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Isolation and Characterization of *Moringa Olifera* Gum: A Novel Sustained Release Polymer

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ABSTRACT

If one were to imagine the ideal drug delivery system, two prerequisites would be required. First, it would be a single dose for the duration of treatment, whether it will be for days or weeks, as with infection, or for the lifetime of the patient, as in hypertension or diabetis. Second, it should deliver the active entity directly to the site of action, thereby minimising or eliminating side effects. This may necessitate delivery to specific receptors or to localization to cells or to specific areas of the body. In the past decade great interest got generated on replacing conventional administration of drugs by novel delivery systems which would release effective quantities from a protected supply at a controlled rate over a long period of time. Ideally a drug to provide desired therapeutic action should arrive rapidly at the site of action (receptor) in optimum concentration, remain there for desired time, spare other sites and get removed from the site. One of the interesting results of pharmaceutical research is the fact that absorption rate of a drug can be decreased by reducing its rate of release from the dosage form. The products so formulated are designed as sustained action, sustained release, delayed action, prolonged action, depot, respiratory, retarded release and timed release medication. In order to control the release of drug from its dosage form, an effective sustained release polymer is essential. Though, there are several sustained release polymers available in the market, there is continuous need to develop sustained release polymers which are safe and inexpensive. The aim of the work was to isolate and characterize the *Moringa olifera* gum as novel sustained release polymer.

Keywords: Isolation, Sustained release, *Moringa Olifera* gum

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INTRODUCTION

Number of natural, semi synthetic and synthetic polymer materials are used in the sustained or controlled delivery of drugs. In recent years, researchers have become increasingly interested in the utilization of natural biopolymers due to their wide ranging advantages over synthetic polymers. Natural polymers have gained the attention for their use in drug delivery systems due to their easy availability, non-toxic, cost effectiveness, eco-friendliness, biocompatible, capable of chemical modifications, potentially biodegradable and degradation under natural and physiological conditions. Natural gums and mucilages are widely explored as pharmaceutical excipients. In the present study an effort was made to extract the *Moringa olifera* gum from the trees (injured site) and to evaluate their physical characteristics.

MATERIALS AND METHODS

Isolation of Gum from *Moringa Olifera* Tree (Injured Site):

The gum was collected from *Moringa olifera* tree (injured site). It was dried, ground, and passed through sieve no 80. Dried gum (10g) was stirred in distilled water (250ml) for 6-8 hours at room temperature. The supernatant was obtained by centrifugation. The residue was washed with water and the washings were added to separate supernatant. The procedure was repeated four more times. Finally the supernatant was made up to 500 ml and treated with twice the volume of acetone by continuous stirring. The precipitated material was washed with distilled water and dried at 50-60 ^{0}C under vacuum.

Physicochemical Characterization of Gum

The separated *Moringa olifera* gum was evaluated for solubility, bulk density, tapped density, Compressibility index and angle of repose.

Bulk Density[1]:

Bulk density (g/cc) was determined by three tap method in a graduated cylinder.

$$\text{Bulk density} = \frac{\text{Bulk Volume of Powder}}{\text{Mass of powder}}$$

Tapped Density[2]:

Tapped density is achieved by mechanically tapping a measuring cylinder containing a powder sample.

$$\text{Tapped density} = \frac{\text{Mass of powder}}{\text{Tapped volume of powder}}$$

Compressibility Index[4]:

Compressibility index (CI) was determined by measuring the initial volume (V_0) and final volume (V) after hundred tappings of a sample in a measuring cylinder. CI was calculated using equation.

$$\text{Compressibility index(CI)} = \frac{V_0 - V \times 100}{V_0}$$

Angle of Repose[3]:

Angle of repose was measured by fixed funnel method.

$$\tan\theta = h/r$$

Phytochemical Examination:

For the detection of the presence of carbohydrates, reducing sugars, tannins, mucilage and peroxide enzymes the standard tests Molisch's test for carbohydrate, reduction of Fehling's solution for reducing sugars, ferric choride test for tannins, ruthenium red test for *Moringa olifera* gum were done.

1. **Test for Carbohydrates** (With aqueous test solution):

Molisch's Test[5]:

To the aqueous solution of *Moringa olifera* gum, few drops of α-naphthol were added and to it few drops of concentrated sulphuric acid was added through sides of the test tube.

2. Test for Proteins:

Ninhydrine Test[5]:

To the aqueous solution of *Moringa olifera* gum ninhydrine solution was added and then this solution was boiled.

3. Test for Alkaloids:

Wagner's Test[5]:

To the aqueous solution of *Moringa olifera* gum, Wagner's reagent was added.

4. Test for Tannins:

Ferric Chloride Test[5]:

The extract was treated with ferric chloride solution.

5. Fehling's Test[5]:

To the aqueous solution of *Moringa olifera* gum, few drops of Fehling's reagent was added.

Characterization of *Moringa olifera* gum:

Fourier Transform Infrared (FTIR) Spectroscopy

FTIR spectra of TSP were recorded on samples prepared in potassium bromide (KBr) disks using a Shimadzu Corporation, (Tokyo, Japan) Model-1601 PC. Samples were prepared in KBr disks by means of hydrostatic press at 6-8 tons pressure. The scanning range was 500 to 4000 cm^{-1}.

RESULTS AND DISCUSSION

Physicochemical Characterization of *Moringa olifera* gum

Gum derived from the *Moringa olifera* tree (injured part), was initially white and brown when it becomes older. It is sparingly soluble in water but swells in contact with water, giving a highly viscous solution. The angle of repose of gum, indicates that the gum has good flow properties suitable for the sustained release dosage forms. The gum obtained was subjected to physicochemical characteristics the results of which are summarized in table 1.

Table 1: Physicochemical Characterization of *Moringa olifera* gum

Parameters	Observation
Solubility	Sparingly soluble in water.
Bulk density	0.39 ± 0.2
Tapped density	0.43 ± 0.2
Compressibility index	23.18 ± 0.2
Description Powder	Initially white and brown when it becomes older
Angle of repose	28^0 ± 0.2

Phytochemical Screening of *Moringa olifera* gum:

The Phytochemical screening of *Moringa olifera* gum indicated the presence of carbohydrates, alkaloids and reducing sugars in *Moringa olifera* gum and absence of proteins and tannins in *Moringa olifera* gum.

Table 2: Phytochemical Screening of *Moringa olifera* gum:

S.NO	Tests	Observation
1	Test for Carbohydrates (Molisch's test)	Violet coloured ring appeared at the junction and this confirmed the presence of carbohydrates in the *Moringa olifera* gum
2	Test for proteins (Ninhydrine test)	No violet colour was formed indicating the absence of proteins in *Moringa olifera* gum.
3	Test for alkaloids (Wagner's test)	Reddish brown precipitate was formed with Wagner's reagent indicating the presence of alkaloids in *Moringa olifera* gum.
4	Test for Tannins (Ferric chloride test	No blue or green coloured appeared indicating the absence of tannins in *Moringa olifera* gum.
5	Reducing sugars (Fehling's test)	Brick red precipitate of cuprous oxide was formed indicating the presence of reducing substances in *Moringa olifera* gum.

Characterization of *Moringa olifera* gum:

Fourier Transform Infrared (FTIR) Spectroscopy analysis

The absence of sharp peak at 1700-1800 cm^{-1} in the FTIR spectrum indicates that there is no carboxyl group in the extracted sample. On the other hand, the presence of peak at 1000-1200 cm-1 corresponds to the presence of alcoholic group mostly secondary alcohols. These findings proved that there were no uronic sugars or esters in the structure (Figure 1).

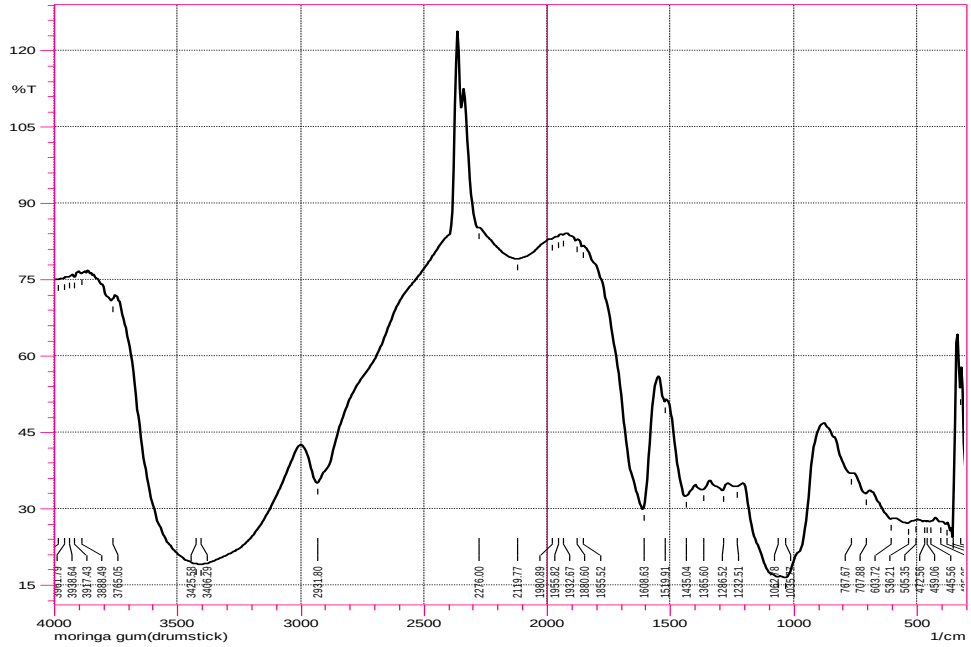

Fig 1: FTIR Spectra of *Moringa olifera* Gum

CONCLUSION

The result of the present study demonstrated that the *Moringa olifera* gum obtained from the exudations of tree trunk of plant *Moringa olifera* is initially white and brown when it becomes older. It is sparingly soluble in water but swells in contact with water, giving a highly viscous solution, which is suitable for the sustained release of the drug.

Moreover as this plant is widely distributed in nature, available chiefly in India and many other countries. It will be one of the suitable options to utilize as pharmaceutical sustained release polymer. Since the primary ingredients are inexpensive, devoid of toxicity, biocompatible, biodegradable and easy to manufacture, this can be used in place of currently marketed sustained release polymers.

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