



The Soil Re-Union Science for Healthy Soils

4th International and
16th National Congress
of the Serbian Society
of Soil Science



Serbian
Society of
Soil Science



THE BOOK OF ABSTRACTS

Vrdnik, Fruške Terme, Serbia,
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EFFECTS OF DIFFERENT IRRIGATION METHODS ON LETTUCE YIELD, WATER USE EFFICIENCY AND WATER STRESS INDEX

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ABSTRACT

The introduction of efficient irrigation methods and the creation of optimal cultivation conditions have become the most important goals of modern agriculture in order to ensure the sustainable and rational use of water resources.

This study investigated the effects of regulated deficit irrigation (RDI) on the yield, water use efficiency and water stress index (CWSI) of lettuce (*Lactuca sativa* L.). The study was conducted in a greenhouse in the period from November 2023 to February 2024. Lettuce of the variety Cindarella (Meridiem Seeds) was planted at a spacing of 25 cm in gutters 0.4 m wide, 0.4 m deep and 10 m long, filled with Free Peat substrate with known water-physical and chemical properties. Two irrigation methods were used: a new method, Responsive Drip Irrigation (RDI), which delivers water according to the needs of the plants, and the Standard Drip Irrigation (SDI) method, which served as a control.

Plant growth and the amount of water applied using the two irrigation methods were continuously monitored throughout the experiment. Every 7 to 10 days, the temperature of the lettuce canopy was measured using remote sensing techniques and a thermal imaging camera (FLIR T335). The thermal images were processed using FLIR Tools software and the resulting data were used to calculate the Crop Water Stress Index (CWSI) according to the method described by Idso et al. (1981). At the end of the experiment, the yield was measured (fresh and dry weight in g·m⁻²) and the water use efficiency (WUE) was calculated as the ratio between the yield and the total amount of irrigation water applied.

The average lettuce yield was significantly higher in the RDI treatment (7271.7 g·m⁻² fresh weight and 208 g·m⁻² dry weight) than in the SDI treatment (4699.2 g·m⁻² fresh weight and 160 g·m⁻² dry weight). In the RDI treatment, the plants used the water more efficiently (7.5 g·L⁻¹) than in the SDI treatment (6.4 g·L⁻¹), which corresponds to an improvement of 15%. The average CWSI value in the RDI treatment was 0.0, while the average CWSI value in the SDI treatment was 0.3, indicating that the plants suffered from water stress.

The results of this study show that the application of the new irrigation method (RDI) resulted in higher yield, improved water use efficiency and lower CWSI in lettuce grown under protected conditions. The application of RDI irrigation could be one of the solutions for the sustainable use of water resources. It is recommended to conduct further tests with different soil types, substrates and crops.

Key words: responsive drip irrigation, water use efficiency, crop water stress index

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