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Isolation and Characterization of Mucilage from Leaves of *Cinnamomum Tamala* Nees and Evaluation of Binding Property

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Abstract

In the present study the mucilage obtained from bay leaves [cinnamomum tamala Nees (lauraceae)] was used as binder for the formulation of paracetamol tablets. The physicochemical characterization of mucilage was done and the % swelling capacity of mucilage was found to be 33.2%. Mucilage was also characterized by FTIR spectroscopy as well as qualitative phytochemical screening. Mucilage showed the presence of tannins and sugars. Five batches of paracetamol tablets were prepared using three different concentrations (5, 10 & 15%) of mucilage, PVP & starch as binder. From in-vitro release data it was observed that bay leaves mucilage posses good binding property similar to commercial pharmaceutical binders in the concentration range between 10 to 15%. Tablets were also evaluated for hardness and friability and the friability values for all the tablets was found to be less than 1% and thus showing good binding property.

Keywords: Bay leaf, *Cinnamomum tamala,* binder, mucilage, paracetamol.

INTRODUCTION

Mucilage is a polysaccharide complex composed of sugar and uronic acid units which form slimy masses in contact with water are typically heterogeneous in composition. On hydrolysis the main components formed are arabinose, galactose, glucose, mannose, xylose and uronic acids. Mucilage is obtained mainly from seeds or other plant parts. Some are obtained from marine algae, and selected microorganisms4. Mucilage is widely used as pharmaceutical excipient because they possess a variety of pharmaceutical properties such as binding, disintegrating, suspending, emulsifying and sustaining properties at different proportion in different pharmaceutical dosage forms**[1-4]**. Natural mucilage is preferred over semi-synthetic

and synthetic materials due to their non-toxic, low cost, free availability, emollient and non-irritating nature**[5,6]**.

Bay leaves are obtained from the plant *Cinnamomum tamala nees*. Bay leaves have many properties that make them useful for treating high blood sugar, migraine headaches, bacterial and fungal infections, and gastric ulcers. Bay leaves and berries have been used for their astringent, carminative, diaphoretic, digestive, diuretic, emetic and stomachic properties. Bay leaf has been used as an herbal remedy for headaches. It contains compounds called parthenolides, which have proven useful in the treatment of migraines. Bay leaf has also been shown to help the production of insulin in body more efficiently, which leads to lower blood sugar levels. It has also been used to reduce the effects of stomach ulcers. Its leaves also contain eugenol, which has anti-inflammatory and anti-oxidant properties. Additionally, leaves also exhibit anti-fungal, anti-bacterial activity **[7]**.

MATERIALS AND METHODS

Bay leaves were purchased from the local market in Meerut and were authenticated from NBPGR (PUSA, NewDelhi). Sodium carboxy methyl cellulose, magnesium stearate, Talc was obtained Central Drug House New Delhi). Paracetamol was kindly donated by Unicure Pharmaceutical limited Roorkee India. All other chemicals and reagent were of analytical grade.

Isolation of mucilage [8, 9]

Dried bay leaves were powdered and 100 g of the powder was soaked in distilled water for 48 h and then boiled for 1 h for complete release of mucilage. The material was filtered through a muslin cloth to remove marc. Then equal volume of acetone was added to the filtrate to precipitate the mucilage. The mucilage was separated and dried in oven at a temperature less than 60º, powdered (#60 mesh), weighed and stored in desiccator until further use.

Characterization of mucilage

Determination of Swelling Index [10]

The swelling index is the volume in ml occupied by 1g of drug; including any adhering mucilage after it has been swollen in an aqueous liquid for 4h .The swelling index of bay leaves mucilage was determined according to the BP method. One gram of mucilage powder was taken in a 25 ml measuring cylinder. To this 25 ml of water was added and this was shaken vigorously every 10 m for 1h and then allowed to stand for 24 h. The volume occupied by the mucilage was measured.

Physicochemical Evaluation of Mucilage

The separated mucilage was evaluated for solubility, swelling index, loss on drying, ash value, bulk density, tapped density, compressibility index and angle of repose.

Various qualitative tests for identification of alkaloids, glycosides, sugars, saponins etc were also carried out with the mucilage.

Fig 1: FTIR spectra of bay leaves mucilage

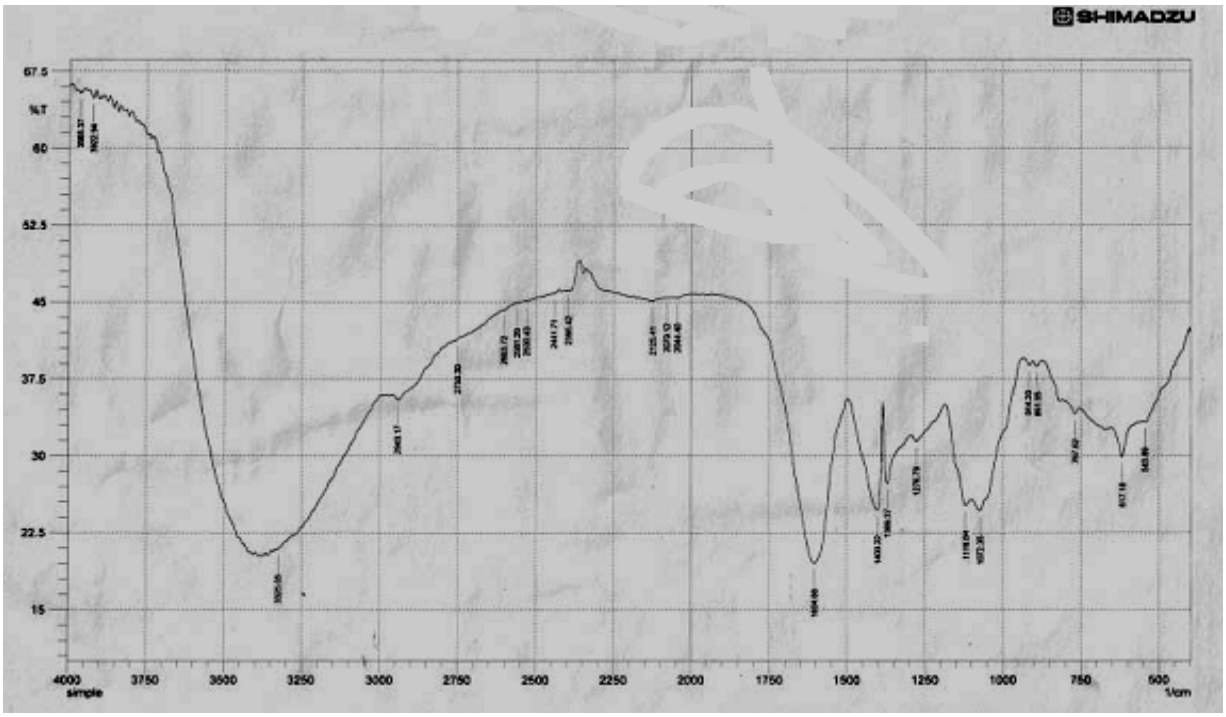


Table 1: Physicochemical Properties of Bay Leaves Mucilage

S.No.	PROPERTY	VALUE
1	Description	Brown coloured powder
2	Odour	Characteristic
3	Swelling index	33.2 %
4	Loss on drying	1.9 %
5	Ash value	0.68 %
6	Bulk density	0.4231 g/cm^3
7	Tapped density	0.4673 g/cm^3
8	Compressibility index	9.46
9	Hausner ratio	1.1045
10	Angle of repose	27.32^0
11	Solubility	Soluble in water, forms viscous colloidal solution, insoluble in ether, acetone, chloroform, methanol, and ethanol.
12	pH (1% solution)	5.8

Formulation and evaluation of paracetamol tablets

Formulation of Paracetamol tablets

For the evaluation of the starch as binder, sodium carboxy methyl cellulose was used as a disintegrant in the prepared paracetamol tablet. The composition of tablet formulation containing paracetamol is given in Table 2.

Table 2: Qualitative Tests for Bay Leaves Mucilage

S.No.	CONSTITUENT	TEST	RESULT
1	Sterols	Salkowaski test	-
		Libermann's test	-
2	Alkaloids	Mayer's test	-
		Wagner's test	-
3	Tannins	$FeCl_3$ test	+
		Lead acetate test	+
4	Saponins	Foam test	+
5	Proteins	Millon's test	-
		Xanthoprotiec Test	-
6	Sugars	Molish test	+
		Fehling test	+
7	Glycosides	Killer-killani test	-
		Brontrager test	-
8	Phenlos	$FeCl_3$ test	-
		Lead acetate test	-
9	Acidic Compounds	$NaHCO_3$ test	+
10	Mucilage	Ruthenium red test	+
11	Chlorides	Silver nitrate test	+
12	Sulphates	Barium chloride test	-
13	Foreign matter	-	Not more than 0.2%
14	Heavy metals	-	10-15ppm
15	Arsenic	-	Absent

Wet granulation and compression [11]

Wet granulation method was used for all tablet production. The calculation is made for 20 tablets in each batch. In case accurately weighed quantities of each ingredient were mixed in a mortar and an appropriate quantity of the binder solution was added as a granulating agent and mixed for 20 min in a mortar. The damp mass was sieved with sieve no. 22 and dried at 50^0c in oven. The dried granular mass was passed through sieve no. 40 to obtain uniform sized granules. The different batches of the granules were then mixed with calculated equal quantity of magnesium stearate (0.5%) and talc (0.5%). Granules were then compressed into tablets under constant pressure with a sixteen station rotary tablet machine.

Table 3: Formula of prepared paracetamol tablet

S.No.	Ingredient	F1	F2	F3	F4	F5
1	Paracetamol(mg)	500	500	500	500	500
2	Na CMC (disintegrant %)	7.5	7.5	7.5	7.5	7.5
3	Starch (%)	2	-	-	-	-
4	PVP (%)	-	2	-	-	-
5	Mucilage (%)	-	-	5	10	15
6	Talc (%)	0.5	0.5	0.5	0.5	0.5
7	Magnesium stearate (%)	0.5	0.5	0.5	0.5	0.5

Evaluation of Tablets

Hardness test

Five tablets were selected at random from each batch to perform this test. Pfizer hardness tester (Elite, Mumbai, India) was used to measure the hardness. Tablet was placed between spindle and anvil of the tester and the calibrated scale adjusted to zero, then applied a diametric compression force on the tablet and the position on the calibrated scale at which the tablet broke was recorded in kg units. A mean hardness was calculated for each batch.

Weight uniformity test

Twenty tablets from each batch were selected randomly and weight individually using a highly sensitive electronic balance. Their mean weights were calculated for each batch.

Friability test

Ten tablets were selected at random, dusted and weighed together using electronic balance and then placed in the friabilator. The machine was operated for 4 min at 25 rotations per min and then stopped. The tablets were dusted and again reweighed. The percentage losses were calculated for each batch of the tablets.

Disintegration time

The method specified in the USP/NF (1980) was used. Disintegration medium used was 100 ml of 0.1 N HCl maintained at temperature 37±2ºc throughout the experiment. Five tablets selected at random from each batch were placed one in each of the cylindrical tubes of the basket with discs. The time taken for each tablet to break up into small particles and pass out through the mesh was recorded. Mean disintegration time was calculated for each batch.

***In vitro* dissolution test**

The *in vitro* dissolution test of the compressed paracetamol tablet was performed using USP 2nd dissolution apparatus. Phosphate buffer (pH7.4) was used as dissolution medium. The temperature was maintained at 37±2 ^{0}c using rotation speed 100 rpm. Samples were withdrawn at regular intervals up to 1hour, replacing equal amount of fresh dissolution medium (phosphate buffer pH 7.4). Samples were analysed using UV spectrophotometer and % cumulative drug release was calculated.

RESULT AND DISCUSSION

From the above study it can be concluded that the optimum concentration of bay leaves mucilage as binder is 10-15%. Physicochemical evaluation of the mucilage was performed. Table 1 shows the results of physicochemical evaluation of mucilage. Isolated mucilage was also characterized by FTIR spectroscopy (figure 1) as well as by phytochemical evaluation. The results of phytochemical screening have been shown in table 2. Mucilage showed the presence of tannins and sugars.

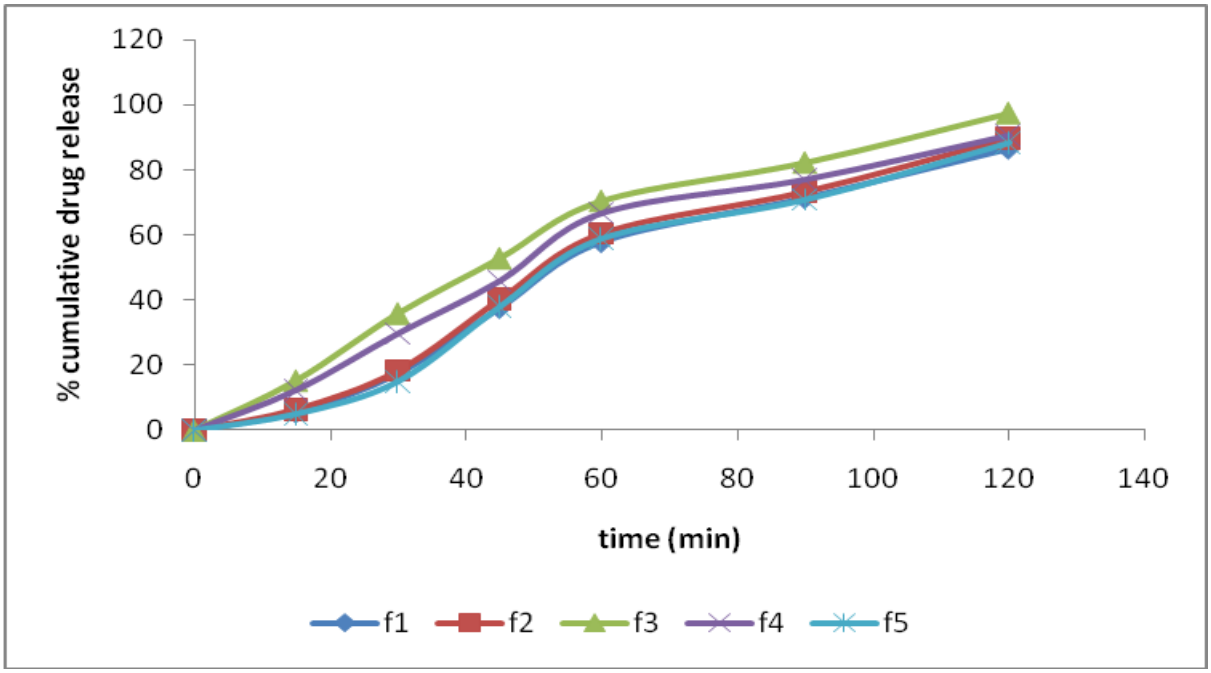
Tablets of paracetamol were prepared by wet granulation method using two commonly used binders and three different concentrations of mucilage (table 3). Compressed tablets were evaluated for various parameters (table 4). Tablets were also evaluated for hardness and friability and the friability values for all the tablets was found to be less than 1% and thus show good binding property. The hardness of tablets was within 6.8-7.2 kg/m^2. Disintegration time was found to be almost equal for 15% mucilage and 2% starch. Dissolution profile of tablets showed

almost 85-98% drug release within 2 hours. From the results it can be concluded that higher concentration of mucilage is required to obtain the desired binding property.

Table 4: Evaluation of Paracetamol tablets

S.No.	Ingredient	F1	F2	F3	F4	F5
1	Avg. weight (mg)	547.82	541.09	548.19	542.86	549.04
2	Thickness (mm)	4.36	4.42	4.55	4.45	4.5
3	Diameter (mm)	12.06	12.02	12.00	11.98	12.03
4	Hardness (kg/cm^2)	6.8	7.0	6.7	6.8	7.2
5	Friability (%)	0.61	0.72	0.63	0.69	0.82
6	Disintegration time (min)	12.53	11.82	5.62	9.37	12.72
7	Drug content (mg)	502.82	501.09	498.19	500.86	499.04

Fig 2: *In-vitro* dissolution of paracetamol tablets



CONCLUSION

It can be observed from the results that mucilage obtained from bay leaves [*Cinnamomum tamala nees*] have significant swelling property. The evaluation of tablets showed that mucilage posses significant binding property and can be used as a substitute for various synthetic binders. The mucilage is obtained from natural origin and thus it should be biocompatible and devoid of any significant side effects which may be there in case of commonly used synthetic excipients.

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