c. Potassium

Potassium is an essential element not normally associated with a prominent visual response such as shoot color, density, or growth. However, it does help plants overcome some of the negative effects of excessive nitrogen fertilization, for instance decreased tolerance to cold, heat, drought, diseases, and wear. Since an ample supply of potassium increases plants' tolerance to these stresses, potassium often is called the "health" element. Potassium is directly involved in maintaining plants' water status, the turgor pressure of their cells, and the opening and closing of stomata. As potassium concentration in plants increases, tissue water content decreases and plants become more turgid due to potassium's regulation of stomatal opening. Because potassium provides much of the osmotic pressure necessary to pull water into plant roots, it improves plants' drought tolerance. Cold tolerance also is influenced by a plant's phosphorus to potassium ratio. High phosphorus to potassium ratios in leaf tissue can increase cold temperature damage in St. Augustinegrass and bermudagrass.

The dry matter of leaf tissue consists of 1.0% to 5.0% potassium. Sufficient levels range from 1.5% to 3.0% in recently matured leaf tissue. Potassium deficiency occurs when levels are less than 1.0%, potassium excess when they are greater than 3.0%. Most plants, however, can absorb more potassium than they need, a phenomenon often referred to as *luxury consumption.* An inverse relationship also exists among potassium, magnesium, and calcium in plants. As potassium levels increase, the first deficiencies to appear are in magnesium; at higher concentrations of potassium, calcium deficiencies occur. In saline soils, an inverse relationship can occur in which calcium, magnesium, or sodium ions compete with potassium for uptake by plants.

Potassium deficiency symptoms include interveinal yellowing of older leaves and rolling and burning of the leaf tip. In later stages of deficiency, leaf veins appear yellow and margins look scorched. The turf stand will appear thin, with a spindly growth of individual plants. Since potassium is a mobile element within plants, it can be translocated from older leaves to younger meristematic tissues if a shortage occurs.

Potassium fertilizer often is referred to as "potash." The name was coined by early settlers, who produced potassium carbonate for soapmaking by evaporating water filtered through wood ashes. The ash-like residue in the large iron pots was called potash and the first U.S. registered patent was issued for this process.

Muriate of potash (potassium chloride), the most commonly used potassium-based fertilizer (Table 13), is derived from potassium salt deposits that have been mined and processed. These salt deposits, which developed on land surfaces once occupied by seawater, crystallized as the water evaporated to become beds of potassium chloride. Potassium sulfate forms when potassium chloride is reacted with sulfuric acid and potassium nitrate results from the reaction of potassium chloride with nitric acid. These derivatives are used instead of potassium chloride to reduce the salt index and also to carry sulfur and nitrogen, respectively.