

PHARMACEUTICAL STUDY OF GANDHAKA DRUTI USING TWO DIFFERENT MEDIA AND EVALUATION OF ITS ANTIMICROBIAL ACTIVITY

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ABSTARCT

Background of the study: *Druti Kalpana* is a particular procedure where hard and dense metals and minerals are converted into a liquefied state. The various *lakshanas* of *druti* are *Nirlepatvam*, *Drutatvam*, *Tejastvam*, *Laghuta*, *Drutam Yogasca sutena*. The importance of selection of shodhanan media in Rasashastra to serve different therapeutic benefits was highlighted. The classical methods of Gandhaka shodhana and Gandhaka Druti nirmana as per Rasaratna samucchaya was taken. This study is an attempt to develop a standard operating procedure of *Gandhaka druti* and to prove its antimicrobial property. **Objectives-** To study the *Shodhana* of *Gandhaka* with different media. To develop a standard operating procedure of *Gandhaka Druti*.and to evaluate its anti-microbial activity. **Methodology-** The pharmaceutical study of Gandhaka shodhana was done by Dhalana in Bhringaraja Swarasa and Godugdha and then Gandhaka druti was done separately

(Sample1 and Sample 2). This Sample1 and Sample 2 of Gandhaka druti was sent for antimicrobial study in authenticated laboratory. **Observations & Results:** The key observations of Gandhaka shodhana was that in sample 1, the shodhita Gandhaka had

brownish yellow color and in sample 2, the shodhita Gandhaka had bright yellow color. The resultant quantity of druti obtained was 250 ml and 240 ml from Sample 1 and Sample 2 respectively. For sample 1 (Gandhaka druti in Bhringaraja media) shows minimal anti-microbial activity at the dose of 60mg/ml – inhibition area-11 mm and maximum activity at 180 mg/dl- inhibition area 15 mm. For sample 2 (Gandhaka druti in Godugdha media) shows minimal anti-microbial activity at the dose of 60mg/ml - inhibition area 10 mm and maximum activity at 180 mg/dl - inhibition area 20 mm. **Discussion & Conclusion:** In sample 1, the shodhita Gandhaka had brownish yellow color which may be due to the Bhringaraja Swarasa. Brownish tinge to the Gandhaka was imparted due to the kesaranajna property of Bhringaraja. In sample 2, the shodhita Gandhaka had bright yellow color. The color of Gandhaka was enhanced by Godugdha. After varti of Gandhaka was soaked, around 300 ml and 290 ml of taila was absorbed by varti of Sample 1 and Sample 2 respectively. The resultant quantity of druti obtained was 250 ml and 240 ml from Sample 1 and Sample 2 respectively. Gandhaka druti made in Godugdha media shows better antimicrobial activity than Gandhaka druti in Bhringaraja media.

KEYWORDS: Rasashastra, Shodhana, Dhalana, Gandhaka, Druti, Antimicrobial study

INTRODUCTION

Rasashastra is a pharmaceutical branch of *Ayurveda* in which various drug formulations are described along with the tests for assessing the quality of ingredients be it a metal or a mineral. *Druti Kalpana* is a process which converts hard and dense metals and minerals into a liquefied state. The various *lakshanas* of *druti* are *Nirlepatvam* (Nonstickiness), *Drutatvam* (Liquified state), *Tejastvam* (Lustrous), *Laghuta* (Lightness), *Drutam Yogasca sutena* (Mixes quickly with mercury).^[1]

Gandhaka Druti is one among the unique Herbo-mineral formulation with main content as *Gandhaka*. The references of *Gandhaka Druti* can be traced from different text books like *Rasaratna samucchaya*, *rasatarangini*, *Rasendra chintamani*, *Rasayoga sagara*, *Ayurveda prakasha* etc. The current reference taken from *Rasaratnasamucchaya* directs its use in *Kasa*, *Swasa*, *Grahani*, *Ajirna* etc. The main ingredients of *Gandhaka Druti* are *Gandhaka* and *Trikatu* (*Shunti*, *Maricha*, *Pippali*).

Different procedures in *Rasashashtra* like *shodhana*, *marana* etc have unique significance. The *shodhana dravya* used in procedure have greater impact towards its therapeutic utility. Here the changes occurred during the *shodhana* of *gandhaka* by different media i.e,

Godugdha and *Bhringaraja* was documented through organoleptic characteristics.

This study is an attempt to develop a standard operating procedure of *Gandhaka druti* and prove its antimicrobial property in vivo with respect to specific microbes causing *Kasa*.

OBJECTIVES

- To study the *Shodhana* of *Gandhaka* with different media.
- To develop a standard operating procedure of *Gandhaka Druti*.
- To evaluate the anti-microbial activity of *Gandhaka Druti* with respect to specific microbes causing *Kasa*.

METHODOLOGY

A) PHARMACEUTICAL STUDY

The Pharmaceutical study is said to be carried out in 3 steps.

- I) Raw material study
- II) In Process study
- III) Finished drug study

RAW MATERIAL IDENTIFICATION AND AUTHENTICATION

It includes collection, identification and authentication of raw materials either mineral or herbal drugs.

Collection of Raw materials

- *Gandhaka*, *Shunti*, *Maricha*, *Pippali*, *Bhringaraja* was procured from authentic source.
- Procurement of *Goghrita* and *Godugdha* was done from the local market.

Identification and authentication

- Identification of mineral drugs was done by assessing organoleptic characters (*Shabda*, *Sparsha*, *Rupa*, *Rasa*, *Gandha*) and authentication by assessing the *lakshanas* of the sample and verifying with *Grahyagrahytwa lakshanas* as given in the *Rasashastra* classics.
- Herbal drugs were identified by the experts of *Dravyaguna* department.

IN PROCESS STUDY

1. *Gandhaka Shodhan*
2. Preparation of *Bhringaraja Kwatha*.^[2]

GANDHAKA SHODHAN**Method 1^[3]**

Reference – Rasaratnasamucchaya (R.R.S 3/ 24)

Type of procedure – Dhalan

Apparatus- Stainless steel pan of capacity 1 lit., Cylindrical steel vessels of capacity 3Litres, Muslin cloth, Thread, Digital thermometer, Gas stove, Spoon, weighing machine, Khalva yantra, Measuring jar, Butter paper.

Ingredients

- Raw Gandhaka – 1000gms
- Goghrit – Q.S
- Bhringaraja Swarasa – 1000ml

Preparation of Bhringaraja Swaras**Ingredients**

- Bhringaraja churna: 1 kg
- Water: 4 litres

Procedure

- The required quantity of Bhringaraja churna was added to water and soaked well.
- Then it was boiled over madhyama agni.
- Then reduced to ¼.
- After cooling it was strained through a cotton cloth.

Procedure of Gandhaka shodhana

- Ashudhha Gandhaka was powdered in Khalvayantra.
- Cotton cloth was washed properly and dried.
- Fresh Bhringaraja Swarasa was taken in cylindrical steel vessel.
- This vessel was covered with cotton cloth and tied by a thread.
- Goghrit was taken in vessel and heated on gas to melt.
- When Goghrit was melted then powdered Gandhaka was added to it slowly and stirred it continuously by spatula.
- Then melted Gandhaka was poured through muslin cloth covered on steel pot.
- Continuous stirring was done over cloth to avoid blockage of pores of the cloth.

- After self-cooling, Bhringaraja Swarasa was poured out of the vessel.
- And then dhalit Gandhaka was taken out of the vessel and break into small pieces and then washed with hot water 8-10 times till it gets free from goghrit and Bhringaraja Swarasa.
- The Gandhaka was again crushed to coarse powder and allowed to dry.
- Dried Gandhaka was weighed and took for next Dhalan.
- In this way 7 Dhalan were completed and Shodhit Gandhaka was weighed and kept in a container.

Method 2^[4]

Reference – Rasaratnasamucchaya (R.R.S 3/ 21-23)

Type of procedure – Dhalan

Apparatus- Vessel of capacity 1 lit., Cylindrical steel vessels of capacity 3Litres, Cotton cloth, Thread, Digital thermometer, Gas stove, Spoon, weighing machine, Khalva yantra, Measuring jar, Butter paper.

Ingredients

- Raw Gandhaka – 1000gms
- Goghrit – Q.S
- Godugdha – 1000ml

Procedure

- Ashudhha Gandhaka was powdered in Khalvayantra.
- Cotton cloth was washed properly and dried.
- Fresh Godugdha was taken in cylindrical steel vessel.
- This vessel was covered with cotton cloth and tied by a thread.
- Goghrit was taken in vessel and heated on gas to melt.
- When Goghrit was melted then powdered Gandhaka was added to it slowly and stirred it continuously by spatula.
- Then melted Gandhaka was poured through muslin cloth covered on steel pot.
- Continuous stirring was done over cloth to avoid blockage of pores of the cloth.
- After self-cooling, Godugdha was poured out of the vessel.
- And then dhalit Gandhaka was taken out of the vessel and break into small pieces and then washed with hot water 8-10 times till it gets free from goghrit and Godugdha.

- The Gandhaka was again crushed to coarse powder and allowed to dry.
- Dried Gandhaka was weighed and took for next Dhalan.
- In this way 3 Dhalan were completed and Shodhit Gandhaka was weighed and kept in a container.

Precautions

- Ashuddha Gandhaka is to be powdered to get melted properly.
- Cotton cloth should be washed and dried properly. If cloth is wet, Gandhaka is accumulated on that wet portion.
- Temperature for melting of Gandhaka should not exceed 125 C as it gets reddish colour.
- After melting of Gandhaka, it should be poured quickly to avoid its solidification.
- Continuous stirring should be done during melting of Gandhaka in Goghrit.
- The whole procedure should be done by wearing mask.
- Gandhaka should be washed thoroughly with hot water to remove Ghrita and dried in sunlight to remove moisture.

FINAL DRUG STUDY

Pharmaceutical study of Gandhaka Druti was carried out by the following Rasaratnasamucchaya reference.

गन्धक द्रुततैल^[5]

कलांशव्योषसंयुक्तं गन्धकं श्लक्ष्णचूर्णितम् । अरलिमात्रे वस्त्रे तद्विप्रकीर्य विवेष्ट्य तत् ॥२९॥

सूत्रेण वेष्टयित्वाऽथ यार्म तैले निमज्जयेत् । धृत्वा संदंशतो वर्तिमध्यं प्रज्वालयेच्च तम् ।

हुतो निपतितो गन्धो बिन्दुशः काचभाजने ॥ ३० ॥ तां हुतिं प्रक्षिपेत्पत्रे नागबल्ल्यास्त्रिविन्दुकाम् ।

वल्लेन प्रमितं स्वच्छं सूतेन्द्रं च विमर्दयेत् ॥ ३१ ॥ अङ्गुल्याऽथ सपत्रां तां द्रुतिं सूतं च भक्षयेत् ।

करोति दीपनं तीव्र क्षयं पाण्डुं च नाशयेत् ॥३२॥ कासं श्वासं च शूलार्तिं ग्रहणीमतिदुर्धराम् ।

आमं विनाशयत्याशु लघुत्वं प्रकरोति च ॥ ३३ ॥ (र.र.स. ३/२९-३३)

Table no:01 Showing the Contents of Gandhaka druti.

Ingredient	Proportion	Quantity taken
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Shodhita Gandhaka	1 part	450 g
Trikatu Churna	1/16 th part	28.14 g

Method of preparation

- Trikatu and Gandhaka churna was mixed in *khalwayantra*.
- Then this mixture was sprinkled over cotton cloth and rolled gradually from one end to another end till it forms a *varti*.
- The *varti* was tied with the help of thread.
- Then it was immersed in a vessel containing *Tila taila* for 3 hours.
- Then *varti* was removed from tail and ignited by fire.
- The oil dribbling from *varti* was collected in bottle and stored.

In the same method, 2 batches of *Gandhaka druti* (GD1- using *Bhringaraja swarsa shodhita Gandhaka*, GD2- using *Godugdha shodhita Gandhaka*) was prepared from *Gandhaka* purified in different medias.

Precautions

- The whole procedure was done by wearing mask.
- The temperature was noted at each step of the procedure.

OBSERVATIONS & RESULTS

OBSERVATION OF GANDHAKA SHODHANA

Table no: 02 showing observations of Gandhaka shodhan by Method 01.

No: of Dhalana	1	2	3	4	5	6	7
Initial weight of Gandhaka	500 g	492 g	486 g	480 g	476 g	465 g	460 g
Quantity of kwatha taken	1litre	1litre	1litre	1litre	1litre	1litre	1litre
Time taken for melting of gandhak	15 min	15 min	15min	15 min	15 min	15 min	15 min
Self-cooling time	20min	20min	20min	20min	20min	20min	20min
Final weight	492 g	486 g	480 g	476 g	465 g	460 g	450 g

Table no: 03 showing observations of Gandhaka shodhan by Method 02.

No: of Dhalana	1	2	3
Initial weight	500g	490g	480g
Quantity of godugdha	1litre	1litre	1litre
Self-cooling time	25 min	25min	25min
Time taken for melting of gandhaka	20min	20 min	20min
Final weight	490g	480g	470g

Table no: 04 showing Organoleptic properties of Shodhita Gandhaka by Method:01

Sparsha	Smooth
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Rupa	Brownish Yellow
Rasa	Pungent
Gandha	Characteristic smell of gandhaka

Table no: 05 showing Organoleptic properties of Shodhita Gandhaka by Method:02.

Sparsha	Smooth
Rupa	Bright yellow
Rasa	Pungent
Gandha	Characteristic smell of gandhaka mixed with smell of godugdha

OBSERVATION OF GANDAKA DRUTI NIRMANA

Table no: 06 showing observation of gandaka druti nirmana.

Particular	SAMPLE 1	SAMPLE 2
Weight of cotton cloth	15 g	15g
Initial amount of Tila taila	1litre	1litre
Weightof Shodhita Gandhak	450g	450g
Weight of Trikatu	28.125g	28.125g
Oil soaked by varti	300ml	290ml
Obtained druthi	250 ml	240 ml
Time taken	15 min	15 min

OBSERVATIONS OF ANTIMICROBIAL STUDY**1) Gandhak druti (Bringaraja Media)**

Table no:07 Showing the antimicrobial activity of Gandhak druti in Bringaraja Media

SI.NO	Organism	Standard (chloramphenicol) 4mg/ml	60mg/ml	90mg/ml	120mg/ml	180mg/ml
A	Streptococcus aureus	30mm	11mm	14mm	15mm	15mm

2) Gandhak druthi (Godugdha media)

Table no:08 Showing the antimicrobial activity of Gandhak druti in Bringaraja Media.

SI.NO	Organism	Standard (chloramphenicol) 4mg/ml	60mg/ml	90mg/ml	120mg/ml	180mg/ml
A	Streptococcus aureus	30mm	10mm	15mm	17mm	20mm

DISCUSSION**GANDHAKA SHODHAN**

- For Gandhaka Shodhan, Goghrita and Godugdha and Bhringaraja swarasa were taken which helps in prevention of excessive heating of Gandhaka and also allows it to remain

in a liquid state for longer duration and therefore eases the entire procedure specially filtration with a cotton cloth.

- The importance of Ghrita also lies in the fact of it being a fatty substance which is important to remove the impurities of Gandhaka. Visha (Arsenic) in Gandhaka are removed as arsenic is lipid soluble.
- As Gandhaka has the tendency to burn very quickly, mild heating just enough to liquefy the Gandhaka is very essential. Also as the temperature goes above the melting point or heated for a longer time Gandhaka changes its colour and consistency from yellow liquid to orange semisolid which is not desired.
- In sample 1, the shodhita Gandhaka had brownish yellow color which may be due to the Bhringaraja Swarasa. Brownish tinge to the Gandhaka was imparted due to the kesaranajna property of Bhringaraja.
- In sample 2, the shodhita Gandhaka had bright yellow color. The color of Gandhaka was enhanced by Godugdha.

GANDHAKA DRUTI NIRMANA

- The varti of Gandhaka druti was soaked in Tila Taila for 3 hours for proper absorption of taila into the cloth.
- After being soaked, around 300 ml and 290 ml of taila was absorbed by varti of Sample 1 and Sample 2 respectively.
- Since the absorbed amount of taila was more the time for complete burning of varti took around 15 min.

ANTIMICROBIAL STUDY

- For sample 1 (Gandhaka druti in Bhringaraja media) shows minimal anti-microbial activity at the dose of 60mg/ml – inhibition area-11 mm and maximum activity at 180 mg/dl- inhibition area 15 mm.
- For sample 2 (Gandhaka druti in Godugdha media) shows minimal anti-microbial activity at the dose of 60mg/ml - inhibition area 10 mm and maximum activity at 180 mg/dl - inhibition area 20 mm.

CONCLUSION

- Gandhaka shodhana in Godugdha media resulted in bright yellow color shodhita gandhaka and shodhana in Bringaraja Sawarasa resulted in brownish yellow color shodhita gandhaka.

- This reveals the change in the organoleptic characteristics when the media of shodhana is different.
- This gives the clue of possible chemical changes taken place when media of purification is changed.
- The gandhaka druti prepared from different samples of gandhaka (Sample 1 – purified in Bhringaraja Swarasa and Sample 2- Purified in Godugdha) showed slight quantitative differences in the result.
- For sample 1 (Gandhaka druti in Bhringaraja media) shows minimal anti-microbial activity at the dose of 60mg/ml – inhibition area-11 mm and maximum activity at 180 mg/dl- inhibition area 15 mm.
- For sample 2 (Gandhaka druti in Godugdha media) shows minimal anti-microbial activity at the dose of 60mg/ml - inhibition area 10 mm and maximum activity at 180 mg/dl - inhibition area 20 mm.
- This suggests that Gandhaka druti made in Godugdha media shows better antimicrobial activity than Gandhaka druti in Bhringaraja media.

PHOTOS

BHRINGARAJA KWATHA PREPARATION



Water



Bhringaraja churna



Boiling of kwatha



Filtration



Bhringaraja Kwatha

PREPARATION OF TRIKATU CHURNA



SHODHANA OF GANDHAKA



Ashuddha Gandhaka



Ghrita



Godugdha



Bhringaraja Kwatha



Melting of Gandhaka



Pouring into media



Shodhita Gandhaka in Godugdha media



Shodhita Gandhaka in Bhringaraja media

PREPARATION OF GANDHAKA DRUTI

Trikatu Churna



Sh. Gandhaka

Mixture of Trikatu
churna and Sh. Gandhaka**ANTIMICROBIAL STUDY**

Rolling into Varti



Varti



Dipping in Tila Taila



Igniting Varti



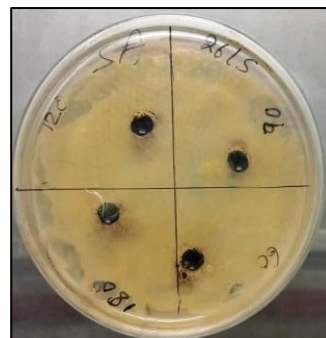
Gandhaka Druti

Gandhaka druti (Bhringaraja media)

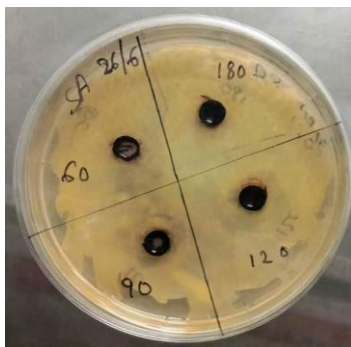
Standard control Streptococcus aureus



Sample inhibition Streptococcus aureus

**Gandhaka druti (Godugda media)**

Sample inhibition Streptococcus aureus

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