THE UNIVERSITY of ADELAIDE

ARC Training Centre for Innovative Wine Production

Technical note

IMPLICATIONS OF POTASSIUM NUTRITION ON GRAPES AND WINE

Introduction

From a viticultural perspective, potassium is important from the cellular to the whole plant level, having a role in frost, drought and disease resistance. It is integral to plant growth, vascular transport, photosynthesis, protein and starch synthesis. Potassium nutrition in the vineyard can also have implications for the properties of the wine. High potassium reduces the free acids in the wine and raises wine pH, resulting in a loss of tartness, reduced colour intensity in reds, and an increased chance of oxidative and microbial spoilage. High potassium also lowers the tartrate to malate ratio and therefore increases the likelihood of malolactic fermentation with implications for the organoleptic qualities of the wine. More tartrate in the salt form may mean tartaric acid addition is required in the winery, resulting in additional costs. Cold stabilisation may also be necessary to remove the potassium bitartrate crystals prior to bottling. For these reasons the ability to modify berry potassium levels in the vineyard is valuable.

The key outcomes

Managing berry potassium levels without inducing vine deficiency symptoms is a significant challenge for the warm viticulture regions of Australia. The paradox for the grower is to ensure that enough potassium is available to maintain normal berry functioning but simultaneously avoid unwanted increases in berry pH so that wine quality is maintained. Considering predicted increases in heat and drought periods, a predicted increase in grapevine water requirements within warm viticultural regions due to climate change, together with increased competition for available water supplies, sustainable, cost-effective management options are required.

From a viticultural perspective, information is required on the optimal potassium concentration in the berry at various stages of growth and development. Given the ability of potassium to translocate from roots to leaves and then back down to roots again, the grapevine is an extremely responsive and adaptable system, capable of maintaining internal homeostasis and driving nutrient flow to areas of greatest demand.

Recommendations

Mild water stress through deficit irrigation strategies can be considered for reducing potassium uptake but this approach is complex due to variety differences, climatic variations and soil variability. Extreme care is required when considering irrigation as a management tool. Rootstocks such as those of the *V. berlandieri* parentage that are low potassium accumulators show promise and require additional research attention.

The effects of vine vigour, canopy shading, crop load and foliar potassium application on berry potassium accumulation are inconclusive and require further research. The compensatory mechanisms built into the vine may alter potassium mobilisation and partitioning so that reserves are drawn upon during times of low potassium availability in order to sustain growth and crop development. Berry potassium levels may thus not respond readily to the cultural manipulation of nutrition, vine water uptake, bunch exposure or crop load.

What's next?

Further field trials are required to find effective means to manipulate plant and berry potassium levels so that berry composition can be optimised.

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