

# POTASSIUM, SPECIFIC GRAVITY AND GETTING THE BALANCE RIGHT

Potassium is essential for many processes in both plants and the human body. If people want potassium, they most likely reach for a banana. However, the best source of potassium is actually the potato, with approximately 600mg per medium sized tuber.

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Potassium (K) in the tubers needs to come from somewhere, so potato plants need a lot of K to thrive<sup>1</sup>. Getting the right amount of potassium into the soil when and where the plant needs it is essential for maximum yield.

Potato plants take up large quantities of potassium with peak daily uptake reaching over 4 kg/ha/day. Supplying potassium is most important during stolon and tuber initiation, although maximum uptake occurs during tuber bulking.

Petiole potassium levels can decrease over time, particularly following the tuber initiation stage, with the rate of decrease dependent on soil K availability and overall potato growth rate.

Potassium plays an important role in converting carbohydrates from the leaves into starch. Increased levels of K can increase tuber size as well as total yield. Even in soils where exchangeable potassium is considered adequate, some authors have reported increases in yield from additional fertilisation.

Excessive potassium can reduce uptake of other nutrients, especially calcium and magnesium, so a balance

is needed. There are also some reports of high potassium reducing specific gravity, but other studies have found no effect<sup>2</sup>.

## SUPPLYING POTASSIUM TO CROPS

There are three main sources of K:

- **potassium chloride** (KCl or muriate of potash)
- **potassium sulfate** (K<sub>2</sub>SO<sub>4</sub> or sulfate of potash)
- **potassium nitrate** (KNO<sub>3</sub>)

Among these three, potassium sulfate and potassium chloride tend to be more effective than potassium nitrate in increasing yield.

Potassium sulfate is the more readily plant available form of K, so can speed up the translocation of carbohydrates from the leaves to the tubers. This may potentially increase tuber specific gravity, especially if exchangeable K levels in soil are high<sup>2</sup>.

## MORE POTASSIUM HELPS CANOWINDRA POTATOES

A recent PotatoLink demonstration in Canowindra (NSW) looked at high

rates of potassium that could increase tuber specific gravity, without inhibiting the uptake of magnesium and other essential nutrients. The demonstration was conducted on a paddock low in soil potassium.

Chipping variety Crop 77 was planted in January 2022 following a winter wheat crop (stubble retained). A pre-plant soil test (0 – 15 cm) showed a potassium content of 0.2 meq/100g and magnesium 2.8 meq/100g, which represents a low ratio of K:Mg of 0.07.

In the main crop, potassium was applied prior to planting, using a mix of 1/3 potassium chloride and 2/3 potassium sulfate to deliver 115 kg/ha of K and 42 kg/ha of sulfur (S).

Within the demonstration area, an additional 250 kg/ha of potassium sulfate (100 kg/ha of K + 45 kg/ha of S) was banded on top of the hills in one section immediately after planting, giving a total of 215 kg/ha of K and 87 kg/ha of S on the demonstration crop.

## RESULTS

The additional potassium increased tuber size, and despite a 3% decrease in tuber number, **the extra potassium increased net yield by 2.1t/ha**. There

was no significant effect on specific gravity, which was high in both the control and treated areas.

The additional potassium cost \$400/ha, but the extra yield was worth \$850/ha, **a net return on the investment of \$450/ha.**

## MAGNESIUM TRIALS

In the last issue of the PotatoLink magazine, there was a report on high rates of magnesium sulfate applied

to processing potatoes which found less disease and higher specific gravity benefits. For a report on the magnesium trials, refer to the autumn issue of Potato Link magazine article on magnesium (page 30): [potatolink.com.au/potatolink-magazine](http://potatolink.com.au/potatolink-magazine)

Interestingly, although high levels of K can reduce uptake of magnesium, high levels of soil magnesium do not reduce K uptake (a phenomenon known as unilateral antagonism)<sup>4</sup>.

Potassium fertiliser recommendations should also consider soil magnesium content. Soil K:Mg ratios between 0.3 - 0.5 are considered ideal, where the absorption of both nutrients can be guaranteed. Both calcium and potassium have an antagonistic or inhibiting effect on the absorption of magnesium (Mg).



Site in February (left) and May following harvesting of the demonstration area (right) 2022

## REFERENCES

1. Hort Innovation Guide 2022: Innovations in Potato Management: The Australian Potato Industry Manual
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3. How to influence potato tuber numbers. <https://www.yara.co.uk/crop-nutrition/potato/influencing-potato-tuber-numbers/>
4. [Interactions of potassium and magnesium | K+S Aktiengesellschaft \(kplus.com\)](https://www.k-plus.com/en/interactions-of-potassium-and-magnesium)