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A COMPARATIVE PHYTOCHEMICAL ANALYSIS OF *CHOORNA* AND BHAVITHA *CHOORNA* OF RHIZOME OF *HARIDRA* (*CURCUMA LONGA* LINN.)

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ABSTRACT

Bhavana is the most extensively used *samskara* (pharmaceutical procedure) of Ayurveda, which potentiates the drug and induces additional therapeutic properties. Hence the effective dose can be reduced. In the present study, the *bhavana* process is carried out by the powdered drug of *Haridra* (*Curcuma longa* Linn.), which is soaked into the *swarasa*(juice*)* of rhizome of *haridra*(*Curcuma longa* Linn.) overnight and kept for drying the next day. The preliminary phytochemical evaluation of *choorna*(powder) and *bhavitha choorna* (processed powder) of *Curcuma longa* Linn. was done and the tannin, fibre, Total sugar, reducing sugar, extractive values and successive solvent extractive values were found more in *bhavitha choorna*(processed powder) when compared to *choorna* of the drug, which substantiates that the *bhavana* process can increase the potency and efficacy of the drug. The present study aimed to compare the findings of phytochemical analysis of both the *choorna*(powder)and *bhavitha choorna*(processed powder) of the drug.

Key words: *Haridra*, phytochemical analysis, *choorna, Bhavitha chorna, Curcuma longa* Linn.

INTRODUCTION

The drug *Haridra*, botanically identified as *Curcuma longa* Linn.[1], has been used traditionally in rituals, spices as well as therapeutically. *Haridra* contains many phytochemicals such as Alkaloids, tannins, curcuminoids, saponins, phytosterols, fatty acids and polysaccharides.[2],[3]phytochemicals are biologically active naturally occurring chemical compounds found in plants, which are responsible for the various pharmacological activities and helpful in the identification and authentication of the drug Curcuma longa Linn. along with knowledge of safety and efficacy. Various phytochemical studies were conducted on Curcuma longa Linn. by researchers[2],[3] but phytochemical evaluation of *bhavitha choorna*(processed powder) of the drug has not been reported yet. Acharya *charaka* defines *samskara* as the transformation of inherent attributes and the addition of extra properties to substance.[4] *Bhavana* is an important *samskara* mentioned in classics which can increase the potency of the drug, thereby reducing the dose. In *Bhaishajya ratnavali, bhavana* (processing) is that, the powdered drugs should be soaked in the liquid at night and it should be kept for sundry and this procedure has to be repeated for seven times.[5] The *bhavitha choorna* (processed powder) is the *choorna* (powder) after subjecting to *bhavana* (processing). In this study, *bhavitha choorna*(processed powder) prepared according to the reference of *bhavana vidhi* (processing method) mentioned in *Bhaishajya ratnavali*.[5] The most important benefit of *bhavana* is that even a small dose of a drug can produce high effect. As the *bhavana* can potentiate the drug, the present study aimed to compare the findings of phytochemical analysis obtained for the *choorna* (powder) and *bhavitha choorna*(processed powder) of dried rhizome of *haridra* (Curcuma longa Linn.).

MATERIALS AND METHODS

Collection of the drug

The drug *Curcuma longa* Linn. was freshly collected from Puranattukara village, Thrissur district, Kerala. The harvesting was done manually when the leaves turn dry and light brownish in colour and all the extraneous matter adhering to them was cleared by hand.

Preparation of *choorna* (powder)

The fresh rhizomes of the drug were washed with water thoroughly to remove residual physical impurities and dried. A sufficient quantity of dried rhizome was then powdered and passed through sieve of 120 mesh size to obtain fine powder.

Preparation of *bhavitha choorna* (processed powder)

The *choorna*(powder) of the rhizome of *Haridra*(Curcuma longa Linn.) was subjected to *bhavana* according to reference quoted in *Bhaishajya ratnavali*.[5] A sufficient quantity of

rhizome was crushed and *swarasa*(juice) was taken for *bhavana*.[6] The *choorna*(powder) of the drug was taken in a clean tray and evenly spread so that it forms a thin layer. The prepared *swarasa*(juice) was filtered and gradually poured into the fine powder such that the *swarasa*(juice) get drained into the *choorna*(powder). The powdered drug got completely submerged in *swarasa* (juice) and a thin layer of *swarasa* (juice) was left above the fine powder. Using a clean sharp thin rod ensured the complete soaking of each and every fine particles of the drug. To ensure uniform spreading of *bhavana dravya* in the fine particles of the powder, the tray was slowly and uniformly shaken on both sides. Then the tray was covered with a clean thin cloth to avoid dust and contamination and then left overnight. On the next day morning the tray was taken and then dried in shade. When the top layer of soaked drug got dried, it was stirred using a clean rod to ensure uniform drying. Once properly dried, it was again powdered to remove lumps. The *bhavana* (processing) was done in the same manner for 7 times and the process of powdering of *choorna* was done after each *bhavana*. After whole procedure, the properly dried *bhavitha choorna* was made into fine powder and sieved through mesh with size-120.

Figure 1: *Choorna* (powder) of dried rhizome of *Haridra* (*Curcuma longa* Linn.)

Figure 2: *Bhavitha Choorna* (powder) of dried rhizome of *Haridra* (*Curcuma longa* Linn.)

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.

Apparatus

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

Procedure

Determination of the physicochemical parameters

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* and *bhavitha choorna* of rhizome of Curcuma longa Linn.

Qualitative analysis of ash

The ash obtained from both powders of the plant was subjected to qualitative analysis to confirm the presence or absence of acid radicals such as carbonate, phosphate, sulphate and chloride and basic radical of potassium.

Determination of Extractive values

The cold water soluble, hot water soluble, cold alcohol soluble, and hot alcohol soluble extractive values of both test drugs of Curcuma longa Linn. was estimated in the study.

Petroleum ether, cyclohexane, acetone, and alcohol were the solvents used for successive solvent extraction of both *choorna* and *bhavitha choorna* of rhizome of the drug.

Phytochemical parameters

Phytochemical constituents like alkaloids, saponins, flavonoids, tannins, steroids, phenols, carbohydrates, and proteins were screened to detect the presence or absence of them in both *choorna* and *bhavitha choorna* of rhizome of the drug.

Petroleum ether, cyclohexane, acetone and alcohol extracts of *choorna* and *bhavitha choorna* of Curcuma longa Linn. were subjected to qualitative analysis for detecting the presence of steroids, alkaloids, flavonoids and phenols.

RESULTS

Results of the preliminary phytochemical analysis done on *choorna* and *bhavitha choorna* of rhizome of *Curcuma longa* Linn. are tabulated below:

Table No.1 Physico-Chemical Parameters of *choorna* and *bhavitha choorna* of rhizome of *Curcuma longa* Linn.

Sl no.	Parameters	*Choorna*	*Bhavithachoorna*
1	Foreign matter	Nil	Nil
2	Total ash	8.9%	8.3%
3	Acid Insoluble Ash	0.8 %	1.4%
4	Water Insoluble Ash	5.6 %	5.8%
5	Moisture Content	8.40%	9.70%
6	Volatile oil	Nil	Nil
7	Fibre	3.73%	7.94%
8	Tannin Content	5.1%	5.6%
9	Total sugar	2.11%	3.18%
10	Reducing sugar	1.15%	1.76%
11	Phenol	0.57%	0.50%
12	pH	6.26	7.0

Table 2: Qualitative analysis of ash of *choorna and bhavitha choorna* of rhizome of *Curcuma longa* Linn.

Sl no	Experiment	*Choorna* of *Haridra*	*Bhavitha choorna*
Acid radicals			
1	Carbonate	+	+
2	Phosphate	+	+
3	Chloride	+	+
4	Sulphate	+	+
Basic radicals			
5	Potassium	+	+

Table 3: Extractive values (water soluble and alcohol soluble) of *choorna* and *bhavitha choorna* of rhizome of *Curcuma longa* Linn.

Sl no	Type of Extractives	*Choorna*	*Bhavitha choorna*
1	Cold Alcohol soluble	9.38%	7.76%
2	Hot Alcohol soluble	9.4%	14.5%
3	Cold water soluble	11.1%	12.7%
4	Hot water soluble	12.1%	17%

Table 4: Extractive values (in different solvents) of *choorna* and *bhavitha choorna* of rhizome of Curcuma longa Linn.

Sl no	Solvents	*Choorna*	*Bhavitha choorna*
1	Petroleum ether	1.4%	2.1%
2	Cyclohexane	3.2%	4.32%
3	Acetone	3.4%	4.5%
4	Alcohol	4.2%	5.1%

Table 5: Qualitative phytochemical analysis of *choorna* (powder) *and bhavitha choorna* of rhizome of *Curcuma longa* Linn.

Sl.no	Experiment	*Choorna*	*Bhavitha choorna*
1	Alkaloids a. Dragendroff"s test	+	+
	b. Meyer's test	+	+
2	Flavonoids	+	+
3	Saponins	+	+
4	Carbohydrates a. Fehling's test	+	+
	b. Benedict's test	+	+
5	Proteins	-	-
6	Phenols a. Ferric chloride test	+	+
	b. Lead acetate test	+	+
7	Steroids	+	+
8	Tannins a. Ferric chloride test	+	+
	b. Lead acetate test	+	+

Table 6: Qualitative analysis of successive solvent extractives of *choorna* (powder) and bhavitha choorna of rhizome of *Curcuma longa* Linn.

Sl no	Extract	Steroids	Alkaloids	Flavonoids	Phenols
1	Petroleum ether	+	-	-	+
2	Cyclohexane	+	+	-	+
3	Acetone	+	+	-	+
4	Alcohol	+	+	-	+

DISCUSSION

The detailed preliminary phytochemical evaluation was carried out in both the powder i.e. *choorna* (powder) and *bhavitha choorna* (processed powder)of *Haridra*(*Curcuma longa* Linn.) to confirm the quality and purity of the drug. The results obtained were then compared with available references in literature. The preliminary phytochemical evaluation of *bhavitha choorna* (processed powder) is not available to make a comparison.

The physicochemical parameters such as foreign matter, total ash, acid insoluble ash of *choorna* (powder) of rhizome of *Haridra* are available from Ayurvedic Pharmacopoeia of India [1], Quality Standards of Indian Medicinal Plants by ICMR[7]. Foreign matter in the drug determines the presence of undesirable organic and waste materials. In the present study, foreign matter was absent in both the samples of the drug, which indicates the purity of the drug. The ash value is the residue remaining after incineration of the drug and it denotes the presence of an inorganic substance in the drug. The percentage of total ash obtained was 8.9% for *choorna* and 8.3% for *bhavitha choorna* of the drug. Acid insoluble ash value mainly indicates the presence of siliceous impurities. In the present study, the acid insoluble ash value obtained was 0.8% in *choorna* (powder) and 1.4% in *bhavitha choorna* (processed powder) of the drug. All these observed results of *choorna* were found in normal limits compared to the literature. The percentage of water-insoluble ash of both *choorna* (powder) and *bhavitha choorna* (processed powder) was found to be 5.6% and 5.8% respectively.

The value of moisture content in *choorna* and *bhavitha choorna* was found to be 8.4% and 9.7% respectively, which was less than the value obtained for turmeric powder in the pharmacognosy textbook by C. K. Kokate[8] and previous research by Rajkumari lahari et al.[9] The moisture content obtained for *bhavitha choorna* is slightly higher than *choorna* due to repeated soaking of *choorna* in the juice of the drug, but it was not decomposed. As per Ayurvedic Pharmacopoeia of India, the volatile oil content of the drug is not less than four percentage. In the study drug, volatile oil content was absent in *choorna* (powder) and *bhavitha choorna* (processed powder) of the drug, which may be due to the sun-drying of the drug.

The tannin content of *choorna* and *bhavitha choorna* obtained was 5.1 % and 5.6% respectively. More tannin content in *bhavitha choorna* may be due to the repeated *bhavana* process whereas for the *choorna* it was comparable to previous research.[3] The Fibre content in *choorna* and *bhavitha choorna* were 3.73% and.7.94% respectively. The fibre content obtained for *choorna* is comparable with research work by M padma et al.[10] and in *bhavitha choorna* it may be increased due to the repeated *bhavana* process.

The total sugar content in *choorna* (powder) was 2.11% which has increased to 3.18% in *bhavitha choorna* (processed powder). Reducing sugar was 1.15% in *choorna* (powder) while in *bhavitha choorna* (processed powder), it was found to be slightly increased to 1.76%. The phenol content obtained in *choorna* and *bhavitha choorna* was 0.57% and 0.50 % respectively, which is almost similar in both. The phenol content obtained was low in the study drug, when compared to the literature which may be due to seasonal variation during the collection of the drug.

Qualitative and quantitative estimation of pH of *choorna* and *bhavitha choorna* of the drug was estimated. Both *choorna* of drug turned blue litmus paper into red denoting the acidic nature. The *choorna* showed an acidic pH of 6.26 and *bhavitha choorna* with a pH of 7. It was found that the pH of *bhavitha choorna* became neutral due to the *bhavana* process. The observation obtained was comparable with the Ayurvedic Pharmacopoeia of India.

The qualitative analysis of ash of *choorna* and *bhavitha choorna* showed the presence of all the acid radicals like carbonate, phosphate, chloride and sulphate and basic radicals like potassium.

Extractive values of drugs help to determine the quality, purity, and adulteration in the drug. In the *choorna*, cold alcohol soluble extractive value and cold water soluble extractive value analysed were 9.38% and 11.1% respectively. In *bhavitha choorna*, cold alcohol soluble extractive and cold water soluble extractive values were 7.76% and 12.7% respectively. In addition, hot alcohol and hot water-soluble extractives estimated to

choorna were 9.4 % and 12.1% respectively whereas, in *bhavitha choorna*, hot alcohol soluble extractive and hot water-soluble extractive values were 14.5% and 17% respectively. Here, in both the *choorna*, the water-soluble extractive values were found higher than the alcohol-soluble extractive values. This shows that the maximum amount of active phytoconstituents in the rhizome was extracted in water. Also, hot extractive values were greater than cold extractive values in both *choorna* (powder) and *bhavitha choorna* (processed powder) of the drug. While comparing the extractive values obtained for *choorna* and *bhavitha choorna*, it was found that *bhavitha choorna* possess more extractive values than that of *choorna* which indicates that *bhavana* process resulted in increasing the extractive values of the drug.

Successive extraction with solvents of increasing polarity from a non-polar (petroleum ether) to a more polar solvent (methanol) is used to extract various compounds of a wide polarity range. In the present study, the results obtained on successive solvent extraction of *choorna* and *bhavitha choorna* of rhizome were 1.4% and 2.1% for petroleum ether, 3.2% and 4.3% for cyclohexane, 3.4% and 4.5% for acetone and 4.2% and 5.1% for alcohol respectively. The successive solvent extractive values were found more in the *bhavitha choorna* indicating its better potency compared to the *choorna* of the drug. The maximum extractive values were obtained in an alcohol solvent in both *choorna*(powder) and *bhavitha choorna* (processed powder) of the rhizome of the drug.

In the qualitative analysis, the presence of chemical constituents such as alkaloids, flavonoids, saponins, carbohydrates, proteins, phenol, steroids, and tannins were determined in the *choorna* by previous researchers in various extracts.[3]In present study, alcoholic extract of the powdered drug was used to determine the presence of alkaloids, flavonoids, phenol and steroids and aqueous extract for saponins, carbohydrates, proteins and tannins in both *choorna*.

The qualitative analysis of successive solvent extractives in petroleum ether, cyclohexane, acetone and alcohol of *choorna* and *bhavitha choorna* of rhizome was done and revealed the presence of steroids and phenols in all the four extracts whereas flavonoids are absent in the same. The presence of alkaloids was observed in all extracts except in petroleum ether.

CONCLUSION

The phytochemical evaluation of the drug helps to reveal the presence of phytoconstituents that provides evidence to support its therapeutic potency. In the preliminary phytochemical evaluation of *choorna* and *bhavithachoorna* of *Haridra*(Curcuma longa Linn.), quantitative increase in tannin, fibre, total sugar, reducing sugar, extractive values and successive solvent extractive values was found more in *bhavitha choorna* when

compared to *choorna* of the drug, which substantiates that the *bhavana* process can increase the potency and efficacy of the drug. Hence the dosage of the drug can be reduced.

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