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# WHY ANALYSIS OF SOIL AND LEAF FOR BORON AND SULPHUR IS VALUABLE

Both sulphur (S) and boron (B) are essential plant nutrients. Sulphur is a macro-nutrient of which roughly about 30 kg/ha is utilized by orchards, while B is a micro-nutrient and only about 120 g/ha is annually taken up by trees. For inexplicable reasons, many producers have neglected to analyse their soil and leaf samples for both of these two nutrients – in this information sheet the role of these two nutrients in tree crops, as well as the value of knowing the S and B concentrations of soils, are discussed.

## Sulphur in plants:

*Sulphur (S):* In the tree, S is important for the production of amino acids, proteins, and chlorophyll; so deficiency symptoms express as a light green to yellow colour, sometimes very light yellow to almost off-white. Deficient plants also have retarded growth.

## Sulphur in soil:

In soil, S is found in a large variety of minerals. Near the coast, S-containing spray – or, in industrial areas, emissions – ends up in the soil. It can vary between 1 and 100 kg/ha/year, which is enough to meet the nutritional needs of trees. A considerable amount of S is also found in the organic fraction of the soil, with N:S ratios varying between 10:1.2 and 10:1.5. This S is released through mineralisation. Citrus trees, for instance, require slightly more sulphur than phosphorus to produce optimally. From this, it should be clear that S nutrition ought to receive attention and be routinely incorporated into the fertilisation programme. In many areas that are far from industries, sulphur (S) deficiencies are becoming more common. Deficiency also often appears on very sandy, low pH soils where it leaches out more easily. Any S deficiency in soil can easily be addressed with a once-off application of 1 ton/ha gypsum. But, bear in mind that recovery from deficiencies in the plant takes place gradually over more than one season. It is, therefore, better to be proactive and to ensure sufficient S levels in the soil from orchard establishment. **It should therefore be a standard practice to test for the soil's S concentration.**

## Boron in plants:

*Boron (B):* In the tree, B is involved in sugar/carbohydrate transport and cell division, and since it is immobile in the tree, symptoms develop in young growing sites, such as apical meristems, terminal younger leaves, flower development, fruit set, and young fruit development.

## Boron in soil:

In the soil, B is generally associated with micas, clay, and especially sesquioxides, while the organic fraction can also have a meaningful B content. It occurs in the soil solution mainly in an undissociated, electroneutral boric acid ($B(OH)_3$) form and is mobile in soil – i.e., acidic soil can become depleted of B owing to leaching from rainfall or excessive irrigation. In calcareous (or over-limed) and saline soils, the plant availability of B is also reduced. Boron deficiencies in soil are widespread but very common on acidic, sandy soils. The margin between sufficient and deficient supply of B in the soil is quite narrow. Soil applications, therefore, are risky. Even though the correct quantity is applied, poor distribution can lead to areas of toxicity. Some crops are very sensitive to excessively available soil boron. When taken up in excess, leaf symptoms can be confused with excessive heat stress, salinity, K deficiency, or even biuret toxicity.
Of the six micronutrients, B and molybdenum are the easiest to correct by foliar application just before or during flowering or to maintain the level with a foliar application during October. **However, since one can easily induce B toxicity with foliar sprays, it is necessary to establish what the soil and leaf B concentrations are – this allows the producer to make an informed decision whether they need to apply foliar B to their orchard(s).**