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# EFFECT OF BORON, LIME AND NPK ON CHICKPEA (*CICER ARIETINUM*) IN MEDIUM LAND RICE-FALLOW ECOSYSTEM OF JHARKHAND

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## ABSTRACT

**An on farm trial was conducted during *rabi* 2005-06 at 5 locations in rice-fallow ecosystem to study the effect of boron, lime and balanced NPK on growth, yield and economics of chickpea (*Cicerarietinum L.*). A combined dose of N:P:K:B:Lime::20:40:20:01:300kg/ha gave significantly maximum pod formation (29.2/plant), seed yield (9.07q/ha) and net return (Rs.12,588/ha) followed by N:P:K:B::20:40:20:01 kg/ha (27.3 pods/plant, 8.05 q seed yield/ha and Rs.10,834 net return/ha). Recommended dose of only NPK @ 20:40:20 kg/ha performed significantly inferior than treatments consisting B or B with lime but better than farmers practice (application of only N and P @ 09 and 22.73 kg/ha respectively).**

***Key words :*** *Boron, lime, N,P,K, chickpea.*

Majority of medium land after rice remain vacant in Jharkhand. The soils of medium lands of Jharkhand are slightly to moderately acidic having pH ranging from 6.5 to 5.5 and are deficient in boron and falls under low to medium category in N,P and K content. Apart from N,P and K, the boron plays a vital role in chickpea growth especially in flowering, fruiting and seed setting and yields (Kumar et al, 2006). The availability of plant nutrients in acidic soils is reduced and may be insufficient.In Jharkhand, there is large area of chickpea whose productivity has gone down due to deficiency of micro-nutrients specially boron and in many pockets due to acidic condition of soils. Therefore, the present experiment was planned to study the effect of boron, lime with recommended NPK on chickpea in medium land rice-fallow ecosystem of Jharkhand.

## MATERIALS AND METHODS

An on farm trial was conducted at 5 locations in rice-fallow ecosystem of farmers field during *rabi* 2005-06 in Pakur district. The soils were Alfisolshaving pH ranges from 6.5 to 5.5, organic carbon (70- 76 %), available phosphorus (8.7 - 9.8 kg/ha), available potassium (139 - 166 kg/ha) and available boron (0.28 –0.39 mg/kg).

There were 4 treatments, viz. $T_1$ : The control-Farmers practice (N:P:K::09:22.73kg/ha); $T_2$ : Application of N:P:K::20:40:20 kg/ha; $T_3$ : Application of N:P:K:B::20:40:20:01kg/ha and $T_4$ : Application of N:P:K:B:Lime::20:40:20:01:300 kg/ha. The experiment was laid out in randomized block design with 5 replications. The boron was applied in the form of borax powder, nitrogen and phosphorus in from of urea and DAP. The crop was sown in line at 30 cm spacing with a seed rate of 75 kg/ha between 10-12 November, 2005. Two irrigations were applied at 50 and 100 days after sowing. Weeding was done between 35-40 DAS. The variety sown was small seeded desi variety-C235. The crop was harvested between 25 March to 5 April, 2006.

## RESULTS AND DISCUSSION

Yield attributes and yield **:**Yield attributes were significantly influenced by the application of boron and lime (Table-1). Highest pods/plant (29.2) and seeds/pod (1.2) were recorded under recommended NPK + 01 kg boron + 300 kg lime per hectare. However, the combined effect of boron and lime was significant in case of pods/plant (29.2) but at par with boron without lime in case of seeds/pod. The minimum pods/plant (23.3) and seed/pod (1.0) was recorded in control (farmers practice). The control was at par with recommended dose of only NPK application. The effect of boron was more pronounced in pods/plant and seeds/pod because it has a chief role in plant cell wall and membrane constancy. It influences the major cellular functions and metabolic activities in plants (Bassil*et al,* 2004). Boron has a positive effect on growth and development, nitrogen assimilation and root growth. It also helps in conversion of flowers into fruits. Kumar, *et al* (2006) has also reported similar

**Table-1 :** Effect of boron, lime and NPK on yield attributes, yield and net return of chickpea.

| Treatments | Pods/ plant | Seeds/ pod | 100 grain weight (g) | Seed yield (q/ha) | Straw yield (q/ha) | Net returns (Rs/ha) | B : C ratio |
|---|---|---|---|---|---|---|---|
| $T_1$ : Control - Farmers practice (N:P::09:22.73 kg/ha) | 23.3 | 1.0 | 12.01 | 5.92 | 8.2 | 7345 | 1.99 |
| $T_2$ : N:P:K::20:40:20 kg/ha | 23.6 | 1.0 | 12.04 | 6.84 | 10.0 | 8613 | 2.02 |
| $T_3$ : N:P:K:B:20:40:20:01 kg/ha | 27.3 | 1.14 | 12.12 | 8.05 | 12.2 | 10834 | 2.17 |
| $T_4$ : N:P:K:B: Lime::20:40:20:01:300kg/ha | 29.2 | 1.2 | 12.18 | 9.07 | 14.1 | 12588 | 2.25 |
| CD (P=0.05) | 1.52 | 0.12 | NS | 0.95 | 1.64 | 1277 | - |

findings.Though, the significant effect of lime was visualized in all yield attributes over farmers practice or recommended NPK practice but outyielded the recommended NPK + Boron only in case of pods/plant. This may be due to the fact that lime neutralizes the soil which increases the cation capacity and thus increases the availability of plant nutrients (Tisdale *et al*, 1990).

The highest significant seed (9.07 q/ha) and straw (14.1 q/ha) yields were recorded under recommended NPK + 01 kg boron + 300 kg lime/ha followed by recommended NPK + 01 kg boron/ha (8.05 q seed /ha and 12.2 q straw/ha). The lowest was obtained under farmers practice at only N 9 + P 22.73 kg/ha which was at par with recommended NPK level (6.84q seed/ha and 10.0 q straw/ha). The marked response in yield due to B application may be attributed to the deficiency of available B in the experimental soils, as their values were less than the critical limit.Sakal*et al*. (1998) also reported higher yield of chickpea on application of B. The effect of lime was significant due to the fact that lime neutralizes the soil which increase the cation capacity and makes the nutrients available to the plants and it also increases the root nodulation in pulses.(Richardson *et al.,* 1983).

**Net return and B:C ratio :** Perusal of data presented in table-1 clearly reflects that the combined effect of lime and boron gave the highest net return (Rs.12,588/ha) and B:C ratio (2.25) followed by boron without lime (Rs.10,834/ha and 2.17, respectively). The effect of boron was significant which did better than only recommended NPK. The lowest net return& B:C ratio were obtained under farmers practice (Rs.7,345/ha and 1.99, respectively) which was at par with only recommended NPK application.

It was concluded that chickpea in acidic soils require boron as well as lime for proper root nodulation, growth, yield and higher monetary return.

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