A semi-synthetic superabsorbent polymer based on starch for water conservation

Key characteristics

- Uses cassava starch backbone (other starches can also be used, but absorbency may vary)
- Contains no detectable level of the monomer, acrylamide.
- Absorbency ranges from 400-425 g/g of the dry sample
- Application rate: 0.5% based on soil weight in pots.
- Maintains about 40-50% of absorbency even after 4-5 cycles of swelling-deswelling-reswelling.
- Improves physical properties of soil such as porosity, water holding capacity, and electrical conductivity.
- Improved soil nutrient and organic carbon status.
- Improvement in soil microflora.
- Reduces watering interval of plants, especially in pots.
- Suitable for cultivation of medicinal plants, garden plants etc and application in nurseries.

Salient features of cassava starch based superabsorbent polymer

Colour	White
Form	Granules
Odor	Odorless
pH	6.9 ± 0.5
Solubility in water	Insoluble (swells in water)
Absorbency (g kg^{-1})	42500
Nature	Partially hygroscopic

Superabsorbent polymers (SAPs) are hydrophilic compounds that can absorb, swell and retain considerable amount of fluids within their network structure. Because of the unique properties, SAPs possess novel applications in various fields including chemical, petroleum, construction, medicine and sanitation, agriculture and horticulture. Due to the widespread application of SAPs, especially in personal hygiene products and agriculture, the use of synthetic polymers for the synthesis of SAPs has raised concerns. The extensive use of these polymers may cause serious environmental and economic problems in future. Hence global decision supports the replacement of synthetic materials with one or more economical and environmental friendly substitutes. In this context, starch based hydrogels are particularly important due to their increased biodegradability, biocompatibility, good water absorbing ability and reduced toxicity. Replacement of at least some portions of synthetic polymer by starch promotes the biodegradation of these polymers.

The pilot study indicated that application of superabsorbent hydrogel can result in better plant establishment and plant growth through improvement in nutrient availability including increased moisture retention especially under the prevailing situation of reduced moisture availability due to global climate change. Hence, this polymer can be recommended for use as a soil additive in tropical and subtropical areas for water conservation. In addition, this can be used to reduce the watering frequency in nurseries and pots.