Cherry Sap and Fruit NU-test data review:

Seasonal Trends and Regional Differences 2004-2009

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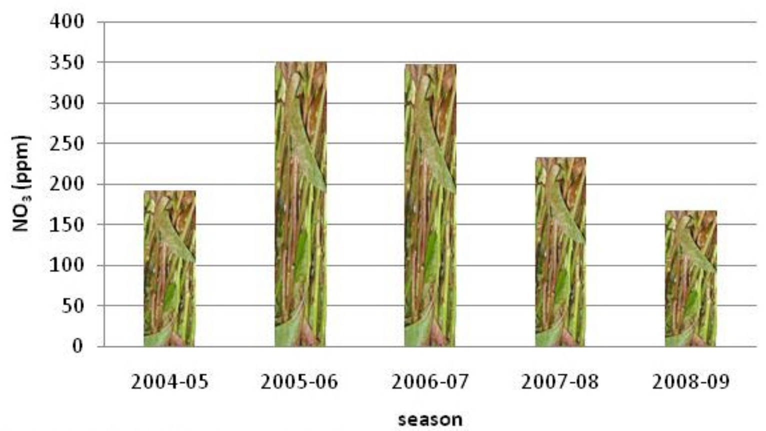
Background

A client was concerned that their cherry fruit nitrate levels for the 2008-09 season appeared to be lower than those in previous seasons, and contacted AgVita to obtain further information regarding this. A review of all cherry sap and fruit data for the past five seasons was undertaken to help determine whether the client had an issue, and if it was unique to their situation or if it was being reflected elsewhere. In addition to seasonal trends, it was possible to identify some differences between Tasmanian and Mainland Australian samples.

Seasonal Trends

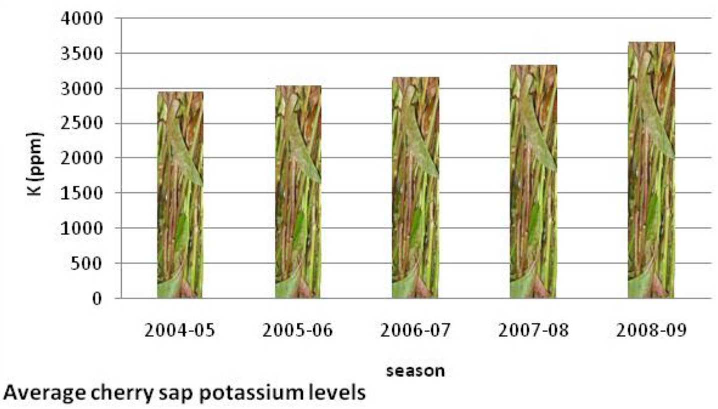
Sap nutrient levels:



Average cherry sap nitrate levels

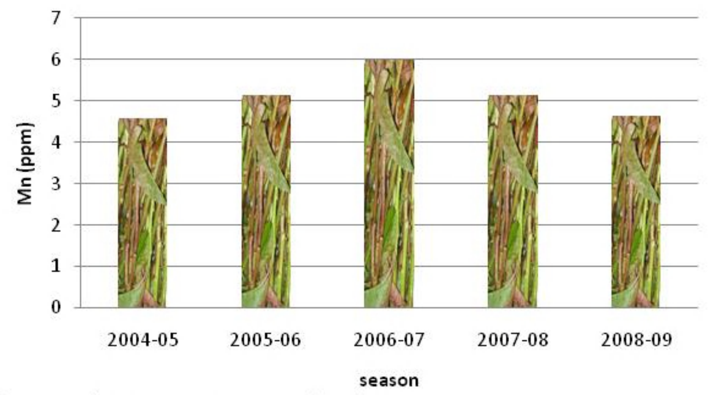
Sap nitrate levels were, on average, lower in the 2008-09 season than in previous years. This difference, although not statistically significant, was also reflected in the increasing proportion of samples with sap nitrate levels of less than 200ppm (which is the average minimum level recommended) from the 2005-06 season onwards.

Suggested reasons for the general decrease in sap nitrate levels are related to the extended dry conditions experienced through most of the cherry-growing regions over the past few years. Plant uptake of nitrate is highly reliant on soil moisture levels, and the drought would make it less available. Similarly, nitrate uptake can be suppressed by high soil chloride levels. Sap and soil chloride levels were not available to verify how much of a role these had in reduced nitrate uptake, but salinity levels (which would be partly comprised of chloride) often rise in response to reduced water availability and the poorer-quality water which becomes more prevalent in drought conditions.



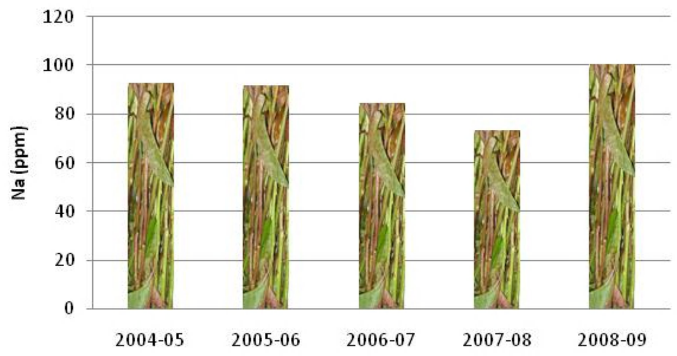
Average cherry sap potassium levels

Average sap potassium levels increased steadily over the years 2004-05 to 2008-09. This is most likely due to the increased focus on potassium as part of crop nutrition management over the past few years to address the issue of post-harvest potassium deficits.



Average cherry sap manganese levels

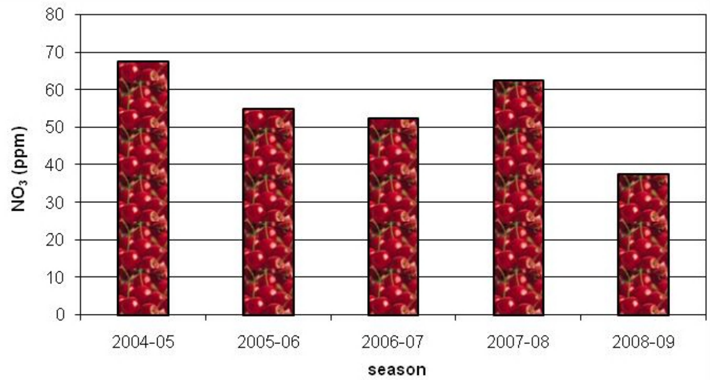
Sap manganese levels were lower than the previous three seasons' but similar to the 2004-05 levels. Manganese is another nutrient that is highly reliant on soil moisture levels for adequate plant uptake, so the same dry conditions that have likely been responsible for reduced nitrate uptake would also have affected manganese uptake. Another possible reason for the lower manganese levels is the increase in potassium levels; many nutrients compete with each other for plant uptake, and potassium and manganese are two such nutrients, so the improvement in plant potassium usage may have come partly to the detriment of manganese.



Average cherry sap sodium levels

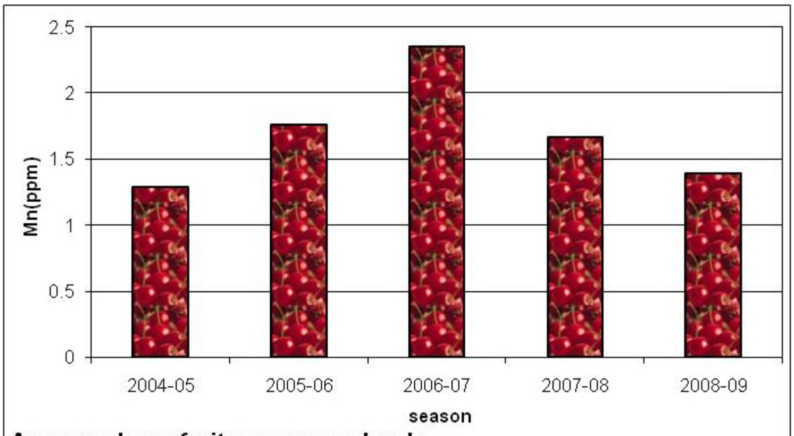
Sap sodium levels increased markedly this last season, with the average sap sodium levels rising as well as the proportion of samples with sodium levels greater than 200ppm (which is considered the maximum desirable level). This can, once again, be attributed to the drought: as dry conditions continue, less water is available for irrigation, and the water that is available is usually of poorer quality. These combine to increase salts, which often mostly comprise of sodium and/or chloride.

Fruit nutrient levels:



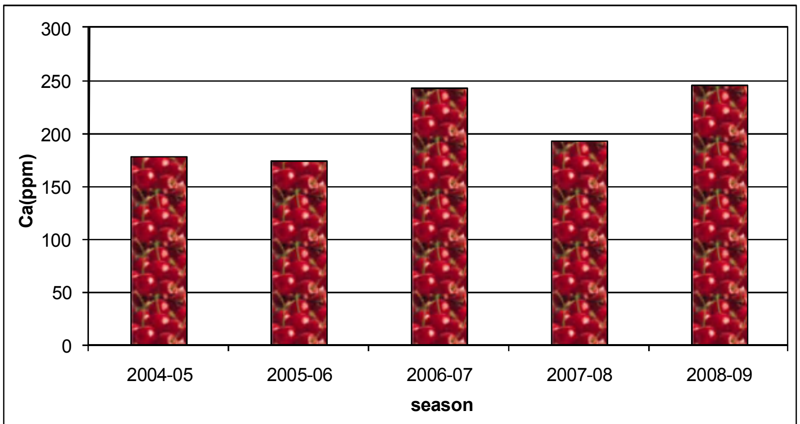
Average cherry fruit nitrate levels

Average fruit nitrate levels were much lower this season than the previous seasons' levels. The reason for this is likely twofold. Firstly, the generally lower sap nitrate levels would translate into lower fruit nitrate levels, once again attributable to the extended dry conditions; this is borne out by nearly half of the 2008-09 fruit samples having nitrate levels lower than 30ppm (the minimum recommended level), whereas in previous seasons the proportions were less than one-third. A secondary influence could be the increased number of early fruitlets being sampled, as growers are starting to sample their fruits earlier to identify potential issues earlier; however, this is likely to be secondary to the effects of the drought, as it does not account for the proportion of samples with nitrate levels below 30ppm.



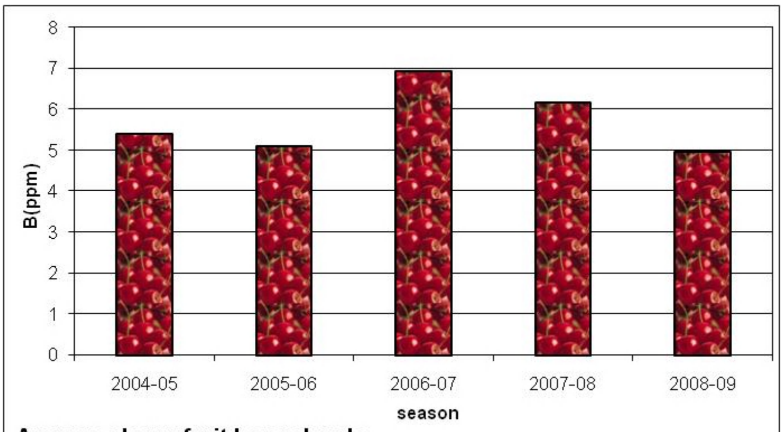
Average cherry fruit manganese levels

Fruit manganese levels mirrored those of sap manganese levels, and would primarily be due to the reduced uptake of manganese, as shown in the sap. As with the sap results, the most likely reasons for this are reduced water availability and competition with other nutrients, particularly potassium and calcium.



Average cherry fruit calcium levels

Average fruit calcium levels showed an increase in the 2008-09 season; sap calcium levels did not show as much change. The increased calcium in fruit is likely due to the improved focus on the importance of calcium as part of a complete plant nutrition program and its subsequent increase in use.



Average cherry fruit boron levels

Average fruit boron levels decreased from 2006-07 to 2008-09.

Regional Differences

Although some regional differences in sap and fruit nutrient levels were noted, the trends for both Tasmanian and Mainland samples were very similar, reinforcing the likelihood of drought and cultural practices being mostly responsible for the results seen, as these were factors prevalent across all cherry-growing areas. The differences that were seen between regions could mostly be attributed to climatic differences, as Tasmania generally has cooler and moister growing seasons than the Mainland. Many nutrients, such as phosphorus and magnesium, experience reduced plant uptake in cool, overcast and wet weather, while sodium issues tend to be more prevalent in drier areas. Sodic soils, subsoils and irrigation water and their associated issues tend to be more prevalent on the Mainland than in Tasmania. Differences in soil types may account for some of the results seen, but this is more difficult to verify as the soils in each growing area are not necessarily available for comparison.

Average sap nutrient levels:

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Element/Nutrient	Tasmania	Mainland (primarily NSW/Vic)
Phosphorus	Lower	Higher
Calcium	Lower	Higher
Magnesium	Lower	Higher
Zinc	Lower	Higher
Boron	Higher	Lower
Manganese	Lower	Higher
Sodium	Lower	Higher

Average fruit nutrient levels:

Element/Nutrient	Tasmania	Mainland (primarily NSW/Vic)
Nitrate	Lower	Higher
Phosphorus	Lower	Higher
Magnesium	Lower	Higher
Sulphur	Lower	Higher
Boron	Higher	Lower
Iron	Higher	Lower
Sodium	Lower	Higher

Conclusions

As a result of the data review, it was concluded that many nutrients in this season's sap testing program were indeed lower than what could be considered "usual." This is most likely due, in the most part, to reduced water availability and/or reduced water quality as drought conditions continued. Improvements in nutrient levels, such as with calcium and potassium, could be traced to an increased focus on these nutrients as part of a crop nutrition program.

This study highlights the significance of seasonal variability in nutrient levels (both sap and fruit juice), and the importance of crop monitoring to pick up these variations. The importance of water quality monitoring has also been flagged, as water quality and water availability are two crucial factors in plant nutrient uptake.

Acknowledgements

AgVita would like to thank our clients for their feedback, which better connects us with the real-life aspects of the data we produce.

Particular thanks must go to Doris Blaesing from RMCG Consulting and Bruce Scott from E.E.Muir and Sons for their personal input to help us provide explanations for the data.