

## Research Article

## Extraction of A Novel Seed Gum From A Locally Available Plant and It's Evaluation

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### ABSTRACT

*DelonixRegia* is a local flamboyant tree found allover Maharashtra during rainy season. It is commonly known as Gold mohur (English) and Gulmohar (Marathi), family *Leguminosae*. The legumes bear the seeds.

The present study is an effort to establish *DelonixRegia* seeds as a novel source of gum. *DelonixRegia* seeds are extracted by aqueous extraction and the gum is precipitated by adding excess of semi polar solvent. The seeds were found to yield 15.57% gum (DRSG). The Seed gum so obtained was further evaluated for its chemical and physical nature and properties. The FTIR studies indicate the presence of chemical groups in it and the XRD studies indicate the amorphous nature of the product. The preliminary phyto-chemical studies were carried-out to study the chemical nature of the gum. The results confirm the carbohydrate nature of the gum. The DRSG was also evaluated for physical properties like Swelling index, viscosity, flow properties, Bulk density and tapped density. The results of the study indicate that the *DelonixRegia* seeds yield a substantial amount of gum ( 15.57% ).

The evaluation of chemical and physical properties of DRSG indicate that it can be a useful excipient for many pharmaceutical dosage forms. Thus it is concluded that the seeds of *DelonixRegia* can be used as an alternative source of gum which can be used as an excipient in pharmaceutical formulations.

**Keywords:** Delonixregia seed gum (DRSG), phyto-chemical studies X-ray diffraction(XRD).

### INTRODUCTION

Gums are amorphous, translucent solids which are completely or partially soluble in water to yield adhesive solution or colloidal suspension. Gums are obtained from the plants of number of families but they are chemo-taxonomically more related to *Leguminosae*, *Sterculeaceae*, *Combretaceae*, *Anacardiaceae*, *Rosaceae* and *Rutaceae*.<sup>1</sup>

Gums are conventionally obtained from plant sources by incising stems or branches in the form of exudates. These gums normally contain polysaccharides like glucomannon & galactomannon.<sup>1</sup>

The gum can also be obtained by semi-synthetic and synthetic processes. These gums have wide industrial applications in Pharmaceutical, Polymer, Textile, Rubber, Food and Confectionary industries. In pharmaceutical industry, the gums are widely used as excipient in various dosage-forms. Their applications as tablet binder, disintegrant, rate retention polymer, suspending and emulsifying agent are known examples.<sup>2</sup>

The availability of natural resources for gum is somewhat limited and the synthetic and semi synthetic pathways may produce ecological hazards. The cost involves also needs consideration.

However, plant parts other than the stems and branches may also contain such gums. The possibility of occurrence of gums in seed and fruits is still not explored commercially. The proposed study is an effort to explore the possibility of extracting various seed gums from locally available plant species in order to explore their industrial potential. The present work is designed to identify local plant species having potential gum contents in the seed, establishing methods of their isolation and their chemical characterization in order to utilize the seeds as an alternative source of gum which are otherwise unutilized for this purpose.<sup>3</sup>

*Delonixregia* is a flamboyant tree, its seeds have traveled the world and the species is now common through the tropical cities.<sup>4</sup> It is widely cultivated and may be seen adorning avenues, parks and estates in tropical cities throughout

the world. Planted as avenues in garden and on roads throughout India. It is commonly known as 'Gulmohar' in Hindi and Marathi.<sup>5</sup>

The present study is an effort to establish *DelonixRegia* seeds as a novel source of gum.

### AIMS AND OBJECTIVES

The proposed work is an effort to establish plant seeds as an alternative source of gums. The proposed work is mainly aimed at evaluating the suitability of such seed-gums obtained from locally available plant species as excipient for pharmaceutical dosage forms. It also aims at studying the chemical composition of such gums and their chemical characterization and the possible toxic effects, if any.

The specific objectives of the study may be stated as follows.

1. To identify the potential of *DelonixRegia* seeds as a novel source of gum.
2. To establish method of extraction of the seed gums from *DelonixRegia* seeds.
3. To evaluate the extracted seeds-gum for their suitability as pharmaceutical excipient. This evaluation can be performed by screening the gums for various properties like-
  - a. Solubility
  - b. Viscosity
  - c. Swelling index
  - d. flow properties
  - e. Bulk density and tapped density.

### MATERIALS AND METHODS

The *DelonixRegia* seeds were collected from pods of locally available flamboyant tree. The matured seeds were collected during January and February. The source was duly authenticated by renowned botanist. The seeds were collected from the matured pods and the gums from the seeds was extracted by reported techniques. The gums obtained was precipitated using semi-polar solvents like acetone and alcohol. The solvents reagents and other chemicals were procured from market. All the chemical, solvents and reagent purchased were of analytical grade.<sup>4</sup>

The gum so obtained (DRSG) from the seeds was subsequently evaluated for their suitability as pharmaceutical excipient in various pharmaceutical formulations. The evaluation was based on properties of the seed-gums various physical properties which were screened for the seed-gums are Solubility, Viscosity, Swelling Index, Adhesive Strength, flow properties, bulk and tapped density.<sup>4</sup>

### EXPERIMENTAL

The present study is an effort to establish seeds *DelonixRegia* as an alternative source of gums and their evaluation for suitability as pharmaceutical excipient.

The proposed work was carried out with the following experimental set up based on reported experimental techniques.

#### 1. Literature Survey

The literature survey for the present work was done using the national and international journals, books and e-literature.

#### 2. Identification of local plants containing seed gums

The locally available seeds of *delonixregia* were screened for their gum contents in the seeds.

#### 3. Authentication of plants

The identified plant species was authenticated from Botanist before utilization.

#### 4. Isolation of seeds from the fruits/plants

The seeds of the screened species was isolated as per standard procedure.

#### 5. Preparation of the seeds for further experimentations

The seeds of selected species were prepared for further experimentation by the standard processes such as drying, coarse grinding, size separation etc.

#### 6. Extraction of gum from the seeds

The gum from the isolated seeds, duly prepared was done as per standard reference procedures. The gums was extracted by soaking and boiling the seeds with water and subsequently precipitating the extracted gums with excess of acetone.

#### 7. Study of physicochemical properties of isolated seed gums

The extracted gum was studied for their physico-chemical properties relevant to the specific objectives of the proposed work. Various properties like solubility, viscosity, pH was studied as per standard procedures.

#### 8. Chemical characterization of seed gums

The chemical nature of the gums was studied and confirmed by standard procedures like FTIR spectroscopy, X-ray crystallography and preliminary phyto-chemical investigation was also carried out with the standard chemical tests for the gum.

## RESULTS AND DISCUSSION

The seeds obtained from locally available *DelonixRegia* plant were found to contain substantial amount of gum. The duly processed whole seeds were tried for extraction and the yield was found to be lower than when used in the form of coarse powder. The results are compiled in Fig1A, Fig1B. Hence it was decided to use coarse powder for extraction of the seed gum (DRSG).

DRSG was further evaluated for its chemical and physical nature. The FTIR study was carried-out to study the functional groups present in the gum. The results of the study indicate that functional groups like  $-C=O$ -,  $-CHO$ -,  $-OH$  are present indicating carbohydrate compounds (Fig. 1). The XRD studies were also performed to reveal the physical nature of the compound. The XRD study indicates that the compound is amorphous in nature. (Fig. 2).

The solubility studies were also carried out. The results indicate that the DRSG is insoluble

in acetone and alcohol, dispersed well in water forming a colloidal dispersion. (Table 1).

The physical properties of the gum were also studied and the results indicate that DRSG is free flowing powder having a desirable viscosity. (Table 2)

The preliminary phyto-chemical tests were also carried out and the results confirm the carbohydrate nature of the gum (Table 3).

## CONCLUSION

The results of the present study indicate that *DelonixRegia* yields a substantial amount of gum from its seeds (about 18%) and hence can be established as an alternative source of gums. The physico-chemical properties of DRSG indicate that it can be suitably used as a pharmaceutical excipient.

The present work forms a basis of establishing plant seeds, which are otherwise a forest waste, as an alternative source of gums.



Fig. 1A: Endosperm of DelonixRegia Seed Gum (DRSG)



Fig. 1B: Endosperm of DelonixRegia Seed Polymer Powder (DRSG)

Table 1: Solubility Study of DelonixRegia Seed Gum (DRSG)

Test	Observation
DRSG Polymer+Water	Soluble
DRSG Polymer+Alcohol	Insoluble
DRSG Polymer+Chloroform	Insoluble

Table 2: Physico-chemical parameter of DRSG Polymer

Acid value (Mg of KOH)	2.439
<b>Relative solubility (gm./ml)</b>	
Water	0.834±0.034
Ethanol	0.771±0.021
Chloroform	0.60±0.018
<b>P<sup>H</sup> Buffer</b>	
1.2	5.16±0.8×10 <sup>-3</sup>
4.0	8.2±1.0×10 <sup>-3</sup>
6.9	9.8±1.5×10 <sup>-3</sup>
8.0	12.6±1.7×10 <sup>-3</sup>
Swelling index(%)	126.99±1.18
Viscosity (cps)	128.99 ±1.18
Water retention capacity(ml)	3.6±0.42
Hydration capacity	1.6±0.03
Moisture capacity	1.57±0.52
Angle of repose(°)	34.6
Bulk density(gm/ml)	0.486
Tapped density(gm/ml)	0.521
Hausner ratio	1.2
Carrs index (%)	22.32
Loss on drying	4.9

Table 3: Phytochemical Characterization of DRSG<sup>10</sup>

Test	Observation	Result
<b>Molish test:</b> 100 mg of dried gum/mucilage powder + Molisch's reagent+ concentration H <sub>2</sub> SO <sub>4</sub> on the side of the test tube	Violet color observed at the junction of the two layers	Carbohydrate are present
<b>Ruthenium test:</b> Take a small quantity of dried mucilage/ gum powder, mount it on a slide with ruthenium red solution, and observe it under microscope.	Pink color observed	Mucilage present
<b>Iodine test:</b> 10 mg of mucilage/gum powder add 1 ml 0.2 N iodine solution	No color observed in solution	Polysaccharide present
<b>Enzyme test:</b> Dissolve dried mucilage/gum powder in 20 ml distilled water, add 0.5 ml of benzidine in alcohol.	No blue color produced	Enzyme absent
<b>Fehlings test:</b> Mix 1 ml Fehlings A and 1 ml Fehlings B solutions, boil for 1 min. Add equal volume of test solution. Heat in boiling water bath for 5-10 min.	First yellow and brick red ppt is observed	Reducing sugar is present
Mix equal amount of test solution and HCL. Heat this mix. Add a crystal of Phloroglucinol.	Red colour appears	Pentose sugar present
<b>Tollens test:</b> Mix 2.5 ml of conc. HCL and 4 ml 0.5% phloroglucinol. Add 1-2 ml test solution. Heat the mix.	Yellow to red colour is Appeared	Hexose Sugar present

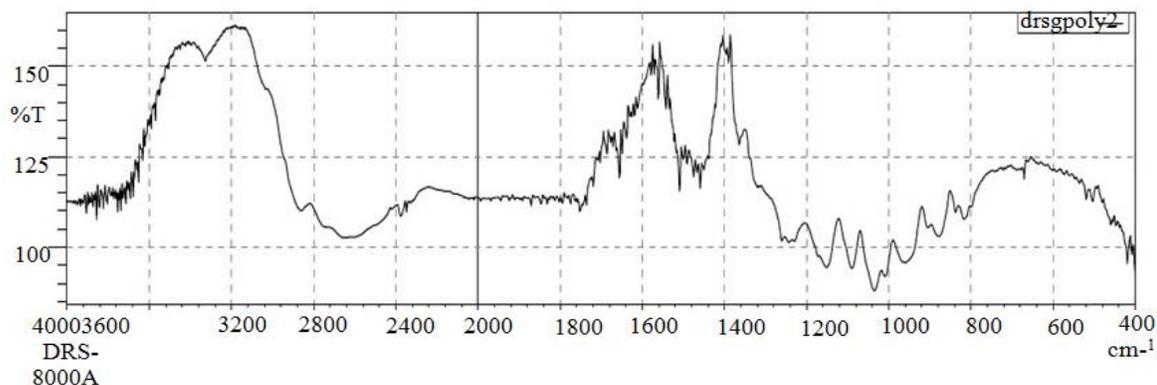


Fig 1: FTIR of DelonixRegia Seed polymer

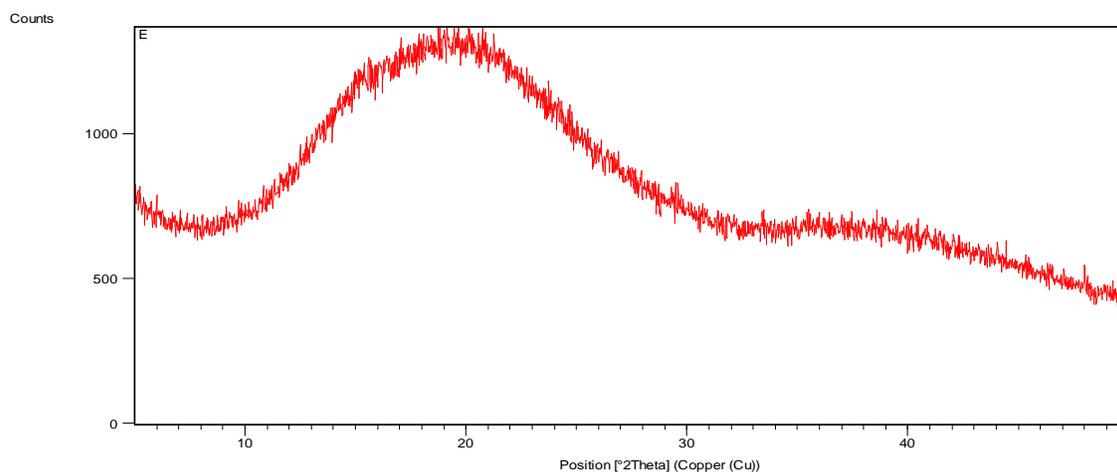


Fig 2: XRD pattern of Delonixregia Seed polymer

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