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## Population dynamics of major insect pests of lentil

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**Abstract**

Population dynamics of insect- pests viz *Aphis craccivora*, *Etiella zinckenella* and *Helicoverpa armigera* on lentil was studied under field conditions during *Rabi* 2015-16. Peak population of *A. craccivora* (78.0 aphids/ 5 plants), *E. zinckenella* (11 larvae+ faecal material/ plant) and *H. armigera* (0.83 larvae / 5plant) was recorded on 7<sup>th</sup>, 12<sup>th</sup> and 9<sup>th</sup> Standard meteorological weeks (SMW), respectively. Population dynamics studies revealed significant negative correlation of *Aphis craccivora* population with the Temperature (max. & min.) i.e  $r = -0.5015^{**}$  and  $r = -0.6138^{*}$ , significant positive correlation of *Etiella zinckenella* with the Temperature (Tmax. & Tmin.) i.e  $r = 0.8251^{*}$  and  $r = 0.8481^{*}$  and non-significant correlation of *H. armigera* population with the abiotic factors.

**Keywords:** Population dynamics, lentil, *E. zinckenella*, *H. armigera*, *A. craccivora*

**1. Introduction**

Lentil (*Lens culinaris* Medikus), locally known as Masoor, is an important *Rabi* season pulse crop. Poor crop management along with abiotic and biotic stresses are the major constraints in its production. Among the biotic constraints, insect pests play a major role in its yield reduction. About three dozen insect pests have been reported to infest lentil under field and storage conditions<sup>[5]</sup>, out of which 21 species have been reported from India alone<sup>[9]</sup>, however *Aphis craccivora* Koch<sup>[14]</sup> Phycitid, *Etiella zinckenella* Treit.<sup>[12]</sup> have been reported as major insect pests of lentil in India. Among the above pests, *Etiella zinckenella* is a polyphagous pest attacking many cultivated crops such as medics, clovers, lucerne, field peas, lentils and soybean<sup>[6]</sup>. *Etiella zinckenella* infests lentil at flowering and pod formation stages and is considered as main reason of low productivity, besides reduction in yield and quality of the grains is also affected. In India, it has been reported to infest 11.4 and 50.9 per cent of lentil and pea pods, respectively, resulting in yield losses of 10.6 and 23.9 per cent<sup>[12]</sup> and 12 to 15 per cent pods of lentil were infested by *E. zinckenella*<sup>[11]</sup>. Infestation of this pest has been reported up to 17.5 per cent in Haryana<sup>[7]</sup>. A few aphids recorded on leguminous crops, *Aphis craccivora* Koch. appears to be highly important both from geographical distribution and damage points of view<sup>[4]</sup>. Lentil aphid, *Aphis craccivora* Koch (Hemiptera: Aphididae) has become a major pest of lentil in last few years. Direct feeding by aphids includes sucking sap from leaves, stems, blossoms and pods. Plants heavily infested are stunted and produce fewer and smaller pods and seeds. *Helicoverpa armigera* is also highly polyphagous and also a serious pest of lentil crop. Pod borer, *Helicoverpa armigera* infest many host plants, especially lentil in West Asia and the Indian subcontinent. *Heliothis armigera* is an important pest of lentil crop<sup>[15]</sup>. High polyphagy, mobility and fecundity are major factors contributing to the serious pest status of *H. armigera* hence observations on their occurrence and population dynamics may greatly help in development of a more effective integrated pest management strategy against them.

**2. Materials and methods**

Lentil crop variety "Garima" was grown on 16th of the November, 2015 with plot size of 225sq.m. at Research Farm of Pulses Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar with randomized block design (RBD) in three replications by following the good agricultural package of practice. The crop was kept under regular observations and when pest appeared on the crop, data with respect to same was recorded at weekly intervals till harvesting of crop. Visual observations of *A. craccivora* were recorded per five plants after selecting middle twigs of each plant and nymphs as well as adults

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population were counted from each twig by using hand lens. Larval population of *H. armigera* was recorded by ground sheet method after selecting five plants randomly at fifteen spots. For *E. zinckenella* five plants were selected randomly and larval population was counted after dissecting the pods. At maturity, the pods having the faecal material of *E. zinckenella*, webbing and exit holes of lentil pod borer were also considered as infected pods. Data on incidence of major insect pests was correlated with the weather data viz., maximum and minimum temperature, morning and evening relative humidity, rainfall and sunshine hours

### 3 Results and Discussion

#### 3.1 Population dynamics of major insect pests of lentil

Population (nymph & adult) of the aphid was recorded on the crop from 1st to 13<sup>th</sup> meteorological standard weeks (SW). The population of *A. craccivora* appeared in the 1st standard week (1.74 aphids/5 plants) with rise in minimum temperature. Peak activity of pest was recorded during 7th SW with a population of 78.0 aphids/ 5 plants when the maximum temperature was 21.9 °C and min.temp.6.2 °C, relative humidity morning- 92.3% and evening-53%, sunshine hours was 6.7 hrs and rainfall was 5.3 mm.(Table 1) The population remained 13.07aphids /5 plants during the 11th to 13th SW. These findings are in accordance with the studies of [1] who reported that with rise in temperature population showed a decreasing trend and are also in corroboration with

the findings of [10] who reported that minimum temperature showed significant negative correlation during *Rabi* season. Larval population of *Helicoverpa armigera* was recorded from 6<sup>th</sup> to 14<sup>th</sup> meteorological standard weeks (SW). Larval population of *Helicoverpa armigera* appeared in 6<sup>th</sup> standard week with onset of flowering and pods. Peak of *Helicoverpa armigera* population was found during 9th SW with a population of 0.83 larvae / 5 plant when the temperature (max.) was 29°C and min. temp.11.7°C, relative humidity morning- 90.6% and evening-44.8%, sunshine hours was 8.2 hrs and there was no rainfall. (Table 1). These studies are more or less in agreement with the findings of [2] who reported the pest population declined gradually towards the maturity of the crop. *E. zinckenella* (larvae+ faecal material) were recorded from 6<sup>th</sup> to 14<sup>th</sup> meteorological standard weeks (SW). *E. zinckenella* appeared in 6<sup>th</sup> standard week with onset of flowering and pods. Peak of *Etiella zinckenella* population was found during 12<sup>th</sup> SW with a population of 11 (larvae+ faecal material)/ plant when the temperature (max.) was 31.5 °C and min. temp.13.4 °C, relative humidity morning- 82.6% and evening-42.9%, sunshine hours was 9.3 hrs and rainfall was 1.8 mm (Table 1) but the present studies do not comply with the findings of [3] who observed negative and significant correlation of *E. zinckenella* population with both maximum and minimum temperature and this might be due to climatic variation during the period of investigation.

**Table 1:** Mean population of *Aphis craccivora*, *Etiella zinckenella* and *Helicoverpa armigera* on lentil during 2015-16

SMW	Mean population of <i>A. craccivora</i> (nymph+ adult) per 5 plants	Mean population of <i>E. zinckenella</i> per plant	Mean population of <i>H. armigera</i> per 5 plants
1	1.74	-	-
2	11.05	-	-
3	33.24	-	-
4	38.52	-	-
5	41.60	-	-
6	52.45	0.2	0.13
7	78.00	0.4	0.33
8	57.33	1.4	0.53
9	22.07	3.2	0.83
10	13.07	7	0.33
11	0.30	9.8	0.27
12	0.20	11	0.27
13	-	10.6	0.20
14	-	9.2	0.07

SMW- Standard Metrological Week

#### 3.2 Correlation

Significant negative correlation of aphid population with the Temperature (Tmax. & Tmin.), ( $r = -0.5015^{**}$  and  $r = -0.6138^{*}$ , respectively). Relative humidity Morning, relative humidity Evening, Sun shine hours and rainfall had non-significant correlation with *Aphis craccivora* population (Table 2) and these findings are in accordance with the findings of [8] who reported populations of aphids influenced positively by relative humidity. These studies are also in accordance with the findings of [13] who reported average number of cowpea aphid per tiller showed highly significant negative correlation with minimum temperature However, cowpea aphid showed significant negative correlation with maximum temperature. Correlation of *H. armigera* population with various environmental factors revealed that *H. armigera* population had non- significant correlation with Temperature (Tmax. & Tmin.) Relative humidity (%) Evening, Sun shine hours and Rainfall and was positively associated with relative humidity (%) morning. (Table 2) and these studies are more or less in agreement with the findings of [2] who reported the

pest population declined gradually towards the maturity of the crop. Correlation of *H. armigera* with different weather parameters indicated that maximum temperature exhibited negative correlation with larval population of *H. armigera*, however, the pest population showed highly significant positive correlation with morning relative humidity ( $r = 0.7098$ ), evening relative humidity ( $r = 0.7293$ ). Correlation of *Etiella zinckenella* population with various environmental factors revealed that *Etiella zinckenella* population had significant positive correlation both with Temperature (Tmax. & Tmin.), ( $r = 0.8251^{*}$  and  $r = 0.8481^{*}$  respectively) Relative humidity (%) Morning, Relative humidity (%) Evening, Sunshine hours and rainfall had non-significant correlation with *Etiella zinckenella* population. (Table 2) But, the present studies do not comply with the findings of [3] who observed negative and significant correlation of *E. zinckenella* population with both maximum and minimum temperature and this might be due to climatic variation during the period of investigation.

**Table 2:** Correlation between population of insect pests and weather parameters in lentil

Insect	Max. Temp.	Min. Temp.	RH (m)	RH(e)	Rain fall	S.S. (hours)
<i>A. craccivora</i>	-0.5015**	-0.6138*	0.3153	0.1788	-0.1727	-0.1511
<i>E. zinckenella</i>	0.8251*	0.8481*	-0.5731	-0.4574	0.3403	0.1632
<i>H. armigera</i>	-0.2205	-0.2249	0.5172	0.1614	0.2371	-0.0619

\*significant at p=0.05

\*\*significant p=0.1

#### 4. Conclusion

Peak activity of *A. craccivora*, *H. Armigera* and *E. zinckenella* on lentil crop was noticed in 7<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> SMW i.e when pods were towards maturity. However, studies revealed negative correlation of aphid with temp. (Tmax & Tmin), significant positive correlation of *E. zinckenella* with temp. (Tmax & Tmin) and non-significant correlation of *H. armigera* with abiotic factors.

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