



# IRRIGATING

## According to grapevine water potential



Water is a scarce resource and agriculture remains under pressure to improve water use efficiency. Research being conducted by Drs Howell and Myburgh from the ARC Infruitec-Nietvoorbij is demonstrating that by using the midday stem water potential of the grapevine as a basis on which to schedule irrigation, water can be scheduled more accurately and more efficiently.

### Project background

Since 2018, SATI has been funding a project led by Drs Carolyn Howell and Philip Myburgh, which aims to develop guidelines for responsible and more efficient water use. Through previous studies, they have become aware that:

- (1) in table grape production, there is a tendency to over-irrigate;
- (2) calibration of irrigation scheduling equipment, in many instances, could be done better; and
- (3) using the water status of the grapevine to calibrate irrigation scheduling equipment could be more accurate than using the soil for calibration.

The current project titled, *Developing guidelines for the judicious irrigation of table grapes according to grapevine water potential* builds on some of their previous work, which was done on "old" cultivars such as Barlinka and Dan-Ben-Hannah, which showed that when using grapevine water potential to schedule irrigation, the latter can be applied more accurately and water use can be reduced. In these studies, they determined that if water is to be applied according to grapevine water potential, it should be applied when a midday stem water potential reaches -0.8 to -1MPa to obtain optimum grape quality, with no reduction in yield.

For the current project, trial sites have been established on commercial farms which are located near to each other in the Northern Paarl area, on newer more popular cultivars. For each trial site there is an "experimental" plot and a "commercial" plot. In the experimental plot irrigation is scheduled according to the midday stem water potential threshold, and in the commercial plot irrigation is applied according to the general practice on the farm (specific details about each of the plots is provided in Table 1).

To apply irrigation according to the grapevine stem water potential threshold, the research team determined the point at which irrigation should be applied by establishing the soil water content for each experimental block, at the point when midday stem water potential has reached -0.8 to -1MPa, using a pressure bomb. These values can be used to set refill lines where the soil water content is measured by means of probes.

Table 1: Details for each of the trial sites

Cultivar/ rootstock	Date planted	Grapevine spacing	Trellis system	Irrigation system
Starlight/ Ramsey	2011	3 m x 1.5 m	Gable	Drip 2.3ℓ/h x 0.6 m
Scarlotta/ Ramsey	2008	3 m x 1.875 m	Gable	Micro-sprinkler 32 ℓ/h
Crimson Seedless/ Ramsey	2005	3 m x 1.875 m	Gable	Micro-sprinkler 32 ℓ/h
Regal Seedless/ Ramsey	2000	3 m x 1.5 m	Gable	Micro-sprinkler 32 ℓ/h
Midnight Beauty/ Ramsey	2006	3 m x 1.875 m	Double Gable	Micro-sprinkler 32 ℓ/h
Sweet Globe/ Ramsey	2016	3 m x 1.5 m	Double Gable	Micro-sprinkler 32 ℓ/h
Tawny/Paulsen	2016	3.5 m x 2 m	Gable	Micro-sprinkler 32 ℓ/h
Joybells/ Ramsey	2017	3.5 m x 1.8 m	Gable	Micro-sprinkler 32 ℓ/h
Autumn Crisp/ Ramsey	2017	3.5 m x 2 m	Gable	Micro-sprinkler 32 ℓ/h



### Results so far

Results for the 2018/19 season are reported below but importantly, must be considered preliminary – the 2019/20 season's data must still be assessed, and there will be a last set of measurements done in the 2020/21 season. The 2018/19 season results are interesting in that they not only demonstrate that in most cases the water use for the experimental plots was lower than the commercial plot (See Figure 1), but also that average berry diameter for grapes harvested from the experimental plot were similar to, or larger than those of the commercial plots (data not shown). In the current season (2019/20), berry size and yield responses are being measured. Additionally, the effect on using stem water potential to schedule vineyard irrigation on storage capacity is being quantified.

SATI will continue to report on the progress of this project. An important aspect of this project is knowledge transfer, and consequently a "Root Safari" and two field days were arranged to provide industry with the opportunity to observe the effects of this method of irrigation scheduling in the vineyard.

Figure 1: Irrigation applied to experimental plots compared to that which was applied to the commercial plots during the 2018/19 production season.

