

Effect of Sowing Times and Varieties on Incidence of Pod Borer in Lentil

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Abstract – Field experiment was conducted to study the effect of sowing times and varieties on incidence of pod borer (*Helicoverpa armigera* Hubner) in lentil at the Farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh during the period from October 2008 to April 2009. Four sowing times, S₁: sowing on 06 November, S₂: sowing on 16 November, S₃: sowing on 26 November and S₄: sowing on 06 December, and four varieties, V₁: BARI Masur-3, V₂: BARI Masur-4, V₃: BARI Masur-5 and V₄: BARI Masur-6, were evaluated in this experiment. The experiment was laid out in Factorial Randomized Complete Block Design (RCBD) with three replications. Pod damaged by pod borer varied significantly due to sowing times and crops sowing in November 16 had the lowest level of pod borer infestation (11.33%) compared to early (14.71%) and late season (15.84%) sowing crops. Pod infestation also significantly varied in different lentil varieties and it was found lowest (12.53%) in BARI Masur-4 compared BARI Masur-3 (14.52% pod infestation). BARI Masur-5 and BARI Masur-6 had the same level of pod infestation as BARI Masur-4. Combined effect of sowing times and varieties showed significant effect on lentil pod infestation by pod borer. BARI Masur-4 sowing on 16 November and BARI Masur-5 sowing on 26 November were found as the best combination with lowest percent of pod damage (10.41% and 10.69%, respectively) by pod borer.

Keywords – Lentil, Pod Borer, Pod Infestation, Sowing Time, Variety.

I. INTRODUCTION

Lentil, *Lens culinaris* Medik., is one of the oldest and most popular food legumes in Bangladesh, which ranks third among the lentil growing countries of Asia Pacific region [1]. It is the second most important pulse crop in area and production, but stands first in the consumer's preference in Bangladesh [2]. Lentils are used to prepare an inexpensive and nutritious split (Dal) all over Bangladesh. They are frequently combined with rice providing more complete protein. In addition to their food value lentil also plays an important role in cropping systems because of its ability to fix atmospheric nitrogen (101 kg/ha/annum) and thereby enrich the soil [3]. Lentil contains carbohydrates, mainly starches (55-65%); proteins, including essential amino acids (24-28%), and fat (1-4 %).

In Bangladesh, pulses are attacked by eleven species of insect pests [4]. Among these pests pod borer (*Helicoverpa armigera* Hubner) is the most serious insect pests of the growing areas of the country [5]. The larva of these pests feed on the foliage for some time and later suck the immature pod. In later stage, the young larvae also bore

into the pod. In a country wide survey, averages of 30 to 40 percent pods were found to be damaged for that and it was estimated at 400 kg/ha yields losses [6]. In favorable condition, the pod damage may go to 90-95% [7].

Low yield potential, susceptibility to diseases, delayed sowing, drought and weed infestation are the main production constraints to the lentil crop in Bangladesh. A number of agronomic practices have been found to influence the yield of vegetable crops [8]. Sowing time had a marked effect on growth and development of crops [9]. Optimum sowing time provides more time for the growth and development of plant which is favorable for higher yield whereas both early and late sowing hinder the growth and development with lowest yield potential that influences insect's infestation and ultimately hindering the productivity of lentil. Different varieties also influence the insect pests. Out of 11 chickpea cultivars (ICCV 10, PG 81-1-1, GG 1, JD 315, GG 2, Chaffa, GNG 469 (C), Dahod Yellow, BG 391, Phule G5 and ICC4) tested, Chaffa was found the most tolerant cultivar with lowest larval population [10]. Reference [2] reported genotype C-727 as relatively resistant to pod borer infestation, compared to other seven genotypes. Reference [1] found pod length, breadth and area of respective genotypes showed significant effect in resistance mechanism against pod borer damage and Correlation study showed a negative correlation between pod length, breadth and area to pod borer damage. The pods having higher length, breadth and area are less preferred by the pod borer. Information pertaining to the effect of sowing times and varieties on incidence of pod borer is scanty in Bangladesh and elsewhere. Therefore, there are enough scopes to increase the productivity of lentil using appropriate variety and optimum sowing time. So, the present study was undertaken to find out the proper time of sowing, identify the tolerant varieties and to know the combined effect of sowing times and different varieties of lentil in relation to pod borer attack.

II. MATERIALS AND METHODS

The experiment was conducted at the Farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh during the period from October 2008 to April 2009. It was laid out in Factorial Randomized Complete Block Design (RCBD) with three replications. Four sowing times, S₁: sowing on 06 November, S₂: sowing on 16 November, S₃: sowing on 26 November and S₄: sowing on 06 December, and four varieties, V₁: BARI Masur-3, V₂: BARI Masur-4, V₃: BARI Masur-5 and V₄:

BARI Masur-6, were evaluated in this experiment. There were 16 treatment combinations for the experiment; they were S_1V_1 , S_1V_2 , S_1V_3 , S_1V_4 , S_2V_1 , S_2V_2 , S_2V_3 , S_2V_4 , S_3V_1 , S_3V_2 , S_3V_3 , S_3V_4 , S_4V_1 , S_4V_2 , S_4V_3 , and S_4V_4 . Lentil seeds of different varieties were collected from the Pulse Seed Division, Bangladesh Agricultural Research Institute (BARI). The whole experimental field was divided into three equal blocks. Each block was divided into 16 plots, where 16 treatment combinations were allocated at random. There were 48 unit plots altogether in the experiment. The size of the each unit plot was 3.0 m × 2.0 m. The distance maintained between two blocks and two plots was 1.0 m. The lentil seeds of different varieties were sown as per the sowing date of treatments i.e., November 06, 16, 26, and December 06 in 2008. Seeds were treated with Bavistin before sowing the seeds to control the seed borne diseases. The seeds were sown in rows in the furrows having a depth of 2-3 cm. Line to line distance was 30 cm and plant to plant distance was 8-10 cm. Thinning, irrigation and weeding were done as intercultural operation. The plots were spaded one day before seed sowing and the basal dose of fertilizers was incorporated thoroughly with the soil. Urea, Triple Super Phosphate (TSP) and Muriate of Potash (MP) were used as a source of nitrogen, phosphorous, and potassium, respectively. Cowdung 10 tons/ha, Urea 45 kg /ha, TSP 85 kg/ha and MP 35 kg /ha were applied to the experimental plot as basal dose at the time of land preparation.

Data were collected on number of healthy and infested pods per plant at 7 days intervals. After fruit setting, 10 lentil plants were selected randomly from each plot and closely examined the number of healthy and borer infested pods per plant. After harvest 10 plants were also selected randomly from each plot and the number of healthy and borer infested pods per plant. From these data the per cent pod infestation was calculated. The data analyzed to find out the differences due to different sowing times and varieties, and their interactions. The mean values of all the characters were calculated and analyses of variance were performed by the 'F' (variance ratio) test. The differences among the mean values of different parameters were estimated by the Duncan's Multiple Range Test (DMRT) at 5% level of probability [6].

III. RESULTS AND DISCUSSION

Effect of sowing times on pod borer incidence

Sowing times had profound effect on incidence of pod borer in lentil. The best effect was found for S_2 (sowing on 16 November) having lowest number of borer infested pod per plant (6.03) with 11.33% pod infestation (Table 1). But no significant difference was observed between S_2 and S_3 (sowing on 26 November) regarding infested pod and per cent pod infestation. However, significant variation was found with other sowing times (S_1 and S_4). The maximum number of infested pod (7.13/plant) and higher percentage of pod infestation (15.84%) was obtained in S_4 which was significantly higher than other sowing times. The result indicates that pod infestation of lentil by pod borer significantly varied with sowing times. Among the

four sowing times, borer infestation was low in crops sowing on mid November compared to early (sowing on 06 November) and late sowing (sowing on 06 December) crops. The result support the findings of [7] who reported that pod damaged by pod borer varied significantly due to sowing times and mid season crops sowing in March 27 had the lowest level of pod borer infestation compared to late season sowing crops in May 01. Nevertheless, [1] reported that lentil sowing in November received less aphid infestation and produced higher yield. The result may vary with others due to differences in temperature, humidity and rainfall.

Effect of lentil varieties on pod borer incidence

Pod borer incidence significantly varied on different lentil varieties. Among the four varieties, the lowest number of borer infested pod (6.31/plant) and minimum percentage of pod infestation (12.53%) was obtained in V_2 (BARI Masur-4). No significant variation was observed with V_3 (BARI Masur-5) and V_4 (BARI Masur-6) regarding borer infested pod and per cent pod infestation (Table 2). However, significant difference was observed with V_1 (BARI Masur-3) which had highest level of pod infestation (14.52%). The result indicates that pod infestation by pod borer significantly varied in different varieties and the lowest percentage of borer infestation was found in BARI Masur-4 compared to BARI Masur-3. The result could not compare with others due to lack of exact reference. However, the result may vary with others due to climatic factors and inherent resistant quality of lentil variety against the borer. Reference [7] Reported that rainfall was the influencing factor of pod borer moth emergence as well as higher pod borer infestation.

Combined effect of sowing times and variety on pod borer infestation in lentil

The data in Table 3 demonstrate the combined effect of sowing times and lentil varieties on incidence of pod borer on lentil. The lowest number of borer infested pod (5.83/plant) was recorded from S_2V_2 followed by 5.97/plant in S_3V_3 . No significant difference was observed among S_2V_2 (5.83/plant), S_3V_3 (5.97/plant), S_2V_4 (6.00/plant), S_3V_2 (6.00/plant), S_2V_3 (6.10/plant), S_3V_4 (6.13/plant), S_2V_1 (6.20/plant) and S_3V_1 (6.40/plant) regarding borer infested pod/plant. In contrast the highest number of borer infested pod (7.57/plant) was found in S_4V_4 combination followed by 7.43/plant in S_4V_1 and 7.27/plant in S_4V_3 combination having no significant variation among them. However, significant difference was observed with other combination. Similarly, the lowest level of pod infestation (10.69%) was recorded in S_2V_2 combination followed by 10.89% in S_3V_3 combination having no significant variation between them. The data (Table 3) also indicate that statistically same level of pod infestation was found in combinations S_3V_2 (10.89%), S_2V_4 (11.35%), S_2V_3 (11.43%), S_3V_4 (11.85%) and S_2V_1 (12.13%). The highest percentage of pod infestation (17.58%) was found in S_4V_1 combination having no significant difference with S_4V_4 (16.21%) and S_4V_3 (15.56%). However, significant variation was observed with other combinations regarding pod infestation by *H. armigera*.

This result indicate that S₂V₂ (BARI Masur 4 sowing on 16 November) and S₃V₃ (BARI Masur 5 sowing on 26 November) combinations showed the best performance with lowest number of borer infested pod/plant and minimum percentage of pod damage by *H. armigera*. The result of the study could not compare with other due lack of appropriate reference regarding combined effect of sowing times and lentil varieties. However, it may vary with others because of difference in climatic factors and inherent resistance quality of lentil varieties against *H. armigera*. The overall results of the present study indicate that mid November is the best sowing time of lentil in Bangladesh, BARI Masur-4 and BARI Masur-5 are suitable varieties, and BARI Masur-4 sowing on 16 November and BARI Masur-5 sowing on 26 November are the best combinations regarding pod infestation by *H. armigera* in lentil.

IV. CONCLUSION

Sowing time and variety had a significant effect on incidence of pod borer in lentil. BARI Masur-4 sowing on 16 November and BARI Masur-5 sowing on 26 November are the best combinations to avoid pod borer infestation in lentil.

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Table 1: Effect of four sowing times on pod borer infestation in lentil

Sowing Times	Number of borer infested pod plant ⁻¹	% pod infestation
S ₁	6.80 b	14.71 b
S ₂	6.03 c	11.33 c
S ₃	6.13 c	11.40 c
S ₄	7.13 a	15.84 a
CD _(0.05)	0.252	0.725
CV (%)	9.64	6.53

In a column means having same letter(s) are not significantly different at 5% level of probability by DMRT.

Table 2: Effect of four varieties on pod borer infestation of lentil

Varieties	Number of pod borer infested pod plant ⁻¹	% pod infestation
V ₁	6.82 a	14.52 a
V ₂	6.31 b	12.53 b
V ₃	6.45 b	12.88 b
V ₄	6.51 b	13.35 b
CD _(0.05)	0.252	0.725
CV (%)	9.64	6.53

In a column means having same letter(s) are not significantly different at 5% level of probability by DMRT.



Table 3: Combined effect of sowing times and varieties on pod borer infestation in lentil

Sowing time × Variety	Number of pod borer infested pod plant ⁻¹	% pod infestation
S ₁ V ₁	6.73 cd	14.82 bcd
S ₁ V ₂	6.50 cde	13.62 d
S ₁ V ₃	6.53 cde	14.38 cd
S ₁ V ₄	6.70 cd	14.65 bcd
S ₂ V ₁	6.20 def	12.13 ef
S ₂ V ₂	5.83 f	10.41 f
S ₂ V ₃	6.10 ef	11.43 ef
S ₂ V ₄	6.00 ef	11.35 ef
S ₃ V ₁	6.40 def	12.15 e
S ₃ V ₂	6.00 ef	10.89 ef
S ₃ V ₃	5.97 ef	10.69 ef
S ₃ V ₄	6.13 ef	11.85 ef
S ₄ V ₁	7.57 a	17.58 a
S ₄ V ₂	7.00 bc	15.41 bc
S ₄ V ₃	7.27 ab	15.56 bc
S ₄ V ₄	7.43 ab	16.21 ab
CD _(0.05)	0.503	1.450
CV(%)	9.64	6.53

In a column means having same letter(s) are not significantly different at 5% level of probability by DMRT.