

15. POTENTIALLY TOXIC NON-ESSENTIAL ELEMENTS

(Al, Cd, Cr, Fl, Li, Ni, Se, Si)

Aluminum

After oxygen and silicon, aluminum is the most abundant element in the earth's crust (soils range from 4 to 14% aluminum oxide). Aluminum is adsorbed by plants just like any other element and, like the metallic nutrients, its concentration in the soil solution increases as the soil becomes acid (as the pH drops). Many of the symptoms seen on plants growing on excessively acid soil are symptoms of aluminum toxicity. Aluminum is also associated with calcium deficiency. Unlike many of the essential plant nutrients, aluminum is rarely run on plant tissue on a routine basis. Aluminum should be run more often since it affects the balance of metallic nutrients and affects calcium nutrition. A history of routine aluminum analysis on plant tissue for a particular crop could be enlightening. Raising the soil pH is the best method of countering aluminum toxicity; application of phosphorus (which ties up aluminum) can also help.

Cadmium

Cadmium is a metallic element that is used in industry; sewage sludge can contain toxic levels of cadmium. As more sewage is used in agriculture, this potential problem will be monitored more closely.

Chromium

Chromium toxicity can occur on soils derived from serpentine parent material.

Fluoride

Fluoride is an impurity that can occur in significant quantities in some lots of superphosphate fertilizer. Fluoride toxicity has occurred in greenhouse culture and has fluoride been found in toxic levels in planting mixtures and in water.

Lithium

Lithium can occur in toxic amounts in well waters in the southwestern U.S.

Nickel

Like chromium, nickel can be found in toxic amounts on soils derived from serpentine parent material.

Selenium

Selenium can be toxic to plants at high concentrations. There are soils that are naturally high in selenium (seleniferous soils). Interestingly, although not essential for plants, selenium deficiency can cause problems in livestock; these problems can occur when a feed source that is low in selenium is used.

Silicon

Although not considered toxic to plants, silicon is mentioned here because of the vast quantities found in soils. Next to oxygen, silicon is the most abundant element in the earth's crust; soils range from 60 to over 90% silicon oxide. Silicon is not an inert material and can effect the nutritional balance of plants. Silicon has been shown to improve rice yields and may one day be shown to be essential for some plant species.