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Purification, Characterization and Evaluation of Babool Gum as Pharmaceutical Excipients

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Abstract: ***Natural polymers have been widely used pharmaceutical formulations. In present investigation Gum was purified from crude babool gum (Acacia nilotica) and further characterized to be used as a pharmaceutical excipient. A water based isolation and purification and characterization of babool gum was done. Characterization was based on various parameters such as test for carbohydrates, test for purity, organoleptic properties, ash value, solubility behavior, pH, swelling index, surface tension, viscosity, particle size, bulk density, tapped density, bulkiness, powder flow behavior, etc. Results showed that polymer is white in colour with pH 6.8. Bulk density, tapped density, carr's index and angle of repose were found to be 0.631±0.01(cm^3/g), 0.91±0.01(g/cm^3), 30.51(%), 74±0.74(°) respectively. The isolated polymer can be used as a pharmaceutical excipient in different pharmaceutical dosages forms.***

Keywords: Pharmaceutical excipients, babool gum, Binding agent, Natural polymer, mucoadhesive

1. Introduction

Gum is widely used in the adjuvant in pharmaceutical preparations and dosage form. Babool gum *(Acacia nilotica)* are pharmaceutically important polysaccharide with wide range of applications such as thickening gelling agent, binding agent, disintegrating agent, suspending agent, emulsifying agent, stabilizing and gel formtion agents. It is used as matrices for sustained and controlled release dosage forms. Natural gums are obtained from natural a source that is plant and animal species. Naturally available gums are also known as natural materials. Natural gums are the non toxic, cheap, easily available, emollient and non irritating in nature, stable in nature [1]. Gum acacia, babool gum, agar gum, tragacanth, gum ghati, gum karaya, sodium alginate, kheri gum, locust bean gum are the popular examples of plant mucilages.

Present paper deals with isolation, purification and characterization and evaluation of binding properties of babool gum. As a dose formulators essential to develop very low cost and less tedious procedures for preparation of sustained and controlled release formulations on the pharmaceutical industrial scale. [2].

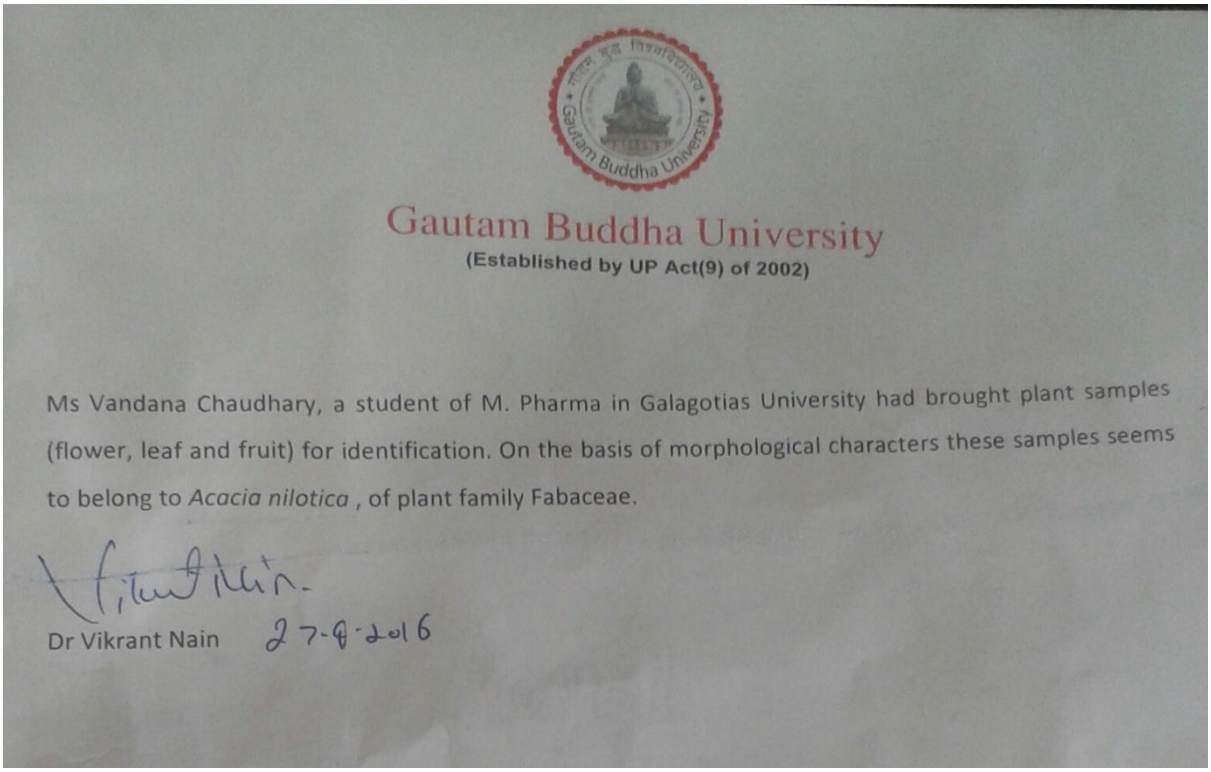
Now a day's many research are doing for the use of natural polymers occurring biocompatible polymer material in fabricated of pharmaceuticals dosage form for oral and transdermal and others controlled release administration. Mostly natural gums are biodegradable and nontoxic, non irritable of mucous membrane which disintegrate and swell on contact with aqueous media, so these have been used for the formulation of pharmaceutical dosage forms [2]. Monosaccharide and polysaccharides obtained from plants, has been shown to be useful for the development of drug delivery systems. Many researches is doing on in field of use of natural occurring biocompatible polymeric material in designing of dosage form for oral controlled and sustained release administration. Natural gums are biodegradable and nontoxic in nature it is disintegrate and swell on contact aqueous media, and these have been used for the preparation of dosage form [3].

Natural plants are playing a major role in pharmaceutical excipients. These are easily available, biodegradable and having cheap in nature. Bio-compatibility of these natural polymers promotes their use as in pharmaceutical formulations [4].

2. Materials and Methods

Crude babool gum was obtained from the plant situated in university by making incision on the bark of plant gum extrudes out and was kept under sunlight for two months for variably drying and then gum (material) was collected by shedding them from the bark. Plant leaves and bark was identified and authenticated by Dr. Vikrant Nain, Department of Biotechnology, Gautam Buddha University (State Govt. University) Greater Noida.

Babool gum was dried in hot air oven and temperature was maintaining 50ºC. After drying of gum than purification procedure start. So water is boiled at temperature 100°C for 2 hrs. Than Gum was mix above water and boiled for 4 hrs and kept aside for 1 hrs for fully dissolve of gum into water. The material was squeezed in a muslin cloth to remove the impurities. Than above solution make thick slurry by the boilation. This slurry kept in refrigerator for 2-3 hrs after that 40 ml volume of Ethyl alcohol was added to filtrate to precipitate the gum. Precipitated gum was filtered, dried in oven at about 40°C. After complete drying, powder was passed through sieve # 20. The powdered gum was stored in air tight container [5].



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Ms Vandana Chaudhary, a student of M. Pharma in Galagotias University had brought plant samples (flower, leaf and fruit) for identification. On the basis of morphological characters these samples seems to belong to *Acacia nilotica* , of plant family Fabaceae.

Dr Vikrant Nain 27-9-2016

Authentication of babool plant parts

Physicochemical Characterization of Purified Mucilage:
Identification tests for carbohydrates, proteins, fat, mucilage and gums: 1% aqueous solution of purifiedbabool gum was used for chemical tests.Test for carbohydrates, proteins, mucilage, alkaloids,fats, amino acids, and gums were performingaccording to the standard procedure [6].

Organoleptic Evaluation of purified gum: The purified gum was characterized for organoleptic properties that is color, odor, taste, fracture and texture were tested [6].

Solubility Behavior of gum: One part of dry babool gum powder was shaken with different solvents and further solubility was determined [6].

pH of Gum: Babool gum was accurate weighed and fully dissolved in water and make 1%w/v solution. The pH of solution was determined using digital pH meter [6].

Swelling Index of Isolated gum: Swelling index of babool gum powder was calculated. Firstly take butter paper of size 2.2 cm. Then butter paper was dipped in a petridish contain 15 ml of water. 0.1 gm of the powdered sample and it is kept in a butter paper placed in a petridish and the swelling index was taken defferent interval. First time 5, 10, 30, 60, 120 minutes. this procedure was repeated three times and mean value calculated [6].

Evaluation of Babool Gum Powder:
Evaluation of powder: Powdered gum was evaluated for following parameters

Bulk Density and Bulkiness: The inverse of bulk density is known as the bulkiness. Accurately weighed quantity of (20g) babool gum powder was introduced into a calibrated measuring cylinder. The cylinder was kept in the bulk density apparatus and the volume of occupied powder was noted.
Then, the powder to tapping in a bulk density apparatus until constant volume was obtained. The final obtained volume (bulk volume) was noted [7].

Powder Flow Property: The flow characteristics of babool gum powder were measured by angle of repose. This procedure was repeated three times. Using the readings and the formula, the angle of repose was calculated and average value noted [7].

Viscosity of gum: Viscosity of babool gum was measured by the Ostwald' viscometer. Firstly 1% solution of babool gum was prepared and viscosity was determined [8].

Surface tension of gum: Firstly babool gum was weighed and dissolved in distilled water and to get a1% w/v solution of gum. Then viscosity measured by the Stalaglanometer [8].
Particle size analysis: The particle size was determined using microscopy method. Microscopy was done by optical microscope. 150 individual particles were measured and calculated by the standard formula [9].

Ash value: Ash value was calculated. Firstly weighing 2gm of Babool gumpowder in a tared silica crucible. It was then incinerated in a muffle furnace upto 450 °C till the powder completely changes to ash form. Then the crucible was kept in dessicator after complete incineration. Weight of ash was noted and total ash was calculated in terms of percentage as per standard formula [9].

Powder Compressibility: This property is also known as carr index. The fine babool gum powdered (5g) was

transferred into a measuring cylinder and determination were done using bulk density apparatus [10].

IR: Babool gum powder was dried in oven at 70-80 °C for 4 hr and dessicated overnight prior to FTIR analysis. FTIR spectra were recorded at the absorbance mode from 4000 to 667 cm^{1}.The FTIR analysis was done by the ATR, Alpha (Bruker) [9].

SEM analysis: Surface morphology of powdered gum was studied using SEM photographs.

3. Results and Discussion

The pH of babool gumgum (1% solution) was found to be 6.9 ± 0.01. Total ash calculated was 3.11% ± 0.51. Bulk density and tapped density were calculated as 0.631 ± 0.01 g/cm^3 and 0.91 ± 0.01 g/cm^3 respectively. Bulkiness was found to be 1.57 ± 0.15 $cm^{3/}g$. Hausner's ratio and Carr's index calculated were 1.483 ± 0.00 and 30.51 ± 0.00%. Angle of repose of 28.74° ± 0.74 suggested that the powdered gum possess good flow property. The average size of 150 particles calculated was 101.64µm ± 20.75. Surface tension calculated was 89.947 (dyne/cm) $gm\times cm\times sec^{-2}$ ± 1.77 and viscosity was 0.014 (poise) $N\times sec\times m^{-2}$± 0.02. Swelling index of gum was found to be 39.49% ± 1.12 which suggests that the gum has optimum swelling property.

Organoleptic properties of babool gum were observed and were found to be good acceptable property. The colour of powdered gum was white. The odour was odourless and taste was found to be sweet. The fracture was smooth and texture was irregular. Organoleptic properties of babool gum powder found to be acceptable and shown in table 1.

Table 1: Organoleptic properties of babool gum

Colour	Odour	Taste	Fracture	Texture
White	Odourless	Sweet	Smooth	Irregular

After isolating babool gum. It is purifiedby the ethyl alcohol then Phytochemical investigation showed the presence of tannins and glucose while carbohydrates, proteins, fat, volatile oils and polysaccharides were absent. Results after phytochemical test are summarized in table2.

Table 2: Phytochemical tests of gum

Tests	Present/Absent
Carbohydrates	+
Glucose	+
Protein	_
Tannins	_
Fats	_
Polysaccharides (Starch)	_
Volatile oils	_

+ Present; – Absent

Solubility analysis showed that Baboolgum was soluble in hot water, swells and forms a gel with cold water and was insoluble in most of the organic solvents. Solubility profile of gum is shown in table3.

Table 3: Solubility study of babool gum

Solvents	Solubility
Cold water	Swell to form a gel
Hot water	Soluble
Methanol	Insoluble
Ethanol	Insoluble
Diethyl ether	Insoluble
Petroleum ether	Insoluble
Acetone	Insoluble

Surface morphology of babool gum powder studied by SEM at DEPT of nanotechnology, Jamiya Miliya Islamia University (Delhi) and result was found to be smooth surface of babool gum powder so it can be used for pharmaceutical drug delivery system.

Particle size of babool gum was acceptable, it is fine powder. Surfacetension of babool gum powder is good and acceptable.

Figure 2: SEM study of babool gum powder

IR study of babool gum was done. It is shown in Table 4.

Table 4: IR study of babool gum

S. No	Wave number ($cm^{-1)}$	Functional group
1.	1679-1740	COOH(Carboxy)
2.	1916	C=C
3.	2876	CHO
4.	2947	O-H str
5.	3525	O-H

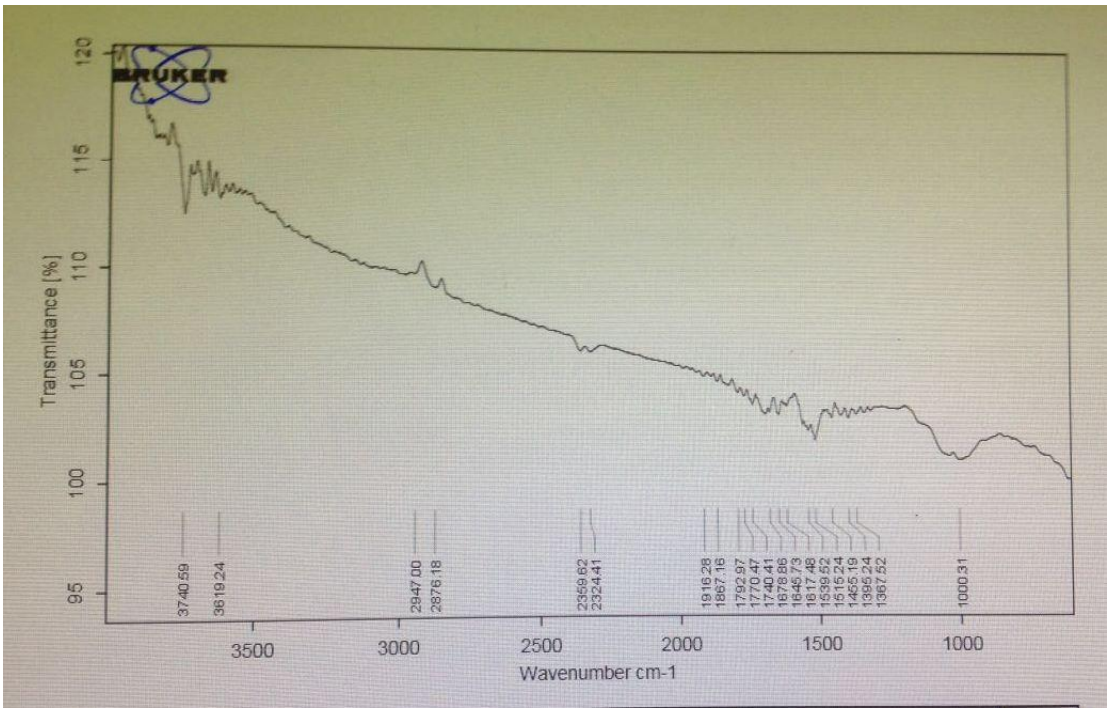

Figure 2: IR study of babool gum powder

4. Conclusion

In this literature survey it can be concluded that the babool gum can be used as pharmaceutical excipient in drug delivery system. Polymer has neutral pH so can be used for oral and transdermal drug delivery. Babool gum has good micromeritics properties and flow behaviour.

5. Acknowledgement

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