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Short Note

Influence of nitrogen fertilization on performance of linseed (*Linum usitatissimum* L.) under *utera* system

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Abstract

A field experiment was conducted at experimental farm of Oilseed Section, CSK HPKV, Palampur in RBD keeping 9 treatments, comprising of three linseed varieties (*'Bhagsu'*, *'Surbhi'* & *'Baner'*) and three nitrogen levels (10, 20 and 30 kg/ha) to study the influence of nitrogen on linseed varieties under *utera* condition. Variety *'Baner'* being at par with *'Bhagsu'* had recorded significantly more plant height, higher number of primary branches/plant, capsules/plant and seed yield of linseed (538 and 514 kg/ha, respectively). Nitrogen fertilization at 30 kg/ha was proved to be significantly best for recording significantly highest plant stand, growth, yield attributes and yield of linseed (610 kg/ha). Interaction of varieties and nitrogen levels was significant on seed yield. *'Baner'* behaved statistically similar to *'Bhagsu'* when supplied with 30 kg N/ha for significantly higher seed yield of linseed. 45.4 and 43.1% respective increase in the seed yield was recorded with these combinations over *'Surbhi'* grown with same nitrogen level.

Key words: Linseed, nitrogen levels, *utera*, varieties, yield.

Linseed (*Linum usitatissimum* (L.) Griesb.) occupies a greater importance among oilseeds; owing to its various uses and special qualities. In India, it is grown mainly for seeds, used for extracting oil. It is a source of complete protein, high-order linolenic acid (an essential polyunsaturated omega-3 fatty acid), complex carbohydrates, vitamins, minerals and lignans (Morris, 2005) and becoming increasingly popular as a nutritional and functional food especially for vegetarians. In North West Himalayas linseed is generally broadcasted in paddy crop, 15-20 days before the harvest of the crop. This system of cultivation is known as *utera* or *paira* system of cultivation, which limits the scope of application of modern improved technology along with use of inputs generally associated with increased productivity. In this system the succeeding crop (Linseed) faces many constraints like poor seed soil contact leading to poor germination with low plant population, plant mortality at paddy harvest, use of local varieties, lack of fertilization and plant protection measures which limit its production. For such situation varieties having small seed size and deep root system will be of much importance as variety is important input under *utera* system (Agarwal *et al.*, 1986). Moreover, varieties respond differently to fertilizer application because of their genetic characters along with environmental conditions. Among different nutrients, nitrogen is the most important constituent of protein, enzymes and chlorophyll and involved in all processes associated with protoplasm, enzymatic reactions and photosynthesis. Reported responses of linseed to N are diverse and conflicting. Several reports indicated a favourable response to N (Hocking and Pinkerton, 1991) especially when soil N was low (Marchenkov *et al.,* 2003). At other times nitrogen had no effect on seed yield or oil content or there was a poor response to N (Rossini and Casa, 2003). Although, nitrogen has considerable effect on growth, development and yield of crops, yet, the effect is considerably altered by the variation in environmental conditions, season, genotype, moisture supply, source, method and quantity of fertilizer added especially in *utera* system where presence of previous crop residues plays important role.

Keeping this in view, the present study was conducted at experimental farm of Oilseed Section, CSK HPKV, Palampur during *rabi* 2006-07. The experiment was conducted

in factorial randomized Block design keeping 9 treatment combinations, comprising of three varieties (*viz. 'Bhagsu'*, *'Surbhi'* and *'Baner'*) and three nitrogen levels (*i.e.* 10, 20 and 30 kg/ha) replicated thrice. The soil of the experiment site was silty clay loam in texture with pH 5.7 and medium in available nitrogen, phosphorus and potassium. The crop was sown by broadcasting linseed seeds of respective varieties as per treatments at dough stage of paddy. The total number of plants present in 0.25 m^2 area were counted by using a quadrate of 0.5m x 0.5m at random in each plot and expressed in No. of thousand plants/ha. Plant height, No. of primary, secondary branches and capsules/plant were recorded from the selected five plants in each net plot. After maturity, the crop was harvested from the net plot area, sun dried and threshed with wooden mallet and the seed yield was expressed in kg/ha.

The results revealed that plant stand was not significantly influenced by varieties. '*Baner'* being at par with *'Bhagsu'* had significantly more plant height. All the yield attributes *viz.* primary branches/plant, capsules/plant and seeds/capsule were significantly influenced by varieties. Significantly more number of all yield attributes was recorded in '*Baner'*. However, *'Bhagsu'* was also at par to '*Baner'* in having more number of primary branches/plant and capsules/plant. Due to higher number of yield attributes '*Baner'* being at par with *'Bhagsu'* had resulted in significantly higher seed yield of 538 and 514 q/ha, respectively. The percent increase in the seed yield due to '*Baner'* and *'Bhagsu'* over *'Surbhi'* was 33.2 and 27.0 %, respectively (Table-1). These results are in direct conformity with the findings of Chopra and Badiyala (2015). *'Baner'* was found to be significantly best in term of yield and disease resistance and released for *utera* cultivation in Zone-I of India (Anonymous, 2005-06). '*Baner'* was also evaluated as best variety along with *'Himani'* under *utera* system by Kaushal (1995) and Badiyala *et al.* (2004). Similarly, based on the best performance of *'Bhagsu'* in *utera* system, this variety was released by CVRC during 2010 (Anonymous, 2010-11).

All growth and yield attributes of linseed was significantly influenced by different nitrogen levels and increased with successive increase in nitrogen level upto 30 kg/ha. Application of 30 kg N/ha had recorded significantly more plant stand, plant height and all yield attributes. 20 kg N/ha was found to be the next best for all these attributes. There was an increase of 28.7 and 64.0 % in seed yield of linseed with the application of 30 kg N/ha over 20 and 10 kg N/ha, respectively (Table-1).

Table 1. Effect of varieties and nitrogen levels on growth, yield attributes and seed yield of linseed

Treatments	Plant stand ('000/ha)	Plant height (cm)	Primary branches	Capsules/ plant	Seeds/ capsules	Seed yield (kg/ha)
Varieties						
Bhagsu	738	60.0	4.9	22.4	7.2	514
Surbhi	734	53.0	4.6	19.0	7.0	404
Baner	722	60.0	5.0	21.8	7.5	538
CD (P=0.05)	NS	0.82	0.24	0.59	0.2	24
Nitrogen level (kg/ha)						
10	593	54.4	4.4	18.6	7.0	372
20	749	57.8	5.0	20.5	7.6	474
30	852	60.8	5.4	24.2	7.9	610
CD (P=0.05)	47.8	0.82	0.24	0.59	0.4	24

Table 2. Interaction effect of varieties and nitrogen levels (kg/ha) on seed yield of linseed

Varieties / Nitrogen levels (kg/ha)	Bhagsu	Surbhi	Baner
	Seed yield (kg/ha)		
10	373	335	409
20	495	404	522
30	674	471	685
CD (P=0.05)	41		

The interaction between varieties and nitrogen levels was found significant for seed yield. *'Baner'* and *'Bhagsu'* being at par with each other had recorded significantly higher seed yield when fertilized with 30 kg N/ha. This might be due to better root development of these varieties which helped in better absorption of nutrient and water in this system and had resulted in more plant stand with better growth for contributing higher yield and yield attributes. Same varieties at 20 kg N/ha were found to be other best combination. *'Bhagsu'* fertilized with 20 kg N/ha behaved statistically similar to *'Surbhi'* supplied with 30 kg N/ha. Similarly, *'Baner'* supplied with 10 kg N/ha was also at par to *'Surbhi'* at 20 kg N/ha. Thus, there was saving of 10 kg N/ha with *'Bhagsu'* and *'Baner'* over *'Surbhi'* at respective fertilizer levels. *'Baner'* and *'Bhagsu'* supplied with 30 kg N/ha recorded 45.4 and 43.1% increase in seed yield over *'Surbhi'* at same nitrogen level and 104.5 and 101.2% at 10 kg N/ha (Table-2). Leilah (1993) found that interaction between flax cultivars and nitrogen levels had significant effect on seed yield. Dwivedi *et al.* (1994) stated that seed yield of flax cultivar Jawahar increased with addition of 30 kg N/ha and Badiyala *et al.* (1998) also reported higher yield of flax at higher level of fertilizer application.

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