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Research Article

PHARMACEUTICO-ANALYTICAL STUDY OF *GANDHAKA RASAYANA*

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ABSTRACT

Gandhaka Rasayana is a much more beneficial drug on wide variety of skin disease such as psoriasis which is difficult to completely cure, but manufacturing procedure is generally tough and time consuming. As per classical references there were 88 numbers of *Bhavana* (levigation) and according to practical experience it was taken near about six month for completion. Therefore total effort has been spent here to establish and revalidate standard operative procedure for preparation of *Gandhaka Rasayana* to fulfill objectives of this work. Successfulness of pharmaceutical study can be confirmed through assessing results of analytical study. Analytical study provides idea about quality of finish product and safety profiles the same on the basis of scientific background. Hence without analytical study of the drug, the research which was related to medicinal field is incomplete. Among the main and important aims of conducted analytical study are to assess chemical configuration and the physico chemical changes which occurred after *Samskara* (procedures) in the finish product.

Objectives: To developed standard operative procedure for preparation of *Gandhaka Rasayana*, to find out the cumbersome in the preparation, reduce time factor in preparation considering with safety and efficacy, find out suitable dispensing form and to analyze the *Gandhaka Rasayana* for safety and purity.

Material and methods: *Gandhaka Rasayana* was prepared as per Yogaratnakara, *Rasayanadikara* with some modifications and analyze it as per parameters of "Protocol of testing ASU medicine" published by Govt. of India Dept. of AYUSH, Ministry of health and family welfare. Physical characters, Physico-chemical analysis, HPTLC, Heavy metals, Microbial load etc parameters were used for analysis of sample of test drug which were prepared by using wet grinder.

Results & discussion: Weight of *Gandhaka Rasayana* after 88 *Bhavana* was increased accordingly total solid content present in the used liquids for *Bhavana*. Presence of low amount of moisture content of *Gandhaka Rasayana* (4.67%) is leading to decrease decomposition and enhance the shelf life and therapeutic value of the same. Low Acid insoluble Ash determines the presence of low adherent dirt as well as sand particles. High % of water & alcohol soluble extractives (62.18% & % 63.12% respectively) confirms the presence of more active principles in the sample. Heavy metal test and Microbial analysis were shown within limit results which refers safety profile of the samples and stability of the drug. Retention factor values in HPTLC confirmed about the multi-polarity index of the compounds and wide range of active principles.

KEYWORDS: *Bhavana*, Physico-chemical analysis, Standard operative procedure, Safety profile.

INTRODUCTION

Fruitfulness of treatment depends on the good qualities *Cikitsaka* (physician), properly prepared *Aushadha* (medicine), experienced *Paricaraka* (attendant) and treatment tolerable patient. Properly prepared *Aushadha* is an important branch among these quadripod. Preparation of *Gandhaka Rasayana* is generally tough and time consuming procedures. As per classical references there were 88 numbers of *Bhavana* (levigation) and according to practical experience it was taken near about six month for completion. Therefore total effort has been spent here to establish and revalidate standard operative procedure for preparation of *Gandhaka Rasayana* to fulfill objectives of this work. Successfulness of pharmaceutical study can be confirmed through assessing results of analytical study. The meaning of the term analysis is the detailed examination, which reveals the minor but important aspects regarding the drug. Analytical chemistry is one of the most important disciplines of the science which deals with qualitative and quantitative analysis of various substances, it is essential to standardize the drug and examine the quality and safety of the drug. Analytical study provides idea about quality of finish product and safety profiles the same on the basis of scientific background. Hence without analytical study of the drug, the research which was related to medicinal field is incomplete. The finish product which was followed standard operative procedure will leads to qualitatively and quantitatively fruitful outcome. Among the main and important aims of conducted analytical study are to assess chemical configuration and the physico chemical changes which occurred after *Samskara* (procedures) in the finish product.

Aim & objectives

To developed standard operative procedure for preparation of *Gandhaka Rasayana*, to find out the difficulty in the preparation, reduce time factor in preparation considering with safety and efficacy, find out suitable dispensing form and analyze the *Gandhaka Rasayana* for purity and quality.

MATERIAL AND METHODS

Raw materials were procured from NIA pharmacy, and the pharmaceutical study was carried out at pharmaceutical lab of Rasa Shastra and Bhaishajya Kalpana, NIA, Jaipur with following steps; *Gandhaka Shodhana,* Preparation of *Chaturjata sheeta Kashaya,* Preparation of *Bhavana Kwatha,* Preparation of *Ardraka Swarasa,* Preparation of sugar powder, Preparation of *Gandhaka Rasayana* and Capsulation of *Gandhaka Rasayana*.

Practical no 1

Gandhaka Shodhana [1]

Materials

Unpurified *Gandhaka* → 500g × 3 batches =1500g
Cow's milk → 2 L × 3 × 3 = 18 L
Cow's Ghee → 20g × 3 × 3 = 180g
Hot water → Quantity sufficient

Type of procedure: *Dhalana*

Procedure

Unpurified *Gandhaka* was made into fine powder with the help of mortar and pestle and weighed properly. Obtained amount of *Gandhaka* powder divided into 3 equal parts. Cow's milk was boiled in a stainless steel vessel and kept for Luke warm condition. The mouth of vessel was closed by clean cotton cloth which was smeared with cow's ghee and tied with the help of thread. The first batch of powdered unpurified *Gandhaka* was kept in a stainless steel vessel which was containing cow's ghee. Then it was melted at mild heat with continuous stirring. Completely melted *Gandhaka* was poured immediately into the vessel containing warm milk, through ghee smeared cotton cloth. Cloth covering was removed from the vessel, milk part discarded and *Gandhaka* poured into another vessel which was containing hot water. It was washed thoroughly several times till complete removal of milk and ghee particles. Dried it in shade then powdered and weighed. The same procedure was carried out 3 times per batch and replacing milk every time. Three batches were subjected to above same procedure and finally recorded the weight of purified *Gandhaka*.

Practical no 2

Preparation of C*haturjata Sheeta Kashaya* [2]

Material

1. *Twak* coarse powder 2 Kg → 250g × 8
2. *Ela* coarse powder 2 Kg → 250g × 8
3. *Patra* coarse powder 2 Kg → 250g × 8
4. *Nagakeshara* coarse powder 2 Kg → 250g × 8
5. Water → 6 times as per each coarse powder of *Sheeta Kshaya*

Procedure: *Twak, Patra, Nagakeshara* and peeled off *Ela* seeds were taken 2.1Kg each separately into tray then removed physical impurities, cleaned properly then pounded into coarse powder with the help of Pounding machine, measured 2Kg and kept in separately, cleaned and closed plastic jar finally labeled. 2L soft water was taken into stainless vessel boiled up to 100˚C then kept till calm 40˚C. 250g of *Twak* was taken into stainless steel vessel and 1500ml of above water was added to it and rubbed with both hands then closed with lid and kept for overnight. Next day morning again rubbed and filtered through cotton cloth and measured. 100ml of *Sheeta Kashaya* was separated for analytical test. Rest 500ml of those, were used for *Bhavana*. The same procedure was adopted for rest 07 *Sheeta Kashaya* of *Twak* daily. Same procedure was adopted for *Ela, Patra* and *Nagakeshara*.

Practical no 3

Preparation of *Bhavana Kwatha* [3]

Materials

1. Fresh *Guduchi* stem 4.8 Kg → 600gms × 8
2. Dried *Haritaki* fruits 2.4 Kg → 300gms × 8
3. Dried *Vibhitaki* fruits 2.4 Kg → 300gms × 8
4. Dried *Amalaki* fruits 2.4 Kg → 300gms × 8
5. Dried *Shunthi* rhizome 2.4 Kg → 300gms × 8
6. Dried *Bhringaraja Panchanga* 4.8 Kg 600gms × 8
7. Soft water 8 times as per each coarse powder 2-5 drugs
8. Soft water 4 times as per each coarse powder 1 & 6 drugs

Procedure: Fresh *Guduchi* stem was taken from herbal garden of Rajasthan Ayurveda University, Jodhpur. The fresh stem of *Guduchi* was cleaned, cut into small pieces weighed and chopped, *Haritaki, Vibhitaki, Amalaki, Shunthi* and *Bhringaraja* were cleaned properly kept in mild sunlight for 30 minutes then separately powdered into coarse powder and put mentioned amount into a stainless steel vessel added above mentioned amount of soft water then rubbed thoroughly by hands kept for overnight. Next day morning it was rubbed again and boiled on mild heat without covering its mouth. The water was reduced till the desired quantity obtained which was 1/4th. Then the *Kwatha* was filtered through clean dry cotton cloth. Above same procedure was adopted separately for 8 *Kwatha* on *Guduchi, Haritakai, Vibhitaki, Amalaki, Shunthi* and *Bhringaraja. Guduchi* should be used in the state of fresh but in this practical *Kwatha* of *Guduchi* was used due to low content of *Swarasa* in summer season. *Bhringaraja* was used in dry form as a *Kwatha* because of unavailability in fresh due to summer season. Among 8 *Kwatha* of above drugs from 1st, 4th and 7th 100ml of *Kwatha* was separated for Analytical test and 500ml was used for each *Bhavana*. Excess amount was discarded.

Practical no – 4

Preparation of A*ardraka Swarasa* [4]

Materials

Fresh *Ardraka* rhizome 8 Kg → 1 × 8

Procedure: 1kg of fresh *Ardraka* was cleaned properly and cut into small pieces with the help of knife. The small

pieces were put into juicer to extract juice from *Ardraka.* The extracted juice was filtered through cotton cloth to remove *Ardraka* covering and fibrous particles. The obtained *Swarasa* was measured by measuring cylinder then 100ml was separated for Analytical test and 500ml for *Bhavana* process. Above same procedure was adopted for each 8 *Swarasa* preparation and used for 8 *Bhavana.*

Practical no 5

Preparation of sugar powder

Material

Sugar ⟶ 1.025Kg

Procedure: Weighed sugar quantity was made into fine powder with the help of grinder and filtered through clean cotton cloth to remove impurities. 1 Kg of sugar powder was stored in air tight plastic container.

Practical no 6

Preparation of *Gandhaka Rasayana* [5]

Date of Starting: 18/ 04/ 2015

Date of completion: 18/ 08/ 2015

Type of procedure: *Bhavana,* Wet trituration.

Materials

Purified *Gandhaka* ⟶ 1 Kg

Bhavana Dravya ⟶ *Sheeta Kashaya* of *Twak, Ela, Patra* and *Nagakeshara Kwatha* of *Guduchi, Haritaki, Vibhitaki, Amalaki, Shunthi* and *Bhringaraja, Swarasa* of *Ardraka.*

Quantity of *Drava Dravya* for 8 *Bhavana* ⟶ 500ml × 8 = 4000ml

Sugar powder ⟶ 1Kg

Procedure: First of all wet grinder was washed properly and dried completely. Then its empty grinding compartment was weighed and noticed. 3 batches of purified *Gandhaka* was mixed homogenously then made into fine powder and weighed 1Kg, after that shifted to wet grinder. Prepared 500ml of *Twak Sheeta Kashaya* was poured into a wet grinder and mixed with purified *Gandhaka* powder with the help of spatula then started to grinding continuously till mixture was dried somewhat. After completed first *Bhavana* the drug containing wet grinder was covered with clean cotton cloth and kept in clean dry place. 8 *Bhavana* of *Twak Sheeta Kashaya* were conducted by following above same procedure. In the end of 8 *Bhavanas* the materials were taken out and kept in stainless steel trays which was slightly smeared with ghee then allowed to dry in shade. After somewhat dried materials was made into small balls and dried again then that balls were made into *Chakrika* and dried again after that those were separated to small pieces and dried again. Finally dried materials were powdered and weighed then again shifted to wet grinder for next *Bhavana. Sheeta Kashaya* of *Ela, Patra* and *Nagakeshara, Kwatha* of *Guduchi, Haritaki*, *Vibhitaki, Amalaki, Shunthi*, and *Bhringaraja, Swarasa* of *Ardraka* were given respectively. After completion of 88 *Bhavana* finally the materials were taken out with the help of spatula and knife kept in stainless steel trays and dried in shade following above same procedure. Completely dried materials were powdered, filtered through clean dry cotton cloth and measured every time before subjecting next procedure. Finely powdered 1Kg sugar was added to above same materials and mixed thoroughly. The mixture was shifted to wet grinder and grind for some times for expecting homogeneity and further reduction of particle size. Final amount was weighed and stored in a zip sealed polythene bags then kept in airtight plastic container.

Practical no 7

Capsulation of *Gandhaka Rasayana*

Material

- Hard gelatin capsules in the size of 500mg
  Colour of capsule ⟶ Maroon
- Hand operated hard gelatin capsules filling machine 300 capsules per one time
- Cotton cloth for cleansing capsule after filling.

Methods: The capsule filling machine was cleaned properly to prevent direct contamination. Empty capsules were filled into the loading tray and then placed over the machine bed. The bodies of capsules were locked by pressing handle and caps separated from the loading tray by operating the lever. 150g of drug was filled in the capsules which were placed over the machine bed. Powders of drugs were spreads with the help of spreader to fill capsule body uniformly. Excess of powder was collected then pin plate was put down to press the powder in the bodies. After that pin plate was put up and unlocked the compartment then excess of collected powder filled into the bodies with the help of spreader. After removing powder tray caps holding tray was kept over the bed then plate fitted and locked. By operating lever filled capsules were unlocked and then removed carefully and collected in a tray. Filled capsule was cleaned by cotton cloth. Capsules were packed in small (3"×4") zip sealed polythene bags as a 28 capsules per one bag.

Analytical Study

Successfulness of pharmaceutical study can be confirmed through assessing effectiveness in clinical study as well as results of Analytical study. The meaning of the term analysis is the detailed examination, which reveals the minor but important aspects regarding the drug. Analytical chemistry is one of the most important disciplines of the science which deals with qualitative and quantitative analysis of various substances, it is essential to standardize the drug and examine the quality and safety of the drug. For that purpose some analytical test are performed and their results are compared with standard parameters. Analytical study provides idea about quality of finish product and safety profiles the same on the basis of scientific background. Hence without analytical study of the drug, the research which was related to medicinal field is incomplete. The finish product which was followed standard operative procedure will leads to qualitatively and quantitatively fruitful outcome. For that raw drugs of the selected formula should be subjected to different procedure such as Agni *Samskara, Jala Samskara, Bhavana, Shodhana, Marana,* etc. Among the main and important aims of conducted analytical study are to assess chemical configuration and the physico chemical changes which occurred after *Samskara* in the finish product. It is

complicated work to analyze and standardize the herbal and herbo-mineral formulations due to presence of more active principals with them.

At the time of ancient the Ayurvedic science was developed analytical parameters according to available facilities at the same time such as organoleptic test Viz. *Sneha Siddhi Lakshana, Avaleha Paka Lakshana, Bhasma Pareeksha*. In the present Analytical study is plan to developed analytical parameters for *Gandhaka Rasayana* according to classical and modern methodology.

Aim and objectives: To analyze the *Gandhaka Rasayana* for purity and quality.

Material: Prepared sample of *Gandhaka Rasayana*

Method: Evaluation parameters

Organoleptic parameters: (a).Colour, (b).Taste, (c).Odour, (d).Appearance, (e).Touch

Physico-chemical parameters: (a). Total solid content of *Bhavan Dravya*, (b). pH (c). Loss on drying at 105˚c, (d). Total ash, (e). Water soluble ash, (f). Acid insoluble ash, (g). Alcohol soluble extractive, (h). Water soluble extractive, (i). Particle size.

HPTLC, Test for heavy metals and Microbial contamination

Results of Pharmaceutical Study

Summary analyzed of *Gandhaka Shodhana*

Total raw *Gandhaka* → 1.5 Kg

Total purified *Gandhaka* → 430+435+430=1.295 Kg

Total loss of weight → 205 g

% of total loss of weight → 13.66%

Finally three samples of purified *Gandhaka* were mixed homogeneously and 1000g were taken for further process of preparation of *Gandhaka Rasayana.*

Table 1: Showing pH of prepared *Bhavana Drava*

S.No.	Name of *Kashaya*	Mean pH
1	*Twak*	5.0
2	*Ela*	5.7
3	*Patra*	5.3
4	*Nagakeshara*	4.5
5	*Guduchi*	6.25
6	*Haritaki*	3.7
7	*Vibhitaki*	4.0
8	*Amalaki*	2.8
9	*Shunthi*	6.2
10	*Bhringaraja*	5.3
11	*Ardraka*	6.35

Table 2: Showing weight gain after completion of each 8 *Bhavana*

Time duration	Name of *Bhavana Dravya*	Weight of *Gandhaka* before *Bhavana* (Kg)	Weight of *Gandhaka* after *Bhavana* (Kg)	Amount of weight increase (g)	% of weight increase
8 days	*Twak Sheeta Kashaya*	1.000	1.067	67.2	6.72
8 days	*Ela Sheeta Kashaya*	1.067	1.132	65.0	6.09
8 days	*Patra Sheeta Kashaya*	1.132	1.197	65.0	5.74
8 days	*Nagakeshara Sheeta Kashaya*	1.197	1.259	62.0	5.17
8 days	*Guduchi Kashaya*	1.259	1.379	120.0	9.52
8 days	*Haritaki Kashaya*	1.379	2.117	738.4	53.53
8 days	*Vibhitaki Kashaya*	2.117	2.497	380.0	17.94
8 days	*Amalaki Kashaya*	2.497	3.074	577.0	23.10
8 days	*Shunthi Kashaya*	3.074	3.221	146.4	4.76
8 days	*Bhringaraja Kashaya*	3.221	3.295	74.0	2.29
8 days	*Ardraka Swarasa*	3.295	3.399	104.0	3.15
Total				2.399Kg	239.9

Table 3: Showing final results of preparation of *Gandhaka Rasayana*

S. No	Description	Weight
1	Purified *Gandhaka*	1 Kg
2	After 88 *Bhavana*	3.399 Kg
3	After preparation of powder of *Gandhaka Rasayana*	3.349 Kg
4	Powdering loss	50 g
5	% of powdering loss	1.47%
7	Final weight gain due to *Bhavana*	2.349 Kg
8	% of weight gain	234.9 %
6	Added sugar powder	1 Kg
10	Grand final weight of *Gandhaka Rasayana*	4.349 Kg

Final results of capsulation *Gandhaka Rasayana*

- Quantity used for filling ⟶ 4300g
- Number of capsules fill in one time ⟶ 300
- Number of capsules filled ⟶ 8600
- Average weight of one capsule ⟶ 530mg
- Capsules containing in one pouch ⟶ 28
- Prepared total pouch ⟶ 304

Results of Analytical Study

Table 4: Showing organoleptic characters of *Gandhaka Rasayana*

S. No.	Colour	Odour	Taste	Appearance	Touch
1.	Brownish ash	Characteristic smell of *Chaturjata* and *Ardhaka*	*Madhura Amla Kashaya*	Powder form	Soft & smooth

Table 5: Showing total solid (TS) contents of the *Bhavana Dravya* [6]

S.No	*Bhavana Dravya*	Mean TS %
1	*Twak*	01.98
2	*Ela*	01.95
3	*Patra*	02.01
4	*Nagakeshara*	01.94
5	*Guduchi*	04.01
6	*Haritaki*	19.71
7	*Vibhitaka*	10.07
8	*Amalaki*	14.93
9	*Shunthi*	04.16
10	*Bhrngaraja*	02.12
11	*Ardhaka*	03.10

Table 6: Showing pH value of the *Gandhaka Rasayana* [7]

S. No	Sample drug	Parameter	Value			
			1st time	2nd time	3rd time	Mean pH
1.	*Gandhaka Rasayana*	pH	3.5	3.9	3.7	3.7

Table 7: Showing analytical results of below test

S. No.	Sample Name	Parameter	Results
1	*Gandhaka Rasayana*	Loss on drying at 105˚c [8]	4.67% w/w
2	*Gandhaka Rasayana*	Total Ash value [9]	3.86%w/w
3	*Gandhaka Rasayana*	Water soluble ash [10]	1.22%w/w
4	*Gandhaka Rasayana*	Acid insoluble ash [11]	0.369%w/w
5	*Gandhaka Rasayana*	Alcohol soluble extractive [12]	63. 12 % w/w
6	*Gandhaka Rasayana*	Water soluble extractive [13]	62.18 % w/w

Table 8: Showing particle size of *Gandhaka Rasayana* [14]

S. No	Sample Name	Parameter	Nominal mesh aperture	Results
1	*Gandhaka Rasayana*	Particle size	355µm	74.43 w/w

Results of heavy metal test [15]: Lead, Cadmium, Arsenic, Mercury are not detected.

Microbial analysis [16]:

Total aerobic bacterial count : 88 cfu / g

Total yeast mould coconut < 10 cfu /g

HPTLC [17]

1gm of Sample was extracted with 10 ml of alcohol.15µl of the above extract was applied on a pre-coated silica gel F254 on aluminum plates to a band width of 8 mm using Linomat 5 TLC applicator. The plate was developed in Methanol. The developed plates were visualized in UV 254, 366, and then derivatised with anisaldehyde sulphuric acid and scanned under UV 254 and 366 nm. Rf colour of the spots and densitometric scan were recorded.

Results

Table 9: Retention factor value (Rf) of in different wave length

Wave length (nm)	Track No	Maximum retention factor value	Total peak
200	1	0.01, 0.14, 0.16, 0.20, 0.24, 0.29, 0.33, 0.38, 0.41, 0.43, 0.48, 0.50, 0.58, 0.62, 0.77, 0.80, 0.87, 0.92, 0.96, 0.98, 1.02	21
	2	0.01, 0.12, 0.18, 0.22, 0.26, 0.37, 0.39, 0.45, 0.48, 0.51, 0.55, 0.60, 0.63, 0.69, 0.74, 0.77, 0.87, 0.94, 0.96, 1.01	20
300	1	0.01, 0.06, 0.14, 0.16, 0.19, 0.24, 0.29, 0.33, 0.38, 0.41, 0.43, 0.50, 0.58, 0.62, 0.69, 0.77, 0.81, 0.87, 0.89, 0.92, 0.96, 1.02	22
	2	0.01, 0.12, 0.18, 0.22, 0.26, 0.31, 0.37, 0.39, 0.45, 0.48, 0.51, 0.55, 0.60, 0.63, 0.69, 0.74, 0.77, 0.80, 0.85, 0.87, 0.94, 1.01, 1.03	23
400	1	0.01, 0.29, 0.33, 0.56, 0.87, 0.94	06
	2	0.01, 0.29, 0.34, 0.39, 0.56, 0.95	06
After derivatization			
450	1	0.01, 0.29, 0.33, 0.56, 0.94	05
	2	0.01, 0.29, 0.34, 0.38, 0.56, 0.94	06
500	1	0.01, 0.29, 0.33, 0.47, 0.56, 0.94	06
	2	0.01, 0.29, 0.34, 0.38, 0.47, 0.56, 0.95	07
550	1	0.01, 0.29, 0.33, 0.47, 0.56, 0.94	06
	2	0.01, 0.12, 0.29, 0.34, 0.38, 0.47, 0.56, 0.95	08

DISCUSSION

Pharmaceutical study of *Gandhaka Rasayana*

Gandhaka Shodhana: Total weight loss of procedure of *Gandhaka Shodhana* was 13.66 % because of following below precaution; Unpurified *Gandhaka* was powdered into fine powder to reduced melting time duration in *Dalana* process (To avoid burning of *Gandhaka*), *Ghee* smeared cloth was used for the filtration of melted *Ghee.* (To reduced adherent to cloth), Each times *Dalita Gandhaka* was washed with hot water properly, powdered and dried in shade. (To avoid carbon formation in further melting process)

Sheeta Kashaya* of *Chaturjata: *Chaturjata* drugs were prepared in to *Sheeta Kashaya* separately, to protect their volatile active principles. The water which was used for the preparation of *Sheeta Kashaya* boiled up to 100˚C for 5 minutes to sterilization.

Fresh *Guduchi* and dried *Bhringaraja* were used to prepare *Kwatha* by adding 4 times water due to their soft natures. *Bhringarja* was used in dry form as a *Kwatha* because of unavailability in fresh due to summer season.

Gandhaka Rasayana is a *Kharaliya Rasa Yoga* which used 11 *Drava Dravya*, one in 8 times total 88 *Bhavana* that can be correlated with wet triturating in modern concept which were given benefits such as finer particle size, eliminates the dust hazards, Produce low speed, Consume less power, the minute particles of the materials come in close contact to the liquid media. Here in study has been used wet grinder for conduct *Bhavana* procedure expecting reduced time factor and labour, adopted homogeneous speed and power, less contaminated due to its lid and less handling loss. Energy which was generating by wet triturating helped to increase extraction of medicinal properties from *Bhavana Dravya* and reduced particle size; it refers to increase bioavailability of *Gandhaka Rasayana*.

Bhavana Drava was prepared daily and triturate continued till it dry on same day to prevent any microbial growth, reduce time factor and assure medicinal value, after 8 *Bhavana* of each *Drava Dravya* the mass was dried totally to observe weight gain to re-assess SOP. As per extractive value of used *Drava Dravya*, weight of Purified *Gandhaka* mass should be increased. So it can be helpful to confirm about following SOP, in the in process procedure.

As per table no. 2 of pharmaceutical study, % of weight gain after each 8 *Bhavana* and table no.5 of analytical study, mean % of total solid of each *Bhavana Dravya* shows 9.1 % difference. That can be clarified as a handling loss on drying and powdering process of after each 8 *Bhavana.* As per calculations final weight was gained 234.9 %.

Dravya	**Expected wt. gain as per TS % (E-wt)**	**Observed amount of wt. gain (O-wt)**	**Difference (E-wt) (O-wt)**	**% of Difference**
Twak	079.2 g	067.2 g	12.0 g	15.15
Ela	078.0 g	065.0 g	13.0 g	16.66
Patra	080.4 g	065.0 g	15.4 g	19.15
Naga Keshara	077.6 g	062.0 g	15.6 g	20.10
Guduchi	160.4 g	120.0 g	40.4 g	25.18
Haritaki	788.4 g	738.4 g	50.0 g	06.34
Vibhitaki	402.8 g	380.0 g	22.8 g	05.66
Amalaki	597.2 g	577.0 g	20.2 g	03.38
Shunthi	166.4 g	146.4 g	20.0 g	12.01
Bhringaraja	084.8 g	074.0 g	10.8 g	12.73
Ardraka swarasa	124.0 g	104.0 g	20.2 g	16.12
Total	2639.2	2399 g	240 g	09.10

Final product is highly hygroscopic in nature due to adding sugar powder same weight as purified *Gandhaka*. So it was capsulated to protect from moisture and to fix the dose as 500 mg per 1 capsule which was helpful to increase therapeutic value and prevent misuse drug dose by patients.

Analytical study of *Gandhaka Rasayana*

1. **pH**: Mean pH value of *Gandhaka Rasayana* was shown in acidic nature, mostly it may be due to used *Drava Dravya* for *Bhavana* which were all in acidic pH range. It was facilitated the absorption of drug at the stomach level.
2. **Loss on drying**: *Gandhaka Rasayana* is a powder form drug which is highly hygroscopic in nature due to presence of 41.68 % sugar as an ingredient. But in this study moisture content could be kept comparatively less in value (4.67 %) because of capsulation in moisture free condition soon after adding sugar powder.
3. **Total Ash**: It is the criteria for identity or purity of drugs. Total ash is inclusive of physiological ash derived from plant tissue and non physiological ash consists of residue of the extraneous matter such as sand, soil etc. adhering to the herb itself. Total Ash value of *Gandhaka Rasayana* was shown low in number (3.86 % w/w) which refers the less amount of non physiological Ash refers to purity of the drug.
4. **Water soluble Ash** and **acid insoluble ash** also has been shown less value such as 1.22 % w/w and 0.369 % w/w respectively. Less acid insoluble ash value refers less adherent dirt and sand particles. This can be used as criteria for quality control purpose.
5. **Water soluble and alcohol soluble extractives** were shown in higher % (62.18 % w/w & 63. 12 % w/w) in value which can image more in active principles in the sample and their quality standards.
6. 74.43 w/w of *Gandhaka Rasayana* particles of which passes through a sieve with nominal mesh aperture of 355µm so can be determined particle size as a moderately fine powder. Particle size was helped to facilitate absorption of drug.
7. **HPTLC**: *Gandhaka Rasayana* was shown in 200nm and 300nm, 20-13 peaks & after derivatization in 450nm, 500nm, 550nm wave length 5-8 peaks or spots in retention factor (Rf) values that separation of spots confirmed about the multi-polarity index of compounds and this results can be use as a finger print for *Gandhaka Rasayana* which is prepared by following same SOP to quality control purpose.
8. **Heavy metal test**: Lead, Cadmium, Arsenic and Mercury were not detected in *Gandhaka Rasayana* sample which refers to safely profile of the drug as an internal medication.
9. **Microbial analysis** of *Gandhaka Rasayana* was shown within the limit results which can say safety and stability of the drugs.

CONCLISION

- Wet grinder is the better instrument for preparation of *Gandhaka Rasayana*, which could be helpful in reducing time factor, labour, particle size and enhances the purity.
- Summer is the best season to manufacture *Gandhaka Rasayana* to prevent any fungal growth and helped in early drying.
- *Bhavana dravya* plays a vital role of potentiating of purified *Gandhaka* with medicinal properties which increase the efficacy of *Gandhaka Rasayana*.
- The SOPs and SMPs adopted with conventional method under GMP guideline for the preparation of *Gandhaka Rasayana* should lay a strong foundation for its validation and standardization.
- The data obtained from the physico-chemical analysis of *Gandhaka Rasayana* can be considered as reference for its standardization.

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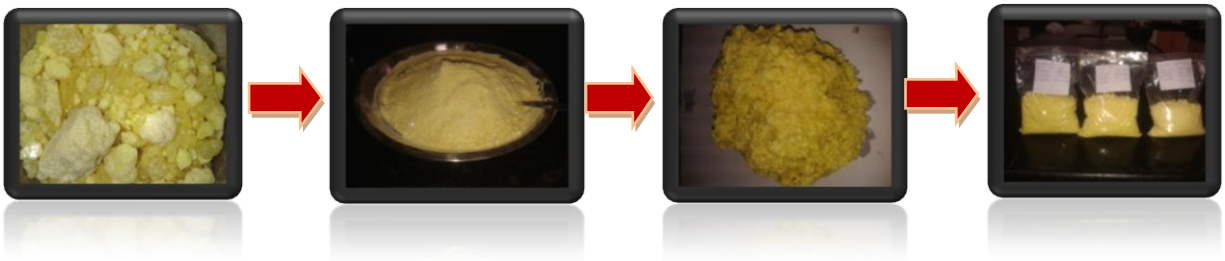
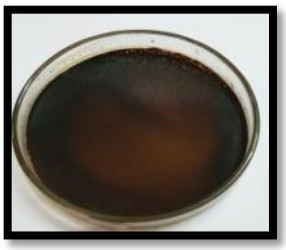
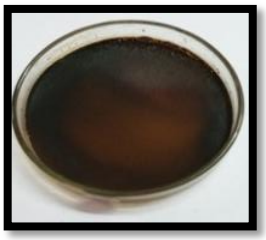
RAW INGREDIENTS OF *GANDHAKA RASAYANA*



Unpurufied Gandhaka ***Powdered Gandhaka*** ***Purified Gandhaka*** ***P.Gandhaka powder***

Drugs for *Bhavana*

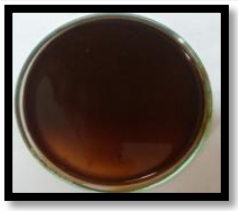
Raw	***Kwatha***	***Extractive***
Twak		
		
Ela		
		
Patra		
		
Nagakeshara		
		
Guduchi		
		

Haritaki



Vibhitaki



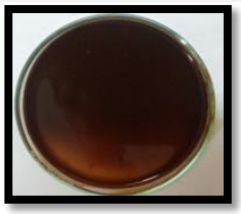


Amalaki



Shunthi





Bhringaraj



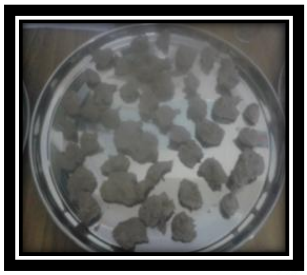
Adraka



Pharmaceutical procedure of *Gandhaka Rasayana*

Shuddha powdered Gandhaka

Gandhaka triturating with liquid media



Drying of *Gandhaka Rasayana*

Mixing of Sugar with *Gandhaka*

Gandhaka Rasayana

Capsulated *Gandhaka Rasayana*