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Studies on mucilage from *Acacia nilotica* fruits as suspending agent and binding agent

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Abstract: Plant product serve as an alternative to synthetic products because of local accessibility, eco-friendly nature and lower prices compared to important synthetic products. Natural gums and mucilage have been widely explored as pharmaceutical excipients. The present study was undertaken to separate mucilage from fruits of*Acacia nilotica*and explore its use as Suspending agent.Mucilage extracted from the pods of *Acacia nilotica*were subjected to toxicity studies for its safety and preformulation studies for its suitability as a Suspending agent. Themucilage extracted is devoid of toxicity. Dispersible tablets of Paracetamolwere prepared and compared with different concentrations viz5, 10, 15, 20 and 25% (w/w) of*Acacia nilotica* mucilage powder Eight formulations were prepared and evaluated for physical parameters such as thickness, hardness, friability, weight variation, drug content, disintegration time and drug dissolution. Suspensions were prepared using different concentrations of mucilage (1, 2, 3, 4, 5 and 6%) as suspending agent. The stability of suspensions was measured using sedimentation volume (F=Hu/Ho). The suspensions prepared with *Acacia nilotica*fruitmucilage showed better stability than tragacanth as suspending agent.
Key words : *Acacia nilotica,* preformulation studies, tragacanth.

Introduction

Mucilage is glutinous substance which mainly consists of polysaccharides, proteins and uranides. Dried up mucilage or the concentrated mucilage is called as Gum. The main difference between them is that mucilage do not dissolve in water whereas gum dissolves in water. Mucilage is formed in the normal growth of plant by mucilage secreting glands. Mucilage and gum are well known since ancient times for their medicinal use. In modern era they are widely used in Pharmaceutical industries as thickeners, water retention agents, suspending agents and disintegrants. Naturally the demand of these substances is increasing and new sources are tapped. India due to geographical and environmental positioning has traditionally been a good source for such products. *Acacia nilotica*Linn has not been explored as a pharmaceutical excipient. *Acacia nilotica*Fabaceae family is also known as the shoe-flower plant The plant is available in India in large quantities.[1-2]

The plant *Acacia nilotica*is reported to contain 20% of mucilage. The mucilage contains polysaccharide galactomannan, a gelatinous type of fiber that is not absorbed by the GIT when consumed and passes through our system undigested.[3]The juice of this plant is used externally as stimulant and rubifacient, and internally as laxative. haemorrhage. for production of industrial alcohol. Various plant parts are used in wounds, dry cough and anthrax.The plant contain l-arabinose, catechol, galactan, galactoaraban, galactose, N-acetyldjenkolic acid, N-acetyldjenkolic acid, sulphoxidespentosan, saponin, tannin.[4] Seeds contain crude protein 18.6%, ether extract 4.4%, fiber 10.1%, nitrogen-free extract 61.2%, ash 5.7%, and silica 0.44%..The objective of this study was to

extract mucilage from the fruits of *Acacia nilotica* and examine the various pharmaceutical properties of the dried mucilage to assess its functionality as an excipient

Material and Method

Collection and identification of Plant Material

The fruits of the plant *Acacia nilotica*were collected from local field, Moga. The authentication of plant material was done by Dr. M.C. Sidhu, Department of Botany, Punjab University, Chandigarh

Isolation of Mucilage from the fruits.[5]

The fruits were cut into small pieces and 100g was weighed and soaked in water (500 ml) for 12 hours, and the material was crushed in a blender. The crushed material was warmed for 45 minutes with stirring cooled it and passed through several folds of muslin. To the filtrate, acetone was added to precipitate the mucilage. The mucilage was washed with acetone several times for purification. The material was dried, crushed and passed through sieve number 80 and stored in a desiccator.

Identification of Mucilage:

The mucilage powder was mounted with ruthenium red. After few seconds, it was irrigated with lead acetate by sucking off the excess stain with a blotting paper, which was done simultaneously with flooding by lead acetage. Mucilage will stain pink.Mucilage was heated with distilled water for some time and then cooled. After cooling, gelatinous mass was observed.[6-7]

Physicochemical properties of dried powdered mucilage

Dried- powdered mucilage was studied for percentage yield, particle size, mass loss on drying, swelling index, bulk density, angle of repose, and compressibility.

Organoleptic Evaluation of Muciage:

The organoleptic of the isolated mucilage such as color, odor; taste, fracture, and texture were determined after isolation and drying of the mucilage

Microbial Count of Mucilage:

Specified amount (10g) of the sample was dissolved in a suitable medium to have no antibacterial activity under conditions of test and the volume was adjusted to 100ml with the same medium. If necessary, the pH may be adjusted to 7.

Examination for Bacteria:

To petridishes of 9-10 cm diameter, 20ml of nutrient agar was added at temperatures not more than $45^{O}C$. The sample soultion was spread on the surface of the solidified medium. Two such petridishes were prepared and incubated at 30-$35^{O}C$ for 5 days. The number of colonies formed were counted.

Examination for Fungi :

The procedure is same as that for bacteria, but Sabouraud dextrose agar medium is used and the plates were incubated at 20-$25^{O}C$ of 5days.[8-10]

Result and Discussion

The mucilage was isolated from the fruits using acetone as non-solvent and the yield was found to be 17%. After isolation, the mucilage was tested for confirmation, and the identification tests were positive. The mucilage was evaluated for organoleptic properties like color, odor, taste, fracture and texture (Table 1). The mucilage was also subjected to physical characteristics like solubility, loss on drying and swelling index (Table 2). The pH of mucilage was found to be 7.46, which indicates that the mucilage is less irritating in GIT and is suitable for oral preparations. The microbial load of the mucilage was tested and found to be 100cfu/g.

Table-1: Organoleptic properties of isolated mucilage:

Color	Odor	Taste	Fracture	Texture
Slightly Black or Brown	Mucilagenous	Mucilagenous	Smooth	Smooth

Table-2 : Physical parameters of the isolated mucilage:

Parameter	Value
Swelling index	7.2
Loss on drying	8.5%
Viscosity (0.1% W/V solution)	1.3842 cps
pH	7.46

Evaluation of Binding Properties of *Acacia Nilotica* Mucilage

Compatibility Studies:

One of the requirements for the selection of suitable excipient or carrier for pharmaceutical formulation is its compatibility. Therefore, in the present wrok, a study was carried out using FTIR spectrophotometer to confirm the absence of any chemical interactions between the drug and the mucilage.

Ten miligrams of drug and the mucilage were mixed with 400 mg of KBr individually and 100 mg of each mixture was compressed under 10 tons of pressure using a hydraulic press to form a transparent pellet. The pellet was scanned from 400 cm−1 to 400 cm−1. Similarly, a pellet containing 1:1 physical mixture of drug and mucilage was also prepared and scanned. In (Figure 1) F.T.I.R. spectra of sample of Paracetamol. In (Figure 2): F.T.I,R. spectra of sample of binder. In Figure (3) F.T.I.R. spectra sample of KBr+Paracetamol+binder.

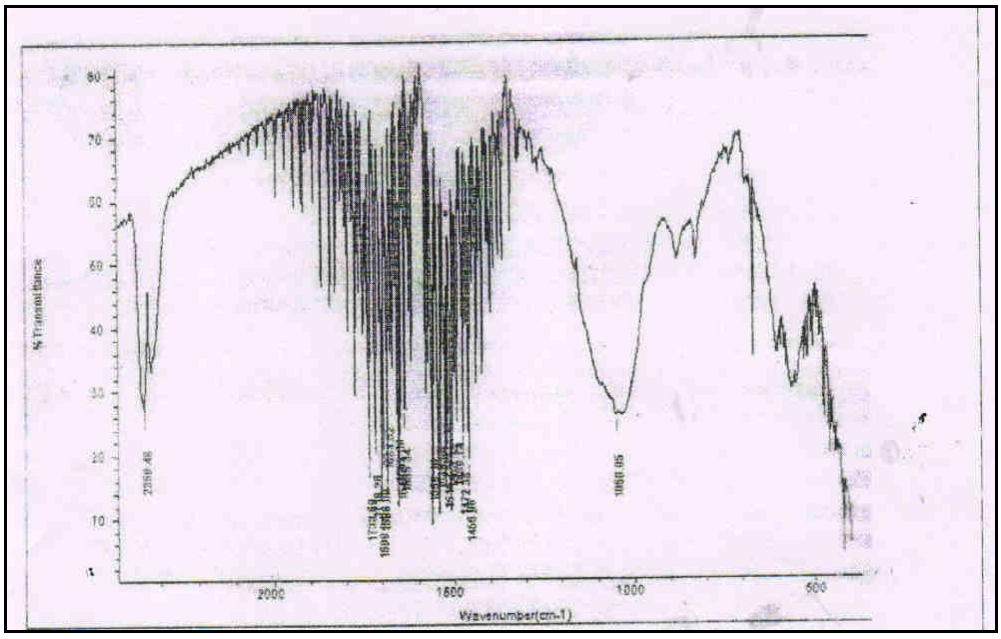

Figure 1 F.T.I.R. spectra of sample of Paracetamol

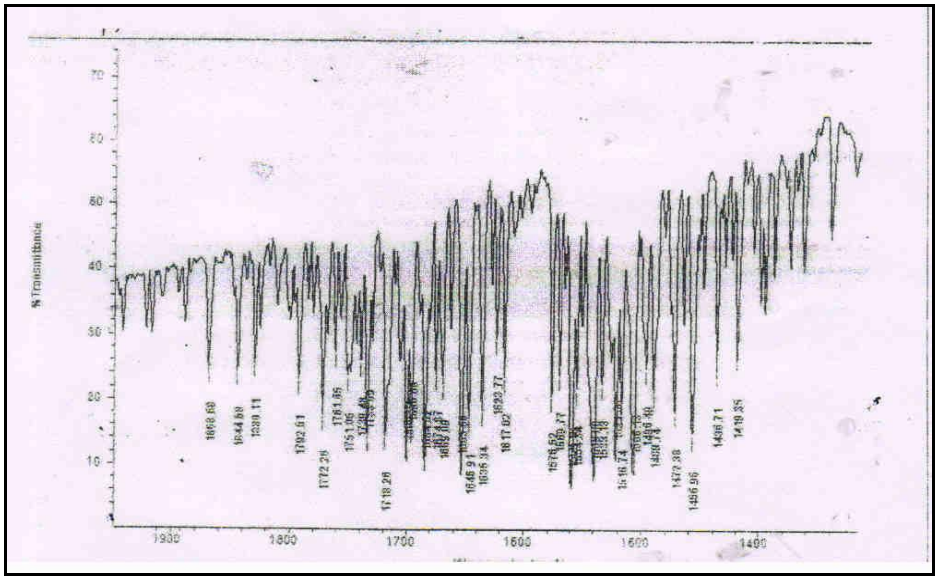

Figure 2: F.T.I.R. Spectra of sample of Binder

Development of Calibration Curve for Paracetamol:

Stock solution of paracetamol was prepared by dissolving 100 mg of drug in 100 ml of phosphate buffer (7.2 pH). From this 5, 10, 15, 20 and 25 µg /ml dilutions we prepared using phosphate buffer of pH 7.2. The λ max of the drug was determined by scanning one of the dilutions between 400 and 200 nm using UV visible spectrophotometer. At the λ max, the absorbance of all solutions was measured against a blank. Standard curve between concentration Vs absorbance was plotted and its intercept (B) and slope (K) were noted. The results are shown in (Table 4) and (Figure 3).

Table 4: Development of calibration curve for paracetamol

Concentration (µg /ml)	Absorbance at 247 nm
5	0.249
10	0.477
15	0.743
20	0.956
25	1.185

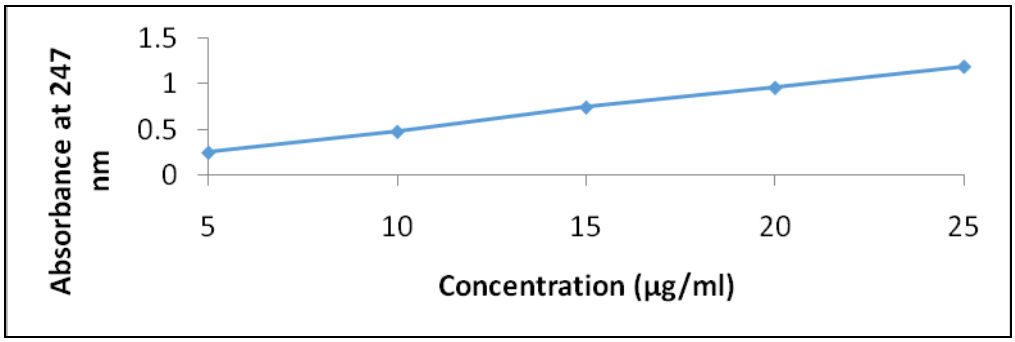

Figure 3: Calibration Curve of Paracetamol in phosphate buffer of pH 7.2

Evaluation of Paracetamol Tablets

The drug content was determined using the calibration curve, after suitable dilution. The results are shown in (Table 5).

Table-5: Content uniformity of paracetamol tablets prepared with different concentrations of *Acacia nilotica*fruitmucilage and starch as binder:

Binder	Content uniformity at different concentrations (SEM)				
	5%	**10%**	**15%**	**20%**	**25%**
Acacia nilotica	95.28 (0.320)	96.50 (0.290)	95.35 (0.330)	93.50 (0.460)	96.90 (0.180)
Starch	96.12 (0.322)	97.23 (0.220)	96.40 (0.290)	95.84 (0.330)	98.32 (0.350)

Evaluation of Suspending Properties of *Acacia Nilotica Fruit* Mucilage

We have prepared suspensions by using different concentration of *Acacia nilotica* fruit mucilage such as 1, 2, 3, 4, 5 and 6%. Tragacanth was also used in the same concentration. To find out the physical stability, we have kept the prepared suspensions at room temperature for 30 days in stoppered measuring cylinders. The stability of suspensions was measured by using sedimentation volume (Hu/Ho). We observed that the suspensions prepared with *Acacia nilotica* fruit Mucilage shown better stability compared to tragacanth as suspending agent.

After 30 days, the suspensions, prepared with *Acacia nilotica* and tragacanth were shaken thoroughly. It was observed that the suspension prepared with different concentrations of *Acacia nilotica* fruit mucilage gave pourable, non-separable and non-caking suspensions. From the observations, the suspensions prepared with *Acacia nilotica* fruit mucilage shown better stability compared to that oftragacanth as suspending agent as shown in (Table 6 and 7).

Table 6Sedimentation volume of suspensions prepared with different concentration of *Acacia nilotica*fruitMucilage as suspending agent:

Times in Day	**Sedimentation Volume [F=Hu/Ho] of suspensions at different concentration of mucilage**					
	6%	**5%**	**4%**	**3%**	**2%**	**1%**
0	1	1	1	1	1	1
5	0.95	0.95	0.92	0.92	0.92	0.87
10	0.93	0.93	0.92	0.92	0.92	0.87
15	0.93	0.93	0.92	0.92	0.92	0.87
20	0.93	0.93	0.92	0.92	0.92	0.87
25	0.93	0.93	0.92	0.92	0.92	0.87
30	0.93	0.93	0.92	0.92	0.92	0.87

Table 7: Sedimentation volume of suspensions prepared with different concentration of tragacanth as suspending agent.

Times in Day	**Sedimentation Volume [F=Hu/Ho] of suspensions at different concentration of tragacanth**					
	6%	**5%**	**4%**	**3%**	**2%**	**1%**
0	1	1	1	1	1	1
5	0.92	0.92	0.85	0.84	0.84	0.78
10	0.92	0.92	0.85	0.83	0.84	0.76
15	0.92	0.92	0.83	0.83	0.83	0.75
20	0.92	0.92	0.82	0.83	0.82	0.73
25	0.92	0.92	0.82	0.83	0.82	0.73
30	0.92	0.92	0.82	0.83	0.82	0.73

Conclusion

We observed that the *Acacia nilotica*fruitmucilage as binding agent showed a delay in the drug release profile compared to starch.Suspensions were prepared using different concentrations of mucilage (1, 2, 3, 4, 5 and 6%) as suspending agent. The stability of suspensions was measured using sedimentation volume (F=Hu/Ho). The suspensions prepared with *Acacia nilotica*fruitmucilage showed better stability than tragacanth as suspending agent.

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