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Effect of method of sowing and seed rate on the yield and yield components of lentil

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Abstract: A field experiment was carried out at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh to study the effects of method of sowing and seed rate on the yield and yield components of Lentil (BARI Masur 5) from October 2008 to March 2009. The experiment was conducted using two methods of sowing (Broadcast and Line sowing) and four seed rates (30, 40, 50 and 60 kg ha^{-1}) in a randomized complete block design with four replications. Method of sowing showed significant effect on number of pods $plant^{-1}$, straw yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index (%). Thus the highest number of pods $plant^{-1}$ (127.89) and the highest harvest index (34.69%) were found from Broadcast method whereas the highest straw yield (2.46 t ha^{-1}) and the highest biological yield (3.65 t ha^{-1}) were found from Line sowing method. Both the methods of sowing produced identical seed yields. Seed rate showed significant effect on all characters except plant height and 1000-seed weight (g). The highest seed rate 60 kg ha^{-1} gave the highest plant population (77.50 m^{-2}), the highest seed yield (1.44 t ha^{-1}), the highest straw yield (2.98 t ha^{-1}) and the highest biological yield (4.41 t ha^{-1}). But the lowest seed rate of 30 kg ha^{-1} gave the highest number of branches $plant^{-1}$ (29.96), the highest number of pods $plant^{-1}$ (144.32), the highest number of seeds pod^{-1} (1.46) and the highest number of seeds $plant^{-1}$ (189.55). On the other hand the seed rate of 50 and 40 kg ha^{-1} gave the highest harvest index of 34.98 and 34.41%, respectively. The highest seed yield was obtained with the seed rate of 60 kg ha^{-1}. The interaction effects of method of sowing and seed rate were highly significant in case of plant population, number of pods $plant^{-1}$, number of seeds $plant^{-1}$ and harvest index. But interaction of method of sowing and seed rate did not exert any significant influence on seed yield. The result indicates that Broadcast method is better than Line sowing method and higher seed rate is better than lower ones as it gave higher yield.
Key words: Lentil, method of sowing, seed rate.

Introduction

Lentil (*Lens culinaris* L. Medik) is the most common pulse crop grown in Bangladesh and is popularly known as 'Masur'. In Bangladesh, the crop is commonly grown under rainfed condition during winter on soils that conserve moisture from the preceding monsoon. Lentil as characterized by its ability to enter into a symbiotic relationship with the bactrium *Rhizobium leguminosarum* in the fixation of atmospheric nitrogen. It helps in reducing the amount of added nitrogenous fertilizer to the plants. Total production of lentil in Bangladesh in the year 2007-2008 was 71535 tons from an area of 179354 acres with an average yield of 0.40 t ha^{-1} (BBS, 2008). It is increasingly recognized that lentil offers most practical means of solving the protein malnutrition which has necessitated giving more efforts to improve and increase its production in the country.

Several causes are responsible for low yield of lentil of which the use of traditional local cultivars, low plant density $unit^{-1}$ area, weed infestation and poor crop management practices constitute the major ones. Use of the modern lentil cultivars and maintenance of proper plant density $unit^{-1}$ area would thus help in increasing the yield from $unit^{-1}$ area.

Seed rate is one of the main factors that has an important role on growth, yield and quality of lentil. Optimum spacing can ensure proper growth of the aerial and underground parts of the plant through efficient utilization of solar radiation, nutrients, water, land as well as air spaces. Spacing for line sowing is recommended to maintain the required number of plant population and to undertake intercultural operations for harvesting a higher yield. But in Bangladesh most of the farmers follow broadcast method or line sowing method without maintaining proper spacing for growing lentil. As a result, significant variation in lentil yield was reported by many researchers (Sengupta, 1962; Rahman, 1975; Khaleque *et al.*, 1975; Bhuiyan, 1976).

Seed rate has a major bearing on the yielding ability of any crop. Substantial yield increase of lentil can be achieved by using optimum seed rate (Sekhon *et al.*, 1994; Venkateswarlu and Ahlawat, 1993; Malik and Singh, 1996).Therefore, the present experiment was undertaken to study the effect of method of sowing and seed rate on the yield and yield components of lentil.

Materials and Methods

The experiment was conducted at the Agronomy Field Laboratory of Bangladesh Agricultural University (BAU), Mymensingh during the period from October 2008 to March 2009. The land was medium high having silty loam texture soil with soil p^H 6.7 (BARC, 1989). The soil is low in organic matter contents and its general fertility level is low. Treatments were: **Factor A -** Methods of Sowing: **(**i) Broadcast method (M_1), (ii) Line sowing method (M_2); and **Factor B -** Seed Rate: (i) 30 kg ha^{-1} (S_1), (ii) 40 kg ha^{-1} (S_2), (iii) 50 kg ha^{-1} (S_3), (iv) 60 kg ha^{-1} (S_4). The experiment was laid out in a randomize complete block design with four replications. The unit plot size was 2.5m × 2m and the total number of plots was 32. BARI masure 5 was used as planting material. It is a semi-dwarf cultivar and its life is around 110-115 days. The land was fertilized with 45, 85 and 35 kg urea, triple super phosphate (TSP) and muriate of potash (MoP) ha^{-1}, respectively (BARI, 2000). Entire amount of TSP, MoP and $^1/_3$ rd of urea were applied at the time of final land preparation. While urea was applied in splits- $^1/_3$ rd at sowing time, 2^{nd} $^1/_3$rd after 1^{st} weeding (15 days after sowing) and the rest $^1/_3$ rd after 2^{nd} weeding (30 days after sowing). The crop was grown under rainfed condition and thinning was done and the chemical Sadid 250EC @ 1L/500L ha^{-1} was applied to control foot and root rot disease. The weeds were controlled by hands and it was done twice. At full maturity, five sample plants were uprooted for data collection from each plot. Grain and straw yields were recorded through whole plot harvesting.

The collected data for 11 different characters were analyzed statistically using Computer Package MSTAT and Duncan's Multiple Range Test (DMRT) were done to

find out the differences between the means of each individual characters. (Gomez and Gomez, 1984).

Results and Discussion

Effect of method of sowing on yield and yield components was shown in Table 1. It is observed that method of sowing exerted significant influence on number pods palnt^{-1}, straw yield (t ha^{-1}), Biological yield (t ha^{-1}) and harvest index (%). While plant population, plant height, number of branches plant^{-1}, number of seeds pod^{-1}, number of seeds plant^{-1}, 1000- seed weight (g) and seed yield (t ha^{-1}) were not significantly affected by method of sowing. Singh and Verma (1996) also obtained similar results in respect of plant population and number of branches plant^{-1}. The highest number of (127.98) pods plant^{-1} and the highest (34.69%) harvest index was found in broadcast method (Table 1). Highest straw yield (2.46 t ha^{-1}) and the highest biological yield (3.65 t ha^{-1}) were recorded in line sowing method (Table 1). The highest seed yield (1.19 t ha^{-1}) was found in line sowing method though it was not significant. This result is at per with the result of Bhuiyan (1976).

Table 1. Effect of method of sowing on the yield and yield components of lentil

Method	Plant population (m^{-2})	Plant height (cm)	No. of branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	No. of seeds plant^{-1}	1000-seed weight (g)	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
M_1	71.75	37.23	26.51	127.89a	1.44	172.31	25.77	1.17	2.23b	3.40b	34.69a
M_2	71.25	36.66	26.86	120.99b	1.43	173.06	25.87	1.19	2.46a	3.65a	32.44b
Level of significance	NS	NS	NS	**	NS	NS	NS	NS	**	**	**

In a column figures with same letter (s) or without letter (s) do not differ significantly whereas figures with dissimilar letter (s) differ significantly (as per DMRT); M1 = Broadcast Method, M2 = Line sowing Method, NS = Not significant, * = Significant at 5% level of probability, ** = Significant at 1% level of probability

Table 2. Effect of seed rate on the yield and yield components of lentil

Seed rate	Plant population (m^{-2})	Plant height (cm)	No. of branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	No. of seeds plant^{-1}	1000-seed weight (g)	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
S_1	61.50 b	36.11	29.96a	144.32a	1.46a	189.55a	26.14	0.96d	2.02c	2.98c	32.33b
S_2	65.50b	37.61	28.30ab	121.95b	1.42ab	168.71b	25.52	1.13c	2.17b	3.30b	34.41a
S_3	70.50b	37.04	25.20bc	117.85b	1.44ab	169.02b	25.92	1.19b	2.22b	3.41b	34.98a
S_4	77.50a	37.01	23.29c	113.63c	1.41b	163.45b	25.70	1.44a	2.98a	4.41a	32.54b
Level of significance	**	NS	*	**	**	**	NS	**	**	**	**

In a column figures with same letter (s) or without letter (s) do not differ significantly whereas figures with dissimilar letter (s) differ significantly (as per DMRT); S1 = 30 kg Seed ha-1,S2= 40 kg Seed ha-1,S3= 50 kg Seed ha-1,S4= 60 kg Seed ha-1,NS = Not significant, * = Significant at 5% level of probability, ** = Significant at 1% level of probability

Table 3. Interaction effect of method of sowing and seed rate on the yield and yield components of lentil

Interaction (M×S)	Plant population (m^{-2})	Plant height (cm)	No. of branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	No. of seeds plant^{-1}	1000-seed weight (g)	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
M_1S_1	54.00f	36.25	30.48	156.30a	1.47	190.45a	26.41	0.95	1.95	2.89	32.99c
M_1S_2	61.00e	36.42	28.95	129.95bc	1.43	175.18b	25.50	1.15	1.98	3.13	36.84a
M_1S_3	87.00a	37.83	24.65	112.70d	1.44	162.25c	25.72	1.20	2.14	3.34	35.95ab
M_1S_4	85.00ab	38.42	21.98	112.60d	1.41	161.35c	25.47	1.41	2. 87	4.28	32.97c
M_2S_1	83.00b	35.97	29.45	132.35b	1.46	188.65a	25.86	0.98	2.10	3.08	31.68c
M_2S_2	78.00c	38.80	27.65	113.95d	1.42	162.25c	25.55	1.11	2.35	3.46	31.97c
M_2S_3	54.00f	36.25	25.75	123.00c	1.43	175.80b	26.13	1.18	2.30	3.47	34.01bc
M_2S_4	70.00d	35.60	24.60	114.65d	1.41	165.55c	25.94	1.46	3.09	4.55	32.10c
Level of significance	**	NS	NS	**	NS	**	NS	NS	NS	NS	*
CV (%)	3.89	5.56	12.22	4.39	1.96	14.93	2.64	4.25	5.06	3.76	4.33

Seed rate exerted significant effect on all crop characters of lentil except plant height (cm) and 1000-seed weight (g). On the other hand Habbasha *et al.* (1996) reported increasing plant density increased plant height and Singh *et al.* (2003) reported that with the increase of seed rate 1000-seed weight decreased which is in agreement with the findings of the present study. Plant population m^{-2} (77.50), seed yield (1.44 t ha^{-1}), straw yield (2.98 t ha^{-1}) and biological yield (4.41 t ha^{-1}) were highest in the highest seed rate (60 kg h^{-1}). Dwivedi *et al.* (1997) also

observed that the population density m^{-2} increased significantly with the increasing seed rate. Siddique *et al.* (1998) observed an increase of biological yield of 236 g m^{-2} with the seed rate of 60 kg ha^{-1} and harvest index up to 36% at the seed rate of 40 kg ha^{-1} which is at per with the findings of the present study. The highest seed rate (60 kg ha^{-1}) was found to be the best for lentil production in terms of seed yield (Table 2). This result is quite similar to the findings of Malik and Singh (1996).

Interaction effect of method of sowing and seed rate was shown in Table 3. The interaction of method of sowing and seed rate on plant population, number of pods $palnt^{-1}$, number of seeds $plant^{-1}$ and harvest index were significant. On the other hand, plant height, number of branches $plant^{-1}$, number of seeds pod^{-1}, 1000-seed weight (g), seed yield (t ha^{-1}), straw yield (t ha^{-1}) and biological yield did not vary significantly due to the interaction of method of sowing and seed rate. But Singh *et al.* (2002) reported increase of 1000-seed weight with the increase of seed rate which is contradictory to the findings of the present study. The reason behind this might be due to the fact that they have applied diammonium phosphate at the rate of 80 and 160 kg ha^{-1} in there experiment. The highest seed yield (1.46 t ha^{-1}) was observed in line sowing method coupled with 60 kg seed ha^{-1} (Table 3). Straw also exhibited similar trend as that of seed yield.

From the above result and discussion it is appears that apparently Line sowing method was better than broadcast method though they were not statistically significant. Yield increased with the increase of seed rate. Highest yield was recorded from the seed rate of 60 kg ha^{-1}. Numerically higher seed yield was obtained from Line sowing method with 60 kg seed rate ha^{-1}.

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