

Innovative water and fertilizers management in horticulture: preliminary tests on a new super absorbent polymer

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Agricultural consumption of available fresh water is variable depending on the level of development of the country: it is around 40% for high-income countries and can reach 90% for developing countries. The sustainability of available fresh water is threatened by the competition due to other uses of water (domestic and industrial). In order to reduce the use of available fresh water in agriculture, an innovative management of water resources based on polymers (called also hydrogels/super absorbent polymers (SAP)) is merging for horticultural crops. The water is retained by the hydrogel thanks to interactions of an electrostatic nature and forces of an osmotic nature. The effectiveness of a commercial potassium polyacrylate-based hydrogel called PolyGreen® (PG; contains also small doses of fertilizer) was tested in this study. Two pot experiments were carried out in the greenhouse at the University of Padova (Legnaro 45°20'43N, 11°57'30"E). The objective of the first pot experiment was to analyze the physical absorption characteristics and the chemical nutrients release of the PG in two soil granulometry (coarse and fine sand) during 17 days (8 sampling dates (SD)). Then, for the second pot experiment, the effect of PG was tested on chicory catalonia (*Cichorium intybus* Var. Katrina) in a loamy-silty soil. For both experiments, 0.5 g of PG of different doses of fertilizer (0% (without fertilizer), 1%, 3% and 5%) were added to the pots and compared to a control treatment (pots without PG). The results of the first experiment showed a significant interaction in evaporated water between sand and PG factors for all SD. However, the significant interaction in retained water between the same factors was observed only starting from the fourth SD. Assessment of chemical nutrients release demonstrated a significant interaction between the sand and PG factors on nitrate in all SD (except SD 6). The results of the second experiment showed a significant difference in plant height between PG 3% treatment and control treatment from the 21st to the 35th day after transplant and between PG 5% treatment and control treatment from the 35th to the 49th day after transplant. A significant difference was identified, only in the 21st day after transplant, between PG 1% treatment from one side and PG 3% and 5% treatments from another side. At the end of the experiment, no significant difference was found between all treatments on total aerial biomass but results of dry matter revealed a significant difference between PG 5% treatment and control treatment. A significant difference was found between control treatment and PG 5% treatment in total antioxidant capacity and total polyphenols.

Keywords: *Cichorium intybus*, super absorbent polymers, fertilizers, pot experiment, biomass.