Diagnosis of micronutrient deficiencies in crops

Function of micronutrients in crops

Micronutrients such as boron, iron, manganese, copper, zinc and molybdenum are no less important to plant growth than macronutrients such as nitrogen, phosphate and potassium. Most micronutrients play an important role in enzyme systems for metabolic processes of plants and symbiotic microorganisms.

Symptoms and remedies of micronutrient deficiencies in crops

Since most micronutrients are relatively immobile in a plant, they are not easily transferred from older leaves to younger ones. Therefore, it is in younger leaves that the concentration of the nutrient becomes the lowest in the plant, and where the first symptoms of deficiency appear. There are many micronutrients needed, but plants are most likely to suffer from a deficiency of boron, iron, manganese, molybdenum, and zinc.

Boron deficiency

One of the earliest symptoms is a mild chlorosis in mature leaves, which become brittle and tend to curl downwards. One of the symptoms in fruit trees is flower shedding. Fruits may become deformed and lumpy (Fig. 1), and do not grow to their full size. The deficiency can be remedied by the application of 0.5-1 kg B/ha.

Iron deficiency and manganese deficiency

Both of these may easily occur under such conditions as ion imbalance, calcareous soils, and poorly drained soils. The main symptom of iron deficiency is the chlorosis of young leaves. If the deficiency is severe, leaves will turn whitish yellow (Fig. 2 and Fig. 3). The main visual symptom of manganese deficiency is dark-green bands along the midrib and main veins, with a lighter-green area between bands in young leaves (Fig. 4 and Fig. 5). Foliar application of 0.25% of Fe (or Mn) sulfate can effectively correct the deficiency.

Molybdenum deficiency

This may easily occur in acid soils (Fig. 6). Concentrations of molybdenum in leaves and nodules show a good correlation with the shoot dry weight and nitrogen content in peanut, soybean, green gram, and black gram. Deficiencies can be remedied by the application of 2 mt/ha of slaked lime combined with 2 kg/ha of ammonium paramolybdate to the soil.

Zinc deficiency

Zinc may not be available to plants in calcareous soils. Deficiency tends to result in stunted growth and small leaves (Fig. 7). Deficiency in fruit trees affects the growth of leaves, so that the ends of the shoot tips become rosette-shaped. Citrus trees often show chlorosis between the veins of the leaves, a symptom known as ‘mottle-leaf’. Heavy applications of phosphate fertilizer (200 mg P2O5/kg soil) combined with 10 mg Zn/kg soil will restore yields.

Precaution

Some symptoms of micronutrient deficiency are quite similar to those of virus infection. If a symptom is found simultaneously over a large area of the field, it may be due to a micronutrient deficiency. If a symptom starts in one place and spreads out from there, it is more likely to be a virus infection.

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Typical symptoms of micronutrient deficiency in crops

Fig. 1. Boron deficiency in papaya
Fig. 2. Iron deficiency in peanut
Fig. 3. Iron deficiency in tomato
Fig. 4. Manganese deficiency in tomato
Fig. 5. Manganese deficiency in soybean
Fig. 6. Molybdenum deficiency in peanut
Fig. 7. Zinc deficiency in corn