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Design and Preparation of Guar Gum Nano Particles Based on Emulsification Technique

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Abstract : The guar gum Nano particles play vital role in the targeted drug delivery. The guar gum Nano particles are widely used in various industrial applications like food, paper, textile, petroleum, and pharmaceuticals. NPs are low-cost, non-toxic, biodegradable, amenable, biocompatible, and to chemical modifications. The properties of NPsthat make a perfect solid for mounting drug delivery interpretations. This paper describes the design and preparation of guar gum Nano particles based on emulsification cross linked technique. This technique contains three steps. First is to find whether given liquid contains nanoparticles or not. Second is to measure the size of the different nanoparticles. Third is to design the guar gum Nano particles. This technique produces the better results in the case of overlapping and noisy Nano particles. The experimental results have been presented in the form of tables and graphs.
Keywords : guargum, span80, glutaraldehyde, HPLC water and glycerol.

1. Introduction

The word guar gum is derived from Sanskrit word gaw-ahar, which suggests that it is food for cattles. It has been commercialized in 1953. Since then its rapid growth in the bazaar is due to the fact that guar gum functions not only in the traditional role of a viscosity builder for water systems, but also as a hydrogen bonding reagent type chemical for use in such industries such as mining and papermaking.In [1] Apart from this it is also used as a binder in tablet making and as a colloidal agent in water emulsions. Chemically the gum is non-ionic, neutral polysaccharide and is a polygalactomannan. The massive status of green chemistry synthasization and categorisation of natural biopolymers which excludes the risk to strength and environment [2].Guar gum is an owing representative of eco-friendly, green, bio polymers. Various techniquesare used to enhance guar gum, to change, differentiates its properties and applications [3].

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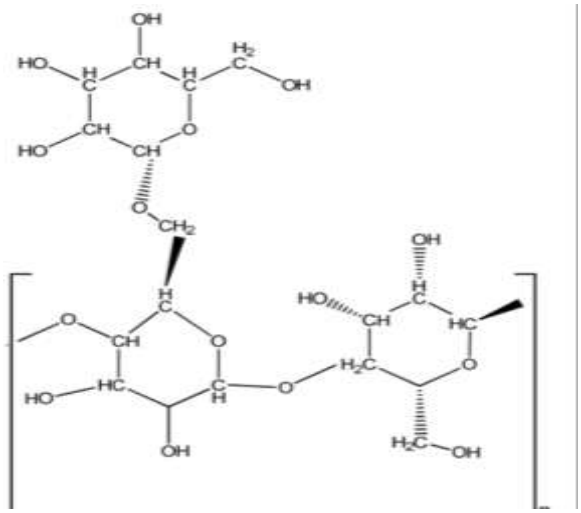


Fig 1: Guar gum structure

Mostly Guar gum contains high molecular weight polysaccharides. These polysaccharides serene of galactomannans which contains a linear series with 1 to 4 relates β-D mannopyranosyl units and 1->6 relatesα−*D*-galactopyranosyl remains as cross chains. The galactosemannos percentage is nearly1:2, varies from 1.8:1to 1.5:1 based on climatic deviations[4]. The range of molecular weight is 50,000-8,000,000.GGis derived from guar plant ground endosperm seed of the. Guargum also called guar flour or Gum cyamopsisor Cyamopsis, tetragonalobaTaub. In[5]GGplant has been cultured inPakistan & India for centuries. It can also becultured in Australia, South Africa, USA, Brazil and Arizona. This Guar seed composed of 43 - 47% germ, 27 to 30% endosperm,30 to 33% hull. Guarmealis a combination of hull and germ of the guar seed. Th ehull and germ of the guar seeds are called.

It is used for the cattle feed because of Guarmeal is rich in protein. The seed has poisonous effect but newly cutting-edge study has been prepared on the seed to decreases its poisonous outcome and to make it proper for animal feeding as a annoying source of proteins. Guar seed contains endosperm and it is converted into powder gum. It has acetone insoluble solids of the seed and 41% dry weight. The guargum pick remains assimilated an profitable prominence later the detection of the sticky substance in its endosperm [6].The Guar gum further purified and clarified by suspension in water, precipitation and retrieve with isopropanol or ethanol named assimplified guar gum. Simplified Guar gum in the souk is identical with sugars. The Simplified Guar gum has greatergalactomannans and no longer holds the cell structure. In [7]Guargum is yellowish white colour, free-fluid precipitate and nearly odourless and flavourless. In organic solvents Guar gum is unsolvable nature.In[8] Guargum is resolvable in cool water without warming to form a vastly sticky solution. Guar gum results have buffering capacity and stable in the pH 4-10.5. Emulsification technique (O/W)

2. Emulsification Technique

The Emulsification technique is a process of two are more liquid phases contains fine droplets of another liquid without forming solution. The Emulsification technique contains three steps.

Step1:

In this step Dynamic Light Scattering Technology is described to find whether it is nano particle or not. In this process, the Particle dimensions can be resolute by determining the casual changes in the intensity of light.[8] The DLS is mainly based on the mining of spectral data derived from timing fluctuations of the light. When a postponement of particles is hit by a monochromatic coherent beam of light, generated scattered light waves spread out in all directions. Due to the random motion of the suspended particles within the sample the interference can be stochastically either constructive or destructive, hence resulting in a stochastic light intensity signal. The adjourned particles of the colloidal dispersion under investigation undertake Brownian motion. This motion results in variations of the distances between the particles and hence also in fluctuations of the phase relates the scattered light. The no of particles inside the sprinkling volume may differ in time. In this size regime and the purposes of dimension measurement the distinction amongst a molecules and a particles and

even a second liquid phase becomes blurred. DLS also used as probe of complex fluids such as concentrated solutions like guargum Nanoparticles.The equation is given below used for analysization of particle size.

$$D_h = \frac{K_B T}{3\pi\eta D_t}$$

Where

- Hydrodynamic diameter - D_h
- The translational diffusion coefficient D_t
- Boltzmann's constant - K_B
- Thermodynamic temperature is T
- dynamic viscosity is η

Here the sample temperature is important, and it acts directly in the equation. Viscosity is a hard function of temperature. The particle size is determined by DLS .The determined particle size is the size of a sphere that distributes the way as your unit.

Step2:

It describes the images of TEM.TEM stands for Transmission Electron Microscope. TEM is most dominant microscope to produce 2D images with high resolution.TEM allows wide range of applications like educational, medical, science and industry.

Tem Images:

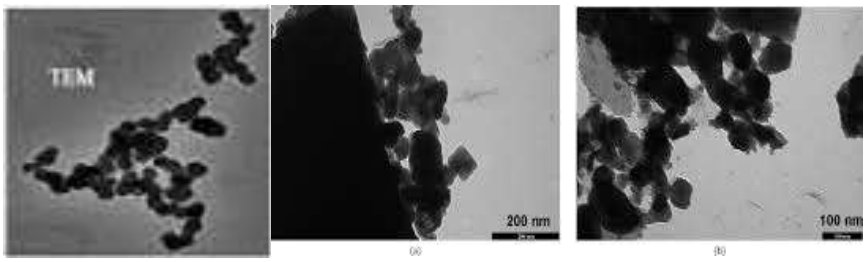


Fig 2: TEM Images of Guar gum Nano particles

TEM produces a black and white images with high-resolution. In these images the interaction takes place between energetic electrons and prepared samples in vacuum space. Air is removed from the vacuum chamber, it creates a space where the electrons are capable to move. Then the electrons passes through the various electromagnetic lenses. The solenoid tubes with coil bound around them. Beamis passed through the solenoid tubes and down the column the electrons are converted to light then image is formed. The image can be deployed by changing the voltage of the gun to reduce the quickness of electrons and change the wavelength of electromagnetic via the solenoid tubes. The coils focus an images onto a graphic plate. During transmission, electron wavelength and speed of electrons are directly correlates to each other. The electrons hasshorter wavelength and moves fast with high quality image. The brighter areas of the image denotes the number of electrons pass through the sample and the shadier areas denotes the dense parts of the object. These changes provide data on the shape, size, structure and texture, of the sample. To find the analysis of TEM, samples have some properties. Here the electron having the nature of electron transparency. Preparation of TEM includes cryofixation, dehydration, staining and sectioning of Guar gum Nanoparticles. TEMs offer morphological, topographical, crystalline and compositional information. TEM images allows researchers to analyse texture and structure of samples. This data is suitable in the study of metals, and crystals but also in industrial applications. TEM is used in production, semiconductor analysis, silicon chips. TEM provides compound structure Images and valuable information with high-quality images.

Step 3:

Emulsification technique is useful to designing and preparation of Guar gum Nanoparticles. Emulsification technique is shown in fig:3.

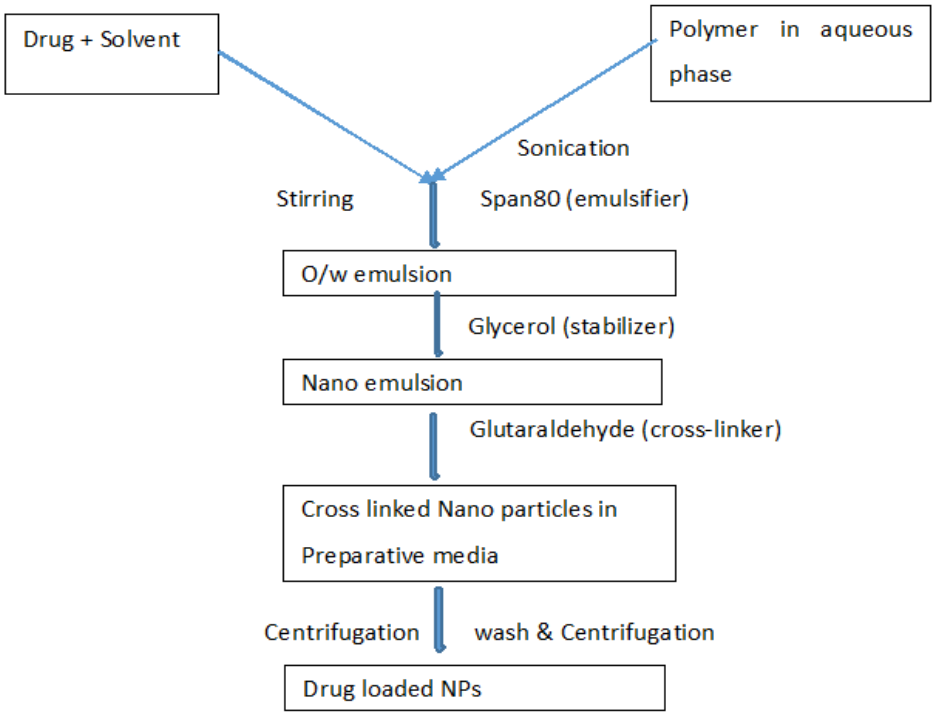
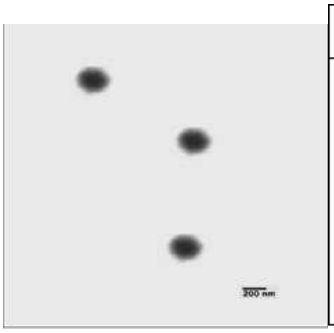


Fig: 3 Schematic representation of nanoparticle preparation.

The preparation of Guar gum Nano particle were done by using oil and water emulsification. Polymer Cross linking method with 10 ml of water is added to 4 to 5 mg of Span 80 under magnetic stirring. Here water acts as solvent. The oil phase was added to 0.5 mg Guar gum solution in continuous magnetic stirring. After shared saturation of the oil under the constant phase, the mixture was quickly stirred under very high rpm. 25% Glutaraldehyde and Glycerol was added then it creates crosslinking. This mixture can be kept overnight for formation of nanoparticle. Nanoparticles were achieved after centrifugation at 0^0Cat 20,000 rpm for 30 minutes, lapped with 10ML HPLC distilled water and centrifuged. The generated nanoparticles were harvested in micro centrifugal tubes and conserved in vacuum desiccator.

3. Experimental results

Mean particles diameter of Nano particles was measured by DLS method (malvernS80, UK). The range of measuring values from 1 nm to 5µ, and the source of light was 650 nm, 5mW Laser diode is used. Sample of 15.0 mL aqueous colloidal distributions calculated directly without any preliminary-treatment. Here Particle size was expressed in terms of weighted mean diameter in nanometres and it was attained from the amounts of three sets of nanoparticles.



	Ingredients	Amount
Oil phase	Solvent(water)	10ml
Aqueous phase	Span80	3-4 mg
	Millipore water	30ml approx
	Guar gum	Variables
		0.3,0.4,0.5,1,1.5,2(%w/v)

*Stabilizer concentration were varied from 10 to 20 mL

* Glutaraldehyde concentration were varied from 0.3 to 2 mL (25% solution)

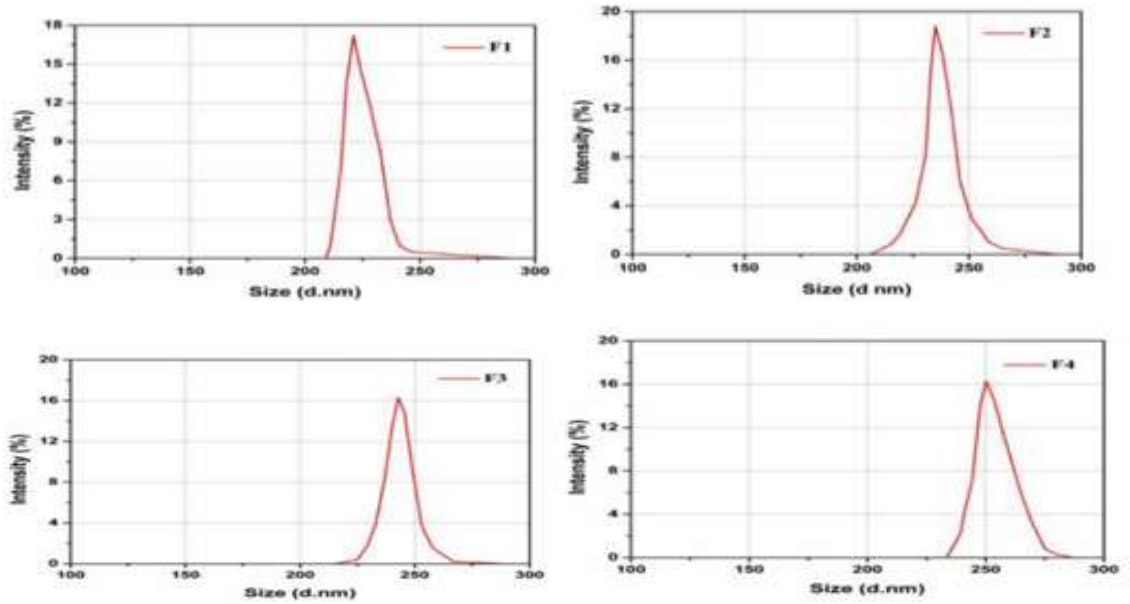


Fig. 4: GG NPS spectra for different concentration formulations (F1, F2, F3 and F4)

4. Conclusion:

DLS is used to monitor the colloidal solidity of the guar gum nanoparticles and hydrodynamic size either an isotropic or spherical structures. DLS analyzation method cannot be employed uniquely to give reactions on the structural information. DLS offers statistical descriptive data about the hydrodynamic size of guar gum nanoparticles.DLS provides valuable information regarding the kinetics of the aggregation process and, at the same time, gives quantitative measurement on the size of the particle clusters formed. DLS can be a powerful technique to search the layer width of the macromolecules adsorbed onto the MNP. The clarification of DLS data includes the interchange of a few parameters, namely size, shape, concentration, surface properties and polydispersity of the MNPs complicated; hence, wary analysis is desirable to extract the accurate information

5. References

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