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Natural mucilage as suspending agent

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Abstract
In the present study was undertaken to evaluate the mucilage obtained from the calyx of flower of *Hibiscus rosasinensis* Linn as a suspending agent. A suspension of $CaCO_3$ was prepared using 2 % w/v of hibiscus mucilage as suspending agent and it is evaluated for its stability using the parameters like, sedimentation volume, viscosity, redispersibility and pH. The suspending effect of hibiscus mucilage was compared with $CaCO_3$ suspensions prepared using 2 % w/v of suspending agents such as acacia and tragacanth. The results obtained indicated that the hibiscus mucilage could be used as a suspending agent. It has low rate of sedimentation, high viscosity, slightly basic pH and is easily redispersible. These effects were comparable with that of the standard suspending agents like acacia and tragacanth. The mucilage isolated from the calyx of flower of *Hibiscus rosasinensis* can be used as a pharmaceutical adjuvant.

Keywords: Calyx of flower *Hibiscus rosasinensis*, natural mucilage, suspending agent, calcium carbonate

Introduction
Gums and mucilages are well known since ancient times for their medicinal use. In recent years, plant gums and mucilages have evoked tremendous interest due to their diverse application in pharmacy in the formulation of both solid and liquid dosage forms [1]. They are employed as suspending agents in the formulation containing indiffusible materials [2]. Naturally demand for this substance is increasing and new sources are getting identified. The present study relates to mucilage, obtained from the calyx of flower of *Hibiscus rosasinensis* Linn that could be used as suspending agent. *Hibiscus rosasinensis* Linn (Malvaceae) [3], commonly known as Jasavanda is used to treat various diseases. The main parts used in the plants are roots and petals, but researchers have explored that even the calyx of flower possess very good medicinal properties and are used as antihypertensive [4], antifertility agent [5], for hair growth6 and as antidiabetic [7].
The plant was found to contain mucilage8 and in our earlier studies [9], we have identified the mucilage in the calyx of flower of the plant. The major constituent of the mucilage is an acidic polysaccharide composed of L-rhamnose: D-galactose: D-galacturonic acid: Dglucuronic acid in the molar ratio of [5, 8, 3, 28]. The present work is an attempt to investigate this mucilage as a suspending agent in pharmaceutical formulations.

Materials and Methods
Isolation of mucilage
The calyxes of flower were collected and sun dried for at least 7 days. The powdered calyxes of flower were defatted using petroleum ether (60-800C) in a soxhlet apparatus. The defatted material (50 g) was soaked in distilled water (1000 ml) at room temperature for 12 h. The resulting mass was stirred at about 100 rpm for 1 h and strained through muslin cloth. To the filtrate, acetone was added until precipitation was complete. The precipitated mucilage was filtered through muslin cloth and the mucilaginous residue was spread on glass plates and dried at 40 0C. Then it was dispersed in 200 ml water with stirring for 12 h and ethanol was added in different proportions. Initially, the concentration of ethanol was made up to 20% in the solution. Some impurities that precipitated were removed by centrifugation. The ethanol concentration was further increased to 60% to precipitate the mucilage. The precipitated mucilage was filtered, treated with acetone to remove the traces of water and dried in an oven at 40 0 C10.

Preparation and evaluation of suspensions

Suspensions of 2 % $CaCo_3$ in water was made using 2% of suspending agents1, 10 like acacia, tragacanth, and hibiscus mucilage. For the preparation of suspension $CaCo_3$ was first levigated with glycerine (1:1) and then the suspending agents were added in required amounts2. The test suspension was evaluated using the parameters like, sedimentation volume, redispersibility, pH and viscosity and it was compared with acacia and tragacanth.

Sedimentation Volume

Sedimentation volume is the most important parameter in the evaluation of suspension stability. Sedimentation volume F is the ratio of the ultimate height (*Hu*) of the sediment as a suspension settles in a cylinder under standard conditions to the initial height (*Ho*) of the total suspension. It was determined by keeping a measured volume of the suspension in a graduated cylinder in an undisturbed position for a definite period of time and noting the value of *Hu* and *Ho*2.

Redispersibility

Redispersibility of a suspension can be estimated by shaking the suspension with the help of a mechanical device, which simulates the motion of human arm during shaking2. Fixed volume (50 ml) of the each suspension was kept in calibrated tubes, which were then stored at room temperature for various time intervals (5, 15, 25 days). At regular intervals (5, 15, 25 days) one tube was removed and shaken vigorously to redistribute the sediment and the presence of deposit if any is noted. The time taken to redisperse the sedimented suspension was recorded10, 11.

Determination of pH and viscosity

The pH of the suspensions was determined at intervals of one week for 21 days using pH meter and their viscosity was determined at 250 C using Brookfield viscometer at 50rpm by using spindle no. 311. The values expressed are mean ± SD of three observations.

Results and Discussion

The average yield of dried mucilage obtained from hibiscus mucilage was 10.6% w/w. It is quite well understood that the better is the suspending medium the lesser the rate of sedimentation. The sedimentation volume profile of the suspensions with hibiscus mucilage, acacia and tragacanth are presented in Table 1. The dispersed particles of $CaCo_3$ prepared using hibiscus mucilage was found to sediment at lower rate than those prepared with tragacanth and slightly higher than that of acacia.

Table 1: Determination of Suspending Property of Hibiscus mucilage

Time in Minutes	Blank ($CaCo_3$) (F)	$CaCo_3$ + Hibiscus (F)	$CaCo_3$ + Tragacanth (F)	$CaCo_3$ + Acacia (F)
0	1	1	1	1
5	0.8	0.92	0.91	0.917
10	0.058	0.91	0.835	0.91
15	0.058	0.882	0.823	0.91
20	0.058	0.882	0.794	0.9
25	0.058	0.852	0.764	0.882
30	0.058	0.852	0.694	0.882

Sedimentation volume (F) = *Hu*/*Ho*

Since the suspension produces sediment on storage, it must be readily dispersible so as to ensure the uniformity of the dose. Less is the time taken to redisperse the sediment, the better is the redispersibility. The suspension prepared by hibiscus mucilage showed better redispersibility than acacia and tragacanth on 5th and 15th day and on 25th day it was similar to the suspension prepared using acacia (Table 2).

Table 2: Determination of pH, Viscosity and Redispersibility

Excipients 2 % w/w	pH after storage for				Viscosity (Centipoise)	Rate of redispersibility (cycles)		
	0th day	7th day	14th day	21st day		5 days	15 days	25 days
Tragacanth	4.00 ± 0.10	4.32 ± 0.15	4.52 ± 0.05	4.60 ± 0.10	16.33 ± 1.52	13.00 ± 1.00	17.33 ± 1.52	20.00 ± 1.15
Acacia	4.24 ± 0.10	4.30 ± 0.10	4.70 ± 0.05	5.00 ± 0.10	20.00 ± 2.00	14.33 ± 1.52	16.66 ± 1.00	22.66 ± 1.15
Hibiscus Mucilage	8.00 ± 0.15	8.10 ± 0.10	8.32 ± 0.15	8.52 ± 0.20	24.33 ± 2.55	12.00 ± 1.00	15.33 ± 1.52	23.00 ± 1.00

Values are expressed in mean ± SD, n=3

Nowadays, the whole world is turning towards natural drugs and excipients. The natural materials do hold advantages over the synthetic materials because they are nontoxic, less expensive and freely available.

Further they can be modified to obtain tailor made materials for drug delivery system and then can compete with the synthetic products available in the market. In this aspect, the hibiscus calyx of flower mucilage tested for suspending effect has shown promising results and the effects were comparable with that of the standard suspending agents like acacia and tragacanth.

Toxicity is not at all a concern for this mucilage because the effective concentration of the suspending agents in conventional dosage form normally does not exceed 2% of the formulation [10] and earlier studies on this mucilage states that it is very safe even in higher doses [8].

From the observations it is concluded that the extracted mucilage from calyx of flower of *Hibiscus rosasinensis* is nontoxic, has the potential as a suspending agent even at low concentration and can be used as a pharmaceutical adjuvant.

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