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**Growth, yield, fruit composition, and postharvest attributes of glasshouse  
tomatoes produced under deficit irrigation**

A thesis

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requirements of the degree of  
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## Abstract

Two experiments in 1994 and 1995 investigated the effects of deficit irrigation (DI) on growth and fruit attributes of tomato (*Lycopersicon esculentum* Mill. 'Virosa') grown in a glasshouse. Two treatments were applied: control which was watered daily and DI where watering was based on the measurement of leaf water potential and soil moisture. Due to the large reduction in plant growth and yield under the DI in the first experiment, a less severe DI was applied during the second experiment. Fruit yield, mineral concentration, colour, soluble sugars, and plant mass were measured in both experiments. Fruit production of ethylene and CO<sub>2</sub> were determined in the first experiment, while fruit total soluble solids (TSS), total acidity, sugar:acid ratio and shelf life were determined in the second experiment.

Plant growth, yield, fruit size and fruit number declined in DI plants. This was more pronounced in the first experiment than in the second. However, the percentage of fruit dry mass was higher in the DI than in the control treatment. Incidence of blossom-end rot was observed only in the DI fruit in the first experiment.

Sucrose, glucose and fructose concentrations were higher in DI fruit than in control fruit only in the first experiment. In the second experiment, TSS was higher in the DI than the controls. DI had no effect on fruit titratable acidity but the sugar:acid ratio was higher for the control fruit. Fruit concentration of Ca, Mg and K was the same for both treatments in the two experiments. The DI fruit had higher colour intensity than the control fruit only in the first experiment. The DI fruit produced higher quantities of CO<sub>2</sub> and ethylene than the control fruit. Cumulative weight loss and shelf life were the same in both treatments. Although DI may

improve certain fruit quality attributes such as colour and TSS, it should be applied with caution. Deficit irrigation should not be severe enough to generate a plant water potential of lower than -1.0 MPa.

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**Glossary of abbreviations**

- $\Theta$  -Soil volumetric water content
- $\psi_l$  -Leaf water potential
- $\psi_f$  -Fruit water potential
- $\psi_m$  -Matric potential
- $\psi_p$  -Turgor potential
- $\psi_s$  -solute potential
- AAS -Atomic absorption spectrometer
- BER -Blossom-end rot
- DAS -Days after sowing
- DI -Deficit irrigation
- EC -Electric conductivity
- HPLC -High performance liquid chromatography
- MPa -Mega Pascal (1 MPa = 10 bars)
- PG -Polygalacturonase
- RDI -Regulated deficit irrigation
- SAS -Statistical analysis system
- TDR -Time domain reflectometry
- TSS -Total soluble solids
- UK -United Kingdom

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