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Preparation of guar gum hydrogels

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Introduction: Hydrogels have existed for more than half century, they are unique, consist of a self-supporting, water-swollen three-dimensional (3D) viscoelastic network which permits the diffusion and attachment of molecules (1). Hydrogels are more elastic and stronger, and they are easy to modify. Despite of the vast importance of green chemistry, synthesis and characterization, natural biopolymers eliminate the danger to health and environment (2). Polysaccharides are widely spread biopolymers with diversity of structure and properties. Guar gum is a natural polymer, which can easily form hydrogels. Guar gum hydrogels are biocompatible, biodegradable in order to make it applicable in biomedical field. It consists of a linear backbone of $\beta(1-4)$ -linked D-mannopyranose units (Man) and with the presence of randomly attached $\alpha(1-6)$ -linked galactopyranose units as side chains. The present study deals with the gelation of guar gum natural polymer in presence of different cross-linkers.

Methods: In the present study focus on the preparation of Guar gum hydrogels with different cross linkers, namely Borax and Epichlorohydrin. The effect of Guar gum and borax on gelation is studied by varying the concentration of both: the polymer and the cross-linker. The dry guar gum gels were prepared using epichlorohydrin cross-linker. Further its preliminary swelling studies in water is studied and shows a good swelling property. Polyvinyl alcohol blend with Guar gum and poured into petri dishes and evaporated water to prepare films.

Results & Discussions: Both the crosslinkers *ie.*, Borax and epichlorohydrin showed good results towards gelation. It was observed that with the increasing concentration of Borax thickness of the gel is increasing and it decaying slowly. Dry gels prepared by epichlorohydrin and then studied the swelling property. These dry gels showed a good swelling property. Films were prepared by different concentrations of PVA-blend-guar gum and the self-supporting transparent films were formed.



Figure 1: Guar gum hydrogels and Guargum-PVA film

Conclusions: Guar gum is a neutral galactomannan, extracted from the seeds of *Cyamopsis tetragonoloba*. It is very cheap, produced in abundance, and easily. Guar gum hydrogels were prepared by using different cross-linkers. Guar based self supporting films were prepared by mixing different concentrations of Guar gum solution with PVA, a low toxic biocompatible polymer.

Key words: Hydrogel, Guar gum

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