Soil Application:
3-4 kg ha^{-1} B can be applied annually.

Foliar Application:
30 grams of B dissolved in 100 liters of water can be applied in November (before winter), right after 1st harvest, 2nd harvest.

TEA

The tea plant prefers acidic soils and is usually grown in regions with very rainy subtropical climates. The problem of boron deficiency in acidic soils, where tea cultivation is common, often arises due to washing of boron from the soil profile by precipitation. Therefore, boron fertilization is common in tea cultivation and significant yield increases are reported. As a matter of fact, boron deficiency in tea was detected for the first time in many countries, including China, India, Sri Lanka, and Malawi, through the positive response of the tea plant to boron fertilization. However, compared to other plants, research on boron deficiency in tea is scarce. Among the reasons for this, the most obvious symptoms of boron deficiency in agricultural plants often occur during the generative development period and affect storage organs such as fruits and tubers, but tea production is based on young leaf/shoot harvesting and boron deficiency in tea gardens is often at the level of "hidden hunger".

Figure 1. *Root and green part development of tea plant in boron deficiency and adequate boron nutrition conditions (Çakmak et al. 2022, unpublished results).*

It is generally accepted that the transportation of boron element from the old leaves to the actively growing young leaves and generative organs in the tea plant is very limited. Therefore, the symptoms of boron deficiency in the tea plant are mostly seen first in the young parts and the roots of the plant. As a result of boron deficiency, green part growth, shoot elongation and root development show significant decreases.[Figure 1] Sometimes, even there is enough boron in the leaves, slowing or even stopping of growth can occur in the youngest parts and growing points of the plants. Therefore, it is important to monitor the boron nutrition status of plants intermittently by analyzing young leaves.

Figure 2. *Leaf and shoot development in tea plants growing in boron deficiency and adequate boron nutrition conditions (Çakmak et al. 2022, unpublished results).*

The symptoms of boron deficiency in tea, as indicated above, firstly manifest themselves in the fast-growing young parts of the plants. In boron deficiency, the growth of young leaves is significantly affected and the leaves show signs of chlorosis (yellowing) and browning from place to place. In addition, symptoms such as shrinkage of the leaves and deformities also occur. (Figure 2) On the other hand, leaf growth, color and shoot elongation are normal and healthy in plants feeding with boron sufficiently.

Root growth of the tea plant is also significantly affected in case of boron deficiency (Figure 3). In parallel with the decrease in the growth of the roots, boron deficiency also leads to darkening of the root color. There are findings that boron nutrition is effective on phenolic metabolism in tea. Probably, excessive phenol accumulation occurs in the tissues, and brown melanoid-like formations appear as these phenols undergo oxidation, and browning and darkening occur in the tissues in case of boron deficiency as seen in the roots in Figure 3.

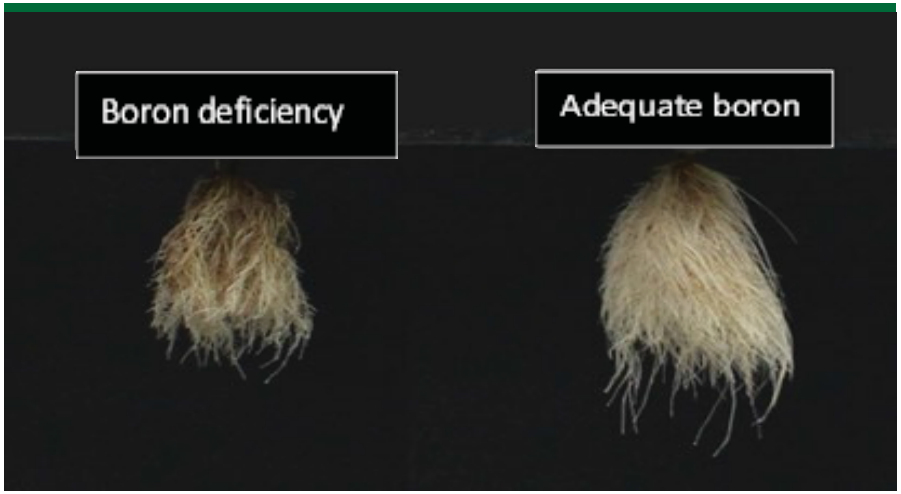

Figure 3. *Effect of different boron nutrition on root growth in tea plants (Çakmak et al. 2022, unpublished results).*

Before deciding on boron fertilization in tea, it is useful to investigate the level of boron deficiency in the plant with leaf samples (especially young leaves). There are findings showing that leaf boron concentration should be above 25-30 mg kg^{-1} level for optimum boron nutrition. In the studies carried out in the Eastern Black Sea Region of Turkey, it has been reported that there are increases in yield with the application of 4 kg of pure boron per hectare from the soil. Soil analysis must be done before boron fertilization to determine the boron needs of the soil.