

## Regulated deficit irrigation strategies in winegrapes

It is likely that in the future wine companies will be placing a higher emphasis on grape quality than they have in the past.

To manipulate vine growth and improve red wine quality, an irrigation strategy called **Regulated Deficit Irrigation (RDI)** can be adopted. It is generally recognised that high quality wine comes from vines of moderate vigour with berries that are moderate in size.

**Regulated Deficit Irrigation (RDI)** is about applying a reduced amount of water than that which vines require at a particular growth phase. This is in order to moderate vine canopy growth and decrease berry size. There is a general recognition that the smaller berries tend to result in more highly coloured and flavoursome wine.



### Timing of RDI

Extensive trials performed at Waikerie, South Australia<sup>1</sup> identified the main water stress period for Shiraz grapes that would enhance the quality effects. The main period to implement RDI is in a four to eight week window from the commencement of fruit set to veraison. The aim is to apply sufficient water stress to moderate vine growth and to reduce berry size.

The amount of water stress required to influence the berry size will vary depending on a number of factors. The length of the period that the water stress is implemented for will also need to be maintained. Before implementing a RDI strategy, the grower must take an integrated approach to irrigation.

Some of the areas for consideration are:

- soil type and its variability across the patch
- soil water-holding capacity
- presence and depth of watertables
- performance of the irrigation system
- vine rootstock
- salinity
- access to water on demand
- soil water monitoring device
- rainfall

<sup>1</sup> Trials conducted by by Mike McCarthy, South Australian Research and Development Institute (SARDI)

## Soil type

Identifying the soil type allows the soil water-holding capacity to be determined. An understanding is gained as to the size of the soil water reservoir, amount of water required to refill the profile, the depth of the rootzone and the level of soil water tension required to exert a stress on the vine.

The amount of tension required to exert a stress on the vine will vary depending on soil type. In a sandy soil an average rootzone tension of around -150 to -200 kPa will need to be maintained. For a loam about -250 kPa and in soil of a clay nature around -300 to -400 kPa will be necessary.

## Presence of watertables

Check for the presence of a watertable. If a watertable is present, install a testwell and record depth weekly. Take a sample of the water and record the salinity level. If there is a watertable within 1.5m of the soil surface it would be unwise to implement RDI.

## Irrigation system performance

Record the application rate of the irrigation system. Check to see that the irrigation system applies water evenly ie. has high distribution uniformity (DU). This is necessary to ensure all vines receive a similar amount of water when irrigation occurs so that some vines do not become overstressed or understressed through uneven water application.

## Vine rootstock

Own rooted vines have a lower resistance to salinity than do rootstocks such as Ramsey and Ruggeri. Generally a rootstock will provide some salinity protection to the vines.

## Salinity

As a reduced amount of water is being applied during a specific period with RDI, no leaching fraction applied, and as the soil dries out salinity levels can increase. As mentioned vines on a rootstock will generally cope with this, own rooted vines may not. If salinity levels become too high, defoliation of the vine could result later in the season.

A suggestion is to take soil salinity samples early in spring and at the completion of the RDI period to determine pre and post RDI leaching requirements. Generally, if soil salinity levels are maintained at 2.0 dS/m or lower this will limit salt affects on vine health.

## Access to water on demand

Hot weather can quickly move the vines from a mild water stress situation to high stress, particularly on sandy soils. Plans should be made to ensure water can be applied to the RDI area relatively quickly if required.

## Rainfall

The occurrence of a large amount of rain during the RDI period will limit the amount of water stress occurring to the vine and may render RDI ineffectual. This is a seasonal effect and little can be done about it by the grower.

## Soil moisture monitoring system

The success or failure of a RDI strategy is often reliant on the amount of soil water monitoring which takes place. To help ensure a successful outcome with RDI the soil water content **MUST** be monitored.

The use of tensiometers whilst suitable for normal irrigation regimes, is of little value in an RDI situation due to their inability to read soil moisture tension levels greater than -80kPa.

Gypsum blocks offer an alternative to tensiometers, as they have the ability to read to soil suction levels to -500kPa. Growers need to be aware that gypsum blocks may not perform in sandy soils, and accuracy of readings can be affected by salinity. Neutron probes, once calibrated, provide an accurate means of determining soil water content. It allows the plant response to water stress and crop water use to be monitored. The EnviroSCAN also provides an accurate means of determining soil water content.

### **When to apply RDI**

Trials have shown that mild water stress, imposed in a 4 to 8 week period immediately following fruit set on red grape varieties lowers yield. It usually results in greater berry sugar level at the time of harvest, with enhanced maturity and improved quality. Care must be taken to avoid excessive water stress or severe crop losses can result.

The length of time of the RDI period will vary depending on weather conditions, soil type, etc. Generally a stress period of four weeks will be the minimum in order to achieve some changes in berry size. Once there is an easily observed difference in the size of the berries from RDI grapes as compared to normally or fully irrigated grapes, then remove the stress period. Irrigation amounts and timing can then return to normal.

Timing and implementation of the strategy are important. Soil moisture levels must be maintained during flowering, but at a level towards the refill end. Once fruit set has taken place, the vine can then quickly move into stress to limit cell division of the berries and thus reduce berry size.

It is advisable to keep various records each year. Records such as irrigation amount and timing, flowering, fruit set and harvest date, brix, the type of product the grapes went into and plant observations, etc.

It is not recommended to implement an RDI strategy if you have watertables, high soil salinity levels, a poor performing irrigation system, no soil water monitoring or poor vine health. Other strategies such as nutrition and canopy management also play a role in improving red wine quality. RDI offers one approach. A combination of all three strategies is likely to give the best results.

### **In conclusion**

RDI offers the chance to improve wine quality, however the smaller berries as a result of RDI will translate into lower yield. Unless there is suitable remuneration for the expected improved quality, or a clear indication that such an approach will mean the difference between a market for fruit as opposed to a no sale in time of supply exceeding demand, there will be little incentive for growers to adopt deficit irrigation management strategies that reduce yield.

## Further Reading

Water Budgeting Guidelines - Vines on the Upper Murray (PIRSA Fact Sheet 15/06)

Water Budgeting Guidelines - Vines on the Lower Murray (PIRSA Fact Sheet 03/07 )

Seasonal & Weekly Water Budgeting Tools (PIRSA Spreadsheets)

Water Trade Decision Tool (PIRSA Spreadsheet)

[http://www.pir.sa.gov.au/pirsa/drought/irrigation\\_\\_and\\_\\_water\\_management/water\\_budgeting\\_and\\_water\\_trade\\_decision\\_tools](http://www.pir.sa.gov.au/pirsa/drought/irrigation__and__water_management/water_budgeting_and_water_trade_decision_tools)

Managing Water Stress in Grape Vines in Greater Victoria (DPI Victoria Agriculture Note AG1074)

<http://www.dpi.vic.gov.au/dpi/nreninf.nsf/fid/-4e6a224e6934f588ca256c7500167b81?OpenDocument>

Monitoring Soil Salinity for Irrigated Horticulture (PIRSA Fact Sheet 31/02/06)

Managing Salinity with Restricted Allocations in the South Australian Riverland (PIRSA Fact Sheet 04/07)

Salinity Impacts of Low Murray River Flows in the South Australian Riverland (PIRSA Fact Sheet 05/07)

[http://www.pir.sa.gov.au/pirsa/drought/irrigation\\_\\_and\\_\\_water\\_management/salinity\\_management](http://www.pir.sa.gov.au/pirsa/drought/irrigation__and__water_management/salinity_management)

Drought Strategy Checklist (PIRSA Fact Sheet 19/06)

Irrigating Horticulture Crops with Reduced Water Supplies (PIRSA Fact Sheet 18/06)

Regulated Deficit Irrigation Strategies in Winegrapes (PIRSA Fact Sheet 106/97/02/06)

[http://www.pir.sa.gov.au/pirsa/drought/irrigation\\_\\_and\\_\\_water\\_management/irrigated\\_crop\\_information](http://www.pir.sa.gov.au/pirsa/drought/irrigation__and__water_management/irrigated_crop_information)

Business Decision Making Tool (PIRSA Spreadsheet)

[http://www.pir.sa.gov.au/pirsa/drought/irrigation\\_\\_and\\_\\_water\\_management/business\\_decision\\_making\\_tool](http://www.pir.sa.gov.au/pirsa/drought/irrigation__and__water_management/business_decision_making_tool)

Irrigators Toolkit, Latest River Murray Information, Government Assistance and Support

[http://www.pir.sa.gov.au/pirsa/drought/irrigation\\_\\_and\\_\\_water\\_management](http://www.pir.sa.gov.au/pirsa/drought/irrigation__and__water_management)



**DROUGHT RESPONSE** 

**South Australian Government Drought Response Initiative**

**Drought Link website: [www.service.sa.gov.au/drought.asp](http://www.service.sa.gov.au/drought.asp)**  
**Drought Hotline 180 2020 FREECALL\***  
*(\*Mobile charges may apply. Call back available)*

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**Author: Irrigated Crop Management Service (ICMS) – Rural Solutions SA**

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