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Natural hydrogel based novel seed technology for climate resilient agriculture

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Natural gums are biopolymers produced by algal (alginate), plant (pectin), microbial (dextran) and animal (chitosan); their useful properties of non-toxic, high swelling ability, stability in wide pH-temperatures, biodegradability, biocompatibility, low cost, etc., makes them versatile natural hydrogels for biomedical (drug delivery, etc.) and agricultural uses against sub-optimal moisture stresses in semiarid and rainfed ecology. The major Earth landmass conducive for agriculture is under abiotic stresses (drought, salinity and temperature) which likely to increase due to land degradation, urbanization and climate change. While, 'Green Revolution' ensured global food security, however increased consumption of chemical fertilizers, pesticides, herbicides in the ground water which degraded the environment seriously whereas, aerobic agriculture suffered with low productivity due to poor seed germination, seedlings-plant growth, dry-matter accumulation, etc. Hydrogels are known for mitigation of moisture stresses, but synthetic hydrogels introduced for agricultural purposes has not become popular due to their prohibitive cost, poor delivery system to root zones and environmental concerns as these contain polyvinyl alcohols or polyacrylamides which are considered carcinogenic and non-biodegradable. To make efficient use of hydrogel in agriculture, Lather (2015) identified the cost effective natural hydrogels and developed farmer's friendly herbal hydrogel coated seed technology (HHCST) for climate resilience agriculture by using natural gums which are consumed as human food since ages e.g. Gum tragacanth (E413), Gum Sterculia (E416) and Xanthan gum (E415), etc. Natural hydrogels coated seed delayed the wilting-mortality of seedling by saving irrigations water and allow the delay of first irrigation which in combination with pre-emergence application of herbicides Pendimethalin proved as game changer technology for effective weeds control including noxious Phalaris minor in wheat, DSR (direct seeded rice) and other crops. With adoption of natural hydrogel based novel seed technology, the water and energy consumption reduced by half at reduced cultivation cost with significant environmental gains and less incidence of pests-diseases. The farmers showed keen interest in novel seed technology by planting thousands hectares of DSR-paddy, wheat and other crops by proving that if technology is beneficial, there is no need for government subsidy regimes, which is prevalent now in various countries.

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