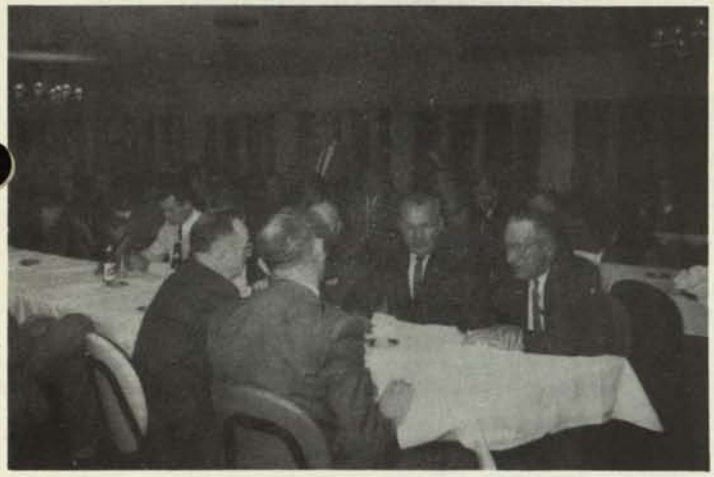

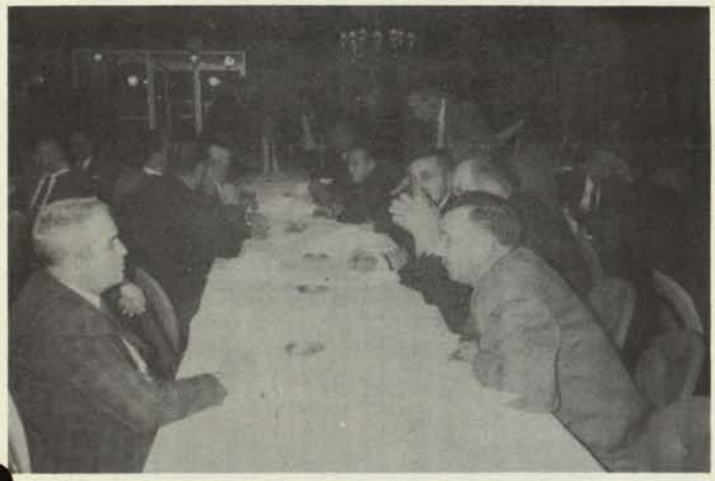

PHOSPHORUS AND POTASSIUM

W. D. Haven
International Minerals & Chemical Corp.

If nitrogen is king of the plant food elements, then phosphorous is the power behind the throne. Long after the role of nitrogen in plant nutrition was well established, the function of phosphorous was still a mystery. Since World War II it has been found that phosphorous compounds supply the energy necessary to run the plant mechanism.

Root Promoting Element ? ?

Several years ago a researcher at one of the experiment stations reported an increase in potato yields following heavy applications of phosphorous fertilizer. From that time on, the major role given to phosphorous in plant physiology has been root development. This is true if we are talking about root crops. In other crops, such as turf grass, phosphorous has no special effect on roots other than normal carbohydrate storage.

Recent research reported in "Crops & Soils" showed that in some instances phosphorous fertilizers increased top growth more than root growth and in most cases the top growth and root growth were nearly equal.

Where The Action Is !

Although phosphorous occurs in organic compounds in a plant it also occurs as a host of inorganic compounds which largely function to supply energy for areas of vigorous development. Wherever there is major activity, such as cell division, seedling development, tip growth, or carbohydrate storage, phosphorous compounds are at the site supplying the power to drive the action.

Phosphorous is involved in the initial reaction of photosynthesis. Without a balanced supply of phosphorous on hand in the sap stream the entire plant organism would soon sputter to a halt.

Deficiency Symptoms

Although extreme phosphorous deficiency may result in some leaf yellowing, the more common appearance is a dull and dark bluish-green color, which may be coupled with tints of bronze or purple. The purple coloration is the most striking and most frequently mentioned, however, it is not a very reliable symptom because conditions other than phosphorous deficiency in turf can cause purpling of the blades. Tissue tests and soil analysis are a more reliable indication of the phosphorous situation.

Phosphate Fertilizers

Phosphate fertilizers are not all alike — they differ in particle size and water solubility.

For example, ground rock phosphate is soluble and of low fertilizing value. When treated with sulfuric acid, it becomes ordinary superphosphate with 20% P_2O_5. When treated with phosphoric acid it becomes triple superphosphate having 46 to 54% P_2O_5. Most of the phosphorous in the superphosphates occurs as water-soluble monocalcium phosphate. Ammonia added to superphosphate forms various ammoniated phosphates — some soluble and some insoluble.

The effectiveness of the insoluble phosphates is increased by finer particle size. In general, the greater the water solubility of a phosphorous fertilizer the more effective it is. The phosphorous diffuses over a large area in the soil thereby increasing the probability of root contact.

(Continued next page)

For tough turf that must repair its divots, phosphorous is a prime necessity — and a soil test periodically to check its level is a wise management practice.

Potassium — The Health Nutrient

One of the principal industries of the Jamestown colonists in 1608 was the making of Potash. Pot ash was essential for the manufacture of soap, glass, and gunpowder in that day. The early pioneers had no idea that potash was essential for growing plant life, though some probably noticed how wood ashes from burned trees seemed to improve their soils.

Approximately 400 to 500 tons of wood was required to produce one ton of potash. In 1840, the German chemist, Liebig, recognized the importance of potash for growing plants. The supplies of wood ashes declined, and the new knowledge about potash for plant growth began to create interest in potash fertilizers.

The role of potash in the plant is associated with the manufacture of carbohydrates, and is linked with nitrogen in controlling growth. Obvious responses to potash fertilizers are seldom obtained, though there is evidence that turf receiving potash remains greener during winter months and in periods of drought.

It has often been called the "Health Nutrient" because plants that are generously supplied with it seem to be more disease resistant. This probably results from its tendency to check the soft rapid, growth produced by nitrogen.

Absorption of potassium from soils by plants is limited by conditions of poor aeration. This inhibiting effect is more pronounced with potassium than with any of the other nutrient elements.

Winterizes

Potassium is the anti-freeze of the turf. It not only promotes large, deep, evenly distributed roots, but also causes large, more evenly spaced xylem vessels — the pipeline of the plant. Potassium hungry plants have smaller pipelines that bunch together in the center of the root. This interferes with the flow of raw materials through the plant making it more difficult to supply the extremeties of the plant during winter stress. Poor pipeline structure also hinders the plant in warding off disease.

Dificiency Symptoms

In young plants the first symptom of potassium deficiency is a slowing down of growth followed by a yellowing and yellow streaking in the leaves. As the plants increase in size, the need for potassium increases; and if the supply becomes inadequate, foliage symptoms appear similar to those in younger plants. In severe cases the edges of the leaves will become dry and scorched.

Deficiency symptoms usually appear first on the bottom leaves and progresses gradually up the plant toward the youngest leaves.

Feltilizer Materials

There are many kinds of potash fertilizers. Among the most common are muriate of potash (KC1), sulphate of potash (K_2SO_4), and sulphate of potash-magnesia (K_2SO_4-$MgSO_4$).

Muriate of potash, the principle potash material used in fertilizer runs 96 to 99% potassium chloride and is equivalent to 60 to 62.5% potash.

Sulphate of potash is produced by treating muriate of potash with acids or neutral salts. It usually runs from 92.5 to 96% potassium sulphate and is equivalent to 50 to 53% potash.

Sulphate of potash-magnesia is a mineral containing a minimum of 22% K_2O (potash), 18% MgO (Magnesium), and 22.7% Sulfur.

Summary

One nutrient alone cannot do the job. Certain interrelationships of potassium and other elements such as nitrogen, phosphorous, calcium, magnesium, sodium, etc., affect turf production. Not only the supply but the relationship of supply called balance is important.

As the technology of the elements and their relationship to prime turf production advances the astute turf manager will find it more and more to his advantage to know the element levels in his soil, the sources of nutrient supply, and the most ideal balances to maintain of all the elements.