POTASSIUM DEFICIENCIES ON THE RISE

By **Deanna Lush**

While there have traditionally been few potassium deficiencies in south-eastern Australia, researchers are finding this is changing and that more soils are showing reductions in exchangeable potassium.

For adequate crop growth, the level of exchangeable potassium in the soil should be more than 120 milligrams per kilogram of exchangeable potassium. The area of soils that do not meet this lower limit have increased in South Australia from seven per cent in 2001 to 25 per cent in 2012.

The International Plant Nutrition Institute's Dr Rob Norton says this is because of the way potassium is stored in the soil. He says that over the past 25 to 30 years the non-exchangeable pool has been slowly depleted, which is leading to deficiencies in the exchangeable pool.

"As the exchangeable pool has previously provided sufficient potassium for plant growth, there has been limited use of potassium as a fertiliser," Dr Norton says. "But as the crop removes potassium from the soil, the exchangeable pool draws on the non-exchangeable potassium, leading to a point where there is no more and deficiencies begin to appear."

Potassium withdrawal is far higher when stubble is removed by hay cutting, silage or burning because stubble contains three times as much potassium as grain. The first signs of potassium deficiency are likely to appear in hay paddocks, where potassium depletion is greatest.

Dr Norton says the first place potassium deficiency will be seen is in crop windrows.

"You would see better growth in the previous year's header tracks compared to between the tracks. That's because the straw in the windrows has quite a lot of potassium in it and enriches the crop in the header tracks. However, this effect could be caused by either nitrogen or potassium, so the best way to tell which would be to perform a tissue test."

A deficiency will often present as suppressed growth or sometimes 'torch marks' on the margins of the leaves. Depletion of the non-exchangeable pool does not appear in soil tests, so it is difficult to gauge from such tests.

Dr Norton says once symptoms have been spotted, it is often too late to manage for the current season.

"If the crop is starting to run up to head, it's getting too late and the response will be small. Growers can topdress some potassium, about 40 to 50 kilograms per hectare of muriate of potash (MOP) broadcast at tillering. However, trials have shown responses using this approach at tillering are not as strong as MOP banded at seeding."

Nonetheless, Dr Norton says it is still better than no treatment: "You can also use foliar sprays – it is difficult to get enough potassium onto the leaves – but it can help."

He says the best approach is to use the symptoms as a diagnosis for next season, and apply potassium MOP when sowing the next crop. When using MOP, dosage rates of at least 50kg of potassium per hectare and up to 100kg/ha are needed to see responses.

Dr Norton recommends growers look out for the 'windrow effect', as the most reliable indication of a potential potassium deficiency, and apply potassium when sowing if a deficiency is suspected.

PHOTO: DR ROB NORTON

Scorched margins on plant leaves are a sign of potassium deficiency.

POTASSIUM POOLS

- There are several pools of potassium in soil, including the exchangeable and non-exchangeable pools.
- The exchangeable pool is present in the surface of soil particles and is available to the plant roots through diffusion via soil moisture.
- The non-exchangeable or fixed pool is contained within clay minerals and is not accessible to the soil; it cannot diffuse via soil moisture.
- Exchangeable potassium is 'topped up' by the non-exchangeable pool due to an equilibrium that exists between the two types of potassium. As the exchangeable potassium pool is depleted, non-exchangeable potassium slowly leaches out of the clay minerals and becomes exchangeable.
- Deficiencies in the exchangeable pool could be because the non-exchangeable pool is being depleted.
- Non-exchangeable potassium does not appear in soil tests, meaning tests cannot predict a deficiency in this potassium type.

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