



POTASSIUM

POTASSIUM IN THE SOIL

Potassium (K) is quite abundant in soils, typically ranging from 0.5 to 4.0%. Of this, only a small part is present in water-soluble and exchangeable forms, and readily available for plant uptake, usually less than 1% of the total.

Potassium in soils exist in three distinct forms: unavailable, slowly available and readily available.

- **Unavailable Potassium:** Soil type dependant accounts for 90-98% of the of the total soil K is found in this form. Overtime the primary minerals that contains K weather, and the K is released. This process is quite slow and cannot supply the requirements if crops.
- **Slowly available Potassium:** This form of potassium is referred to as fixed K as is trapped between the layers of clay minerals. Plants cannot access much of the slowly available K during the growing season. The amount of fixed K in the slowly available forms varies with the type of clay and minerals that dominate a particular soil.
- **Readily available Potassium:** Is potassium that is dissolved in soil water and that is held on the exchange sites of clay particles (exchangeable K) is considered readily available for growth.

Sandy soils have the lowest potassium content, clay and alluvial soils the highest. However, even clay soils can become depleted in potassium where considerable quantities are removed in farm produce, e.g., hay, silage, sugarcane. Potassium that is dissolved in the soil solution is subject to leaching. It is more readily leached than phosphorus, less so than nitrate nitrogen.

POTASSIUM IN PLANTS

Potassium is taken up by plants from the soil as the potassium ion (K^+). It is required in larger amounts than any other mineral element, except for nitrogen. In a few crops, potassium uptake exceeds that of nitrogen, e.g., bananas, and cotton during the boll filling period.

Potassium is not a component of any organic compound in plants. Its primary function is maintaining the ionic balance. Plants take up anions, i.e., negatively charged ions such as nitrate (NO_3^-), phosphate ($H_2PO_4^-$ & HPO_4^{2-}) and sulfate (SO_4^{2-}), so that the total number of negative charges equals that of the positively charged cations, i.e., ammonium (NH_4^+), potassium (K^+), calcium (Ca^{2+}) and magnesium (Mg^{2+}). Nitrate (NO_3^-) is taken up in greater amounts than any other ion. It is potassium (K^+) that balances it.

Potassium is important in various physiological processes, including photosynthesis, the metabolism of carbohydrate and protein, the activation of enzymes, and the adjustment of stomatal movement and water relations. Adequate potassium helps reduce lodging, increase winter hardiness and disease resistance, and improve yields and the quality of seed and fruit.

Optimum potassium concentrations in plant tissue are usually in the range of 1.5 to 4.5% K on a dry weight basis.

DEFICIENCY SYMPTOMS

Potassium is very mobile in plants. As it is readily transferred from older leaf and root tissue to growing points, deficiency symptoms first appear in recently matured and older leaves.

Deficiency symptoms are best described as leaf scorch. This develops from an initial yellowing of interveinal areas near the leaf margins. This is followed by tanning and browning, and finally drying of the tissue to appear as scorching. This scorching is at first confined to the leaf margins and tips but progresses inwards as the deficiency becomes more severe, until the whole leaf may be affected. Rarely does the growing point show deficiency symptoms. Leaves from potassium deficient plants have a flaccid (wilted) appearance and the tips and margins are often frayed. Plant growth is retarded, and root systems are poorly developed.

Potassium balance with other nutrients, particularly the other cations (positively charged ions) such as calcium and magnesium are of importance. Too much potassium can induce deficiencies of other nutrients, while potassium deficiency may occur in soils which seem to have adequate potassium, if soil calcium and magnesium are also high.

POTASSIUM FERTILIZERS

Incitec Pivot markets two imported granular potassium fertilisers, Muriate of Potash and Sulfate of Potash.

Muriate of Potash (50% K) is potassium chloride (KCl). It is the most economical of the potassium fertilizers and therefore the most commonly used. It is used in sugarcane, pastures and many horticultural crops. Other potassium fertilizers are used where the chloride in Muriate of Potash may be detrimental, e.g., in saline soils, where poor quality irrigation water is used, in crops that are sensitive to chloride, or where chloride may have an adverse effect on the quality of farm produce. Muriate of Potash should not be used in foliar sprays as the chloride will burn the foliage.

Sulfate of Potash (41% K) is potassium sulfate (K_2SO_4). It has a lower salt index than Muriate of Potash and is often preferred to the latter in crops sensitive to chloride or susceptible to fertilizer root burn. It is often used in planting mixtures for crops such as French bean and in shallow-rooted tree crops such as avocado and macadamia, where fertiliser may burn roots feeding close to the surface.

Soluble Fine or Solution Grades of these products are used where potassium is to be applied in solution, e.g., in fertigation programs.

Incitec Pivot no longer markets potassium nitrate (KNO_3), also known as Nitrate of Potash and Saltpetre (13% N, 38.3% K), due to low demand on account of its higher price. Potassium Nitrate is often used where potassium is to be applied in solution (through irrigation systems and as a foliar spray). It has an advantage over:

- i) Muriate of Potash in that it doesn't contain chloride (which will burn the foliage), and
- ii) Sulfate of Potash in that it has wider compatibility with other fertilisers in solution and is more soluble, allowing more concentrated fertiliser solutions to be prepared.

APPLICATION

The incidence of potassium deficiency and use of potassium fertilizers in Australia is increasing, as crop and pasture yields increase (often in response to other fertilizers) and certain soils become depleted in potassium.

Potassium is used in horticulture, sugarcane, and improved pastures in high rainfall areas. Responses to potassium have also been obtained in hay and silage, cotton and maize. In Western Australia, responses to potassium also occur in other grain crops on sandy soils.

Often, one application of potassium per annum will suffice, particularly where potassium is applied at low rates. At higher rates, it is customary to split-apply potassium, to avoid luxury uptake and improve utilization. On sandy soils, split applications are often advocated to minimize leaching losses.

Potassium can be applied pre-plant, at planting (provided the rates are not excessive and harm young seedlings) and as a side or top-dressing. It is often applied in conjunction with other nutrients, e.g., in complete NPK fertilisers in sugarcane and horticultural crops.

Incitec Pivot Fertilisers (a business of Incitec Pivot Ltd ABN 42 004 080 264)

28 Freshwater Place

Southbank Vic 3006

Free call 1800 009 832

www.incitecpivotfertilisers.com.au