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# Varietal screening of various genotypes of lentil against aphid and pod borer

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**Abstract**

This experiment was conducted at Research Farm of Tirhut College of Agriculture, Dholi, Muzaffarpur, a campus of Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar during *rabi* season, 2017-18. The research farm of Tirhut College of Agriculture, Dholi falls in the Gandak Command Area of North Bihar and is situated at 25°9’ N latitude, 85°67’ E longitude and at an altitude of 52.98 m above mean sea level. Varietal screening of various genotypes of lentil was done against aphid and pod borer. All the screened genotypes differed significantly in respect of mean number of aphid/plant at 50% flowering stage. The lowest pod damage (7.8%) by pod borer was recorded in genotypes VL 148. Genotype VL 148 was recorded as the least susceptible genotype (- 64.1% susceptibility) followed by LL 1320 (-60.0% susceptibility) whereas genotype L 4751 was found as the most susceptible genotype (3.8% susceptibility).

**Keywords:** Aphid, pod borer, lentil

## Introduction

Lentil (*Lens culinaris* L. Medikus) is the fourth most important cool season, bushy annual pulse crop. Locally it is known as “masoor” and also known by many regional names *viz.*, adas (Arabic), masur (Hindi). The important lentil-growing countries in the world are India, Canada, Turkey, Bangladesh, Iran, China, Nepal and Syria [2]. The total cultivated area of lentil in the world is around 4.6 million ha producing 4.2 million tonnes of seeds with an average production of 1095 kg/ha [6]. The crop is generally grown on less fertile soils with low inputs. Lentil is called as poor man meat because of its rich protein 28%, carbohydrates 59%, nitrogen and fiber contents, high proportion of vitamin-A, vitamin-B, potassium and iron and low sodium and fat that regulates growth and development, low level of anti nutrients and ability to grow in water stress conditions which are the main attributes that make lentil an important crop [3]. It plays an important role in human and animal feeding and soil improvement. Lentil straw is also a valued animal feed due to low cellulose content [5] and vegetative parts can be used as green manure [8]. Among grain legumes grown in Bihar, lentil is grown in 159.7 thousand ha with total production of 183.23 thousand tonnes and an average productivity of 1147 kg/ha [4]. Harvesting of lentil may be done by the end of the spring and the beginning of summer. Farmers usually do not use nitrogen fertilizers for lentil production. This is due to the ability of lentil to fix atmospheric nitrogen. It is reported that lentil can fix 46-192 kg N per ha [13, 14, 17].

The productivity of lentil has steeply come down in changing climatic scenario due to effect of wide range of biotic and abiotic constraints. Out of these, attack of insect pests from seedling to podding stage cause a considerable loss in yield of lentil. About three dozen insect pests have been reported to infest lentil under field and storage conditions [7], out of which 21 species have been reported in India [10]. Among insect pests, aphid (*Aphis craccivora*) and pod borer (*Etiella zinckenella*) are the major insect pests and have been found to appear regularly on lentil causing severe damage. According to a survey, 30 to 40 percent pods were found to be damaged by pod borer [15]. Under favourable conditions, the pod damage may go up to 90-95% [18]. Larvae of pod borer damage the pod by feeding on developing grains, inside the pods, resulting in reduction of grain yield. Both nymphs and adults of aphid suck the plant cell sap from almost all parts of the plant except roots resulting in less setting of flowers, stunted growth with less number of pods. Heavily aphid infested plants are stunted and produce fewer and smaller pods and seeds. Smaller plants may die due to aphid attack through cell sap sucking. Aphids can destroy about 25-50% of developing plants.

The use of resistant genotypes is considered as a simple, easy, cheap and ideal method of combating pest problem. From farmer's point of view, this is the most acceptable form of pest control technique. Selection of resistant genotypes may be helpful in reducing pest damage. High yielding and totally tolerant genotypes of lentil against aphid are not currently available for farmers. Further conventional control methods for pod borer and aphid on lentil through foliar application of insecticides have also been tried by many workers from time to time for the control of pod borer and aphids on lentil and pulses crops [10]. The aim of the present study is to find out the lentil variety which is most resistant and most susceptible to aphid and pod borer in field conditions.

## Materials and Methods

Twelve lentil genotypes were screened for their comparative susceptibility to lentil against aphid and pod borer under natural infestations at the Research Farm of T.C.A., Dholi (Muzaffarpur) during the *rab*i season, 2017 -18. These genotypes were grown by adopting all the recommended agronomic practices uniformly but keeping them completely free from insecticidal contamination in order to support the population of aphid and pod borer incidence. Sowing was done on 15th November, 2017 in the crop season. The experiment was laid out in Randomized Block Design (RBD) with three replications.

List of lentil genotypes

| Genotypes code | Decode |
|---|---|
| $V_1$ | PL 4 |
| $V_2$ | L 4147. |
| $V_3$ | VL 126 |
| $V_4$ | VL 148 |
| $V_5$ | LL 1320 |
| $V_6$ | NDL 14-12 |
| $V_7$ | L 4751 |
| $V_8$ | LL 1370 |
| $V_9$ | PL 406 |
| $V_{10}$ | PL 063 |
| $V_{11}$ | LL 1397 |
| $V_{12}$ | HUL-57(ch) |

Each test entry was planted in three consecutive rows of 3 meter long with 30 cm row to row and 10 cm plant to plant distance. One row of the susceptible check (HUL 57) was sown after every test entry.

Screening of different genotypes of lentil for the resistance against lentil aphid and pod borer was done. From each entry randomly 5 plants were selected for recording observations. Pod borer infestation was recorded at the time of maturity of pods on 5 randomly selected plants in each treatment. Similarly aphid population was recorded at flowering and podding stage at (10 cm length) apical twigs on five randomly selected plants in each treatment.

All the treatments were sown at a time. All the cultural practices were followed uniformly as per the local recommendation excepting that no insecticide was applied at any stage of the crop. Finally pod borer susceptibility percentage for each entry was worked out by using formula given by [1].

$$\text{Pest susceptibility (\%)} = \frac{\text{P.D infester-P.D of test entry}}{\text{P.D of infester}} \times 100$$

Where,
P.D = Mean of % pod damaged.

The pest susceptibility percentage was converted to 1 to 9 rating by adopting the following scale.

| Susceptibility rating | Pest susceptibility (%) |
|---|---|
| 1. | 100 |
| 2. | 75-99.9 |
| 3. | 50-74.9 |
| 4. | 25-49.9 |
| 5. | 10-24.9 |
| 6. | 10-9.9 |
| 7. | -25-9.9 |
| 8. | -50-24.9 |
| 9. | -50 or less |

## Results and Discussion

Twelve genotypes of lentil were screened against the infestation of aphid and pod borer. The aphid and pod borer infestation on different genotypes were recorded as per the methodologies explained in "Material and Methods" and results have been summarized in Table 1.

### Mean number of aphid/plant at 50% flowering stage

The results presented in Table 1 showed that all the genotypes differed significantly in respect of mean number of aphid/plant at 50% flowering stage. Among the genotypes under test PL 4 (25.0 aphid/plant), VL 148 (28.0 aphid/plant), VL126 (29.0 aphid/plant), LL1320 (31.3 aphid/plant), PL 406 (28.6 aphid/plant), NDL 14-12 (29.3 aphid/plant), LL 1370 (30.6 aphid/plant), PL 063 (30.7 aphid/plant) and LL 1397 (29.3 aphid/plant) were found statistically at par with check variety HUL 57 (26.5 aphid/plant). The genotypes L 4147 (36.53) and L 4751 (45.36) were observed to be statistically inferior to check variety HUL 57 for the above character. None of the genotype studied was statistically superior to the check variety.

### Mean number of aphid/plant at 50% podding stage

The results showed that all the genotypes differed significantly in respect of mean number of aphid/plant at 50% podding stage (Table 1). Among the screened genotypes, PL 4 (19.6 aphid/plant), VL 148 (23.6 aphid/plant), VL 126 (26.0 aphid / plant) and PL 406 (24.6 aphid/plant) were found to be statistically at par with check variety HUL 57 for mean number of aphid per plant at 50% podding stage. Remaining genotypes LL 1397 (26.7 aphid/plant), L 4147 (32.3 aphid/plant), LL 1320 (29.2 aphid/plant), NDL 14-12 (26.9 aphid/plant), L 4751 (36.6 aphid/plant) and PL 063 (29.1 aphid/plant) were observed to be statistically inferior to check variety (HUL 57) for the above character. None of the genotype was statistically superior to the check variety (HUL 57).

### Mean percent pod damage by pod borer

The results showed that all the genotypes differed significantly in respect of mean percent pod damage by pod borer (Table 1). The lowest pod damage (7.8%) was recorded with the genotype VL 148 which was statistically at par with LL 1320 (8.0%) and NDL 14-12 (9.4%) and found significantly superior over check HUL-57 (12.8%). Genotypes PL 4 (11.3%), L 4147 (13.1%), L 4751(13.3%), LL 1370 (12.5%), PL 063 (14.6%) and LL 1397 (11.9%) were found to be statistically at par with check variety (HUL 57) for mean percent pod damage due to pod borer.

**Pest susceptibility and susceptibility rating**

The results showed that all the genotypes differed significantly in respect of pest susceptibility percentage (Table 1). Among the screened genotypes, VL 148 was recorded as the least susceptible genotype (-64.1% susceptibility) followed by LL 1320 (- 60.0%), NDL 14-12 (-36.2% susceptibility) and VL 126 (-23.1% susceptibility). The genotype PL 063 (12.3% susceptibility) was recorded as the most susceptible genotype followed by genotype L 4751 (3. 8% susceptibility), L 4147 (2.51% susceptibility), LL 1370 (-2.4% susceptibility) and LL 1397 (-7.6% susceptibility). The susceptibility rating was maximum for VL 148 and LL 1320 genotype while minimum for PL 063 genotype.

The present results are in conformity with the findings of [11] who evaluated the response of different cowpea, *Vigna unguiculata* (L.) Walp, cultivars to the black aphid (*Aphis craccivora* Koch) [16] also reported that the faba bean cultivars showed varying susceptibility to infestation [12]. reported that in the genotype screening against pod borer complex viz.

*M. vitrata*, *H. armigera* and *M. obtuse*, germplasm ICP 6996 showed a minimum larval population, minimum pod damage, minimum grain damage, least pest susceptibility rating and gave maximum yield [9]. Screened one hundred and twelve accessions of lentil (*Lens culinaris* Medik) for tolerance to black aphids (*Aphis craccivora* Koch) and some morphological attributes were recorded to find the association with aphid incidence. Low infestation of aphids was observed on genotypes with green or yellowish green foliage and slightly pubescent leaves. Moderate infestation was recorded in genotypes with dark green foliage while genotypes with ash green foliage and densely pubescent leaves were highly susceptible to aphids.

**Table 1:** Response of different genotypes of lentil against aphid *(Aphis craccivora)* and pod borer (*Etiella zinckenella*) during *rabi* season, 2017-18

| Genotype | Mean no. of aphid/plant at 50% flowering stage | Mean no. of aphid/plant at 50% podding stage | Mean percent pod damage by pod borer | Pest susceptibility (%) | Susceptibility rating |
|---|---|---|---|---|---|
| PL 4 | 25.0 | 19.6 | 11.3 | -13.2 | 7 |
| L 4147 | 36.5 | 32.3 | 13.1 | 2.5 | 6 |
| VL 126 | 29.0 | 26 | 10.4 | -23.1 | 7 |
| VL 148 | 28.0 | 23.6 | 7.8 | -64.1 | 9 |
| LL 1320 | 31.2 | 29.2 | 8.0 | -60.0 | 9 |
| NDL 14-12 | 29.3 | 26.9 | 9.4 | -36.2 | 8 |
| L 4751 | 45.4 | 36.6 | 13.3 | 3.8 | 6 |
| LL 1370 | 30.6 | 28.2 | 12.5 | -2.4 | 6 |
| PL 406 | 28.6 | 24.6 | 10.8 | -18.5 | 7 |
| PL 063 | 30.7 | 29.1 | 14.6 | 12.3 | 5 |
| LL 1397 | 29.3 | 26.7 | 11.9 | -7.6 | 6 |
| HUL 57(ch) | 26.5 | 21.5 | 12.8 | 0 | 6 |
| S. Em (±) | 1.85 | 1.64 | 0.69 | - | - |
| CD (P=0.05) | 5.5 | 4.8 | 2.0 | - | - |

**Conclusion**

All the screened genotypes differed significantly in respect of mean number of aphid/plant at 50% flowering stage. Among the genotypes, PL 4 (25.0 aphid /plant), VL 148 (28.0 aphid/plant), VL126 (29.0 aphid/plant), LL 1320 (31.3 aphid/plant), PL 406 (28.6 aphid/plant), NDL 14-12 (29.3 aphid/plant), LL 1370 (30.6 aphid/plant), PL 063 (30.7 aphid/plant) and LL 1397 (29.3 aphid/plant) were found statistically at par with check variety HUL 57 (26.5 aphid/plant). However, at 50% podding stage PL 4 (19.6 aphid/plant), VL 148 (23.6 aphid/plant), VL 126 (26.0 aphid/plant), PL 406 (24.6 aphid/plant) and LL 1397 (26.7 aphid/plant) were found to be statistically at par with check variety HUL 57 (21.5 aphid/plant). None of the genotypes screened was found superior to check variety. The lowest pod damage (7.8%) by pod borer was recorded in genotypes VL 148 which was statistically at par with LL 1320 (8.0%) and NDL 14-12 (9.4%) and significantly superior over check HUL 57 (12.8%).Genotypes PL 4 (11.3%), L 4147 (13.1%), L 4751 (13.3%), LL 1370 (12.5%), PL 063 (14.6%) and LL 1397 (11.9%) were found to be statistically at par with check variety HUL 57 (12.8%) for mean percent pod damage due to pod borer. Genotype VL 148 was recorded as the least susceptible genotype (- 64.1% susceptibility) followed by LL 1320 (- 60.0%susceptibility), NDL14-12 (- 36.2% susceptibility) and VL 126 (- 23.1% susceptibility). Genotype L 4751 was found as the most susceptible genotype (3.8% susceptibility).

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