Soil Remediation through the Use of Nutrient-Based Nanocomposite Hydrogels

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The growth in land development has resulted to a loss of arable land for crop production. The remaining unused marginal lands are low in productivity and can’t be utilized to produce food to feed the world’s rapidly growing population. The study aims to solve the marginal land problem by examining the effect nutrient-based superabsorbent nanocomposite hydrogels has on soil characteristics. In turn, these characteristics affect crop yield and productivity. Hydrogels have a cross-linked structure that accounts for its ability to absorb 500 times its weight. They also have a high swelling rate, swelling capacity, and porosity which improves soil characteristics. In the study, superabsorbent nanocomposite hydrogel was synthesized and applied to six different groups that contained sandy soil, potting and regular soil, or potting and regular soil and sand. Wheat and Wisconsin Fast Plants were grown in these soils to observe the effects the hydrogel had on plant growth and seed germination. The pH, nitrogen, phosphorus, potassium levels improved in groups where hydrogel was applied. The average number of wheat seeds germinated increased by 25% and average Wisconsin Fast Plant seed germination increased by 20%. Shoot length for wheat and Wisconsin Fast plants also increased by a similar magnitude for groups applied with hydrogel. Water retention characteristics including hydraulic conductivity and water absorbency also improved. The improvements in soil characteristics and crop productivity observed in this experiment can lead to the use of superabsorbent nanocomposite hydrogels to increase marginal land productivity and crop yield in third world countries where optimal farming conditions aren't affordable or for general use on marginal lands.

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