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The Effect of Partial Root-Zone Drying on Tomato Fruit Growth

Milena Marjanović, Zorica Jovanović*, Radmila Stikić, Biljana Vucelić Radović

Faculty of Agriculture, University of Belgrade, Nemanjina 6, 11080 Belgrade, Serbia

Abstract

Tomato fruit growth and productivity are complex processes depending on the interaction between physiological, genetic and environmental factors. Under current climate conditions of drought and scarce water supply, the challenge is to increase water use efficiency and to sustain tomato yield. Partial root-zone drying technique (PRD) is one of the irrigation methods with the potential to increase the water use efficiency and sustain the yield of many crops including tomato. The aim of presented results was to investigate the effects of PRD on tomato fruit growth, the activity of cell wall-associated peroxidase and ABA content in pericarp of tomato cultivar Ailsa Craig.

The experiment was done in controlled conditions and plants under PRD received 70% of water given to full irrigated plants (FI) plants. In PRD irrigation is applied to one half of the root system while the other half dried down and then the treatment was reversed. ABA content in fruit pericarp was measured by ELISA test and cell wall-associated peroxidase activity by a guaiacol test.

Fruit growth parameters showed that the maximal growth rate was significantly higher in FI plants than PRD but because the longer period of cell expansion the final diameter of PRD tomato fruits was slightly higher in PRD than in FI fruits. ABA content in tomato pericarp declined during the tomato development until the end of cell growth phase without significant differences between PRD and FI treated plants. The activity of peroxidase was significantly higher in PRD compared to FI. The significantly increase in the activity of enzyme cell wall-associated peroxidase in tomato fruit pericarp under PRD conditions coincided with the end of cell growth and the beginning of the ripening process. These results pointed out that this enzyme may control tomato fruit maturation.

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Keywords: partial root-zone drying; tomato fruit; ABA; cell wall-associated peroxidase

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* Corresponding author. Tel:+ 381 11 2615315; Fax:+381 11 3161352.
E-mail address: zocaj@agrif.bg.ac.rs

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