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A COMPARATIVE PHYSICOCHEMICAL AND PHYTOCHEMICAL EVALUATION OF *CHOORNA* (POWDER) AND *BHAVITHA CHOORNA* (TRITURATED POWDER) OF *JAPAKUSUMA MUKULA* (FLOWER BUDS OF *HIBISCUS ROSA-SINENSIS* LINN.)

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Abstract

Preliminary phytochemical evaluation of *choorna* (powder) and *bhavitha choorna* (triturated powder) of *Japakusuma mukula* (flower buds of *Hibiscus rosa-sinensis* Linn.) were done to establish the identity, quality and purity of the drug and to standardize these parameters. *Bhavana* is a pharmaceutical process done for potentiating or purification of drugs. The *choorna* of *Japakusuma mukula* which is botanically identified as *Hibiscus rosa-sinensis* Linn. was undergone *bhavana* (trituration) with its *swarasa* (juice) itself for 7 times by which its potency is augmented which resulted in the variations in the levels of various phytoconstituents present in it. Thus, the process of *bhavana* (trituration) can enhance the efficacy of the therapeutic drug during its administration in various clinical conditions. Here, the comparison of *choorna* and *bhavitha choorna* of *Japakusuma mukula* revealed that there were considerable changes in the various physico-chemical and phytochemical parameters of *bhavitha choorna* in comparison with *choorna* of *Japakusumamukula* (flower buds of *Hibiscus rosa-sinensis* Linn.).

Keywords: *Choorna, Bhavitha choorna, Japakusumamukula*

I. Introduction

To detect adulteration and stop the incorrect use of pharmaceuticals, the assessment of physicochemical properties and preliminary phytochemical evaluation are crucial. The physicochemical and preliminary phytochemical evaluation of the *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn. is done as part of analysing the genuineness of the drug in the clinical study conducted to study the effectiveness of *bhavitha choorna* (triturated powder) of *Japakusuma mukula* along with *ksheera* (milk) in *Asrigdhara* (abnormal uterine bleeding) and to standardize the parameters evaluated for future references. The values obtained are related with data available in literatures regarding the physicochemical and preliminary phytochemical evaluation of flower powder of *Hibiscus rosa-sinensis* Linn. By assessing the presence of various phytoconstituents in *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds, the relation between the various phytoconstituents in controlling the excessive bleeding condition which is a major concern in *Asrigdhara* (abnormal uterine bleeding) was analysed.

II. Materials and methods

A. Collection of the drug

The drug was freshly collected from the farm in Shornur and adjacent places of Kollengode panchayat at Palakkad district during the month of April -May. The buds of *Hibiscus rosa-sinensis* Linn. without stalk were plucked at the stage of petals dark red and tightly curled within sepals. Each bud was cautiously plucked separately.

B. Preparation of *choorna* (powder)

The freshly collected flower buds of *Hibiscus rosa sinensis* Linn. were adequately washed to remove the physical impurities and scrutinized for any worm infestation. Then the whole flower bud was dried in the shade until it is ready to get powdered finely. After accomplishing proper dryness (4-5 days), drug was powdered finely using mixer grinder and was sieved through mesh size-120. The dried fine powder obtained was stored in air tight

containers. It was then subjected to seven times *bhavana* (trituration) in the *swarasa* (juice) of *Japakusuma mukula* (flower buds of *Hibiscus rosa-sinensis* Linn.) itself.

C. Preparation of *swarasa* (juice) for *bhavana* (trituration)

Swarasa (juice) of the flower buds of the drug *Japa* (hibiscus) was prepared based on the principle of *swarasa nirmana vidhi* (preparation of juice) mentioned in *Sarangadhara samhitha*.[1] The *swarasa* (juice) needed for the *bhavana* (trituration) procedure was prepared during morning hours collecting the fresh flower buds of *Hibiscus rosa -sinensis* Linn. Initially fresh buds were collected, washed thoroughly to remove physical impurities and were crushed and grinded in a mixer grinder, after sprinkling water for proper wetting. Then obtained paste was placed in a clean cotton cloth, pressed and squeezed out to get the juice. The expressed juice of the drug was collected in a clean stainless-steel container.

D. Preparation of *Bhavitha choorna* (triturated powder)

Bhavitha choorna (triturated powder) of *Japakusuma mukula* (flower buds of *Hibiscus rosa -sinensis* Linn.) was prepared according to the reference of *bhavana vidhi* (process of trituration) mentioned in *Bhaishajya ratnavali*.[2] The procedure was started in the morning. The *choorna* (powder) of the drug prepared earlier was taken in a tray used in driers. Then it was spread uniformly in the tray so that it forms a thin layer. The freshly prepared *swarasa* (juice) of the drug was then gradually poured into the fine powder so that the *swarasa* (juice). gets absorbed into the powder. By means of a clean stainless-steel rod, it was mixed to confirm that each fine particle of the *choorna* (powder) gets completely soaked in the *swarasa* (juice). It was then kept in the sunlight for drying. Often, the contents of the tray were stirred using a stainless-steel rod. It was then covered with a clean thin cloth to avoid dust or any other contamination from the external environment and kept undisturbed overnight. On the next day morning the tray was taken and again poured freshly prepared *swarasa* (juice) of *Japakusuma mukula* (flower buds of *Hibiscus rosa -sinensis* Linn.) into the *choorna* by mixing it with the rod and until it is completely soaked. Then the same procedure of first day *bhavana* (trituration) was repeated. At each stage, it was ensured that there was no contamination. During night time, it was kept undisturbed covering with a clean cloth.

Then, properly dried powder after *bhavana* (trituration) was made into fine powder using mixer grinder and sieved through the mesh size 120. The final powdered drug was stored in air tight containers for physicochemical and preliminary phytochemical evaluation.

Picture No: 1 Fresh flower buds of *Japa* (*Hibiscus rosa -sinensis* Linn.)

Picture No: 2 Dried flower buds of *Japa* (*Hibiscus rosa -sinensis* Linn.)

Picture No: 3 *Choorna* (powder) of *Japakusuma mukula* (flower buds of *Hibiscus rosa -sinensis* Linn.)

Picture No: 4 *Bhavitha choorna* (triturated powder) of *Japakusuma mukula* (flower buds of *Hibiscus rosa -sinensis* Linn.)

E. Reagents

Concentrated and dilute hydrochloric acid, xylene, concentrated and dilute sulphuric acid, concentrated and dilute nitric acid, sodium hydroxide solution, lead acetate solution, sodium oxalate, potassium permanganate, anhydrous sodium carbonate, petroleum ether, cyclohexane, acetone, alcohol, Fehling's solution A&B, chloroform water, Dragendorff's reagent, Mayer's reagent, Wagner's reagent, neutral ferric chloride, magnesium ribbon,

methylene blue reagent, sodium bicarbonate solution and copper sulphate, catechol, Folinciocalteu phenol reagent.

F. Apparatus

Dean and stark's apparatus, Clevenger's apparatus, Soxhlet apparatus, Bunsen burner, water condensers, hot air oven, muffle furnace, heating mantle, silica crucible, round bottom flask, glass beakers, petri dishes, standard flask, measuring jars, conical flask, funnel, glass rods, watch glass, burettes, pipettes, shaker, centrifuge.

G. Procedure

Determination of the physicochemical parameters like foreign matter, total ash, acid insoluble ash, water insoluble ash, volatile oil, moisture content, fibre, tannin, total sugar, reducing sugar, phenol and pH was evaluated in *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn. The ash of both powders was subjected to qualitative analysis to confirm the presence carbonate, phosphate, chloride, sulphate and potassium. Extractive values including cold and hot water-soluble extractives and cold and hot alcohol soluble extractive values of both test drugs was evaluated in the study. Successive solvent extraction of both powders was also carried out using the solvents petroleum ether, cyclohexane, acetone and alcohol. The presence or absence of phytochemical constituents like alkaloids, flavonoids, phenols, saponins, carbohydrates, proteins, steroids and tannins were evaluated. Petroleum ether, cyclohexane, acetone and alcohol extracts of both powders were subjected to qualitative analysis for the presence of steroids, alkaloids, flavonoids and phenols. The physical and preliminary phytochemical analysis was done by standard procedures mentioned in the Ayurvedic Pharmacopoeia of India.

III. Results

A. Determination of physicochemical parameters

Physicochemical parameters such as foreign matter, total ash, acid insoluble ash, water insoluble ash, moisture content, volatile oil content, fibre content, tannin content, phenol content, pH, total sugar and reducing sugar content were estimated in both the *choorna*

(powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa- sinensis* Linn. The observations are listed in the table below.

Table No: 1 Physicochemical parameters of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No.	Parameters	*Choorna*	*Bhavitha choorna*
1.	Foreign matter	Nil	Nil
2.	Total ash	15.2%	8.55%
3.	Acid Insoluble Ash	7.5%	5.2%
4.	Water Insoluble Ash	0.057%	8.5%
5.	Moisture Content	15%	11%
6.	Volatile oil	Nil	Nil
7.	Fibre	15.01 %w/w	11.84 %w/w
8.	Tannin Content	0.065 %	0.071 %
9.	Total sugar	10.19 %w/w	6 %w/w
10.	Reducing sugar	6.09 %w/w	3.26 %w/w
11.	Phenol	1.14 %w/w	0.83%w/w
12.	pH	5.48	5.42

B. Qualitative analysis of ash

Qualitative analysis of ash of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn. Showed the presence of acid radicals such as carbonates, phosphates and chlorides. Basic radical potassium is not present in both.

Table No: 2 Qualitative analysis of ash of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No.	Experiment	*Choorna*	*Bhavitha Choorna*
Acid Radicals			
1.	Carbonate	+	+
2.	Phosphate	+	+
3.	Chloride	+	+
4.	Sulphate	–	+
Basic Radicals			
5.	Potassium	–	–

C. Determination of extractive values (water soluble and alcohol soluble) of flower buds of *Hibiscus rosa-sinensis* Linn.

Observed extractive values such as cold and hot alcohol soluble extractives, cold and hot water-soluble extractives of both the *choorna* (powder) and *bhavitha choorna* (triturated powder) of *Japakusuma mukula* (flower buds of *Hibiscus rosa-sinensis* Linn.) is tabulated below.

Table No: 3 Extractive values (water soluble and alcohol soluble) of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

	Type of Extractives	*Choorna*	*Bhavitha Choorna*
1.	Cold water soluble	26.44%	15.32%
2.	Hot water soluble	65.1%	71.3%
3.	Cold alcohol soluble	5.22%	2.78%
4.	Hot alcohol soluble	8.6%	17.4%

D. Determination of successive solvent extractive values of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

The following results were obtained on successive solvent extraction of *choorna* (powder) and *bhavitha choorna* (triturated powder) of *Japakusuma mukula* (flower buds of *Hibiscus rosa-sinensis* Linn.) in solvents like petroleum ether, cyclohexane, acetone and alcohol.

Table No: 4 Extractive values (in different solvents) of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No.	Solvents	*Choorna*	*Bhavitha choorna*
1.	Petroleum ether	2.095%	2.4%
2.	Cyclohexane	0.32%	0.28%
3.	Acetone	2.52%	2.74%
4.	Alcohol	0.83%	1.31%

E. Determination of the phytochemical constituents of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

a. Qualitative analysis of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn.

The results obtained in qualitative analysis of *choorna* (powder) and *bhavitha choorna* (triturated powder) showed the presence of flavonoids, proteins, alkaloids with dragendroff's test, carbohydrates in fehling's and benedict's test, phenols in lead acetate test, and tannins in ferric chloride test. *Bhavitha choorna* (triturated powder) shows the presence of steroids in them.

Table No: 5 Qualitative phytochemical analysis of *choorna* and *bhavitha choorna* of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No.	Experiment	*Choorna*	*Bhavitha Choorna*
1.	Test for Alkaloids		
	Dragendroff's test	+	+
	Meyer's test	_	_
2.	Test for flavonoids	+	+
3.	Test for Saponins	_	-
4.	Test for Carbohydrates		
	Fehling's test	+	+
	Benedict's test	+	+
5.	Test for proteins	_	+
6.	Test for Phenols		
	Ferric Chloride test	_	_
	Lead Acetate test	+	+
7.	Test for Steroids	_	+
8.	Test for Tannins		
	Ferric Chloride test	+	+
	Lead Acetate test	_	_

b. Qualitative analysis of cold-water extract of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn.

Results obtained from qualitative analysis of cold-water extract of powder of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn. were tabulated as follows.

Table No: 6 Qualitative phytochemical analysis of cold-water extract of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No.	Experiment	Cold water extract	
		Choorna	***Bhavitha choorna***
1.	Alkaloids		
	Dragendroff's test	+	+
	Meyers test	-	-
2.	Flavonoids	+	+
3.	Phenols		
	Ferric chloride test	-	-
	Lead acetate test	+	+
4.	Steroids	-	-

c. Qualitative phytochemical analysis of successive solvent extracts of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn.

Results obtained from the qualitative analysis of successive solvent extractives in petroleum ether, cyclohexane, acetone and alcohol of *choorna* (powder) and *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn. were tabulated as follows.

Table No: 7 Qualitative phytochemical analysis of solvent extracts of *choorna* (powder) of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No.	Experiment	Extracts			
		Petroleum ether	Cyclohexane	Acetone	Alcohol
1.	Test for Alkaloids				
	Dragendroff's test	+	+	+	+
	Meyer's test	+	+	+	+
2.	Test for flavonoids	-	-	-	+
3.	Test for Phenols				
	Ferric Chloride test	-	-	+	-
	Lead Acetate test	-	-	-	-
4.	Test for Steroids	-	-	+	-

Table No: 8 Qualitative phytochemical analysis of solvent extracts of *bhavitha choorna* (triturated powder) of flower buds of *Hibiscus rosa-sinensis* Linn.

Sl. No	Experiment	Extract			
		Petroleum ether	Cyclohexane	Acetone	Alcohol
1.	Test for Alkaloids				
	Dragendroff's test	+	+	+	+
	Meyer's test	+	+	+	+
2.	Test for flavonoids	-	-	-	-
3.	Test for Phenols				
	Ferric Chloride test	-	-	-	-
	Lead Acetate test	-	-	-	-
4.	Test for Steroids	+	-	+	+

IV. Discussion

In physicochemical evaluation of *choorna* (powder) and *bhavitha choorna* (triturated powder), parameters such as foreign matter, total ash, acid insoluble ash, water insoluble ash, moisture content, volatile oil content, fibre content, tannin content, total and reducing sugar, phenol and pH were analysed. In this study, it was found that there was no foreign matter present in the *choorna* and *bhavitha choorna* which suggested the purity of the drug. Ash analysis was performed to find the total ash, acid insoluble ash and water insoluble ash. The quantity of residue left over after the substance has been burned up is indicated by the ash content or ash value. It reveals the amount of inorganic material in a medication and its purity. Sand and siliceous earth, which make up a portion of the overall ash, are two types of silica that are particularly abundant in the medicine and are measured as acid insoluble ash. The amount of total ash that is not soluble in water is made up of the water-insoluble ash. It was also used to evaluate a variety of contaminants, including carbonates, phosphates etc. In this study the total ash is 15.2% in *choorna* and 8.55% in *bhavitha choorna* which shows a decrease in value with *bhavana* process. The acid insoluble ash content reduced in *bhavitha choorna* to 5.2% compared to 7.5% in *choorna*. While considering the water insoluble ash a considerable hike is seen in *bhavitha choorna* to 8.5% from 0.057% in *choorna*. The values of *bhavitha choorna* is almost near to the values of total ash content, acid insoluble ash and water insoluble ash in flower powder of *Hibiscus rosa-sinensis* Linn. evaluated in previous work by Sangari et al.[3] Moisture content of drugs is a crucial quality characteristic in the pharmaceutical industry. The flowability and particle agglomeration of raw materials are directly impacted by the hygroscopicity of pharmaceutical powders. Raw materials with a high moisture content encourage the growth of microbes. In the present study the moisture content was found to be 15 % in *choorna* and 11% in *bhavitha choorna*, in which the *bhavitha choorna* value is comparable with the previous work by Sangari et al.[3] Volatile oil was not found in both *choorna* and *bhavitha choorna* of flower buds. The presence of volatile oil was also found to be absent in various flower extracts as per previous studies. The quantitative tests for fibre content, total sugar, reducing sugar, phenol and pH of *choorna* and *bhavitha choorna* of flower buds are done for the first time in this study. These parameters were found

to be less in *bhavitha choorna* compared to *choorna*. The tannin content was estimated qualitatively in earlier works in various flower extracts of *Hibiscus rosa-sinensis* Linn. But in this study tannin content was quantitatively estimated as 0.01275% in *choorna* and 0.01345% in *bhavitha choorna* of flower buds. The amount of total sugar, reducing sugar and phenol content was also decreased by the process of *bhavana.* The pH was found to be slightly less in *bhavitha choorna* (5.42) as compared to *choorna* (5.48). Qualitative analysis of ash, water soluble extractives, alcohol soluble extractives and successive solvent extractives of *choorna* and *bhavitha choorna* were analysed carefully. The qualitative analysis of ash showed the presence of carbonates, phosphates, chlorides in both *choorna* and *bhavitha choorna,* whereas the sulphates are present in *bhavitha choorna* only. The basic radical potassium is found to be absent in both *choornas*. Here, the cold and hot water soluble and alcohol soluble extractives were analysed and found that cold extractives are less in *bhavitha choorna* in comparison with *choorna*, whereas hot extractives are more in *bhavitha choorna*. This shows that the active constituents are more in cold extractives of *choorna* and hot extractives of bhavitha choorna. It is also evident that water soluble extractives contain more phytoconstituents when compared to alcohol soluble extractives. Successive solvent extraction based on increasing polarity was done with both *choorna* and *bhavitha choorna* to extract the various components with different polarity range. In this clinical study, petroleum ether, cyclohexane, acetone and alcohol were used for successive solvent extraction. The extractive values of *choorna* and *bhavitha churna* were 2.095% and 2.4% in petroleum ether, 0.32% and 0.28% in cyclohexane, 2.52% and 2.74% in acetone and 0.83% and 1.31% in alcohol respectively. The extractive values of *choorna* and *bhavitha choorna* of flower buds are considerably less in comparison with the extractive values obtained for flower powder of *Hibiscus rosa-sinensis* Linn. by Sangari et al.[3]

The qualitative tests to determine various phytoconstituents is done with different extracts like cold water extract, alcoholic extract, chloroform extract and in various successive solvent extracts obtained from petroleum ether, cyclohexane, acetone and alcohol.

Qualitative analysis of various phytoconstituents like sterols, carbohydrates, proteins, alkaloids, saponins, tannins, mucilage, flavonoids, coumarin and wax were analysed by

Sangari et al[3] in powdered drug and various flower extracts like petroleum ether, chloroform extract, ethyl acetate extract, alcohol extract and aqueous extracts of flowers of *Hibiscus rosa-sinensis* Linn. In this study, we are not analysing mucilage, coumarin and wax. Here qualitative analysis of alkaloids, flavonoids and phenols were done in alcohol extract; saponins, carbohydrates, proteins and tannins were analysed in aqueous extract; and steroids are analysed in chloroform extract of *choorna* (powder) and *bhavitha choorna* (triturated powder). It was found that, alkaloids, flavonoids, carbohydrates, phenols and tannins were present in both *choorna* and *bhavitha choorna.* Steroids and proteins were only found only in *bhavitha choorna* and the saponins are absent in both. The observed results are compared with the previous study. As the dosage form in this clinical trial is a cold-water extractive, qualitative analysis of both *choorna* and *bhavitha choorna* to analyse the constituents like alkaloids, flavonoids, phenols and steroids were done and found the presence of all in both, except steroids. Again, the qualitative analysis in various successive solvent extractives (petroleum ether, cyclohexane, acetone and alcohol) of *choorna* and *bhavitha choorna* of flower buds was done in this study and the presence of steroids, alkaloids, flavonoids, phenols was noticed. It was revealed that alkaloids were present in all extracts of *choorna* and *bhavitha choorna*.; flavonoids were found in alcohol extract of *choorna* only; phenols and steroids were present in acetone extract of *choorna*; in *bhavitha choorna* phenols were absent in all solvent extracts, but steroids present in all extracts, except cyclohexane.

V. Conclusion

In this study, it was found that there was no foreign matter present in the *choorna* (powder) and *bhavitha choorna* (triturated powder) which suggested the purity of the drug. The values of *bhavitha choorna* is almost near to the values of total ash content, acid insoluble ash and water insoluble ash in flower powder of *Hibiscus rosa-sinensis* Linn. evaluated in previous work. The quantitative tests for fibre content, total sugar, reducing sugar, phenol and pH of *choorna* and *bhavitha choorna* of flower buds are done and were found to be less in *bhavitha choorna* compared to *choorna*. The amount of total sugar, reducing sugar and phenol content

was also decreased by the process of *bhavana*. The pH was found to be slightly less in *bhavitha choorna* compared to *choorna.* Qualitative analysis of ash, water soluble extractives, alcohol soluble extractives and successive solvent extractives of *choorna* and *bhavitha choorna* were analyzed carefully.

In preliminary phytochemical evaluation, it was found that; alkaloids, flavonoids, carbohydrates, phenols and tannins were present in both *choorna* and *bhavitha choorna;* steroids and proteins were found only in *bhavitha choorna*; and the saponins are absent in both. The qualitative analysis in various successive solvent extractives (petroleum ether, cyclohexane, acetone and alcohol) revealed that alkaloids were present in all extracts of *choorna* and *bhavitha choorna*.; flavonoids were found in alcohol extract of *choorna* only; phenols and steroids were present in acetone extract of *choorna*; in *bhavitha choorna* phenols were absent in all solvent extracts, steroids present in all extracts of *bhavitha choorna* except cyclohexane extract. Thus, physicochemical and preliminary phytochemical were done here initially in this clinical study for *choorna* and *bhavitha choorna* of *Japakusuma mukula* (flower buds of *Hibiscus rosa-sinensis* Linn.) and it is substantiated that *bhavitha choorna* contains various phytoconstituents in different concentration when compared with *choorna.* So, there may be differences in the intensity of various pharmacological action exhibited choorna of *Japakusuma mukula* in comparison with *bhavitha choorna* of the same which could be further analysed by future reserches.

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