

Short Communication

A Rapid Field Test for Estimation of Boron in Irrigation Water

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Boron is essential for the normal growth of all plants. The quantity required is 1.0 mg L^{-1} . In excess of 2.0 mg L^{-1} it is deleterious. It has been estimated that boron is as high as 20-25 mg L^{-1} in the soils of Rajasthan. The higher concentration has been reported from Churu and Pali districts and also some other parts of Rajasthan (Gupta 1983). In Jodhpur District there are some tubewells and hand pumps which yield hard waters associated with boron. These damage the delicate plants grown in-house for decoration purposes. Therefore, it is essential to test regularly the irrigation waters for boron level.

A method has been developed under controlled pH of water. For each test the analytical grade lime, CaO (100 mg), citric acid (2.3 mg), mannitol (100 mg) and bromothymol blue (0.1 mg) are required. All are weighed accurately, mixed and filled in plastic capsules.

The pH of the water was adjusted to 7.0 with the help of an indicator paper strip and adding drops of HCl (1%) or NaOH (1%) in the water through a plastic dropping bottle. The water sample (20 ml) was taken in a graduated glass cylinder and the reagent capsule was opened into the water samples. The contents were stirred by moving the cylinder till it was dissolved. The

colour was noted and compared with the standard (Table 1).

Table 1 Colour developed by standard boron solutions

| Concentration of boron (mg L^{-1}) | Produced colours |
|---|------------------|
| 0.00 | Ink-blue |
| 1.00 | Light-blue |
| 2.00 | Leafy-green |
| 3.00 | Parrot-green |
| 4.00 | Apple-green |
| 5.00 | Light-yellow |

Eighty five water samples from tubewells and hand pumps in and around Jodhpur city were collected and analysed for boron by the carmine (APHA 1989) and field test methods.

The standard carmine method is more laborious, time consuming and requires acid and reagents. It is also unstable in colour as shown in Table 2. The field test developed is very simple and rapid. It gives the results within 3 to 5 minutes. The light tint of greenish colour indicates for 2 and more than 2 mg L^{-1} of boron in the water sample. Beyond 4.0 mg L^{-1} of boron, blue tint, together with yellow-green colour, completely dis-

Table 2 Field method compared with carmine method

| Method | Time taken | Standard solution (Boron in mg L^{-1}) | | | | | |
|--------------|------------|--|------------|-----------------------|--------------|------------------------|--------------|
| | | 0.0 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 |
| Carmine | 3 hrs | 0.00 | 1.01 | 2.002 | 3.004 | 4.002 | 5.001 |
| Field method | 3 min | Ink blue | Light blue | Leafy green | Parrot green | Apple green | Light yellow |
| | | --- Blue --- | | --- Blue + Yellow --- | | --- Yellow (Green) --- | |

appear and at 5.0 mg L^{-1} of boron, yellow colour appears. The colours developed are stable.

Out of 85 water samples analyzed, 28 water samples showed presence of more than 2.0 mg L^{-1} of boron. The capsules gave satisfactory results.

References

- American Public Health Association 1989 *Standard Method for Examination of Water and Waste Water*, APHA, AWWA, WPCF, 16th Ed., pp. 274-277
- Gupta IC 1983 Irrigation water quality and boron toxicity. *Current Agriculture* 7 1-12