Superabsorbent Hydrogels for Water Conservation and Plant Growth

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Biomass waste is underutilized and frequently burned, used for electricity generation, or left to dispose of itself. This research was conducted to evaluate the potential of a value-added product derived from Energy cane bagasse (biomass waste) as superabsorbent cellulosic microfiber hydrogels (SCMH) for water conservation and plant growth. Most of the superabsorbent hydrogels available in the market are synthetic and are not biodegradable and can remain in the soil for a longer duration. SCMHs are biodegradable and will not pose environmental concerns. Super absorbent hydrogels are known to enhance water use efficiency, decrease irrigation cost, increase irrigation intervals, and increase soil's water-holding capacity and soil porosity. Chilli pepper (Capsicum annum) plants were raised in pots using Promix®. Commercial polyacrylamide and two variants of SCMH (35% and 40%) were tested at four different concentrations by mixing them in the Promix® by weight (0, 0.5, 1.0, and 2.0 gram/gram). The observations were made for 16 days for soil water loss, and plant growth parameters (plant height, leaf number, and root-shoot ratio) without supplementing additional water. Also, measured water retention values (180 min) and reswelling kinetics (10-240 min) of hydrogels for comparisons. The results showed that waste biomass-derived SCMH has similar properties as synthetic ones. The two variants of SCMH had comparable performance across the concentrations tested. Pots with a higher concentration of amended hydrogels showed higher plant growth. This research establishes the potential of SCMH in water conservation and enhanced plant growth.

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