

**INTERNATIONAL JOURNAL OF ADVANCES IN PHARMACY,  
BIOLOGY AND CHEMISTRY****Research Article****Preliminary characterization of *Abelmoschus esculentus*  
(L.) pod mucilage as o/w type emulsifier****Avinash B. Gangurde\***

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**ABSTRACT**

The purpose of this study is to search a cheap and effective natural excipient that can be used as an effective alternative for the formulation of stable pharmaceutical o/w type emulsions. The mucilage from the pods of *Abelmoschus esculentus* (L.), family, malvaceae was extracted and subjected to preformulation study for evaluation of its suitability as emulsifying agent. The mucilage extracted is evaluated for phytochemical analysis and indicated presence of carbohydrates, mucilage and reducing sugars. Emulsion of Castor oil was prepared and compared with different concentrations (0.5%, 1%, and 1.5% w/v) of *Abelmoschus esculentus* mucilage. The stability parameters like average globule size, viscosity, density and centrifugation were compared with acacia containing castor oil emulsion NFI. The mucilage was found to be a superior emulsifying agent than acacia. Mucilage produces primary emulsion at oil to mucilage ratio, 1: 0.04. Mucilage also shows better viscosity than the acacia emulsion. Studies indicate that the mucilage of *Abelmoschus esculentus* may be used as a pharmaceutical adjuvant and as a emulsifying agent at 1.5% w/v (Formulation F3), depending on its emulsifying ability and the stability of the resulting emulsion.

**Keywords:** *Abelmoschus esculentus* mucilage, Castor oil emulsion, Acacia Powder and Emulsifier.

**INTRODUCTION**

A pharmaceutical emulsion is thermodynamically unstable disperse system. A stabilizer or emulsifying agent reduces the rate of coalescence and permit easy redispersion of globules both by protective colloidal action and by increasing the consistency of the emulsifying medium.

Gum of the *Abelmoschus esculentus* pods has been reported to have binder potential for tablet Formulations<sup>1</sup>, mucilage of *Abelmoschus esculentus* may be used as a pharmaceutical adjuvant and as a suspending agent at 4%w/v in paracetamol suspension<sup>2</sup>.

The fresh fruits of *Abelmoschus esculentus* (L.) are a common component of Indian diet. In addition, the plant has been used medicinally in treatment of several disorders,<sup>3</sup> Anti-cancer, antimicrobial and hypoglycemic activities of plant are reported,<sup>4,5</sup> anti-ulcer activity of fresh fruits is recently reported.<sup>6</sup>

Castor oil emulsion NFI is an o/w type liquid emulsion. It is used as a laxative<sup>7</sup>. In the present investigation castor oil emulsion is used as model formulation. Viscosity, average globule size and

stability were used as the basis for evaluating the performance of *Abelmoschus esculentus* mucilage as a emulsifying agent.

**MATERIALS AND METHODS**

*Abelmoschus* fruits (Purchased from local market and plant authenticated by botanist from, Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Ref No. Bot./2010-11/0782), Castor Oil (Research Lab), Gum Acacia (Research Lab) and Benzalkonium chloride (Loba Chemie)

**Extraction and purification of the Mucilage**

About 1kg of fresh immature fruit of *Abelmoschus esculentus* were purchased from a local market. After removal of the seeds, the fresh immature fruits were sliced, homogenized and extracted with cold water containing 1% (w/v) sodium meta bisulphate. The crude mucilage was precipitated with three volumes of ethanol. The precipitated gum was washed several times with ethanol; the obtained cream colored mucilage was dried in oven and stored in a desiccators. A light brown colored

powder was obtained after complete removal of moisture. The dried gum was pulverized using Grinder and screened through 80# stainless steel sieve. This was stored in a well closed amber colored specimen bottle till ready for use. The yield of crude *Abelmoschus esculentus* mucilage was 8-10% from fruits<sup>2</sup>.

#### Phytochemical Evaluation

Preliminary tests were performed to confirm the nature of mucilage obtained. The chemical tests<sup>8</sup> conducted were Ruthenium red test, Molisch test and Test for reducing sugars are shown in table 1.

#### Determination of viscosity

The viscosity of the expressed mucilage was done by Brooke field viscometer (Brook Field Engineering Labs. Inc. USA)<sup>9</sup>.

The viscosity of 1% w/v mucilage was found to be  $2.235 \pm 0.043$  Poise.

#### Formulation of castor oil emulsion

An official formulation of Castor oil emulsion NFI was compared with formulations prepared with *Abelmoschus esculentus* mucilage are shown in Table No. 02. Four formulations were prepared by dry gum method and evaluated for viscosity, Average globule size, density and stability study<sup>7</sup>. Benzalkonium chloride was used as a preservative.

#### Method of Preparation of castor oil Emulsion

To study the emulsifying characteristics, mucilage was taken in a clean and dry mortar. The emulsification of castor oil was tried by dry gum method. The oil was added to the gum drop by drop with continuous triturating until a white primary emulsion with clicking sound results. The addition of oil continued till a white cream was obtained<sup>7</sup>. From the study it was found that the primary emulsion results at the oil: gum ratio of 1: 0.04 (Formulation F3). Now the primary emulsion diluted to 100 ml with distilled water and kept in a clean and tightly closed container for stability study for 3 months. No creaming or settling of emulsion results during 3 months of storage period at room temperature, which indicate that the gum is very effective as emulsifying agent at low concentration in comparison to acacia gum.

#### Globule size measurement and emulsion stability

The particle size distribution of the emulsions was measured using a microscopy technique. The emulsions were diluted with distilled water prior to analysis. The dilute emulsions were placed analyzed for average globule size six times and the data are presented as the average<sup>10</sup>. It was carried

for three months in intervals, result shown in Table No.03.

#### Centrifugal method and emulsion stability

The samples of emulsion were placed in the test tube of centrifuge (Remi, C-24BL, Remi Instruments Ltd., Mumbai, India) controlled to temperature at 37°C for 10 min with 3500 rpm<sup>11</sup>. No phase separation was observed in both cases of formulation F3 and F4, indicating 100% stability after centrifugation, shown in table No.03.

#### Viscosity measurement and emulsion stability

The emulsions were stored at 37°C for 3 months and the viscosity of the emulsions were measured by using Brook field viscometer (Brook field - DV-E, Viscometer, U.S.A.) at the interval of 0, 1, 2 and 3 months<sup>9, 12</sup>, shown in Table no. 03.

#### RESULT AND DISCUSSION

In the present investigation *Abelmoschus esculentus* plant was identified from botanist.

The mucilage was extracted from the pods and evaluated for physical and chemical tests. Viscosity of 1% w/v mucilage was found to be  $2.235 \pm 0.043$  Poise. Obtained mucilage was evaluated through Ruthenium red test, Molisch test and Test for reducing sugars. These tests shows positive results for presence of carbohydrate indicating violet ring at the junction of two liquids, presence of Mucilage indicating red color with ruthenium red and presence of reducing sugars by forming brick red precipitate on standing.

Castor oil emulsion NFI was prepared using acacia powder as emulsifier in formulation No. F4 and acacia powder was replaced by *Abelmoschus esculentus* mucilage in formulation No. F1, F2 and F3. It was used in the concentrations 0.5 %, 1.0 % and 1.5 % w/v. From the study it was found that the primary emulsion results at the oil: gum ratio of 1: 0.04. Formulation F3 shows better results as compared to F4, F1 and F2 for viscosity ( $2.10 \pm 0.15$  Poise), Globule Size ( $2.32 \pm 0.12$  micron), Density ( $0.972 \pm 0.022$ ), centrifugation test and better stability for three months as shown in table no. 03. Formulation F3 and F4 does not show any significant difference in values on standing for 3 months. The prepared emulsions were identified as an o/w type emulsions using color dye test.

#### CONCLUSION

From the present study, it was concluded that *Abelmoschus esculentus* has a good potential as emulsifier to produce thermodynamically stable o/w type emulsion as compared to acacia powder. Emulsion was found stable for three months at room temperature.

**Table 1: Phytochemical evaluation of Abelmoschus esculentus mucilage**

S. No.	Name of Test	Observation
1	Test for Carbohydrates (Molisch's test)	Positive
2	Test for mucilage ( Ruthenium red test)	Positive
3	Test for reducing sugar (Fehling's test)	Positive

**Table 2: Formulations of castor oil emulsion**

S. No.	Name of Ingredient	Formulations			
		F1	F2	F3	F4
1	Castor Oil	37.5 ml	37.5 ml	37.5 ml	37.5 ml
2	Abelmoschus Esculentus mucilage	0.5gm	1 gm	1.5 gm	8gm
3	Acacia Powder	-----	-----	-----	-----
4	Benzalkonium chloride	0.005 g	0.005 g	0.005 g	0.005 g
5	Cinnamon Water q.s.	100 ml	100 ml	100 ml	100 ml

**Table 3: Stability Parameters of Emulsions**

Parameter	Formulation							
	F3				F4			
	0 month	1 month	2 month	3 month	0 month	1 month	2 month	3 month
Viscosity Poise	2.10± 0.15	2.094± 0.07	2.046± 0.11	1.981± 0.12	1.827± 0.17	1.801± 0.18	1.794± 0.09	1.756± 0.1
Globule Size µm	2.32 ± 0.12	2.62 ± 0.137	2.81 ± 0.118	2.98 ± 0.19	2.12 ± 0.11	2.15 ± 0.118	2.52 ± 0.115	2.82 ± 0.121
Density g/ml	0.972 ± 0.022	0.968 ± 0.012	0.97± 0.019	0.965± 0.021	0.850± 0.027	0.849± 0.019	0.849± 0.026	0.846± 0.014
Emulsion Identifi Test (Dye Test)	o/w emulsion							
Centrifugation Test	No Phase separa occurs							

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