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Isolation, Characterization and Pharmaceutical evaluation of the mucilage from *Polyalthia suberosa* leaves

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ABSTRACT: Some excipients are currently available for the formulation of Pharmaceutical Dosage Forms. The purpose of current study is to search for a cheap and effective natural excipient that can be used as an effective alternative for the formulation of pharmaceutical dosage forms. *Polyalthia suberosa*, a medicinal plant belonging to family *annonaceae*, has been traditionally used as adaptogenic drug. Present study is done on mucilage, obtained from leaves of *P. Suberosa* (PSM). Various physicochemical as well as pharmaceutical properties of mucilage are studied. Mucilage has been found to be better suspending agent as compared to tragacnath and also found to be effective binder.
Keywords: *binding property, Polyalthia suberosa mucilage (PSM), suspending property.*

INTRODUCTION

The plant *Polyalthia suberosa* is a shrub or small tree found in all over India. The leaves are oblongated to narrow obovate, oblong and 5-11 cm long[1]. In Indian System of Medicine, the plants are being used as bitter tonic, abortifacient, febrifuge, a cure for scorpion stings, high blood pressure and as a respiratory stimulant[2]. The genus has been investigated phytochemically and was reported to contain alkaloids, flavonoids, acetogenin, triterpenoids etc[3,4]. Plant Mucilage are pharmaceutically important polysaccharide with wide range of applications such as thickening, binding, disintegrating, suspending, emulsifying, stabilizing, and gelling agents. They have been also used as matrices for sustained and control release drugs. Acacia, tragacanth, gum ghatti, gum karaya are popular examples of plant mucilages. Present paper deals with isolation, physicochemical characterization and pharmaceutical evaluation of mucilage obtained from *P. Suberosa* (PSM).

EXPERIMENTAL

Plant material: The plant leaves of *Polyalthia suberosa* was collected from Sambalpur in the month of October 2009 were authenticated by Dr. (Mrs) Uma Devi, HOD, department of botany, Govt. Women's College, Sambalpur, Orissa. A voucher specimen (GWC/PS-15/09) is deposited in our Institute for future reference.

Extraction and isolation of mucilage: Dried leaves were ground to fine powder. Powder was first defatted with pet.ether and then extracted with methanol to remove saponins. Then marc was soaked in warm water for 3 hrs and kept aside for 2 hr. material was squeezed in a muslin bag to remove marc from filtrate. Filtrate was added slowly to acetone to precipitate mucilage. The mucilage was separated and made moisture free with successive precipitation with ethanol. Finally isolated mucilage was dried in oven at temperature less than 50 □C, powdered and stored in desiccator until use. Percentage yield of PSM (*P. suberosa* mucilage) was 6.6 %[5].

Physicochemical evaluation of PSM: This isolated mucilage was evaluated for various physicochemical properties and results are listed in table-1.

Evaluation of Toxicity:
Toxicity studies were carried out according to the method of Knudsen and Curtis. The animals used in the toxicity studies were sanctioned by the Institute animal Ethics Committee. The male albino rats of wistar strain weighing 160-200 gm were divided into different groups comprising of six animals each. The control group received normal saline 20ml/kg i.p. The other groups received 500, 1000, 2000, 3000 and 4000 mg/kg of mucilage (PSM) suspension in normal saline orally. The animals were observed continuously for the behavioral changes for the first 4 hours and then observed for mortality if any for 48 hours. Since no mortality, no toxic manifestations were observed and behavioural pattern was unaffected[9].

Evaluation of suspending property: To evaluate suspending properties, 20 % zinc oxide suspension was prepared with three concentrations of PSM (1, 2, and 3%) and compared with same concentrations of CMC and tragacanth. 0.2 % benzoic acid was used as a preservative. After preparation of all suspensions, 20 ml of each were kept aside and observed during 50 days for its separation ratio. Results are elaborated in table-2. From results it is cleared that PSM is better suspending agent than tragacanth[10,11].

Evaluation of binding property: PSM was evaluated for its granulating and binding properties in tablets using Diclofenac Sodium as a model drug. Granules were prepared by two concentrations (5 and 10%) of PSM by wet granulation technique. Same concentrations of gelatine were used as a standard binder. The efficiency of PSM as a binder was evaluated by determining comparative evaluationary parameters with that of gelatine such as percentage of fines, average granule size, porosity (Hauser's ratio), compressibility index, angle of repose, flow rate and illustrated in table-3. Tablets were punched by using Rimek Mini Press-I machine and were evaluated for hardness, friability, disintegration and in vitro dissolution time (Table- 4). Tablets shown good physical properties and drug release was found to be 90-95% within 3 hours[12,13,14].

RESULTS AND DISCUSSION

P. suberasa mucilage (PSM) is pale white crystalline powder which has shown presence of glucose and mannose by osazone tests. TLC studies have confirmed presence of both sugars. The mucilage obtained was subjected to physicochemical characteristics the results of which are summarized in table-1. The IR spectrum is shown in figure-1, the finger print region of the spectrum consists of two characteristic peaks between 780 and 1190 per cm, attributed to the C-O bond stretching. The band at 1604 per cm was assigned to the O-H bending of water. There are absorptions (weak) in the 1714 per cm area that indicate carbonyls. The absence of significant aromatic stretches in the 1660-1690 per cm region and the weakness of stretches, imply that there is a modest amount of peptidic cross linking by amide bond formation. The broad band at 3234 per cm is due to the hydrogen-bonding that contributes to the complex vibrational stretches associated with free inter and intra-molecular bound hydroxyl groups which make up the gross structure of carbohydrates. This is all consistent with a polysaccharide structure. To determine the safety level of the extracted PSM, acute toxicity and chronic toxicity studies were carried out. In toxicity study of the PSM revealed no behavioural changes for first four hours and no mortality, no toxic syndromes were observed even at the dose level 4000mg/kg body weight after 24 hours, indicating the safety of the mucilage. PSM was found to have better suspending property than tragacanth but poor as compared to CMC. So PSM can be utilised as suspending agent in lower concentration instead of tragacanth. Binding properties has shown that binding of PSM giving same binding as that of gelatine.

CONCLUSION

From the observations it is concluded that the extracted mucilage from leaves of *Polyalthia suberosa* (PSM) is non-toxic, has the potential as a suspending agent, binding agent and can be used as a pharmaceutical adjuvant.

Table- 1: Physicochemical evaluation of *P. suberasa* mucilage (PSM)

S.No.	Properties evaluated [6,7]	Observation
1.	Colour	Pale white
2.	Odour	Characteristic
3.	Taste	Mucilaginous
4.	Nature	Cystalline
5.	Solubility	Forms colloidal solution in water and insoluble in alcohol and chloroform
6.	Total Ash value	3.53%
7.	Acid insoluble Ash value	1.4%
8.	Water soluble Ash value	1.98%
9.	Viscosity (1% solution)	0.03243 poise
10.	Density (1% solution)	1.0522 g/ml
11.	Surface tension	73.4537 d/cm
12.	PH (Digital PH meter)	5.7
13.	Loss on Drying	12.6%
14.	Swelling Index	4
Identification Tests [7]		
15.	With iodine	Blue colour
16.	Molish test	Positive
17.	Fehling's test	Negative
18.	Phloroglucinol + HCL	Pentose sugar present
19.	Total Carbohydrate Content	78.34%
20.	Osazone tests	Mannose & Glucose present
21.	IR spectra (figure-1)[8]	Major picks at 815, 1100, 1520, 1724, 1851 and 3200 cm^{-1} conforms presence of hydroxyl and keto groups.
22.	TLC pattern Mobile Phase- Water: Acetone Stationary phase- Silica gel G Spraying agent - Phosphomolybdic acid	1 blue spot matches with glucose.

Table- 2: Sedimentation rate (Hu/Ho) of different suspensions

Suspending agent% / Days	CMC			TRAGACANTH			PSM		
	1	2	3	1	2	3	1	2	3
1	0.40	0.57	0.74	0.40	0.40	0.49	0.44	0.42	0.40
2	0.37	0.53	0.74	0.38	0.38	0.45	0.44	0.40	0.40
4	0.33	0.43	0.72	0.37	0.37	0.45	0.42	0.32	0.40
6	0.28	0.41	0.72	0.36	0.37	0.44	0.42	0.32	0.40
8	0.27	0.41	0.72	0.36	0.36	0.42	0.36	0.32	0.40
15	0.27	0.41	0.72	0.36	0.36	0.42	0.36	0.36	0.40
25	0.26	0.40	0.70	0.34	0.36	0.40	0.36	0.32	0.38
40	0.24	0.40	0.60	0.32	0.32	0.36	0.36	0.32	0.38

Where Hu is apparent height of solid after sedimentation and Ho is height of original suspension.

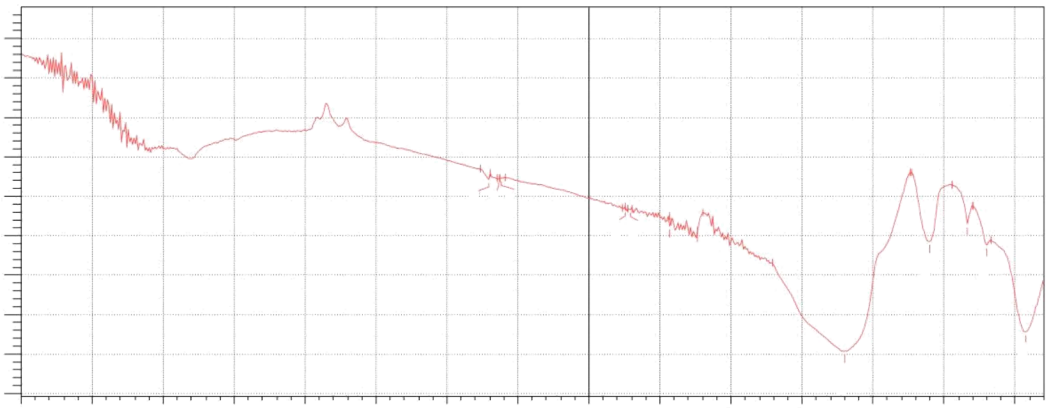
Table -3: Granules properties of Gelatin and PSM

Binder conc. % / Properties	Gelatin		PSM	
	5	10	5	10
Granule size	0.33	0.36	0.40	0.42
Moisture content (%)	1.66	1.82	1.4	1.84
Bulk Density	0.30	0.38	0.33	0.38
Tapped Density	0.34	0.42	0.39	0.38
Hausner's ratio	1.09	1.2	1.07	1.13
Compressibility index	11.8	10	14.9	15.2
Angle of repose	25	22	24	27

Table-4: Tablet properties of Gelatin and PSM

Binder conc. % / Properties	Gelatin		PSM	
	5	10	5	10
Hardness (kg/cm^2)	4.0	4.5	3.4	3.5
Friability (%)	0.30	0.28	0.25	0.40
Disintegration time (sec.)	243	305	255	280

Fig.-1: IR spectra of PSM



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