https://doi.org/10.29321/MAJ.10.A03291

*Madras agric J.* 63 (4): 211 — 214, April, 1976.

# Boron Availability During Crop Growth of Groundnut

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ABSTRACT

A pot experiment was conducted with POL. 1 groundnut variety, with two forms of boron at different levels. The availability of boron increased with increase in applied doses of boron. The available boron content decreased with time and more rapidly during first 40 days presumably due to rapid absorption by the plant in the active period of growth and partly due to fixation. Between the two forms tried borax was found to be more available than boric acid.

## INTRODUCTION

Boron is required generally in small quantities by plants. Boron occurs in most soils in extremely small quantities and the important mineral containing boron is tourmaline, a borosilicate. The available boron in soil is apparently in two forms: organic and inorganic and these are in equillibrium with fixed forms of boron. Various factors such as soil pH, texture, organic matter, clay content, liming and leaching were considered by several workers to affect the availability of boron. A pot experiment was conducted with the object of finding out the availability of boron to groundnut under different soil types.

## MATERIALS AND METHODS

A pot experiment was conducted with groundnut POL. 1, a bunch type, in major groundnut growing soils of Tamil Nadu. Two forms of boron namely boric acid and borax were applied at different levels (cont., 0.3, 0.6, 0.8, 1.2, 1.6 ppm of boron) just before sowing. A constant level of NPK (18, 36, 54 kg/hectare respectively) was applied to all pots. Soil samples were collected before sowing, at different stages of crop growth and after harvest of the crop and analysed for available boron (hot water soluble) by the method of Jackson (1967).

## RESULTS AND DISCUSSION

The mean available boron was highest in Tindivanam soil followed by Pattukottai, Pollachi, Gudiyatham and Karur soils in decreasing order (Table I). There was significant difference in available boron between soils except Pollachi and Gudiyatham soils which were on par. The availability decreased in all the soils as the crop growth attained maturity. The sandy soils of Karur and Gudiyatham recorded low mean available boron and this observation is in conformity with that of Gupta (1968) who found that coarse textured soils have lower available boron than fine textured soils.

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TABLE I. Available boron in different soils (in ppm on oven dry basis)

| Particulars | Soils | | | | | Mean |
|---|---|---|---|---|---|---|
| | Karur | Gudi-yatham | Pollachi | Pattu-kottai | Tindi-vanam | |
| *Forms* | | | | | | |
| Boric acid | 1.35 | 1.37 | 1.46 | 1.47 | 1.71 | 1.47 |
| Borax | 1.57 | 1.71 | 1.60 | 1.76 | 2.06 | 1.74 |
| *Doses* | | | | | | |
| Control | 0.67 | 0.98 | 0.97 | 1.03 | 0.82 | 0.90 |
| 0 3 ppm | 0.95 | 1.26 | 1.02 | 1.21 | 1.22 | 1.31 |
| 0.6 ppm | 1.43 | 1.25 | 1.32 | 1.33 | 1.66 | 1.40 |
| 0.8 ppm | 1.43 | 1.58 | 1.18 | 1.57 | 1.94 | 1.54 |
| 1.2 ppm | 1.78 | 1.56 | 2.04 | 2.11 | 2.06 | 1.66 |
| 1.6 ppm | 1.70 | 2.03 | 2.09 | 1.86 | 2.54 | 2.04 |
| *Stages* | | | | | | |
| Initial | 2.66 | 2.26 | 2 39 | 2.62 | 3.46 | 2.67 |
| A week after flower initiation | 0.95 | 1.50 | 1.14 | 1.19 | 1.51 | 1.26 |
| A week after flower cessation | 0.96 | 1.24 | 1.23 | 1.36 | 1.25 | 1.21 |
| At harvest | 0.97 | 0.94 | 1.16 | 1.07 | 0.93 | 1.01 |
| Mean for soils | 1.38 | 1.48 | 1.48 | 1.56 | 1.79 | |

| | C. D. (P=0.01) | | C. D. (P=0.01) |
|---|---|---|---|
| Between forms | 0.04 | Forms × Soils | 0.10 |
| Between doses | 0.07[1] | Doses × Soils | 0.52[1] |
| | 0.06[2] | | 0.64[2] |
| Between stages | 0.06 | Stages × Soils | 0.14 |

All significant at 1% level 1. Among doses 2. Control vs. doses

As reported by Cook and Millar (1939) excessive leaching might have been responsible for loss of applied boron in sandy nature of Karur soil resulting in low availability. Becker and Mortensen (1966) stated that liming depressed the movement of boron from the surface to the sub soils. Higher availability of boron in Tindivanam and Pattukottai soils might be due to retention of boron in the surface layers by the high calcium content of these soils.

Higher doses of boron resulted in higher available boron in all the soils and control which received no boron showed the least availability. In all the soils, between the two forms of boron, borax was found to be significantly

superior in availability. Increased availability of borax might be due to its higher solubility than boric acid.

Comparing the two carriers of boron, the initial availability was higher for borax than for boric acid (Table II). However, at the flower cessation stage, amount of available boron was practically identical for both the carriers. Hence the decrease in availability of boron during the initial period of crop growth was higher for borax than for boric acid. The pattern of time function for available boron was generally similar for the various soils excepting Karur soil and also for the two forms of boron studied. In most cases the level of available boron decreased sharply and almost only half the initial available boron was found to occur in the soil after flower initiation stage. After the harvest of the crop only one third of initially present available boron was found to remain in soil. The initial rapid decrease of available boron may be attributed to rapid plant absorption and also partly to fixation.

TABLE II. Available boron at different stages (in ppm on oven dry basis)

| Particulars | Initial | A week after flower initiation | A week after flower cessation | At harvest | C. D. (P=001) | |
|---|---|---|---|---|---|---|
| *Forms* | | | | | | |
| Boric acid | 2.43 | 1.18 | 1.24 | 1.03 | 0.92 | |
| Borax | 3.28 | 1.38 | 1.23 | 1.05 | ... | |
| *Doses* | | | | | | |
| Control | 0.86 | 1.03 | 0.96 | 0.72 | | |
| 0.3 ppm | 1.23 | 1.24 | 1.07 | 0.98 | 0.14 | (among doses) |
| 0.6 ,, | 2.27 | 1.26 | 1.14 | 0.92 | ... | |
| 0.8 ,, | 2.82 | 1.11 | 1.27 | 0.98 | 0.16 | (control with doses) |
| 1.2 ,, | 4.20 | 1.13 | 1.29 | 1.21 | ... | |
| 1.6 ,, | 3.95 | 1.09 | 1.39 | 1.13 | ... | |

All significant at 1% level

The available boron determined during the initial stage was found to be correlated with the available boron at completion of flowering stage ($r = 0.297^{*}$) and with available boron after harvest ($r = 0.494^{**}$). The available boron after one week of flower initiation was found to be correlated with the available boron at flowering completion stage ($r = 0.394^{**}$). These correlations suggest a fairly uniform change in the boron available with the time, making it possible for the content at one stage to be predicted for that at another. The total boron content of the leaves from middle part of plant,

collected fifteen days before harvest, was found to be determined by the available boron at stage one ($r = 0.494^{**}$) indicating that accumulation of the element in leaves is decided by the initial boron availability of the soil.

The results indicate that between the two forms tried borax was found to be superior in availability and the availability of boron increased with increase in applied doses of boron.

## ACKNOWLEDGEMENT

The senior author is thankful to the Indian Council of Agricultural Research for the award of Junior Fellowship for carrying out this work and grateful to the University of Madras for kindly granting permission to publish the above work which formed a part of M. Sc. (Ag.) dissertation.

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