



Early results for deficit irrigation trials

The production of high quality citrus is critical to sustain and grow consumer demand in both domestic and export markets.

Asia is the major market for Australian citrus exports and Asian consumers prefer sweeter fruit.

Dr Tahir Khurshid, a research physiologist with NSW DPI, says citrus growers exporting to Asia face a challenge of consistently supplying fruit that meets or exceeds consumers' expectations.

"Replacement of existing citrus orchards with new varieties more palatable and appealing to consumers in Asia is neither economically feasible nor practical," he said.

"It is therefore essential for growers to adopt smart, innovative, agronomic practices that can deliver improved fruit quality suitable for Asian markets."

Dr Khurshid said Chinese consumers preferred fruit with low fruit acidity (about 0.6%) and that fruit acidity above 0.8% was considered as lesser quality "sour" fruit.

Minimum acceptable individual fruit Brix levels was 10.5° to 12° and with high preference around 14°.

"Increasing the Brix and maintaining acidity within acceptable levels is an important factor to increase the demand for Australian citrus in Asian markets," he said.

Dr Khurshid said global research

reveals fruit quality, especially sweetness, can be improved through manipulation of tree physiology.

Regulated deficit irrigation (RDI) is one practice that can be applied during different phenological stages to enhance fruit sugar content, with the added bonus of significant water savings.

"However, successful adoption of the RDI technique requires optimisation of irrigation scheduling, understanding the stage at which to apply deficit irrigation stress, and investigation of potential negative effects on fruit quality and long-term tree health," he said.

RDI is not widely used commercially in Australia to enhance sugar levels in navel oranges and there has been no research done in Australia.

Dr Khurshid is leading a research program on regulated deficit irrigation.

The objective of this project is to increase sugar levels in Navel oranges without compromising the final fruit size at harvest.

"Australian citrus exports are mainly based on selling large-sized oranges, which have a higher return for growers.

"The RDI is expected to enhance sweetness, save water and reduce



This stressed tree was part of the research trial.

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electricity costs for growers. This will reduce inputs and increase fruit prices of sweeter oranges."

Ultimately, a set of guidelines will be developed for growers to use the RDI method to suit their Navel crops based on their varieties, rootstock and soil conditions.

A large replicated trial over 1.5 hectares has been established at NSW DPI's Dareton Research Institute, using three Navel varieties M7 (early maturing), Houghton (mid-maturing) and Lane Late (late-maturing), grafted to Poncirus trifoliata or Troyer citrange rootstocks. The project uses over 1000 trees (8 years old).

A range of RDI treatments were applied in the first year to the above rootstock/scion combinations.

The first year was spent investigating the best time for RDI application and the length of RDI application which can effectively increase the sugar levels in Navel oranges.

RDI treatments were applied between mid-February, mid-March or mid-April, 2018, to three Navel varieties.

RDI treatments with 50% of the control (full irrigation - 100%) were used for 60 days for February, March or April RDI treatments.

Full irrigation was resumed after 60 days after the completion of RDI. Table 1 shows the un-stressed and stressed trees during the RDI experiment.

The results from **Table 1** indicate that both the February and March treatment was able to enhance sugar levels in all three Navel varieties.

Regulated deficit irrigation treatment in February was most effective for M7 Navels as compared to the control and March RDI treatment. However, the

effects were more pronounced in Troyer citrange rootstock as compared to Tri22.

February and March RDI treatments enhanced sugar levels in both Houghton and Lanes late varieties and these effects were higher for Troyer citrange rootstocks as compared to Tri22.

Table 2 suggests that the fruit size was decreased with both February or March RDI treatments for all three Navel varieties as compared to control.

This reduction was more pronounced for February RDI treatment in particular in Troyer citrange as compared to control.

The increase in Brix0 values for Navel varieties was a positive output but this increase came with a cost of fruit size at harvest.

There is a need to quantify the sugar

levels in Navel fruit without the reduction in fruit size.

Therefore, this growing season, Dr Khurshid is adjusting the deficit irrigation treatments in a bid to enhance sugar levels with the least reduction in fruit size. ●

Dr Tahir Khurshid is a Research Physiologist with the NSW Department of Primary Industries.

This research has received funding from the Hort Innovation Citrus Fund.




Table 1. The effect of February and March RDI treatments on Brix0 values at harvest for M7, Houghton and Lanes Late Navel on Tri22 (*Poncirus trifoliata*) and Troyer citrange rootstocks for 2018 growing season.

	M7		Houghton		Lane Late	
	Tri22	Troyer	Tri22	Troyer	Tri22	Troyer
Control	13.8	14.1	12.8	13.1	12.9	12.8
15 Feb	15.1	15.9	14.4	14.7	14.3	14.9
15 Mar	14.8	15.4	14.1	14.4	14.4	14.9

Table 2. The effect of February and March RDI treatments on % fruit size <88 count or >75 mm at harvest for M7, Houghton and Lanes Late Navel on Tri22 (*Poncirus trifoliata*) and Troyer citrange rootstocks for 2018 growing season.

	M7		Houghton		Lane Late	
	Tri22	Troyer	Tri22	Troyer	Tri22	Troyer
Control	62	43	74	61	81	75
15 Feb	40	20	56	37	63	45
15 Mar	48	39	53	48	67	56




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