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## Seasonal abundance and effect on insect pest associate with vegetable pea crop under abiotic factors of U.P.

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**Abstract**

The experiment on seasonal abundance of, six insect-pests were found during the crop season attacking on the crop at different growth stages. Among them, pea pod borer (*Etiella zinckenella*) and gram pod borer (*Helicoverpa armigera*) were recorded as major pests. The pea leaf miner (*Chromatomyia horticola*), pea aphid (*Acyrtosiphon pisum*), blue butter fly (*Lampides boeticus*) and stem fly (*Ophiomyia phaseoli*) were recorded as 'minor' pests. The 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.

**Keywords:** Seasonal incidence, Vegetable pea, abiotic factor

**Introduction**

Pea (*Pisum sativum* Linn.) is the prime vegetable crop of Indian sub continent. Pea is cultivated for the fresh green seeds, tender green pods and dried seeds and foliage (Duke 1981)<sup>[5]</sup>. Pea is a highly nutritive vegetable. The protein concentration of peas range from 15.5-39.75 per cent (Davines *et al.* 1985)<sup>[2]</sup>. Various abiotic and biotic factors causes losses in the pea crop so that the yield of it is reduced. Among the biotic constraints, the losses caused by insects pests are a major limiting factor in realization of optimum yield of the vegetable pea crop. It is known to be ravaged by several insect pests during its various crop stages. Insects pests like aphid, (*Acyrtosiphon pisum*) pea pod borers *Etiella zinckenella* (Treitsshe) and *Helicoverpa armigera* (Hubner) and thrips (*Caliothrips indicus*) are serious insect pest and often causes substantial loss to the crop. Insect pest damage to this crop imposes severe limits in its production. The newly emerged larvae of *Etiella zincknella* (Treitschke) feed on the floral parts and subsequently bore into the pods. The tiny greenish caterpillars enter the pod and eat away the young grains. The young larvae of *Helicoverpa armigera* (Hubner) feed on the foliage and flowers for some time and later bore in to 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**

Field experiment was conducted to studies seasonal abundance of insect pest of vegetable pea crop (*Pisum sativum* Linn) was carried out at Horticulture Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, (U.P.) during Rabi 2016-17. The experiment was comprised of seven treatments and laid out in randomized block design with three replications. An intensive survey was carried out to record the mean number of pod borers population at weekly intervals from the appearance of larvae till the last picking of pods from randomly selected ten plants for each replication and the number of larvae present were counted. The data on weather parameters temperatures, relative humidity and rainfall was collected from meteorological observatory of IIFSR, Modipuram, Meerut will be used for correlation and regression studies to know the influence of weather parameters on the population of major pod borers.

## Results and Discussion

### Seasonal abundance of *Etiella zinckenella*

the larval population of pea pod borer *Etiella zinckenella* (Table 1.) were recorded during experiment from all the control plots the larval population start increases first week of December to 5th March (48th to 9th standard week) abiotic parameters played a key role in build-up of larval population. Similarly, Abdallah *et al.* (1994) <sup>[1]</sup> reported that is a pest of various leguminous crops in the cropping season. The pest showed peak activity in February to March. Mallikarjuna *et al.* (2012) <sup>[6]</sup> were also in agreement of present findings who reported pea pod borer, *Etiella zinckenella* peaked during the 1st week of December. The correlation of the larval population of *Etiella zinckenella* was found negative with maximum ( $r = -0.187$ ) and positive with minimum ( $r = 0.188$ ) temperature during rabi season 2016-17. It was positive correlated ( $r = 0.277$ ) with relative humidity and also positive correlation ( $r = 0.179$ ) with rainfall. Dhaka *et al.* (2011) <sup>[3]</sup> reported that the population of *Etiella zinckenella* on vegetable pea was negative correlated with minimum and maximum temperature and positive correlated with minimum and maximum relative humidity and also positive correlated with rainfall.

### Seasonal incidence of *H. armigera*

the early instars larval population of pea pod borer *H. armigera* were recorded (Table 2.) during experiment from 11th December in the all the control plots the larval population start increases fourth week of November to 26th February (49th to 8th standard week) abiotic parameters played a key role in build-up of larval population. Similarly Dubey *et al.* (1993) <sup>[4]</sup> reported that the *H. armigera* feed on vegetable pea during crop season. The pest showed peak activity in February to March. Prasad *et al.* (1997) <sup>[9]</sup> studied host range and seasonal incidence of *H. armigera* was maximum adult catches obtain in late March. Dhaka *et al.* (2011) <sup>[3]</sup> studied the pea pod borer *H. armigera* showed peak activity with range of 00.00 to 17.67 larvae per ten plants. The correlation of larval population of *H. armigera* was found negative with maximum temperature ( $r = -0.158$ ) and positive with minimum temperature ( $r = 0.235$ ) during rabi season 2016-17. It was positive correlated ( $r = 0.300$ ) with relative humidity and also positive correlation ( $r = 0.187$ ) with rainfall. Prasad *et al.* (1982) <sup>[10]</sup> reported the correlation indicated significant negative correlation with minimum temperature and also with rainfall. Dhaka *et al.* (2011) <sup>[3]</sup> reported that on vegetable pea, *H. armigera* was negative correlated with minimum and maximum temperature and positive correlated with minimum and maximum relative humidity and also positive correlated with rainfall.

### Population fluctuation of pea leaf miner *Chromatomyia horticola*

The pea leaf miner population (Table 3.) appeared in 1st week of December (48th standard week) and gradually reached up to maximum level of 89.00 leaf miner/ 10 plants during 1st week of February (5th standard week), when the temperature and relative humidity ranged from 08.70 °C to 22.00 °C and 80.80 percent respectively. The population of leaf miner decreased very fast during 6th to 11th standard weeks. Similar results were reported by Singh and Saravanan (2008) the pea Leaf miner commenced from 2nd week of February with an average population of 7.3 leaf miner per plant Leaf miner population gradually increased and reached its peak level of 9.25 leaf miner per plant during 4th week of February (9th Standard week). It was found that pea leaf miner

increased with increasing maximum temperature, slight rainfall and morning relative humidity and decreased with increasing minimum temperature, evening relative humidity, wind velocity and sunshine hours.

### Population fluctuation of pea Blue butterfly fly *Lampides boeticus*

The blue butterfly population (Table 4.) appeared in 1st week of January (1st standard week) and, thereafter, population subsequently followed the trends of continuous increase reached up to maximum level of 7.00 larvae/ 10 plants during 1st week of March (9th standard week), when the temperature and relative humidity ranged from 11.10 °C to 27.60 °C and 70.50 percent respectively. The population of leaf minor decreased very fast during 10th and 11th standard weeks. Similar results were found by Kunte, (1997) four tropical habitats with different disturbance levels were monitored for diversity and seasonal patterns in butterfly communities blue butterfly Species richness was highest in late monsoon and early winter. Majority of the butterfly species also showed abundance peaks in these seasons.

### Population fluctuation of pea Aphid *Acyrtosiphon pisum*

The population of (Table 5.) *A. pisum* was the first appeared (3.00 aphid/10 plant) in third week of November (47th standard week) and gradually reached up to maximum level of population increase till first week of February (90.33 aphid/10 plants) (5th standard week). When temperature and relative humidity ranged from 8.70 °C to 22.00 °C and 80.80 percent and rainfall was 0.00 respectively. Similar results were reported by Melesse and Singh, (2012) <sup>[8]</sup> Aphid population was increased when rainfall was reduced and the maximum temperature was increased. The effectiveness of planting dates showed that early and mid were not found effective because all plants were died at 5-10% podding stage due to heavy infestation of aphids (more than 100 aphids per plant) before reaching grain filling stage.

### Population fluctuation of pea Stem fly *Ophiomyia phaseoli*

The population of *O. phaseoli* (Table 6.) was the first appeared (2.00 adult/10 plant) in third week of November (46th standard week) and gradually reached up to maximum level of 26.66 stem fly/ 10 plants during 3rd week of January (4th standard week), when the temperature and relative humidity ranged from 10.70 °C to 21.80 °C and 80.70 percent respectively. The population of stem fly decreased very fast during 4th to 11th standard weeks. Similar results reported by Mangang, (2012) <sup>[7]</sup> from the first week after sowing stem fly infestation (18.40%) was noted and attained peak infestation (50.60%) on 2nd August, soybean leaf folder reached peak of 9.07% infestation on 16th August, white spotted flea beetle reached its maximum population on August, 16 (3.88 adult/three leaves), Amongst the abiotic factors, the per cent infestation of stem fly and leaf folder was significantly correlated with weather parameters viz., the minimum temperature and rainfall that favoured the development of stem fly.

## Conclusion

Larval population of pea pod borer *Etiella zinckenella* were recorded during experiment from 15th November in the all the control plots the larval population start increases first week of December to 5th March. The correlation of the larval population of *Etiella zinckenella* was found negative with maximum and positive with minimum temperature during

*rabi* season. It was positive correlated with relative humidity and also positive with rainfall. The larval population of pea pod borer *H. armigera* were recorded during experiment from 11<sup>th</sup> December in the all the control plots the larval population start increases fourth week of November to 26<sup>th</sup> February (49<sup>th</sup>

to 8<sup>th</sup> standard week) The correlation of larval population of *H. armigera* was found negative with maximum and positive with minimum temperature during *rabi* season. It was positive correlated with relative humidity and also positive with rainfall.

**Table 1:** Population fluctuation of pea pod borer *E. zinckenella*

S.W.	Period	Larval population of <i>E. zinckenella</i> /10plants	Weather parameters			
			Temperature		°C Relative humidity (%)	Rainfall (mm)
			Max.	Min.		
45	Nov,10-16	00	28.9	9.7	71.7	0.0
46	Nov,17-23	00	28.1	10.5	71.7	0.0
47	Nov,24-30	00	28.1	10.4	73.8	0.0
48	Dec,1-7	0.66	26.9	10.1	71.6	0.0
49	Dec,8-14	1.66	23.0	8.5	80.8	0.0
50	Dec,15-21	3.33	22.9	9.3	77.1	0.0
51	Dec,22-28	5.00	24.2	5.5	70.4	0.0
52	Dec,29-Jan,4	5.66	21.6	8.2	82.1	0.0
1	Jan,5-11	6.66	22.2	8.3	78.8	29.3
2	Jan,12-18	7.66	18.5	4.3	74.5	0.0
3	Jan,19-25	8.00	20.1	6.7	77.8	0.0
4	Jan,26-Feb,1	9.33	21.8	10.7	80.7	35.7
5	Feb,2-8	10.66	22.0	8.7	80.8	0.0
6	Feb,9-15	11.33	22.0	9.3	79.1	1.3
7	Feb,16-22	12.66	25.4	9.5	74.9	0.0
8	Feb,23-Mar,1	14.33	26.2	11.0	77.3	0.0
9	Mar,2-8	15.00	27.6	11.1	70.5	0.4
10	Mar,9-15	14.33	25.5	11.4	90.3	18.6
11	Mar,16-22	13.66	25.5	10.1	70.1	0.0

**Table 2:** Population fluctuation of pea pod borer *Helicoverpa armigera*

S.W.	Period	Larval population of <i>H. armigera</i> /10plants	Weather parameters			
			Temperature		°C Relative humidity (%)	Rainfall (mm)
			Max.	Min.		
45	Nov,10-16	00	28.9	9.7	71.7	0.0
46	Nov,17-23	00	28.1	10.5	71.7	0.0
47	Nov,24-30	00	28.1	10.4	73.8	0.0
48	Dec,1-7	00	26.9	10.1	71.6	0.0
49	Dec,8-14	0.33	23.0	8.5	80.8	0.0
50	Dec,15-21	1.00	22.9	9.3	77.1	0.0
51	Dec,22-28	2.33	24.2	5.5	70.4	0.0
52	Dec,29-Jan,4	4.00	21.6	8.2	82.1	0.0
1	Jan,5-11	5.33	22.2	8.3	78.8	29.3
2	Jan,12-18	6.00	18.5	4.3	74.5	0.0
3	Jan,19-25	7.33	20.1	6.7	77.8	0.0
4	Jan,26-Feb,1	8.00	21.8	10.7	80.7	35.7
5	Feb,2-8	9.66	22.0	8.7	80.8	0.0
6	Feb,9-15	10.33	22.0	9.3	79.1	1.3
7	Feb,16-22	11.00	25.4	9.5	74.9	0.0
8	Feb,23-Mar,1	13.00	26.2	11.0	77.3	0.0
9	Mar,2-8	12.33	27.6	11.1	70.5	0.4
10	Mar,9-15	12.66	25.5	11.4	90.3	18.6
11	Mar,16-22	11.33	25.5	10.1	70.1	0.0

**Table 3:** Population fluctuation of pea leaf minor *Chromatomyia horticola*

S.W.	Period	Larval population of <i>C. horticola</i> /10plants	Weather parameters			
			Temperature		°C Relative humidity (%)	Rainfall (mm)
			Max.	Min.		
45	Nov,10-16	00	28.9	9.7	71.7	0.0
46	Nov,17-23	00	28.1	10.5	71.7	0.0
47	Nov,24-30	00	28.1	10.4	73.8	0.0
48	Dec,1-7	2.00	26.9	10.1	71.6	0.0
49	Dec,8-14	11.00	23.0	8.5	80.8	0.0
50	Dec,15-21	18.33	22.9	9.3	77.1	0.0
51	Dec,22-28	27.33	24.2	5.5	70.4	0.0
52	Dec,29-Jan,4	36.66	21.6	8.2	82.1	0.0
1	Jan,5-11	42.00	22.2	8.3	78.8	29.3
2	Jan,12-18	50.00	18.5	4.3	74.5	0.0
3	Jan,19-25	67.33	20.1	6.7	77.8	0.0
4	Jan,26-Feb,1	82.00	21.8	10.7	80.7	35.7
5	Feb,2-8	89.00	22.0	8.7	80.8	0.0
6	Feb,9-15	78.66	22.0	9.3	79.1	1.3
7	Feb,16-22	74.00	25.4	9.5	74.9	0.0
8	Feb,23-Mar,1	67.33	26.2	11.0	77.3	0.0
9	Mar,2-8	62.66	27.6	11.1	70.5	0.4
10	Mar,9-15	54.66	25.5	11.4	90.3	18.6
11	Mar,16-22	48.33	25.5	10.1	70.1	0.0

**Table 4:** Population fluctuation of pea Blue butter fly *Lampides boeticus*

S.W.	Period	Larval population of <i>L. boeticus</i> /10plants	Weather parameters			
			Temperature		°C Relative humidity (%)	Rainfall (mm)
			Max.	Min.		
45	Nov,10-16	00	28.9	9.7	71.7	0.0
46	Nov,17-23	00	28.1	10.5	71.7	0.0
47	Nov,24-30	00	28.1	10.4	73.8	0.0
48	Dec,1-7	00	26.9	10.1	71.6	0.0
49	Dec,8-14	00	23.0	8.5	80.8	0.0
50	Dec,15-21	00	22.9	9.3	77.1	0.0
51	Dec,22-28	00	24.2	5.5	70.4	0.0
52	Dec,29-Jan,4	00	21.6	8.2	82.1	0.0
1	Jan,5-11	00.33	22.2	8.3	78.8	29.3
2	Jan,12-18	0.67	18.5	4.3	74.5	0.0
3	Jan,19-25	1.00	20.1	6.7	77.8	0.0
4	Jan,26-Feb,1	1.67	21.8	10.7	80.7	35.7
5	Feb,2-8	2.66	22.0	8.7	80.8	0.0
6	Feb,9-15	3.66	22.0	9.3	79.1	1.3
7	Feb,16-22	4.66	25.4	9.5	74.9	0.0
8	Feb,23-Mar,1	6.33	26.2	11.0	77.3	0.0
9	Mar,2-8	7.00	27.6	11.1	70.5	0.4
10	Mar,9-15	6.33	25.5	11.4	90.3	18.6
11	Mar,16-22	6.00	25.5	10.1	70.1	0.0

**Table 5:** Population fluctuation of pea Aphid *Acyrtosiphum pisum*

S.W.	Period	Larval population of <i>A. pisum</i> /10plants	Weather parameters			
			Temperature		°C Relative humidity (%)	Rainfall (mm)
			Max.	Min.		
45	Nov,10-16	00	28.9	9.7	71.7	0.0
46	Nov,17-23	00	28.1	10.5	71.7	0.0
47	Nov,24-30	3.00	28.1	10.4	73.8	0.0
48	Dec,1-7	10.00	26.9	10.1	71.6	0.0
49	Dec,8-14	21.33	23.0	8.5	80.8	0.0
50	Dec,15-21	25.00	22.9	9.3	77.1	0.0
51	Dec,22-28	37.33	24.2	5.5	70.4	0.0
52	Dec,29-Jan,4	42.66	21.6	8.2	82.1	0.0
1	Jan,5-11	35.00	22.2	8.3	78.8	29.3
2	Jan,12-18	55.66	18.5	4.3	74.5	0.0
3	Jan,19-25	67.33	20.1	6.7	77.8	0.0
4	Jan,26-Feb,1	60.00	21.8	10.7	80.7	35.7
5	Feb,2-8	90.33	22.0	8.7	80.8	0.0
6	Feb,9-15	76.33	22.0	9.3	79.1	1.3
7	Feb,16-22	71.00	25.4	9.5	74.9	0.0
8	Feb,23-Mar,1	63.66	26.2	11.0	77.3	0.0
9	Mar,2-8	62.66	27.6	11.1	70.5	0.4
10	Mar,9-15	50.00	25.5	11.4	90.3	18.6
11	Mar,16-22	44.33	25.5	10.1	70.1	0.0

**Table 6:** Population fluctuation of pea Stem fly *Ophiomyia phaseoli*

S.W.	Period	Larval population of <i>O. phaseoli</i> /10plants	Weather parameters			
			Temperature		°C Relative humidity (%)	Rainfall (mm)
			Max.	Min.		
45	Nov,10-16	00	28.9	9.7	71.7	0.0
46	Nov,17-23	2.00	28.1	10.5	71.7	0.0
47	Nov,24-30	8.33	28.1	10.4	73.8	0.0
48	Dec,1-7	10.66	26.9	10.1	71.6	0.0
49	Dec,8-14	13.33	23.0	8.5	80.8	0.0
50	Dec,15-21	15.00	22.9	9.3	77.1	0.0
51	Dec,22-28	17.66	24.2	5.5	70.4	0.0
52	Dec,29-Jan,4	19.00	21.6	8.2	82.1	0.0
1	Jan,5-11	22.66	22.2	8.3	78.8	29.3
2	Jan,12-18	23.33	18.5	4.3	74.5	0.0
3	Jan,19-25	25.00	20.1	6.7	77.8	0.0
4	Jan,26-Feb,1	26.66	21.8	10.7	80.7	35.7
5	Feb,2-8	24.66	22.0	8.7	80.8	0.0
6	Feb,9-15	25.33	22.0	9.3	79.1	1.3
7	Feb,16-22	23.00	25.4	9.5	74.9	0.0
8	Feb,23-Mar,1	21.33	26.2	11.0	77.3	0.0
9	Mar,2-8	20.66	27.6	11.1	70.5	0.4
10	Mar,9-15	18.00	25.5	11.4	90.3	18.6
11	Mar,16-22	17.66	25.5	10.1	70.1	0.0

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