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Research Article

EVALUATION OF *HIBISCUS SABDARIFFA* LEAF MUCILAGE AS A SUSPENDING AGENT

***RUPA SENGUPTA[a], J.K.BANIK [b]**

[a]ROFEL, Shri G.M. Bilakhia College of Pharmacy, Namdha Road, Vapi 396191, [b]UCB India Private Limited, GIDC, Silvassa Road, Vapi, Gujarat, India. Email: rupasengupta222@rediffmail.com

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ABSTRACT

The present study was aimed at isolation of mucilage from *Hibiscus sabdariffa* Linn. (Malvaceae) leaves and exploring its utility as a Pharmaceutical excipient such as suspending agent. Four model suspensions of $CaCO_3$ (Calcium Carbonate) were prepared by using 0.5, 1.0, 2.0 and 3.0 % w/v of isolated hibiscus mucilage as suspending agent. Their sedimentation profile, redispersibility, pH and rheological behaviour were compared with standard marketed formulation Calcimax suspension. Mucilage was evaluated for parameters as per Indian Pharmacopoeia like loss on drying, ash value, extractive value and were found to be within the official limit. Mucilage has shown good suspending action in 2.0 % concentration. All the formulations were redispersed uniformly without any deposits and found to be stable during the entire period of study. Hence the present work confirms that the mucilage of *Hibiscus sabdariffa* leaf has got the properties to be used as a suspending agent.

Keywords: *Hibiscus sabdariffa*, Mucilage, Suspending agent, Calcium Carbonate.

INTRODUCTION

The use of natural gums and mucilage for pharmaceutical applications is attractive because they are economical, readily available, non toxic, capable of chemical modifications, potentially biodegradable and with few exceptions biocompitable.[1] In recent years, plant gums and mucilage have evoked tremendous interest due to their diverse application in pharmacy in the formulation of both solid and liquid dosage forms[2]. With the increase in demand for natural mucilage and gums, it has been necessary to explore the newer sources of mucilage and gums to meet the industrial demands. India, due to its geographical and environmental positioning has traditionally been a good source for such products among the Asian countries[3].

Plant mucilage are pharmaceutically important polysaccharides with wide range of applications such as thickening, binding, disintegrating, suspending, emulsifying, stabilizing and gelling agent. They have been used as a matrices for sustained and controlled release drugs[4, 5]. The purpose of the present study was to isolate a natural pharmaceutical excipient which can be used as an effective pharmaceutical suspending agent from the leaves of *Hibiscus sabdariffa* Linn.(malvaceae).

Hibiscus sabdariffa Linn. (Roselle) is widely cultivated in tropical areas and its red persistent calyx is the major component possessing a sour taste that is used as beverage and food colorants. It is commonly used to make jellies, jams, and beverages. In Ayurvedic literature in India, different parts of this plant have been recommended for various ailments like hypertension, pyrexia, and liver disorders. It is also used as demulcent, digestive, diuretic, emollient, purgative, refrigerant, stomachic and tonic[6].

It contains many chemical constituents including alkaloids, L-ascorbic acid, anisaldehyde, anthocyanin, β-carotene, β-sitosterol, citric acid, cyanidin-3-rutinoside, delphinidin, galactose, gossypetin, hibiscetin, mucopolysaccharide, pectin, protocatechuic acid, polysaccharide, quercetin, stearic acid and wax. As a traditional medicine, it is claimed to be effective against kidney stones and urinary bladder stones.[7,8]. It is also used for its antibacterial, antifungal, hypocholesterolemic, antispasmodic and antihypertensive[9-12]. This plant is also reported to have Hepatoprotective[13] and anticancer activity[14].

MATERIALS AND METHODS

Isolation of mucilage

The fresh leaves of *Hibiscus sabdariffa* were collected, washed with water to remove dirt and debris and dried under shade for 7 days. The powdered leaves were defatted using Petroleum ether (60-80°C) in a Soxhlet apparatus. The defatted material (50 g) was soaked in distilled water (1000 ml) at room temperature for 12 hr. The resulting mass was stirred at about 100 rpm for 1 hr and strained with 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°C. Then it was dispersed in 200 ml of 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°C[15,16].

Preparation and evaluation of suspensions

Calcium Carbonate was used as a diffusible solid to make suspension of flocculated type category. Four model suspensions of 5% $CaCO_3$ in water was prepared as per U.S.P using *H.sabdariffa*. mucilage as suspending agent with concentrations of 0.5, 1, 2 and 3% w/v. For the preparation of suspension, $CaCO_3$ was first levigated with glycerine (1:1) and then the suspending agent was added in required amount. Sodium lauryl sulphate used as wetting agent, glycerine as an antibacterial agent, propyl paraben as preservative, orange syrup used as flavouring agent and water used as vehicle to make sufficient volume. All the model suspensions were evaluated using the parameters like, sedimentation volume, redispersibility, pH and viscosity and these were compared with that of standard marketed suspension Calcimax.

Viscosity study

Viscosity was measured by using Brookfield viscometer at 30 r.p.m. under constant temperature (22-25ºC) and results of standard and *H. sabdariffa* mucilage as a suspending agent is summarized in table 1 and figure 1. Viscosity of all the test samples and standard were measured at every 7 days interval up to 21days.

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*. The graph of time against sedimentation volume was plotted for standard and *H. sabdariffa* mucilage as a suspending

agent. The effect of time on sedimentation volume is summarized in Table 2 and Figure 2.

Redispersibility

The redispersibility test was carried out by noting the time required for the sediment to settle after shaking the test sample at different period of days. Redispersibility of a suspension can be estimated by shaking the suspension with the help of mechanical device, which simulates the motion of human arm during shaking[17]. Fixed volume (50 ml) of the each suspension was kept in calibrated tubes, which were then stored at room temperature for various time intervals (7, 14, 21 days). At regular intervals (7, 14, 21days) 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 sediment suspension was recorded. The redispersibility test for standard and *H. sabdariffa* mucilage is summarized in Table 3 and Figure 3.

pH test

The pH of suspensions was determined at intervals of one week for 21 days using digital pH meter. The effect of ageing on pH of standard and different concentration of *H.sabdariffa* mucilage being summarized in Table 4 and Figure 4

RESULT AND DISCUSSION

Nowadays, the whole world is turning towards natural drugs and excipients. The natural materials do hold advantages over the synthetic materials because they are non toxic, less expensive and freely available. Further they can be modified to obtain tailor made in the market. The average yield of dried mucilage obtained from *Hibiscus sabdariffa* leaves was 10.2% w/w. In this aspect, the hibiscus leaves mucilage tested for suspending effect has shown promising results and the effects were comparable with that of the standard marked suspension.

It is observed from the present study that there is sharp increase in viscosities of suspension of *H.sabdariffa* as a suspending agent as concentration is increased and it showed comparable results to standard preparation. Also viscosities of *H.sabdariffa* were measured for 21 days, and were stable over this period. Thus there was no effect of aging on viscosity as there was not much change in values. In this case the viscosity of suspension prepared by using 3% mucilage as a suspending agent is remain same for longer duration of time and compatible with data from standard formulation.

In this case the sedimentation volume shows constant rate after certain period of time interval. In this case the curve is horizontal to time axis it indicates a better suspension. In this case the dispersed particles of $CaCO_3$ suspension prepared using *H.sabdariffa* mucilage 2% was found to sediment at lower rate than standard.

In present study, the redispersion pattern for various concentrations of *H. sabdariffa* showed different curve when plotted redispersion time against days. In this case suspension containing 2% *H. sabdariffa* mucilage shows comparative results to that of Standard.

In this case, the pH showed within an accepted limit. Suspension containing 2% mucilage as a suspending agent showed good results. It showed neutral pH ranges i.e. within pH 6-7 range

Table 1: Effect of aging on viscosity

Concentration	0 Days	7 Days	14 Days	21 Days
0.5 %	23.1± 0.25	23.2±0.15	23.2±0.30	23.2±0.20
1%	23.9±0.35	24.13±0.10	24.14±0.08	24.2±0.25
2%	24.4±0.23	24.56±0.50	24.58±0.35	24.7±0.15
3%	24.8±0.15	24.85±0.15	24.9±0.13	24.8±0.25

Values are expressed in mean± S.D. (n=3)

Table 2: Effect of time on sedimentation volume

Concentration	0 min	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min
0.5%	1±0.00	0.8±0.03	0.9±0.30	0.91±0.03	0.87±0.40	0.85±0.50	0.85±0.40	0.83±0.40	0.80±0.20
1%	1±0.00	0.92±0.04	0.9±.50	0.88±0.30	0.82±0.30	0.89±0.30	0.85±0.30	0.82±0.30	0.80±0.30
2%	1±0.00	0.91±0.03	0.87±0.40	0.89±0.50	0.89±0.30	0.84±0.50	0.80±0.20	0.88±0.40	0.82±0.20
3%	1±0.00	0.91±0.01	0.88±0.50	0.89±0.50	0.90±0.50	0.88±0.40	0.88±0.30	0.85±0.50	0.80±0.50
Standard	1±0.00	0.93±0.05	0.91±0.10	0.9±0.10	0.92±0.10	0.89±0.05	0.88±0.05	0.90±0.10	0.85±0.10

Values are expressed in mean± S.D. (n=3)

Table 3: Effect of time on redispersibility

Concentration	0 Days	7 Days	14 Days	21 Days
0.5%	1.2±0.15	1.19±0.01	1.26±0.03	1.17±0.05
1%	1.22±0.12	1.230±0.02	1.22±0.01	1.23±0.03
2%	1.24±0.09	1.24±0.03	1.25±0.03	1.25±0.03
3%	1.24±0.02	1.22±0.02	1.27±0.04	1.28±0.07
Standard	1.22±0.01	1.240.03	1.25±0.04	1.25±0.01

Values are expressed in mean± S.D. (n=3)

Table 4: Effect of time on pH of suspension

Concentration	0 Days	7 Days	14 Days	21 Days
0.5%	6.1±0.1	6.53±0.05	7.3±0.10	7.03±00.05
1%	6.23±0.05	6.8±0.10	7.23±0.05	7.06±0.05
2%	7.16±0.57	7.1±0.10	7.3±0.57	6.8±0.10
3%	6.7±0.17	7.03±0.57	7.2±0.00	7.1±0.05
Standard	7.23±.05	7.23±0.57	7.13±0.05	7.23±0.05

Values are expressed in mean± S.D. (n=3)

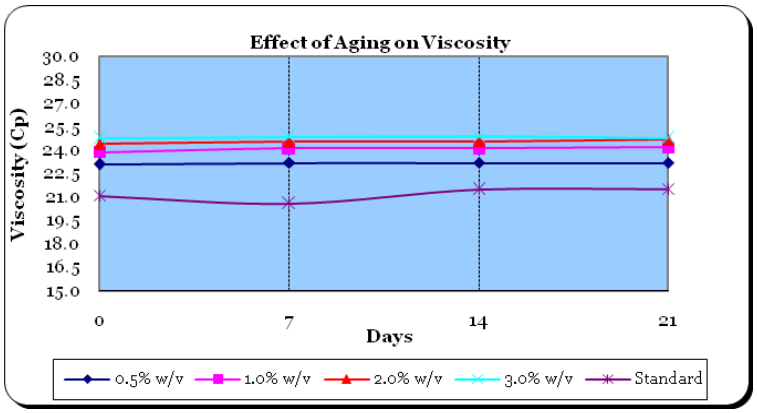

Fig. 1: Effect of aging on viscosity

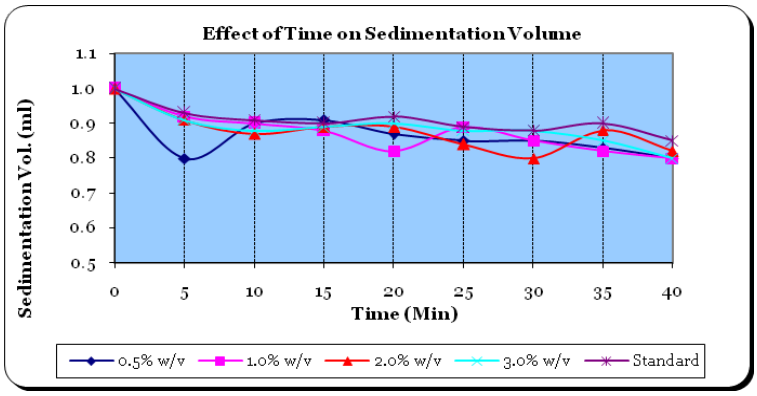

Fig. 2: Effect of time on sedimentation volume

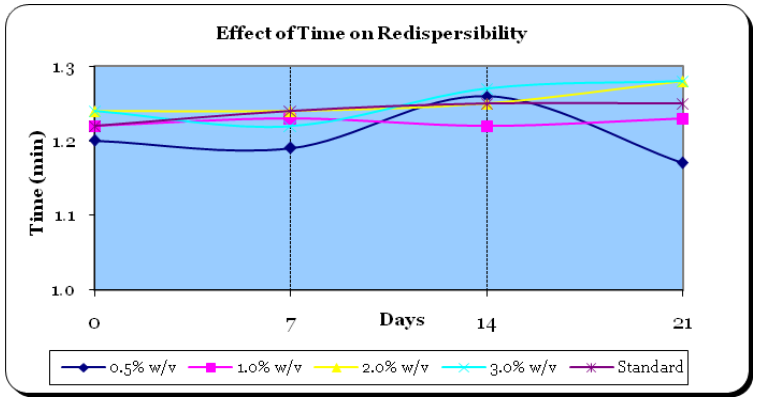

Fig. 3: Effect of time on redispersibility

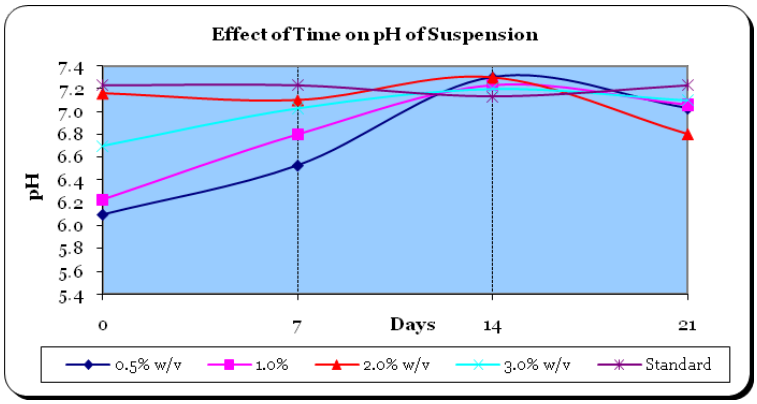

Fig. 4: Effect of Time on pH of suspension

CONCLUSION

For the evaluation of *Hibiscus sabdariffa* mucilage as a suspending agent, samples was prepared with concentration of 0.5%, 1-3% w/v. Different evaluation tests were performed. The viscosity and pH values are within acceptable limit. In sedimentation volume as the curve of sedimentation ratios was plotted against time it gives the curve horizontal to time axis and indicates a better suspension. For redispersibility suspension containing 2% *H. sabdariffa* mucilage shows comparative results to that of Standard. It was observed that the *H. sabdariffa* leaf mucilage at concentration of 2% showed good suspending action. So, In conclusion is revealed that the extracted mucilage from leaves of *H. sabdariffa* is a potential suspending agent even at low concentration and can be used as a Pharmaceutical adjuvant.

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