Francesco Fabiano Montesano[1], Angelica Pizzarelli[2], Beniamino Leoni[2], Massimiliano Renna[1], Angelo Parente[1], Pietro Santamaria[2]

[1]National Research Council - Institute of Sciences of Food Production (CNR - ISPA, Italy)

[2]Department of Agricultural and Environmental Sciences - University of Bari Aldo Moro (DISAAT - UNIBA, Italy)

Interreg Greece-Italy IR2MA European Regional Development Fund — EUROPEAN UNION

INTERNATIONAL SYMPOSIUM ON ADVANCED TECHNOLOGIES AND MANAGEMENT FOR INNOVATIVE GREENHOUSES GreenSys 2019 16th to 20th June 2019 ANGERS FRANCE

Optimal control of substrate water status through soil moisture sensors improves water use and quality of greenhouse soilless basil

Soil moisture sensors use is well suited for automatic control of soilless greenhouse crops irrigation. Beside the effects of sensor-based irrigation management on **water savings**, the precise control of the substrate water status may have interesting applications also for the **enhancement of product quality**. In the present study, we compared timer- and sensor-based irrigation management, with a focus on the effects of different levels of water availability, corresponding to three irrigation set-points, on water use, growth, physiology, and quality of **soilless basil in Mediterranean greenhouse conditions**.

Materials and Methods

The experiment was carried out at the **Experimental Farm "La Noria"** of **CNR—ISPA** (Mola di Bari, southern Italy). Treatments: '**Timer**', with irrigation based on a pre-fixed schedule operated automatically by a timer, '**VWC 0.40**', '**VWC 0.35**' and '**VWC 0.30**' (VWC = volumetric water content), with automatic irrigation based on GS3 moisture sensors (Decagon Devices, USA) connected to a CR1000 datalogger (Campbell Scientific, USA) (Figure 1), providing VWC levels of ≈ 0.40, 0.35 and 0.30 m^3 m^{-3}, respectively (Figure 2). Basil plants ('Genovese' type) were grown in 2 L plastic pots filled with a peat:perlite mixture (3:1 v:v) amended with slow release fertilizers. A randomized block design (3 blocks * 4 treatments * 20 pots) was adopted.

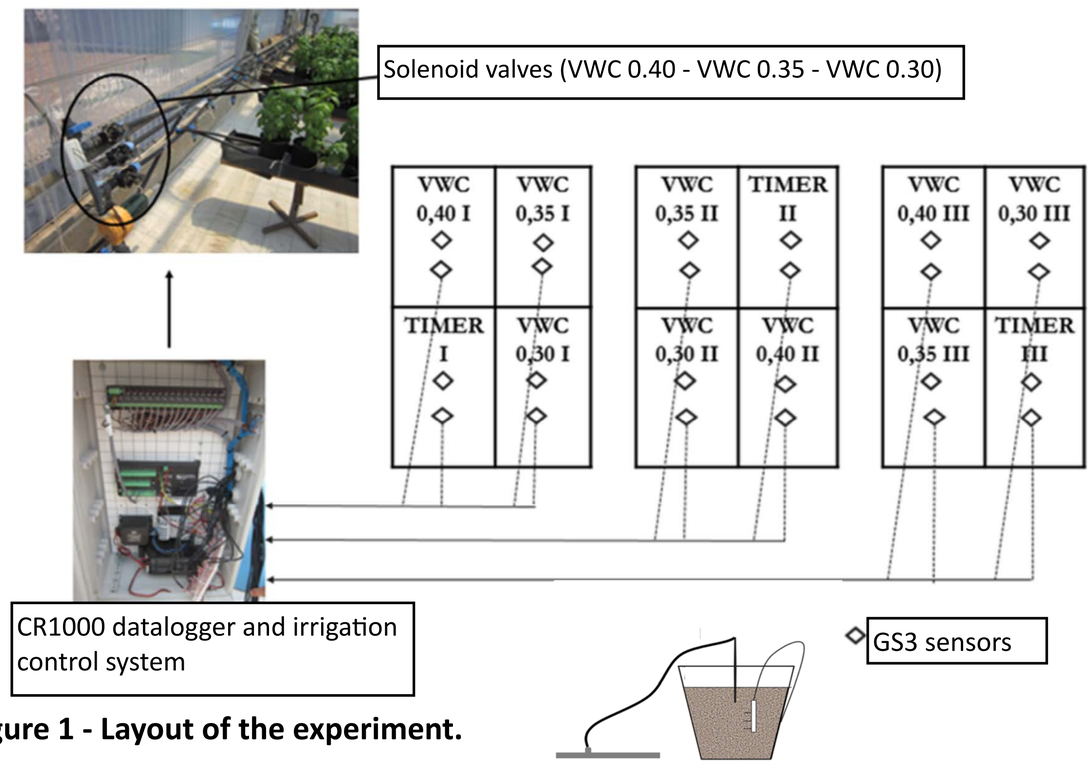

Figure 1 - Layout of the experiment.

Results

Compared to timer, **sensor-based irrigation management led to significant water savings**, ranging from 39% in the case of 'VWC 0.40' to 45% in 'VWC 0.35' and 'VWC 0.30', due to **optimal leaching control** achieved with sensors (Figure 3), and **higher water use efficiency** (18.7, on average, compared to 8.6 g L^{-1} in 'Timer'). **No differences were observed among treatments in terms of leaf area, fresh and dry weight, root-system growth and gas exchanges**, while a slight decreasing trend of leaf water potential was observed at lower moisture levels. According to a **panel test, the application of the lowest irrigation set-points ameliorated the odour of basil leaves** (Figure 4).

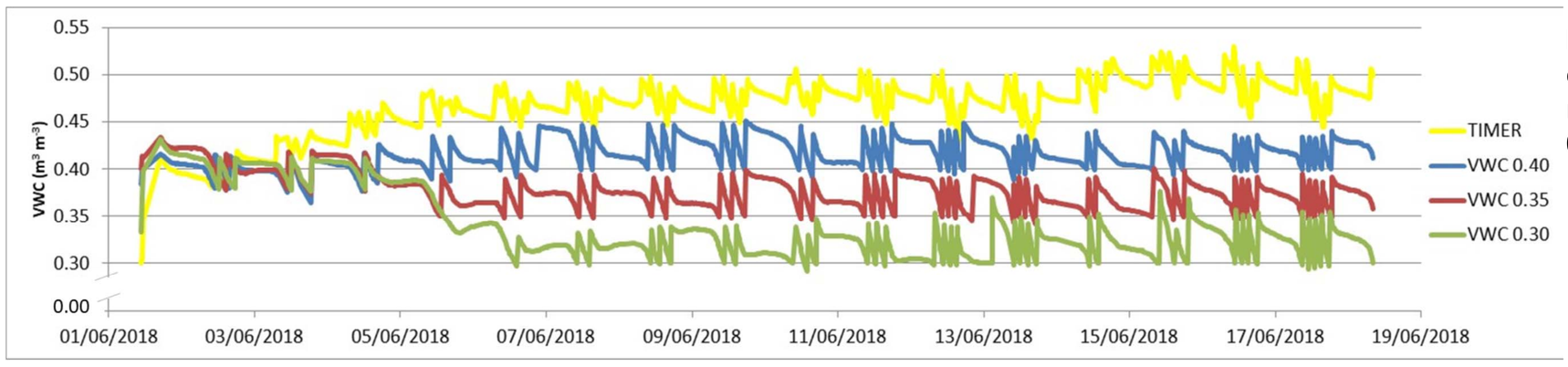

Figure 2 - Substrate VWC trend over the growing cycle of soilless basil subjected to timer- or sensor-based irrigation (set-points in sensor-based treatments: 0.40, 0.35 and 0.30 m^3 m^{-3}).

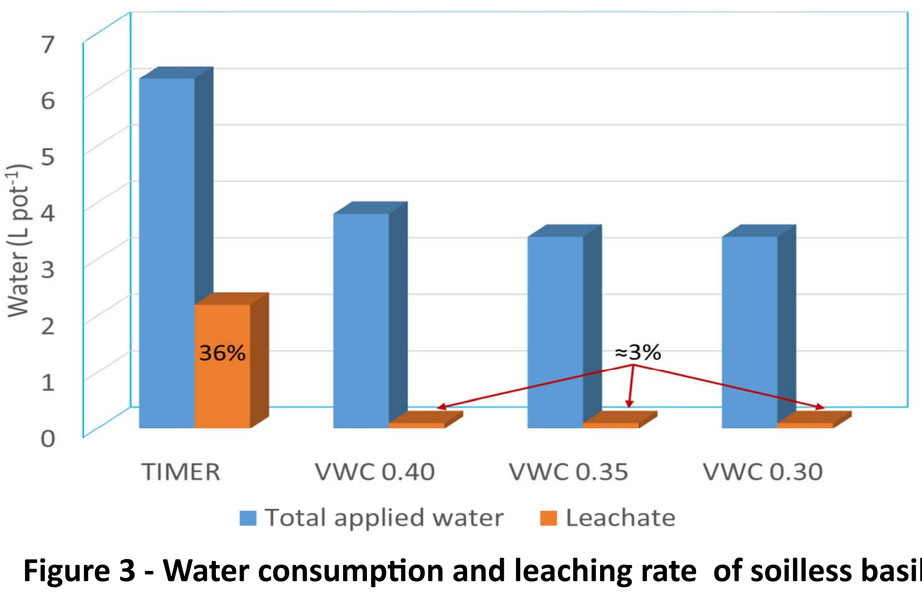

Figure 3 - Water consumption and leaching rate of soilless basil.

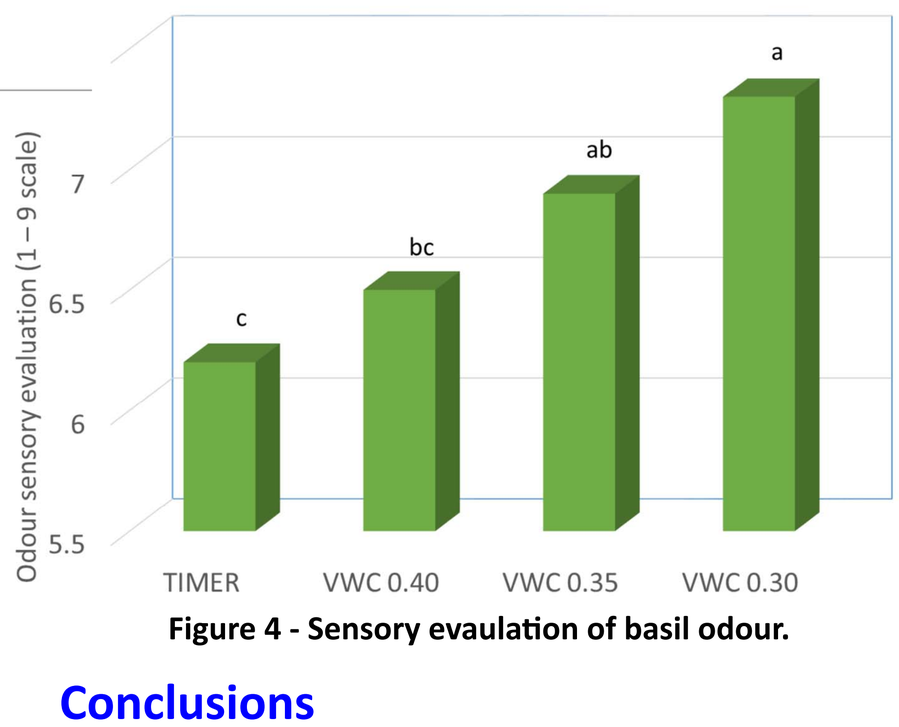

Figure 4 - Sensory evaulation of basil odour.

Conclusions

Substrate moisture sensors can be used to improve water use and product quality of soilless greenhouse basil.

Interreg Greece-Italy IR2MA European Regional Development Fund — EUROPEAN UNION

https://www.interregir2ma.eu

This work has been delivered in the framework of IR2MA project (Subsidy Contract No: I1/2.3/27) which is co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy