



Potassium fertilisation

Viti-note Summary:

- The role of potassium in grapevine function
- Mobility and availability of potassium in soils and the vine
- Sources and losses of potassium
- Potassium management in the vineyard
- The application of potassium fertilisers
- Timing the potassium application for efficient uptake
- Environmental and sustainability issues

Other topics in this Viti-Notes series include:

- Nitrogen fertilisation
- Phosphorus fertilisation
- Potassium fertilisation
- Petiole analysis
- Soil acidification
- Liming
- Trace Elements



Figure 1. Symptoms of potassium deficiency include A: shiny leaves with rolled down margins, B: reddening (in red varieties) at the leaf margins and C: in older leaves, burnt leaf margins. Photos A & C courtesy of Scholefield Robinson. Photo B courtesy of Mardi L. Longbottom.

The role of potassium in grapevine function

Potassium is present in the vacuole of plant cells where it provides electrical balance for organic and inorganic anion uptake. Potassium has a structural role, helping to maintain osmotic balance (turgor) of the non-woody parts of the vine. It is also important in enzyme regulation, protein synthesis, metabolism and grape juice composition.

Mobility and availability of potassium in soils and the vine

Potassium is present in soil in the following forms:

Slowly exchangeable potassium – potassium fixes to clay in the ‘slowly exchangeable’ form making it gradually available to plants.

Available potassium – potassium held in the soil solution by soil organic matter and non-fixing clay particles in an exchangeable form.

Potassium is naturally abundant in most Australian soils, however sandy soils are generally deficient as it is readily leached. There are also areas of heavy clay soils in Western Australia that are naturally deficient in potassium.

Low exchangeable potassium values of 0.4 meq/100g or less are usual in acid soils, whereas alkaline soils have higher values of 1 meq/100g or more. Some alkaline soils may have excessively high potassium concentrations.

Potassium is mobile within the phloem.

Sources and losses of potassium

Potassium occurs naturally in soils in the form of organic materials and can be sourced from applied potassium-rich fertilisers. Potassium can be lost by leaching through the soil profile, immobilised by clay particles in the soil or lost by removal of soil via erosion or runoff (Figure 17 The Potassium cycle). Potassium is also removed from the vineyard in harvested grapes at a rate of approximately 1.6 – 5 kg of actual potassium per ton of fruit.

Potassium management in the vineyard

In Australia, many soils contain clay minerals that supply potassium in a sustained manner so that there is no requirement for additional potassium. However, vineyards planted on sandy soils, which are low in available

potassium, and other soils that readily fix potassium in an unavailable form require potassium supplementation. These soils exist in California and it is possible that some Australian soils behave similarly.

The application of potassium fertiliser should be based on petiole analysis and visual symptoms on vines. Petiole analysis at flowering may indicate low vine potassium status; however, consider the possibility of RSG/spring fever (see section 4.4). If there is no other cause to suspect an actual potassium deficiency in the soil, vines should be closely monitored for any symptoms of potassium deficiency. If symptoms continue to be expressed on mid-shoot leaves after flowering, an application of potassium-based fertiliser should be considered.

The application of potassium fertilisers

The different forms of potassium fertilisers available for use in vineyards are listed in Table 1. Potassium can be applied either by broadcasting or banding to the soil surface, placement in a furrow, or via fertigation. Potassium supplied by fertigation is relatively efficient.

Table 1. Forms of potassium fertilisers

| | |
|---------------------------|--|
| Potassium chloride | Muriate of potash (potassium chloride) is usually the cheapest form per unit of potassium but should not be used where salinity is an issue. |
| Potassium nitrate | Potassium nitrate is a very soluble form that can be used in fertigation. |
| Potassium sulphate | Sulphate of potash is generally suitable. |

If pre-plant soil analysis indicates soil deficiency (especially if the soils are potassium-fixing) either:

- Broadcast or band sulphate along the planting line. A common rate used is (100kg/ha), or
- Apply as a side dressing to the vine rows.

Young vines should not require maintenance application of potassium if levels were adequate at planting or if pre-planting fertiliser was applied. However, in sandy soils maintenance applications may be required. In soils with very low levels of potassium, an annual application may be required. In this instance, broadcast 100-200 kg of actual potassium per hectare of vineyard.

When fertigating, use potassium nitrate at about 15 kg per ha per application. In soils with very low levels of K apply nitrogen at the usual rate (approximately 2-5 g per vine per week) with urea, ammonium nitrate or calcium nitrate, and include potassium nitrate in every application.

Timing the potassium application for efficient uptake

In most of the eastern states of Australia, the best time to broadcast or band potassium is in autumn. Winter rains move the fertiliser into the root zone making it available for uptake during the growing season. In Western Australia, fertiliser is more often applied in spring.

Top-up applications via fertigation may be required from around veraison if vines are stressed, otherwise vines may draw on reserves to ripen fruit to the detriment of the following season.

Environmental and sustainability issues

Large quantities of potassium are removed from vineyard soils in grapes removed at harvest, however, many Australian soils have large reserves of potassium. Soil potassium reserves should be monitored to avoid unnecessary fertiliser application.

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Further information

Training

For regional specific training in grapevine nutrition management, the AWRI is running *Research to Practice: Managing grapevine nutrition in a changing environment*.

Contact

Marcel Essling: rtp@awri.com.au for more information.

Useful references

Nicholas, P. 2004. *Soil, irrigation and nutrition*. Adelaide: Winetitles.

Articles about grapevine nutrition and viticulture in general are available to the Australian wine industry through the Australian Wine Research Institute library. Visit http://www.awri.com.au/information_services/jfml/ for details.

Product or service information is provided to inform the viticulture sector about available resources and should not be interpreted as an endorsement.



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