

EFFECT OF SEED RATE AND NITROGEN DOSES ON YIELD PERFORMANCES OF LENTIL

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ABSTRACT

An experiment was conducted at the agronomy field of Bangladesh Agricultural University, Mymensingh to determine the effect of seed rate and fertilizer doses on yield components of lentil (*Lens culinaris* Medic). The experiment was laid out in randomly complete block design (RCBD) with three replications. Three doses of nitrogen fertilizer, viz. N₁= 25 kg/ha, N₂= 40 kg/ha, N₃= 55 kg/ha and two seed rate, viz., S₁= 35 kg/ha, S₂= 45 kg/ha were used as experimental treatments. Result revealed that the highest yield (1.067 tha⁻¹) was found in higher seed rate (S₂-45 kgha⁻¹). On the other hand, medium fertilizer dose (40 kgha⁻¹ urea dose) confirmed the highest yield (1.1083 tha⁻¹) of lentil. Furthermore, the highest lentil yield (1.20 tha⁻¹) was recorded in S₂N₂ interaction. The study also concluded that yield was positively correlate with plant height, number of branches per plant and number of pods per plant but negatively correlate with days to maturity.

Key words: Lentil, seed rate, nitrogen, yield attributes

Introduction

Lentil (*Lens culinaris*) is an important food source for the people especially in the subcontinent (Singh and Singh, 2014). It is originated mainly from the eastern Mediterranean Egypt, Greek & Asia then Hindukush Mountain in India and later stage in Africa, America & Europe (Al-Khayri *et al.*, 2019). It is rich in proteins and contains high concentrations of essential amino acids like isoleucine and lysine, as well as other nutrients like dietary fiber, folate, vitamin B1, and minerals (Rozan *et al.*, 2001). Research showed that it contains 25% protein, 60% CHO, 4.5% fat and 11% water which are comparatively higher than the other pulse crops (Singh *et al.*, 2016). It is grown as a sole crop and may be inter-cropped with wheat, mustard and chickpea (Biswas *et al.*, 2020). Although lentil requires fertilizers however, it also plays important role to fix nitrogen to soil from the atmosphere (Suryapani *et al.*, 2012). Bangladesh is an over populated country and cultivable land is decreasing day by day creating major problems for food. To get higher production from the available cultivable land resources, feasible conditions for cultivation are needed and the importance of nutrients in plant growth and yield are well known (Shrivastav *et al.*, 2020). Nitrogen is one of the essential plant nutrients, which can augment the production to a great extent. Again, seed rate has a positive effect on total yield as well as with the net profit return (Boyer *et al.*, 2020). Reports showed that combination of seed rate with fertilizer can increase the yield as well as protein content of barley and wheat seed (Walsh and Walsh, 2019). So, this experiment was undertaken to understand the combine effect of seed rate and nitrogen doses on the growth and yield of lentil.

Materials and Methods

The experiment was conducted at the agronomy field laboratory of Bangladesh Agricultural University (BAU), Mymensingh during the period from November/2018 to March/2019. The experiment was laid out in randomly complete block design (RCBD) with three replications. Nitrogen was used as the form of urea, where three doses of nitrogen, viz. N₁= 25 kg/ha, N₂= 40 kg/ha, N₃= 55kg/ha and two types of seed rate, viz., S₁= 35kg/ha, S₂= 45kg/ha were used as experimental treatments. Lentil seed was collected from Bangladesh Agricultural Research Institute (BARI), Gazipur. Land was prepared by using power tiller with ploughing along with cross ploughing and laddering. Then the plot was leveled and entire weed, removed

from the experimental field prior to sowing of seeds; crops were sown at 22 November 2018 and harvested at 2nd March 2019. Seeds were harvested at about 80% of pod maturity. After harvesting the crops were dried for three days and then threshed by beating with a stick. Seeds were then cleaned and dried for another five days in the sun to bring seed moisture content around 8%. Data on plant height, number of branches per plant, number of pods per plant, days to maturity and grain yield were recorded at the time of harvesting. Data analysis was done statistically following the analysis of variance (ANOVA) technique and the means were compared by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

Effect of seed rate on yield attributes of lentil: The seed quality and seed rate of lentil increases yield of lentil under different condition (Ninou *et al.*, 2019). In the present experiment, seed rate has no significant effect on plant height, number of branches and days to seed maturity however, it showed significant effect on number of pods per plant and yield (Table 1). The highest number of pods per plant was recorded (69.889) in S₁ treatment and the lowest number of pod was recorded (50.78) in S₂ treatment. On the other hand, the highest yield was recorded (1.068 t/ha) in S₂ treatment and the lowest yield (1.013) in S₁ treatment. Here in the study, the lesser seed rate showed higher number of pods in each plant indicating the proper plant growth than the plants of higher seed rate. On the other hand, higher seed rate produced more pods resulted higher yield of lentil was achieved.

Table 1. Effect of seed rate on yield attributes of lentil

Seed rate	Plant height (cm)	Number of branches per plant	No. of pods per plants	Days to maturity	Yield (t/ha)
S ₁	33.5a	8.7a	69.9a	96.2a	1.01 b
S ₂	31.6a	7.2a	50.8b	96.0a	1.06a
CV	7.8	26.8	13.2	1.8	4.2
LSD	2.6	2.2	8.3	1.8	0

Effect of fertilizer dose on yield attributes of lentil: Availability of nutrients in soil is one of the basic requirements for proper plant growth in the field (Shrivastav *et al.*, 2020). Soil nutrients are different in different places in the fields and fertilizer can be applied to make the balance of nutrients throughout the fields (Narayanasamy *et al.*, 2020). So, fertilizer dose is an important treatment on growth and yield attributes of plants including lentil. Fertilizer doses have significant effect on plant height, number of branches per plant, number of pods per plant, days to maturity and yield of lentil (Table 2). The highest plant height, number of branches, number of pods and yield was found in N₂ treatment and the lowest plant height, number of pods and yield was found in N₃ treatment whereas the lowest number of branches per plant, days to maturity and yield was found in N₁ treatment. Result also revealed that N₂=40kg/ha⁻¹ treatment was the suitable fertilizer dose for the highest growth and yield of lentil. These results clearly indicating that applying excess fertilizer negatively affect lentil plant height, number of pods and maturity. In addition, excess nitrogen fertilizer created more branching in lentil plants rather than increasing plant height. Similar results were reported in banana where nitrogen and potassium doses affected growth on banana either solely or with combinations (Islam *et al.*, 2020).

Table 2. Effect of nitrogen fertilizer doses on yield attributes of lentil

Fertilizer doses	Plant height (cm)	Number of branches per plant	No. of pods per plants	Days to maturity	Yield (t/ha)
N ₁	33.6a	6.3b	62.8a	94.3b	0.9c
N ₂	35.0a	8.0ab	70.5a	95.8b	1.1a
N ₃	29.1b	9.5a	47.7b	98.2a	1.0 b
CV	7.8	26.8	13.2	1.8	4.2
LSD	3.3	2.7	10.2	2.2	0.05

Effect of seed rate and nitrogen fertilizer dose on yield attributes of lentil: Seed rate and fertilizer interaction showed significant effect on lentil plant morphology and yield contributing characters (Table 3). Two interactions S_1N_1 and S_2N_2 showed the highest plant height (27.4 cm and 39.0 cm), number of branches per plant (10 and 9) and number of pods per plant (79.7 and 70.3) compare to the other interactions. Whereas, the highest days to maturity (99 days and 97.3 days, respectively) were found in S_1N_3 and S_2N_3 interaction. This result clearly pointing that nitrogenous fertilizer elongated maturity period rather than increasing the pod number and yield of lentil. It has been reported that nitrogenous fertilizer induces the vegetative growth rather and delayed the maturity leading to decrease the yield in rice, and cotton (Chaturvedi, 2005; Howard *et al.*, 2001). On the other hand, the highest yield (1.20 tha^{-1}) was recorded in S_2N_2 interaction and the lowest was recorded (0.9433 tha^{-1}) in S_2N_1 interaction.

Table 3. Effect of seed rate x nitrogen fertilizer doses on yield attributes of lentil

Interaction (S x N)	Plant height (cm)	Number of branches per plant	No. of pods per plants	Days to maturity	Yield (t/ha)
S_1N_1	37.4a	10.0a	79.7a	93.3 c	0.9bc
S_1N_2	31.0b	6.3ab	70.7ab	96.3abc	1.01bc
S_1N_3	32.0b	9.7a	59.3 bc	99.0a	1.0b
S_2N_1	29.7bc	2.7 b	46.0 cd	95.3bc	0.9c
S_2N_2	39.0a	9.7a	70.3ab	95.3bc	1.2a
S_2N_3	26.2 c	9.3a	36.0d	97.3ab	1.06b
CV	7.8	26.8	13.2	1.8	4.2
LSD	4.6	3.9	14.4	3.1	0.07

Correlation coefficient analysis of vegetative growth and yield: Correlation coefficient reveals the relationship between the variables of a research (Ratner, 2009). Statistical analyses were done to understand the relationship of morphological characters with yield contributing characters of lentil. The correlation coefficient revealed the positive and significant relation of plant height with number of branches and number of pods in each lentil plant (Table 4). Lentil yield is highly dependent on the plant height and number of pods (Noor *et al.*, 2017; Tambal *et al.*, 2000). Moreover, lentil pod has positive and significant relationship with number of branches which leading to high yield (Aghili *et al.*, 2012). Interestingly, plant height showed negative and statistically significant effect on lentil yield. Analysis also revealed that length of lentil maturity is negatively associated with the number of pods in each lentil plant and yield of lentils, respectively (Table 4).

Table 4. Pearson correlations

Parameters	Plant height	No. of branches	Number of pod	Days to maturity	Yield
Plant height	1				
No. of branches	0.36	1			
Number of pod	0.66	0.21	1		
Days to maturity	-0.16	0.10	-0.40	1	
Yield	0.12	0.30	0.11	-0.01	1

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