ), while non-significant negative correlation was found with average relative humidity ( $r = -0.346$ ).

**Table 1:** Seasonal incidence of pea pod borer, *Etiella zinckenella* Treitschke in relation to abiotic factors during 2020-2021

SW	Larval population of <i>E. zinckenella</i> /5 plants	Temperature max. (°C)	Temperature min. (°C)	Relative humidity (%)	Rainfall (mm)
51	0.00	21.40	6.00	60.50	0.00
52	0.00	21.30	6.50	64.50	0.00
1	0.00	23.60	10.60	71.00	0.30
2	0.00	19.90	8.60	78.50	0.00
3	1.01	20.50	7.50	76.50	0.00
4	1.92	17.00	7.90	81.00	0.00
5	5.01	23.80	6.80	62.00	0.00
6	8.01	24.50	10.10	69.00	4.80
7	11.97	27.30	10.30	67.50	0.00
8	15.43	28.80	11.90	57.00	0.00
9	13.34	30.50	15.10	49.00	0.00
10	12.02	32.50	16.70	56.50	0.00
11	10.85	32.10	16.80	60.00	0.60
12	9.30	34.20	18.50	47.50	0.00
13	7.12	36.50	18.60	35.50	0.00
14	6.95	38.40	18.50	26.00	0.00
15	4.75	39.60	20.10	25.00	0.00

**Year 2021-2022**

The pea pod borer, *Etiella zinckenella* Treitschke population was started from the flowering stage during 3<sup>rd</sup> SMW and continued till 15<sup>th</sup> SMW, of the harvest stage. The observations were recorded from germination of the crop to harvest of the crop at weekly interval.

The observations on larval population of pea pod borer, *Etiella zinckenella* Treitschke recorded from third week of January, 2022 (3<sup>rd</sup> standard meteorological week) to April, 2022 (15<sup>th</sup> standard meteorological week) of crop. The pest population recorded as number of larvae ranged from 1.12 to 16.43 larvae/five plants during *Rabi* season 2021-2022. (Table 2). The larval population was low during December,

2022 to fourth week of January, 2022 and varied from 1.12 to 1.98 larvae/five plants. The pest population increased and reaches its peak (16.43 larvae/five plants) on 22 February (8<sup>th</sup> standard meteorological week) when the maximum and minimum temperature *i.e.* 27.4°C and 12.3°C, respectively, relative humidity *i.e.* 64.50% and rainfall to the tune of nil was recorded. The correlation matrix indicated a significant positive correlation with maximum temperature ( $r = 0.527$ ) with pea pod borer infestation. However, significant positive correlation was observed with minimum temperature ( $r = 0.452$ ) and total rainfall ( $r = -0.568$ ), while non-significant negative correlation was found with average relative humidity ( $r = -0.483$ )

**Table 2:** Seasonal incidence of pea pod borer, *Etiella zinckenella* Treitschke in relation to abiotic factors during 2021-2022

SW	Larval population of <i>E. zinckenella</i> /5 plants	Temperature maxi. (°C)	Temperature mini. (°C)	Relative humidity (%)	Rainfall (mm)
51	0.00	22.10	7.10	64.00	0.00
52	0.00	20.00	9.00	86.00	8.60
1	0.00	20.40	8.50	83.00	23.50
2	0.00	19.60	10.30	84.00	14.60
3	1.12	15.70	4.90	82.50	0.00
4	1.98	17.90	7.70	80.50	3.00
5	5.03	21.20	7.50	74.50	13.00
6	8.15	22.70	8.10	72.50	0.00
7	12.07	25.00	8.10	71.50	0.00
8	16.43	27.40	12.30	64.50	0.00
9	14.34	27.80	11.70	68.00	0.00
10	13.82	29.20	13.90	65.50	0.00
11	11.72	33.40	17.40	63.50	0.00
12	10.57	36.40	18.60	54.50	0.00
13	8.83	38.20	18.40	50.00	0.00
14	7.81	40.00	17.60	45.00	0.00
15	5.57	40.80	21.10	44.50	0.00

**Table 3:** Correlation coefficient between abiotic factors with *Etiella zinckenella* Treitschke on field pea during 2020-2021 and 2021-2022.

Weather variables	<i>E. zinckenella</i> Treitschke	
	2020-2021	2021-2022
Min. Temperature(°C), (X <sub>1</sub> )	0.536*	0.452 NS
Max. Temperature(°C), (X <sub>2</sub> )	0.563*	0.527*
Relative humidity (%),(X <sub>3</sub> )	-0.346 NS	-0.483 NS
Total Rainfall (mm.),(X <sub>4</sub> )	0.091 NS	-0.568* NS

\*Significance at 5% level

The results are in accordance with Vaibhav *et al.* (2018) [7] who also revealed that during the observation the population of *E. zinckenella* larval reached its peak (12.66 larvae/10 plants) in the all control plots on 26th February (8th standard weeks) when the maximum and minimum temperature 22.07 °C and 12.55 °C, respectively, relative humidity 81.07% and rainfall 11.72 mm was recorded. The larval population of *E. zinckenella* showed negative correlation with maximum temperature ( $r = -0.007$ ) while positively correlated with minimum temperature ( $r = 0.378$ ) and the correlation between larval population and relative humidity was found positive ( $r = 0.313$ ) and also positive with rainfall ( $r = 0.393$ ).

Findings of Kumar *et al.* (2017) [11] also confirm present studies who stated that the peak population of pea pod borer was recorded during, first week of December and reached the peak in the first week of March. The pea pod borer population was negatively correlated with maximum temperature and positively correlated with minimum temperature, relative humidity and rain fall. Gram pod borer population was recorded during second week of December and reached to its peaked level in last week of February. Its population showed the significant negative correlation with maximum temperature while positive correlations with minimum temperature, relative humidity and rain fall. The initial incidence of pea leaf miner, pea aphid, and stem fly was observed during last week of November to first week of December and subsequently reaching to while to peak level on first and second week of February.

### Conclusion

To study the seasonal incidence of pea pod borer, *Etiella zinckenella* Treitschke, during Rabi season 2020-2021 and 2021-2022, The population was started from third week of January 2021 & 2022 (3<sup>rd</sup> standard meteorological week) to April 2021 & 2022 (15<sup>th</sup> standard meteorological week) of crop. The larval population was low during January, 2021 to fourth week of January, 2021 and varied from 1.01 to 1.92 larvae/five plants. The maximum population increased and reaches its peak (15.43 larvae/5 plants) in all control plots on 26 February, 2021 (8<sup>th</sup> standard weeks). When the maximum and minimum temperature was 28.8 °C and 11.9 °C, respectively, relative humidity was 57% and rainfall to the tune of nil was recorded. Second year the pest population increased and reaches its peak (16.43 larvae/five plants) on 22 February 2022 (8<sup>th</sup> standard meteorological week). and the maximum and minimum was temperature was 27.4°C and 12.3 °C, respectively, relative humidity was 64.50% and the rainfall to the tune of nil was recorded.

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