Biodegradable Hydrogels: A Measure of Effective Water Conservation in Agricultural Applications, Year 2

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A significant amount of the world's water supply is used in agriculture, and many countries around the globe are experiencing severe water scarcity. Much of that water can be saved by utilizing hydrogels, which can absorb water and release it relative to plants' needs. Previous research indicates that certain biodegradable hydrogels made from citric acid, hydroxyethyl cellulose, carboxymethyl cellulose, and acid whey have high absorbance capacities, while being environmentally friendly, inexpensive, and nutrient-releasing. However, the applications of these hydrogels on water sensitive crops like Lactuca sativa and their effect on soil quality still needed to be investigated. In this study, a factorial experimental design was conducted to measure the effects of watering frequency and the presence of acid whey-based biodegradable hydrogels on the development of L. sativa and soil quality long-term. Growth, biomass, chlorophyll content, protein concentration, germination rate, and stomata content quantified development while soil nitrite content, pH, rate of hydrogel degradation, and hydrogel reswelling kinetics quantified soil quality. Data was analyzed using two-way analyses of variance to determine statistical significance. Visual results indicate that the hydrogels prevented L. sativa plants from excessive wilting in reduced irrigation and bolting in regular irrigation. The hydrogels successfully increased soil microbe respiration levels, significantly increased the number of L. sativa leaves, and consistently held similar amounts of water after being reswelled. Further research is necessary to accurately quantify soil nitrate and phosphorus content as a result of hydrogel application, as well as its effect on nutrient leaching.

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