FERTFACTS

BORON
FACT SHEET

BORON IN SOILS

The soil organic matter is the major reserve of boron (B) in most agricultural soils. It is released as the soil organic matter decomposes, its availability fluctuating according to soil microbial activity.

In the soil solution, boron is present in a non-ionic form [$B(OH)_3$], and is not attracted to soil colloids. It is among the most mobile nutrients in the soil, and can be rapidly leached once released from soil minerals and organic matter. Light textured soils in high rainfall areas are often low in boron, while boron can accumulate in the sub-soil in semi-arid regions, particularly on heavier textured clay soils, and may reach toxic concentrations, e.g. light clays in the Victorian Mallee.

BORON IN PLANTS

Boron is taken up by plants as undissociated boric acid [H_3BO_3 or $B(OH)_3$]. It plays a role in cell wall development, and is important in pollination, fruit development and the translocation of sugars. An adequate supply of boron is important at flowering, and in seed set, e.g. in legumes and oilseeds. Fruit quality is affected in many crops if boron is deficient.

Within plants, boron is relatively immobile. It is not readily relocated from old to young plant tissue. Plants are therefore dependent on continuous uptake of boron during the growing season. In this respect, its behaviour in plants is very similar to calcium (both are immobile) and the deficiency symptoms can be confused.

DEFICIENCY SYMPTOMS

Boron deficiency occurs more commonly in dry soils. Microbial activity in the soil is reduced, and the movement of boron in the soil solution to plant roots is restricted.

Root crops, vegetables and many fruit trees are susceptible to boron deficiency. Consequently, boron is commonly recommended in routine fertiliser programs for high return crops with an established need for boron. Deficiency also occurs in timber species, e.g. *Pinus radiata.*

Because boron is relatively immobile in plants, deficiency begins at the growing points. Frequently occurring symptoms include:

- Chlorosis (yellowing) and death of the growing points.
- Distortion, thickening and cracking of stems. The stems may be hollow or brittle.
- The formation of rosettes, growth of auxiliary buds (side shooting), bushy growth and multiple branching.
- The thickening, twisting and failure of roots to spread out or develop properly. In some cases the roots may show excessive branching. Root crops often fail to develop edible portions, or affected by the presence of dark coloured corky areas. Cuttings may fail to take root.
- The dropping of buds or blossom. Fruits and seed may also be affected. Brown sunken areas may develop in fruit.

The range between deficient and toxic levels of boron is very narrow.

TOXICITY SYMPTOMS

In the early stages, the symptoms of boron toxicity are normally expressed as marginal and tip chlorosis of the older leaves. Moderate to severe toxicity produces progressive leaf necrosis beginning at the tip or margins and gradually covering the whole leaf, resulting in premature leaf drop. One of the most common causes is over-fertilisation with or poor placement of boron fertiliser. Strawberry, peach, grape, bean, pea, and cucumber are sensitive to boron toxicity.

BORON FETILISERS

Borax, (11.3 % B) - A fine crystalline product for dry application by hand to the soil, or application in solution to the soil or foliage. Borax is not used as commonly as it was in the past, Granubor being used for dry application to the soil, Solubor for foliar and soil sprays.

Granubor, (15 % B) and **Borate Granular,** (14.3 % B) – These are granulated fertilisers which makes them more suitable for dry application by machine to the soil than Borax. They can be used on their own or in blends with other fertilisers. Granubor and Borate Granular are unsuitable for foliar application.

Solubor, (20.5 % B) - A fine soluble powder for application in solution through a boom-spray to the soil or foliage. Solubor is more soluble than Borax, especially in cold water, and is the recommended choice for application in solution.

Ulexite, (9.9 % B) - A boron fertiliser containing boron in soluble (sodium borate) and insoluble (calcium borate) forms, which finds use in forestry and other perennial crops on acid soils where boron is applied infrequently and long term responses are required.

Granubor and Solubor can be purchased through most Incitec Pivot Fertiliser Agents and Dealers.

APPLICATION

Given its mobility in the soil and susceptibility to leaching, annual, or more frequent applications of boron are required in most situations. Frequent applications at low rates also minimise the risk of toxicity.

In annual crops, there are limits to the amount of boron that can be safely applied with or near seed or transplants at planting. Alternative application methods should be sought, e.g pre-plant.
In tree crops, the boron should be spread or sprayed over the root zone, i.e. under the whole canopy and just beyond the area of the tree canopy, but no closer than 30 cm to the trunk. Toxicity may occur if it is applied unevenly, i.e. it is concentrated in small areas.

In horticulture, e.g. tree and vegetable crops, foliar sprays, e.g. of Solubor, are often used to supply boron instead of applying boron fertilisers to the soil.

Boron application rates are extremely variable. The rates required in crops with a high demand for boron, e.g. crucifers, may be toxic to other crops.

FURTHER READING

For further information, a copy of the Incitec Pivot Fertiliser Agritopic on “Boron” is available if more detailed information is required. These can be obtained from your Incitec Pivot Fertiliser distributor.

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