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EFFECT OF VARIETY, NITROGEN, PHOSPHORUS AND BORON ON LENTIL (*LENS ESCULENTUM* L.) IN CALCAREOUS SOILS OF NORTH BIHAR

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ABSTRACT

An on farm trial was conducted during *rabi* 2002-03 at 8 locations of farmer's field to findout the suitable technology for optimizing the yield of Lentil in boron deficient calcareous soil. The combined dose of N:P:K:B::20:40:0:01kg/ha with variety-IPL 406 gave significantly maximum plant height (62.0 cm), pods/plant (59.2), seeds/pod (1.6), 1000-seed weight (23.3g), seed yield (1448 kg/ha), straw yield (2331 kg/ha), net return (Rs. 14,217/ha) and B:C ratio (2.29) which was at par with treatment with N:P:K:20:40:0 kg/ha + 3 foliar spray of 0.1 % boric acid powder with IPL 406. The treatment no.2 without boron gave significantly lower value of growth, yield attributes, yield and net return but was significantly superior than farmers practice having non descript variety and with N:P:K:B::05:25:0:0 kg/ha.

Key words : *Lentil, IPL 406, nitrogen, phosphorus and boron.*

Traditionally pulses have been considered important elements of cropping systems in the Indo-Gangeticplains. They were popular because of their importance as a source of protein and ability to fix atmospheric nitrogen (N) and thus improve soil fertility (Joshi, 1998). With about 30 % of calories from protein, lentil has the third highest level of protein, by weight, of any legume or nut, after soybean and hemp.

Lentil is relatively tolerant to drought it is grown throughout the world. The main countries which contribute major area are Canada, India, China, Australia, Turkey and United States of America. In India, it has always been important as it is the one of the most important *rabi* crops in the country. Its cultivation is mainly confined to northern and central part of the country. Lentil is one of the main pulse crop of Bihar in *rabi*. It is mostly grown in the fields vacated by rice during rabi. Major chunk of soils of north Bihar are alkaline in nature and are deficient in boron and falls under low to medium category in N, P and K content. In calcareous belt of North Bihar, 48 % soils are deficient in boron (Sakal*et al.,* 1996). Apart from N,P and K, the boron plays a vital role in lentil growth especially in flowering, pod formation and seed setting. Kumar *et al* (2006) also reported the positive effect of boron in chickpea. Apart from nutrients, the variety of any crop also plays an important role for determining the productivity of the crop. Therefore, the present experiment was planned to study the effect of boron with nitrogen and phosphorus as well as the improved variety IPL 406 of Lentil in north Bihar.

MATERIALS AND METHODS

An on farm trial was conducted at 8 locations of farmer's field in Begusarai district of Bihar during *rabi* 2002-03. The soils were sandy loam, calcareous with pH ranging from 8.1 to 8.6, medium in organic carbon (0.39 to 0.48 %), available phosphorus (18.2 to 21.8 kg/ha) and fairly rich in potassium (290 to 311 kg/ha). The available boron were 0.15 to 0.28 mg/kg below the critical limit of 0.53mg/kg in calcareous soils of north Bihar.

The trial comprised 4 treatments, viz. T_1: nondescript variety with N:P:K:B::05:25:0:0 kg/ha, T_2: IPL 406 with N:P:K:B:: 20:40:0:0 kg/ha, T_3: IPL 406 with N:P:K::20:40:0 kg/ha + 3 foliar spray of 0.1 % boric acid powder and T_4: IPL 406 with N:P:K:B::20:40:0:01 kg/ha. The trial was laid out in randomized block design with 8 replications. Boron was applied in the from of borax. Nitrogen and phosphorus were applied in the from of urea and DAP. All the fertilizers were applied as basal. The crop was sown in line at 25 cm row spacing with a seed rate of 30 kg/ha in between 11 November to 20 November 2002. Weeding was donebetween 20 December to 31 December 2002. One light irrigation was donebetween 30 December to 05 January 2003. The crop was harvested between 10 March to 22 March 2003. Initial and post harvest soil samples

Table-1 : Growth, yield attributes, yield, net return and B:C ratio as influenced by variety, N, P and boron in lentil.

Treatments (varieties)	Plant height (cm)	Pods/ plant (No.)	Seeds/ pod (No.)	1000-seed wt. (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B : C ratio
T_1 : variety-nondescript with N:P:K:B::5:25:0:0 kg/ha (farmers practice)	53.3	40.3	1.2	20.2	962	1401	2363	16532	6532	1.65
T_2 : variety–IPL 406 with N:P:K:B::20:40:0:0 kg/ha	60.2	52.4	1.5	23.1	1100	1705	2805	19058	8558	1.82
T_3 : variety-IPL 406 with N:P:K::20:40:0 kg/ha + 3 foliar spray of 0.1 % boric acid powder	62.4	58.7	1.6	23.3	1408	2230	3638	24465	13765	2.29
T_4 : variety-IPL 406 with N:P:K:B::20:40:0:01 kg/ha	62.0	59.2	1.6	23.3	1448	2331	3779	25217	14217	2.29
CD (P=0.05)	2.90	3.62	0.21	1.76	147	218	405	2108	1667	-

collated from 0-25 cm depth were analyzed for bulk density, pH, OC, available N,P,K and B by using standard laboratory procedures.

RESULTS AND DISCUSSION

Growth and yield attributes : The storage capacity of any pulse depeads on the growth, number of pods per plant, number of seeds per plant and 1000- seed weight. The relative magnitude of these yield attribute varied substantially with variety used but the most important factors which contributes most are soil productivity and crop management practices followed.

Perusal of data presented in table-1 elearlyrefelects that there was combined significant positive effect of variety and N and P on plant height, yield attributes, yields and gross and net returns of lentil. Plant height, pods/plant, no. of seeds/pod and 1000-seed weight were 53.3 cm, 40.3, 1.2 and 20.2 g, respectively in case of nondescript variety with only N and P @ 5 and 28 kg/ha, where as these were 60.2 cm, 52.4, 1.5 and 23.1 g, respectively in case of IPL 406 with N and P @ 50:40 kg/ha Sharer et al (2003) also reported the positive effect of variety and N and P fertilizers on growth, yield attributes and yield in lentil. Application of boron either basal or as foliar spray produced significant positive effect on growth and yield attributes of lentil but both the treatments were at par. Plant height in basal application of boron @ 01 kg/ha was 62.0 cm and in foliar application it was 62.4 cm. The pods/plant were 59.2 and 58.7, no. of seeds/pod were 1.6 and 1.6 and 1000-seed wt. were 23.3 g and 23.3 g, respectively in basal and foliar applications of boron. The effect of boron in growth and yield attributes was more because it has a chief role in plant cell wall and membrance constancy. It influences the major cellular functions and metabolic activities in plants (Bassil*et al,* 2004). Kumar *et al* (2006) also reported significant positive effect of boron on growth yield attributes and yield in case of chickpea.

Yield and net return : Data presented in table-1, elearly reflects that the combined effect of variety, N and P increased the seed and straw yields as well as gross and net returns significantly over farmers practices. The variety IPL 406 with N & P @ 20:40 kg/ha produced significantly higher seed yield (1100 kg/ha), straw yield (1705 kg/ha), gross return (Rs.19,058 the) and net return (Rs.8,558/ha) over farmers practice of 962 kg/ha, 1401 kg/ha, Rs.16,532/ha and Rs.6,532/ha, respectively. The B:C ratio was also higher ie. 1.82 in T_2 than farmers practice (1.65) Sharer *et al* (2003) also reported similar finding in case of lentil.

Application of boron either as basal or as foliar spray increased yield and monetary gain significantly but both were at par between them. The highest seed yield straw yield, gross return and net return were obtained with boron @ 01 kg/ha as basal with values of 1448 kg/ha, 2331 kg/ha, Rs.25,217/ha and Rs. 1,4217 respectively. The B:C ratio in both the basal or foliar application was the same of 2.29. The marked response in yield due to boron may be attributed to the deficiency of available boron in experimental soils as their values were less then the critical limits of 0.53 ppm for such calcareous soils. Sakal*et al* (1998) and Kumar *et al* (2006) also report higher yield of chickpea on application of boron.

It may be concluded that lentil in Begnsarai area requires application of boron @ 1 kg/ha with N and P @20:40 kg/ha with replacement of improved variety like IPL 406 for realizing better yield.

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