KNO_3 (potassium nitrate) contains 13% N and 38% K, is chloride free and is available as a 2mm-4mm prill (Qrop® K) or as a water soluble crystalline powder (Ultrasol® K Plus). Due to its high solubility, its purity and its compatibility with other fertilizers and pesticides, KNO_3 is most often used as a source of N and K for high value crops as foliar sprays, in fertigation, or as a bulk blend with other granular fertilizers.

Horticultural crops most suited to Ultrasol® K Plus applications are those that are sensitive to chloride, those producing high amounts of carbohydrates, those with regular top-dressing frequency, crops grown in sand, lower pH conditions and crops grown in cold climates.

Ultrasol® K Plus on potatoes*

The potato is a high value horticultural crop. Potatoes are heavy feeders of both nitrogen (N) and potassium (K). The amount of K removed by tubers alone is shown in figure 1.

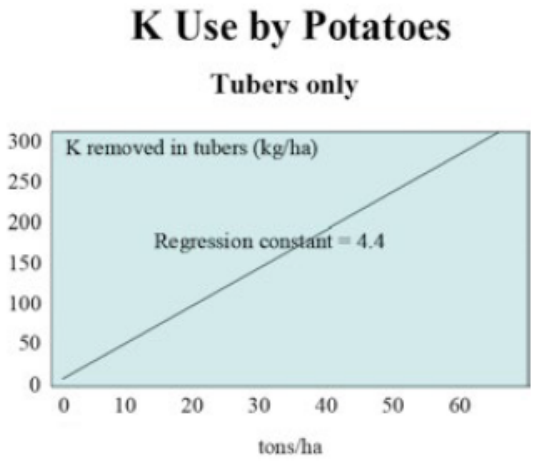

Figure 1.

K removed by the whole plant is two thirds more to double that removed by the tuber alone. This means that 8-8.8 kg of K is removed per ton of potato crop. The plant must obtain this K either from the soil or from applied K. Similarly, potatoes require a total of 4.5 kg of N per ton potato crop. Ultrasol® K plus supplies both these important elements. Potatoes can benefit directly from Ultrasol® K Plus for the following reasons:

Acidification around the roots (rhizosphere)

The area immediately around the root zone of any plant is known as the rhizosphere (figure 2).

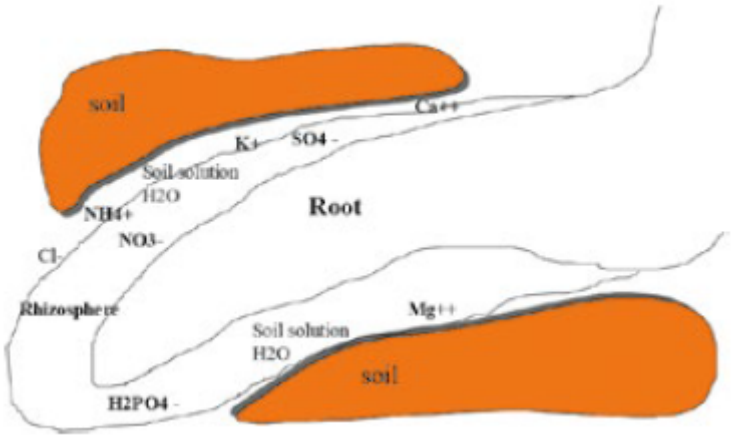

Figure 2: The Rhizosphere.

The rhizosphere pH is directly affected by the uptake of elements from the soil solution. The form in which the nutrients are supplied to the plant determines the pH changes in the rhizosphere.

The magnitude of the pH change in this rhizosphere is dependent on the buffer capacity of the soil and the amount of fer-tilizer applied. Potatoes grown on the low

buffer soils of require large amounts of fertilizer.

This can result in dramatic rhizosphere pH changes. At starting pH of around pH 4.5, if ammo-nium- nitrogen is applied, then the pH of the rhizosphere can decrease to pH 3.0. If nitrate- nitrogen is applied, the pH of the rhizosphere can increase to pH 6.0. The pH of the soil solution in direct contact with the roots can therefore be 1000x more acid when ammonium–instead of nitrate–nitrogen is used.

pH values of around pH 3.0 are not only directly toxic to plant roots, but also renders many other plant nutrients unavailable.

Competing cations

Ammonium–nitrogen is a cation, which competes directly with the uptake of other important cations such as potassium, calcium and magnesium. This cation compe-tition leads to nutrient imbalances resulting in poor growth of plants.
In soilless culture, the amount of ammo-nium applied to plants is never allowed to exceed 20%. In hydroponics and gravel flow techniques, less than 5% ammonium is permitted in the nutrient solution purely to regulate the nutrient solution pH. The sandier a soil, the more the soil tends to a soilless or hydroponic type culture.

For potatoes grown in the sandy soils of the Western Cape, the maximum permissible ammonium should be 20% with lower values being more favourable for plant growth and tuber yield.

Nitrification

Nitrification is the process whereby applied ammonium is converted to nitrates, within the soil, by nitrifying bacteria.

On sandy soils (<5% clay) the nitrification process is non-existent and applied ammonium fertilizer remains in the ammonium form.

The nitrification process is also retarded in cold conditions (winter plantings). Nitrification also does not have time to take place in regular fertilizer applications (daily or weekly applications). In addition, the time that ammonium is in excess to nitrate (ratio basis) is detrimental to plant growth and yield, even if nitrification is taking place but not yet completed!

Energy conservation

Nitrate is converted into nitrogen com-pounds largely in the leaves of plants. The process is driven by light energy. On the other hand, ammonium is con-verted to nitrogen compounds exclusively in roots. The energy used to drive this reaction is from carbohydrates and sugars. An excess of ammonium nitrogen causes a depletion of carbohydrates, which results in reduced yield and quality.

Chloride and potato quality

Although sometimes conflicting, chlo-ride-free fertilizer has been shown to increase dry matter content, starch content and spe-cific gravity of tubers. Chloride-free fertilizer is the preferred source for processing and chipping pota-toes. Chloride-free fertilizer however appears to have no effect on potato yield as is often rumoured. Yield increases are rather due to maxi-mizing nitrates and minimizing ammonium by

having the nitrate with the potassium (Ultrasol® K Plus).

Balanced nutrition

Because Ultrasol® K Plus contains nitrate, farmers can maximize the application of nitrates and minimize the application of ammonium, a situation that cannot be obtained by using either potassium chlo-ride (KCl) or Potassium Sulphate (K_2SO_4.)

Therefore, with Ultrasol K Plus, the potato is being supplied with two of its main nutritional elements in the correct form.
Using only potassium chloride (KCl) an excess of chloride is supplied with its detrimental effects. Using only potassium sulphate (K_2SO_4), supplies sulphate (SO_4) in unbalanced excess to the plants.

Summary

KNO_3 increases the pH in the rhizosphere, decreases cation competition, is chloride free, ensures balanced nutrition, maximizes carbohydrate production and does not rely on nitrification. KNO_3, therefore, benefits both yield and quality of potatoes when used under one or more of the following conditions:

- Acid soils
- Sandy soils
- High rates and regular fertilizer applications
- Cold conditions
- Chloride sensitive uses (chipping and processing)

- Any crop where maximum carbohydrate production is essential (Brix, Specific gravity).

Content provided by

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