Effect of Different Sources of Boron Application on Productivity of Groundnut in Mizoram

A. K. Vishwakarma*, Brajendra**, K. A. Pathak***, Ramesh Singh**** & A. L. Singh*****

ABSTRACT: *A field experiment was carried out during Kharif season of 2006-07 at ICAR RC for NEHR, Mizoram Centre, Kolasib, to study the effect of different sources of boron application on productivity of groundnut (cv. ICGV-86590) under terrace land conditions in Mizoram. The effect of six different boron sources viz., Borax, Boric acid, Colemanite, Chemibor, Salabor, Borosol were assessed as soil and foliar treatments and compared with that of a control. A uniform dose of recommended rate of fertilizer application N_{20} P_{35} K_{35} + Lime 1.0 t/ha was applied as common to all the treatments. Maximum plant height (60.33 cm), maximum number of branches (5.83/plant), maximum number of pods/plant (26.66), pod yield (25.46 q/ha) and kernel yield (16.34 q/ha) was recorded with application of Borax as soil application.*

Keywords: Groundnut, Boron sources, Pod yield, Kernel yield

A plant needs at least seventeen elements to grow and reproduce. A dividing line is drawn between these essential elements and classified as macro-and micro-nutrients based on plant requirement. Macronutrients are required by plants in relatively large amounts and micronutrients in small amounts. Innumerable enzymatic reactions in plants are mediated by micronutrients and role of B is also well established in phenol metabolism, maintaining integrity of plasma membrane and cell division. Keeping the definition of an essential nutrient in front, need for trace quantities of micronutrients in no way lessens their role in plant nutrition. Thus, whether it is micro or macronutrient, supply of all essential elements to plants in appropriate amount and right proportion is a key to the sustenance of higher crop productivity.

In India, among oilseed crops groundnut occupies first position in terms of area of 6.88 m ha with a production of 6.41 m tonnes, which is nearly 55 per cent of the country's total oilseed production (Kumar *et al.*, 2002). The average productivity of *kharif* groundnut has been reported to be 760 kg/ ha, while that of Rabi/ summer groundnut grown with assured irrigation is 1600 kg/ ha (Munda *et al* 1997). Mizoram is a hilly state situated between 21.58° to 24.35° North latitudes and 92.15° to 93.29° East longitudes, lying at an altitude varying from 30 m msl to more than 1300m above msl with steep hill slopes. Rapid soil fertility depletion as well as inadequate application of plant nutrients has been identified as the principal factors leading to poor yield of the crop in the NEH region (Saxena *et al.*, 2004). The crops suffers from Al, Fe and Mn toxicities to varying levels and deficiencies of Ca, P, Mg and B due to acidic soil conditions, which has been considered to be the most important limiting factor in groundnut production in the region. Boron deficiency symptoms become conspicuous on the terminal buds or the youngest leaves, which become discoloured and may die under acute conditions of deficiency.

Studies on effect of boron application on crop productivity were lacking in this remotest part of India. With this background, the present study was undertaken to assess the yield of groundnut with different sources of boron application under agro climatic conditions of Mizoram.

* *Corresponding Author*: Scientist, Agronomy, ICAR RC for NEHR, Umiam-793103, Meghalaya
** Scientist, Soil Science, ICAR RC for NEHR, Umiam-793103, Meghalaya
*** Joint Director, ICAR RC for NEHR, Mizoram Centre, Kolasib-796 081
**** Scientist In charge, Division of Agroforestry, ICAR RC for NEHR, Umiam-793103, Meghalaya
***** Plant Physiologist, NRCG, Junagarh.

MATERIALS AND METHODS

The experiment was carried out during the *Kharif* season of 2006-07 at the research farm of ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib. The experimental site is situated at an elevation of 700m asl with subtropical humid climate experiencing an average annual rainfall of 2563mm. The soil of the experimental site was sandy loam, with a pH of 5.5, organic carbon content of 1.6%, available N, P & K content of 204.0, 14.0 and 225.0 kg/ha, respectively. The experiment consisted of ten treatments replicated thrice and arranged in randomized block design. Groundnut cv. ICGV-86590 was sown in the third week of June and harvested during last week of October. The treatments were applied either as soil application at the time of sowing or as foliar spray. All the operations were carried out as per recommendations for the crop. The growth and yield parameters of the crop under different treatments were recorded. The pod weight was taken after sun drying.

RESULT AND DISCUSSION

Growth Attributes

Significantly higher responses to different sources of boron supplementation were recorded for growth parameters with different sources of boron treatments excepting application of colemanite soil and seed application as compared to treatment without boron application. A perusal of the data presented in Table 1 on growth attributes of groundnut revealed that Maximum plant height (60.33 cm) and maximum number of branches (5.83/plant) was recorded with application of Borax as soil application. All the treatments recorded significantly higher plant height as compared to control (54.43 cm) with exception of application of colemanite as soil and seed application. Application of colemanite as soil application recorded lowest plant height among all the treatments (53.20 cm). The data on number of branches per plant revealed that different treatments could not attain the level of significance and were at par with each other, although maximum number of branches per plant (5.83) was recorded with application of Borax as soil application. Similar effects of boron application on growth attributes of groundnut were also recorded by Singh (1996).

Yield Attributes

Perusal of the data presented in table 1 on yield attributes and yield of groundnut revealed that maximum number of pods per plant (26.66), highest pod yield and kernel yield (25.46 q/ha & 16.34 q/ha) was recorded with application of Borax as soil application which was statistically at par with other boron sources with the exception of application of boric acid, solubor and borosol. The lowest values for these parameters were recorded under control (20.00, 20.83 & 13.32). Positive responses of cereals, pulses, oilseeds and cash crops to B application (0.5 to 2.5 kg B ha^{-1}) have largely been reported from Bihar, Orissa, West Bengal, Assam and Punjab (Takkar *et al.*, 1997). Kumar *et al.* (1996) compared different methods of B application in acid soils of Ranchi and reported that pod yield of groundnut did not differ significantly with the methods of application, while straw yield was higher with band placement.

Table 1
Performance of Different Boron Sources on Growth and Yield Attributes of Groundnut

Treatment	*Plant height (cm)*	*Branches/ plant*	*Pods/plant*	*Pod yield (q/ha)*	*Kernel yield (q/ha)*
Control (RDF)	54.43	5.50	20.00	20.83	13.32
RDF + Borax soil application	60.33	5.83	26.66	25.46	16.34
RDF + Boric acid soil application	56.88	5.33	20.33	19.44	12.62
RDF + Colemanite soil application	53.20	5.40	24.66	20.83	13.44
RDF + Colemanite seed dressing	56.20	5.66	23.33	19.90	13.06
RDF + Chemibor 0.1% foliar spray	57.10	5.70	25.00	24.33	15.81
RDF + Solubor soil application	60.00	5.33	22.33	22.22	13.97
RDF + Solubor 0.1% foliar spray	57.43	5.66	21.33	19.90	12.35
RDF + Borosol soil application	59.53	5.33	20.66	18.51	11.95
RDF + Borosol 0.1% foliar spray	59.00	5.50	23.66	21.99	14.29
CD ($P = 0.05$)	2.41	0.65	3.23	2.97	1.52

REFERENCES

Kumar, S., Shivani & Singh, J. (2002), Growth Analysis of Rainfed Groundnut (Arachis hypogaea L.) in Manipur Valley under Polymulch Condition, *J. Oilseeds Res.*, 19 (2): 181-184.

Laxminarayana, K. (2001), Effect of Integrated Use of Organic and Inorganic Manures on Yield Parameters of Groundnut. In: National Seminar on *Approaches for Increasing Agricultural Productivity in Hill and Mountain Ecosystem*, ICAR, Barapani, 18-20 Oct., p. 26.

Munda, G. C., Hazarika U. K., Singh, R. Sarma, B. K. Singh, J. (1997), Groundnut Cultivation in Northeastern Hills, ICAR Research Complex, Umiam (Meghalaya), pp. 1-32.

Saxena, D. C., Munda, G. C., Panwar, A. S., Hazarika, U. K. & Bordoloi, L. J. (2004), Effect of Integrated Nutrient Management on Growth and Yield of Groundnut (*Arachis hypogaea*) Grown Under Mid Hills of Meghalaya, *Indian Journal of Hill Frmg*, 17 (1&2): 91-95.

Singh, A. L. (1999), *Mineral Nutrition of Groundnut*, In: *Advances in Plant Physiology* (Ed. A. Hemantarajan), Vol. II, pp. 161-200. Scientific Publishers (India), Jodhpur, India.

Kumar, A., Singh, K. P., Singh, R. P. and Sarkar, A. K. (1996), *J. Indian Soc. Soil Sci.*, 44: 178-179.

Takkar, P. N., Singh, M. V. and Ganeshamurthy, A. N. (1997), In *Plant Nutrient Needs, Supply, Efficiency and Policy Issues: 2000-2025*, (Kanwar, J. S. and Katyal, J. C. Eds.), NAAS, New Delhi.