



Effect of deficit irrigation on TSS in tomatoes

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- ▶ A series of trials in California concluded that deficit irrigation of processing tomatoes applied from first colour can improve total soluble solids at harvest without significantly lowering yield
- ▶ A trial in the Riverina was able to maintain yield, compared with a commercial block, with irrigation at 50% ETo replacement, and maximise total soluble solids

Editor's note:

This article has been reprinted from the Farmers' Newsletter, No. 170, Spring 2005, as Table 1 was printed incorrectly in that edition. The error has been rectified and we apologise for any concern raised.

Trial results in a Riverina processing tomato crop indicate the possibility of maintaining crop yield and total soluble solids (TSS) using less water. A trial block with an irrigation treatment of 50% ETo (evapotranspiration) replacement yielded equivalent to a commercial block irrigated at 100% ETo replacement, for the variety Hz 9035. Total soluble solids were also similar in the 50% replacement treatment and the commercial block.

In processing tomatoes, TSS and yield are influenced by variety and growing conditions. Applied irrigation influences the amount of water in the plant, in which soluble fruit solids are dissolved. Research in California over the last few years suggests that deficit irrigation applied from first red fruit colour can improve TSS at harvest, without significantly lowering the yield.

Local field investigation

An irrigation trial with different watering regimes was conducted in the growing season of 2003–04 at a tomato growing property at Darlington Point. To determine the effect of deficit irrigation on TSS development, three separate irrigation treatments were applied at 100%, 75% and 50%

ETo replacement from first red fruit colour onwards.

The trial area was a block of 30 beds running 600 metres long. The beds were 1.8 m wide with single rows of plants. Within the block, four varieties – Hz 9035, CXD 204, Hz 9614 and Hz 4401 – were sown on 20 October 2003. The varieties were sown in runs of 20 m for each water treatment. The treatments were not replicated.

Soil moisture monitoring was done with EnviroSCAN® probes installed on each treatment. All the treatments were maintained at similar moisture level (100% ETo replacement) through the season up to 25 days prior to harvest. From that time irrigation duration was shortened for two of the treatments to apply 50% and 75% replacement ETo. Irrigation was applied in most cases for 6, 4.5 and 3 hours every two days, respectively. ETo was calculated on a weekly basis using *Water Watch* data.

Fruit TSS and yield were recorded based on a small plot (2 m) harvest on 2 March, 2004.

Deficit irrigation may work

The influence of irrigation treatments on final yield, TSS and solids yield is presented in Table 1 and Figure 1. It should be noted that because the treatments were not replicated, it is difficult to make firm conclusions from the results. However, some interesting observations came out of the trial.

The objective of this trial was to manage irrigation during the fruit ripening phase to maximise TSS while maintaining crop

Table 1

Fruit yield and TSS of processing tomatoes for the variety Hz 9035 under different irrigation treatments

Treatment	Ripe t/ha	Green t/ha	Rotten t/ha	TSS at harvest
1. 100% ETo replacement	69.91	11.20	2.05	4.67
2. 50% ETo replacement	95.37	9.94	2.07	4.47
3. 75% ETo replacement	87.97	8.33	1.61	4.33
4. Commercial block (new ground)	100.40	12.60	1.39	4.50




yield. To a degree, this was achieved, with the 50% replacement treatment still yielding similar to the adjacent commercial block (var. Hz. 9035) and achieving the same solids level.

The trial block grew tomatoes in the previous season. The treatment with 100% ETo replacement appeared to have excess moisture in the root zone, which caused root inactivity contributing to the lower yield and delayed maturity of the crop, as compared with the commercial block, which was on new ground and had no apparent waterlogging problem.

The adjacent commercial block was sown to the variety Hz 9035 and managed similarly to the trial block. Water management from first red fruit colour onwards was based on 100% ETo replacement. The commercial crop was watered for 12 hours every three days, compared with the equivalent treatment in the trial being watered for 6 hours every two days.

The observations of this work are in agreement with research conducted in California in 2003, where it was concluded that deficit irrigation applied from first colour can improve fruit solids at harvest without significantly lowering yield.

Further trials needed

Further trials under a range of environmental conditions in southern Australia, over several growing seasons would be required to confirm this hypothesis. Irrigation techniques must therefore be carefully developed for each variety of processing tomato and growing area in order to maximise both fruit solids and yield, returning more economic benefit for the grower. It is hoped that funding can be secured to investigate this hypothesis in controlled trial situations in coming seasons. 

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Further information

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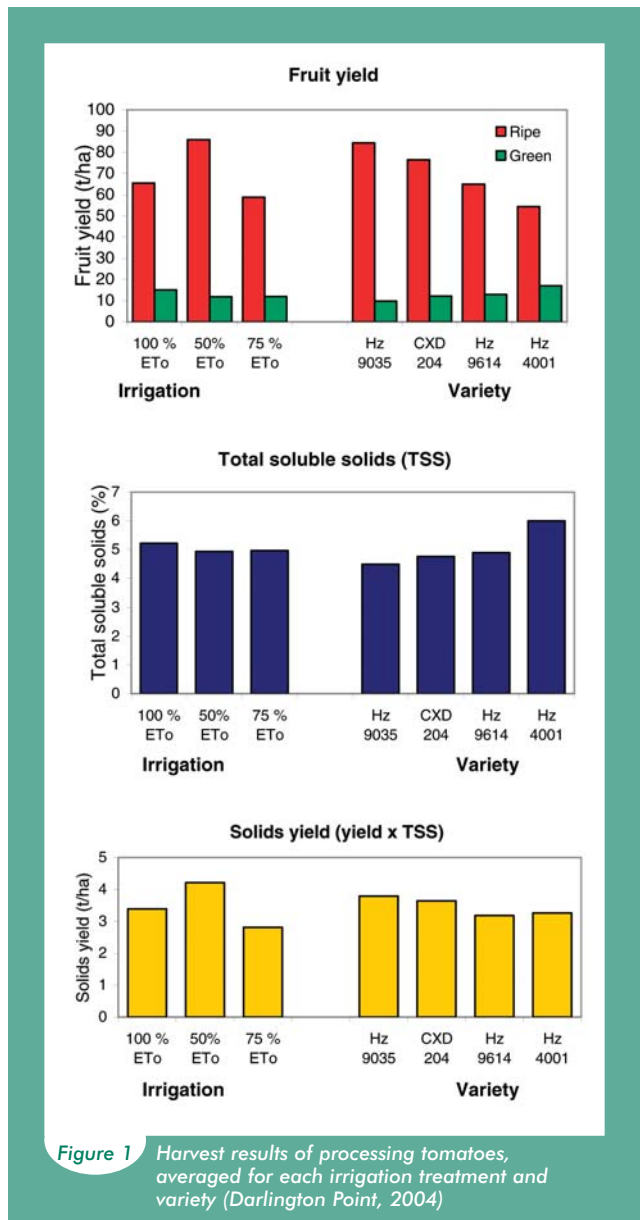


Figure 1 Harvest results of processing tomatoes, averaged for each irrigation treatment and variety (Darlington Point, 2004)