

INTERNATIONAL RESEARCH JOURNAL OF PHARMACY

www.irjponline.com ISSN 2230 - 8407

Research Article

PURIFICATORY PROCESSES OF GANDHAKA (SULPHUR) AS DESCRIBED IN THE MEDIEVAL INDIAN TEXT ANANDAKANDA

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Article Received on: 20/04/14 Revised on: 02/05/14 Approved for publication: 14/05/14

DOI: 10.7897/2230-8407.050590

ABSTRACT

Anandakanda a Rasasastra text of the medieval period illustrated six Gandhaka Shodhana (Purification of Sulphur) methods by using different dravyas, yantras, putas and samskaras. Among the six methods of Shodhana one method is unique and is used for the preparation of Gandhaka Rasayana (rejuvenative Gandhaka). This article is a literary review of Gandhaka Shodhana methods mentioned in Anandakanda. It also discusses the similarities and variations in Gandhaka Shodhana methods between Anandakanda and its contemporary Rasasastra texts. Researching the therapeutic potential of Gandhaka (Sulphur) thus purified in different ways may help in the discovery of newer and safer uses of this pharmaceutical important drug.

Keywords: Rasasastra, Anandakanda, Gandhaka, Gandhaka Shodhana, Rasayana

INTRODUCTION

Sulphur was discovered in pre-historic times. Gandhaka as it is known in Sanskrit is called as 'Sulvari' (enemy of copper). In modern chemistry it is 'Sulphur'(S), VI group element. The Latin name for this element is 'Sulphurium' which means 'Burning stone'. It is also known as Brimstone'. Gandhaka is a multivalent, non-metal, crystalline mineral. In combination with Parada (Mercury) it forms the mainstay of Ayurvedic herbo-mineral preparations. In Rasasastra (alchemy), Gandhaka is placed in the Uparasa category and is used in many Rasayana formulations. Parada is considered as the supreme rasa. Gandhaka is next in importance only to Parada. The Rasasastra tradition that flourished under Nāgarjuna gave way to great literary and scientific works like Rasarnava, Rasaratna Samuccaya, Rasahrdayatantra and Rasaratnakara. Each Rasasastra treatise describes Shodhana (purificatory) procedures for minerals and metals indicating the good knowledge of their natural toxicity in ancient and medieval India. Only proper purifications could convert the toxic elements and compounds to therapeutically efficacious products. The elaborate processing even led to the toxic substance becoming a rejuvenative. While other Rasasastra texts, mostly discuss ghee and milk as agents that purify Gandhaka, Anandakanda (AK) discusses six different methods of Gandhaka purification. This article is an attempt to bring to light the different purification procedures in ANANDAKANDA and to carry out a comparative study of the same with that of other Rasasastra texts.

Anandakanda

Anandakanda is an encyclopedic, but lesser known text of Rasasastra which deals with both Lohavedha and Dehavedha concepts¹. It was written in the thirteenth century AD by Manthana Bhairava a siddhayogi. Although Manthana Bhairava followed the earlier texts of alchemy he offered a more detailed perspective on each topic. The text is totally written in the form of discussion between Bhairava and Bhairavi. The text is divided into two Visrantis (parts) 1. Amrtikarana Visranti, 2. Kriyakarana Visranti. And these

Visrantis are divided into Ullasas (chapters). The Amrtikarana Visranti and the Kriyakarana Visranti contain twenty six and ten chapters respectively. It is in the thirteenth chapter of the Amrtikarana section that the author describes the origin, varieties and purification process of Gandhaka (Sulphur) to prepare Gandhaka Rasayana. The other five purification processes are from the first chapter of Kriyakarana Section.

Gandhaka

Most of the Rasasastra texts classified four varieties of Gandhaka based on variations in color. – 1.Red- Raktavarna (Sukatunda), 2.Yellow- Pita varna (Amla Sara), 3.White-Swetavarna (Khatika) 4.Black- Krishna varna

Rasapanchaka (Pharmaco Therapeutic Properties) of Gandhaka

Rasa (Taste): Tikta (Bitter), Katu (Pungent) and Kashaya (Astringent).

Guna (Property): Ushna (heat producing), Sara (causes movement);

Vīrva (Potency): Sita (Cold), Ushna (Hot);

Vipaka (Post Digestion Effect): Katu (Pungent), Madhura (Sweet):

Karma (Action): dipana (appetizer), pacana (digestive), vishahara (detoxifier), jantughna (antibiotic), krimihara (germicidal), agnikaraka (metabolic restorative), rasoshana (absorbs mercury), sutamurchna (controls mercury), bala virya vardhaka (tonic and restorative), dirghayushyakaraka (longevity promoter), drishivardhaka (improves vision), kandu and visarpajit (relieves eczema and other skin diseases), pitta, kaphavardhaka (increases kapha and pitta); Gandhaka has been described to have Rasayana (rejuvenating) properties based on its Prabhava (special therapeutic effect).

Toxicity of Gandhaka

Impure Gandhaka causes adverse effects. Generally, two types of toxic elements or impurities are present in Gandhaka

viz.1. Silacurna (silica or clay) and 2. Visha (Arsenic). Consuming Gandhaka without neutralizing these impurities causes kushta (skin diseases), tapa (heat), bhrama (giddiness), vrana (wound), balahani (loss of strength), sukrahani (loss of fertility) and viryahani (loss of virility) and pitta diseases. Consuming impure Gandhaka has been associated with respiratory diseases, bronchitis, neurological effects and behavior changes, disturbance of blood circulation, damage to the heart, affects eyesight, damage to immune systems, stomach and, gastrointestinal disorder, damage to liver and kidney functions, hearing defects, disturbance of the hormones, suffocation and lung embolism, irregular fever and diseases related to blood. It is to avoid such toxic effects that Shodhana (Purification) of Gandhaka has been mandated.

The Concept of Shodhana

Shodhana is a method in which different drugs are treated with various processes such as grinding and mixing them with other drugs with a view to removing their toxicity². Avurveda explained the Shodhana process for two purposes. The former is for removal of excess and vitiated doshas from the body or substance and the second is for the removal of toxic elements or undesirable qualities of a drug and make it effective for therapeutics. The drug may be a herb, a mineral, a metal, a herbo-mineral or a precious stone. Shodhana is a process of purification and detoxification by which physical and chemical blemishes and toxic materials are eliminated and substances are subjected for further processing^{3,4}. Shodhana process can transform the pharmacological properties of a drug by changing its constituents. In Sutrasthana of Caraka samhita, Caraka expressed the same that an appropriate samskara can transform the toxic substances into a nector like medicine. Hence, the purification process is inevitable. There are several Gandhaka Shodhana methods mentioned in Rasasastra texts. The ultimate objective of Shodhana process is to increase the biological availability of the drug further potentiating the biological efficacy⁵. Some of the minerals such as sulphur do not require Marana (incineration) as they are very soft in their natural form. Hence, only Shodhana process is sufficient for such minerals to get rid of their toxicity⁶.

Gandhaka Shodhana in Anandakanda

Pharmaceutical processes are known as Samskara. It has two stages. 1. Shodhana (purification or detoxification of a substance) and 2. Bhaishajya Kalpana (formulation into medicines)⁷. For the purpose of Gandhaka purification, different samskaras, yantras (instruments), putas (heating procedures), patras (utensils) and dravyas (ingredients) were used. In Anandakanda author Manthana Bhairava explained six different Shodhana methods for Gandhaka. He illustrated five types of purification procedures of Gandhaka in first chapter of Kriyakarana Visranti, and also explained a unique method of Gandhaka Shodhana to prepare Gandhaka Rasayana in thirteenth chapter of Amrtikarana Visranti for treatment of eight types of Vata diseases, eighteen types of kushta (skin) diseases, diseases of the head, and also for antiaging and rejuvenation purposes. Two types of Shodhana methods are observed in Anandakanda: 1. Samanya Shodhana (general purification of the substance) and 2. Visesha Shodhana (processing the purified substance with special samskaras to increase the potency of the drug)

Gandhaka Shodhana Method (I)

- Extract the juice of Tilaparni (*Gynandropsis gynandra* Linn), Ajamoda (*Apium graveolens* syn.), Brahmi (*Bacopa monnieri* (Linn.), Bhringaraja (*Eclipta alba* Hassk.), Dhattura patra (*Datura metel* Linn.)
- Subject the Gandhaka to Bhavana (titration) with juice of each of the aforesaid ingredients separately for one day.
- Then mix the purified product and ghee in equal proportion and take into a Kantaloha (iron) vessel and pour it into goat's milk and cook on mrudu agni (low temperature). Collect the product.
- Next, fill a wide-mouthed earthen vessel with ghee mixed cow milk and leave some empty place. Cover the mouth with cloth tightly and then sprinkle the above collected product on the cloth and close with an earthen lid and cement the joints with clay and mud.
- Lower the pot into a ground pit and heat with mrudu agni puta by keeping cow dung cakes on the covered mud plate. After it cools one finds that the Gandhaka has melted and mixed/resolved into the milk.
- Collect the product and wash it with hot water and subject it to Bhavana with juice of Tilaparni etc. for three times. Allow it to dry and subject it to Bhavana about seven times with fish bile.
- Subject the collected product to Mardana (grinding) with Jalini / Koshataki (*Luffa acutangulata* Roxb.) or Devadali (*Luffa echinata*) seeds and again perform Bhavana about seven times with the juice of Bhringaraja under the sharp sunlight. Wash it with hot water.
- Mix it with cow ghee and cook in a Kantaloha vessel on low flame and pour it into the juice (swarasa) of Bhringaraja.
- Finally, wash it with hot water and let it dry. Then
 powder it. Thus we get Rasayana karma yogya purified
 Gandhaka (Gandhaka which can be used in rejuvenation
 therapy).

Gandhaka Shodhana Method (II)

- Fill a wide- mouthed earthen vessel with ghee mixed in cow milk and leaving some empty space. Cover the mouth with cloth tightly and then sprinkle the Gandhaka over the cloth and close it with another deep earthen vessel and cement the joints with clay and mud.
- Keep the lower the pot into a ground pit. Then heat with mrudu agni puta by keeping cow dung cakes on the covered earthen lid. After it cools, open it. One finds that the Gandhaka has melted and dripped into the milk.
- Collect the product and wash it with hot water and make it into a fine powder. Purified Gandhaka thus prepared is ready to be used in medicinal preparations.⁹

Gandhaka Shodhana Method (III)

- Pour any one of Jyotishmati (*Celastrus paniculatus* Willd.) oil, Sarshapa (mustard) (*Brassica nigra*) oil, Eranda /Castor oil (*Ricinus cummunis* L.), Kusumbha (*Schleichea oleosa* (Lour.) oil, milk of ewe, cow ghee, cow milk or Aranalam (sour gruel made of fermentation of rice water) into an earthen pot up to the 3/4th level.
- Cover the mouth with cloth tightly and then sprinkle the Gandhaka on the cloth and close it with a lid made up of loha (iron). Cement the joints with clay and mud.
- Lower the pot into a ground pit and cover it with an earthen lid. Then heat it with mrudu agni puta by placing cow dung cakes on it. After it cools, open it. One finds

- that the product has melted and mixed/resolved into the liquid poured in to the lower pot.
- Collect the product and subject it to Bhavana with juice of Dhattura and repeat the whole process to get purified Gandhaka.

Gandhaka Shodhana Method (IV)

- Take the juice of Brihati (Solanum indicum Linn.), juice of Ajamoda, juice of Bhringaraja, juice of Dhattura or juice of Tilaparni and add an equal quantity of Gandhaka and subject it to Mardana separately with each juice for three hours.
- Collect the product with equal quantity of ghee into an iron vessel and melt it. Next drip the collected product in with goat milk. Repeat the whole process for seven times to get purified Gandhaka.

Gandhaka Shodhana Method (V)

- Subject the Gandhaka to Bhavana with the juice of Dhattura for one day and dry it.
- Fill Karanja (Pongamia pinnata (Linn.) Merr) oil, Castor
 oil and goat milk in equal proportion in an earthen vessel.
 Cover the mouth with cloth tightly and then sprinkle the
 above collected Gandhaka onto the cloth and close with
 an earthen lid and cement the joints with clay and mud.
- Subject it to laghu puta. After it cools, open it and find that the Gandhaka melted and mixed/resolved into the milk.
- Collect the Gandhaka and subject it to Bhavana with juice of Dhattura and dry it. Perform the Bhavana about three times
- Subject it to Bhavana with this product along with Matsyapitta (fish bile) for seven times under the sunlight. After that pulverize / pound the product with the seeds of Koshataki.
- Then perform Bhavana with the juice of Bhringaraja for seven days under very sharp sunlight. Wash it with hot water and dry it on low flame (mrudu agni) for one minute. Apply the ghee to Iron vessel and melt the product. Finally, subject it to Dhālana (melting and quenching) in the juice of Bhringaraja to get purified Gandhaka.¹²

Gandhaka Shodhana Method (VI)

- Take Gandhaka and subject it to Mardana for three hours with the juice of Brahmi or juice of Ajamoda or juice of Bhringaraja or juice of Dhattura or juice of Tilaparni.
 After Mardana cook it in an iron vessel along with ghee for a minute to melt Gandhaka.
- Drip the Gandhaka into goat milk. Repeat the whole process for seven times to get purified Gandhaka.

Among the six different purification methods of Gandhaka (Table 1) the first method is particularly recommended for the preparation of Gandhaka Rasayana. The Gandhaka which is acquired purified in the remaining five methods could be utilized for different medical preparations. Each process makes use of different kinds of ingredients, appropriate temperature (puta), yantras, patras and most importantly different samskaras. Different kinds of herbal and animal products are used as ingredients in the purification of Gandhaka. The ingredients are biochemically made up of proteins, fats, nutrients, alkaloids, alkalies, flavonoids, antioxidants and steroids, etc. They were used to purify and

potentiate the Gandhaka with their inherent qualities. Selection of ingredients is as per their rasapanchaka described in Ayurveda. ¹³

A Comparative Study of Gandhaka Purification Methods between Anandakanda and Other Rasasastra Texts

While comparing the methods of Gandhaka Shodhana, variations can be found in the ingredients, equipment, vessels, processing and heating methods. In this paper, Rasarnava (RA), Rasaratna Samuccaya (RRS), Rasendra Cudamani (RC) and Rasendrasarasamgraha (RSS) are selected for comparative study (Table 2). Essentially, the Gandhaka Shodhna methods explained in the RRS and RC are totally similar to each other. The first method from RRS¹⁴, RC¹⁵ and first method from RSS¹⁶ are totally similar to the second procedure from Anandakanda. The third method from RRS¹⁷, RC¹⁸ also similar to the second procedure from Anandakanda, but differs in the selection of Yantra, (Table 3 a). The first method of Gandhaka purification from RA¹⁹ is compared with the fifth method of Anandakanda (Table 3 b). The sixth purification method of Anandakanda is similar to the second method of RRS²⁰, RC²¹ and RA² (Table 3 c).

DISCUSSION

Comparison between Gandaka Shodhana Methods Explained in Anandakanda

The first method of purification of Gandhaka incorporates a significant number of ingredients to purify Gandhaka for its preparation into Gandhaka Rasavana. The ingredients are cow ghee; milk of both cow and goat; juices of Tilaparni, Ajamoda, Brahmi, Bhringaraja, Dhattura; seeds of Koshataki or Devadali and Mtsyapitta are used. The remaining five methods make use of only some of these ingredients. These five methods of purification help to process Gandhaka for its potential use in Gandhaka based preparations. Cow ghee and milk are mentioned in the second method only. The third method grants many choices with respect to the use of Cow ghee or oils of Jyotishmati or Sarshapa (Musturd) or Eranda (Castor) or Kusumbha (Safflower) or Ewe milk or Cow milk or Aranalam and juice of Dhattura. It is to be noted that Aranalam is different from other ingredients. In fourth method goat milk, juice of Brihati, Ajamoda, Bhringaraja and juice of Dhattura or Tilaparni are used. Ghee is absent and Brihati is used in this method. In fifth method different categories of ingredients like Ghee, Karanja oil, Castor oil, goat milk, juice of Bhringaraja, Dhattura, Matsyapitta, seeds of Koshataki are used. In the sixth method, Ghee and goat milk are recommended. In similar lines, many options were given in the third method for the set of ingredients - Tilaparni or Ajamoda or Brahmi or Bhringaraja or Dhattura. Selection of the ingredient depends on the requirement i.e. its prospective use in different Rasaoushadha preparations.

Gandaka Shodhana Methods from Anandakanda in Comparison with Other Rasasastra Texts

Some similarities and dissimilarities can be observed amongst the Gandhaka Shodhana methods between Anandakanda and other texts. The second method of Gandhaka Shodhana and first and third methods of Gandhaka Shodhana mentioned in RRS and RC differ with Anandakanda, although, ingredients are same (Gandhaka, cow ghee and milk). In Anandakanda, the described yantra (instrument) (in the method) is used in the purification process. In the first method of RRS and RC, Swedana

Samskara has been mentioned, but the particular name of the Yantra used is not available. To perform Swedana Samskara, it is inferred that Dolayantra might have been used. Hot water is used to wash the Gandhaka obtained after Swedana Samskara. Anandakanda mentioned laghu puta for this process. Though, RRS and RC did not specify about the heat, the heat employed must be of a low degree in case of Swedana process. Anandakanda, RRS and RC suggested using the earthen vessel. Swedana Samskara (steaming) of Gandhaka takes place using the Dolayantra. The third Shodhana of Anandakanda mentioned many options for ingredients and stated that the process should be done using the described yantra with an iron lid covered. And the third procedure of RA discusses different options of ingredients like Anandakanda, but did not mention the usage of iron vessel. There is no purification method that was found similar to that of third and fourth purification methods of Gandhaka in Anandakanda. Interestingly, the fourth method is the only method considered avoids of ghee. In the fifth method of Anandakanda ghee is one of the ingredients. This is not mentioned in RA. In Anandakanda the use of the juice of Dhattura is narrated where as in RA resin of Dhattura is used. Both the texts used Koshataki seeds. In Anandakanda, both earthen and iron vessels used and in different stages of

process like laghu puta, sunlight and bright sunlight were explained. RA suggested using only the earthen vessel and laghuputa has been suggested for the process. In the sixth purification method of Anandakanda, iron vessel is used to get better results. In RRS and RC there is no mention of the used vessels. In this process, in Anandakanda, Gandhaka is subjected to Mardana Samskara, where as in RRS and RC, Bhavana Samskara is employed. RA also explained a similar process in its second purification method. But in Anandakanda three hours of Mardana process has been mentioned while in RA seven days of Bhavana is mentioned. In other method of RA, juices of Sringaverarasa and lime are used in the purification process. Anandakanda does not mention these two ingredients. All the texts explained the procedures for the preparation of equipment, but did not mention their individual names. The instruments described, seems to be closer to the descriptions of adhahpatana Yantra and Bhudhara Yantra. Anandakanda is not clear about the quantity of herbal ingredients to be considered in the process. though Prof. Siddhanandana Mishra, the translator, did mention the proportions of cow ghee with Gandhaka and that of Karanja oil, Castor oil and goat milk in shodhana procedures number-1 and number-5 respectively

Table 1: Six types of Gandaka Shodhana in Anandakanda

	Anandakanda Shodhana method – 1	Anandakanda Shodhana	Anandakanda Shodhana method –	Anandakanda Shodhana	Anandakanda Shodhana method	Anandakanda Shodhana method
	(for GR)	method - 2	3	method – 4	-5	- 6
	Gandhaka	Gandhaka	Gandhaka	Gandhaka	Gandhaka	Gandhaka
	Ghee	Ghee	Cow Ghee	-	Ghee	Ghee
			Or Oils of Jyotishmati			
			or Sarshapa or		Karanja oil, Eranda	
	-	-	Eranda or Kusumbha	-	oil	-
	Goat and Cow Milk	Cow Milk	Or ewe milk or Cow	Goat Milk	Goat Milk	Goat Milk
			milk			
Ingredients	Hot water	-	-	-	-	-
(Dravya)	Juices of Ajamoda, Brahmi			Decoction of	Juice of Bhringaraja	Or juice of Ajamoda
	, Bhringaraja			Ajamoda, juice of		or Brahmi or
		-	-	Bhringaraja		Bhringaraja
	Juices of Dhattura,		Juice of Dhattura	Juice of Dhattura	Juice of Dhattura	Or juice of Dhattura
	Tilaparni	-		or Tilaparni		or Tilaparni
				Juice or Decoction		
	-	-	-	of Brihati	-	-
	Matsyapitta	-	-	-	Matsyapitta	-
	Seeds of Koshataki or		Or Aranalam		Seeds of Koshataki	
	Devadali	-		-		-
Instruments (Yantra)	Described instrument	Described instrument	Described instrument	-		-
Heating	Mrudu agni, sharp sun light	Laghu puta			Laghu puta , sharp	Mrudu agni
procedure			Laghu puta	-	and low sun light	
(Puta)			Ş F		J 8 .	
Utensils	Kantalōha and Earthen	Earthen vessel	Earthen vessel with	Iron vessel	Earthen and	Iron vessel
	vessels		iron lid		Iron vessel	
Purificationp	Bhavana, Mardana	-	Bhavana	Mardana, Dhālana	Bhavana , Dhālana	Mardana, Dhālana
rocess	ŕ				· ·	, and the second
(Samskara)						

*G.R. - Gandhaka Rasayana

Table 2: Contemporary Rasashatra texts of the medieval period

S. No	Text	Author	Period
1.	Rasarnava	-	12 th century
2.	Rasendra Cudamani	Achrya Somadeva	12 th century
3.	Anandakanda	Manthana Bhairava	13 th century
4.	Rasaratna Samuccaya	Vagbhaṭacharya	13 th century
5.	RasendraSarasamgraha	Sri Gopalakrishna Bhatt	13 th century

Table 3 (a): A comparative study of Gandhaka Shodhana

	Anandakanda Shodhana method – 2	RRS and RC Shodhana method – 1	RRS and RC Shodhana method - 3	RSS Shodhana method – 1
	Gandhaka	Gandhaka	Gandhaka	Gandhaka
	Cow Ghee	Cow Ghee	Cow Ghee	Cow Ghee
Ingredients	Cow Milk	Cow Milk	Cow Milk	Cow Milk
	-	Hot water	-	-
Instruments	Described instrument	Dolayantra	Described instrument	Described instrument
Heating procedure	Laghuputa	Mrudu agni	Laghuputa	Laghuputa
Utensils	Earthen vessel	Earthen vessel	Earthen vessel	Earthen vessel
Purification process	Swedana	Swedana	Swedana	Swedana

Table 3 (b): A comparative study of Gandaka Shodhana

	Anandakanda Shodhana method – 5	RA Shodhana method – 1	
	Gandhaka	Gandhaka	
	Ghee	-	
	Karanja oil, Castor oil	Karanja oil	
	Goat Milk	Goat Milk	
	Juice of Bhringaraja	Juice of Bhringaraja	
Ingredients	Juice of Dhattura	Juice of Dhattura	
	Matsyapitta	Matsyapitta	
	Seeds of Koshataki	Seeds of Koshataki	
Instruments	-	-	
Heating procedure	Laghu puta , sunlight	Laghu puta	
Utensils	Utensils Earthen vessel, Iron vessel Earthen vessel		
Purification process	Fication process Bhavana , Dhālana Bhavana , Mardan		

Table 3 (c): A comparative study of Gandaka Shodhana

	Anandakanda Shodhana method – 6	RRS and RC Shodhana method -2	RA Shodhana method – 2
	Gandhaka	Gandhaka	Gandhaka
	Ghee	Ghee	Ghee
	Goat milk	-	-
		-	Hot water
Ingredients	Or juice of Bhringaraja Or Ajamoda Or Brahmi	juice of Bhringaraja	juice of Bhringaraja
	Or juice of Dhattura or Tilaparni	-	-
Instruments	-	Dolayantra	-
Heating procedure	Mrudu agni	-	Badarāngara (high eat)
Utensils	Iron vessel	-	Iron vessel
Purification process	Mardana, Dhalana	Swedana	Bhavana

CONCLUSION

Gandhaka Shodhana has been described in all the Rasasastra texts. Anandakanda describes six methods, of which one method is exclusive for the preparation of Gandhaka Rasayana. The Shodhana processes help in bringing out the medicinal potential of Gandhaka while mitigating its toxicity. Elaborate use of Samskaras, temperature, herbs, milk, ghee and different instruments has been mentioned in the Rasasastra texts. In all these Shodhana processes, both samanya and vishesha shodhanas are meant for purification and potentiating of Gandhaka. The choice of the method of Shodhana is dependent on the potential usage of Gandhaka. Purification number-1 in Anandakanda has been unique in its recommendation for the purpose of the transformation of toxic sulfur, not only as a safe medicinal drug but also to transform it into a rejuvenating substance. Anandakanda, while elaborating on the procedures, is not very explicit about the names of the equipment used. A comparative study with the contemporary texts helps in inferring missing information. Similarly the exact quantity of ingredients to be used with impure Gandhaka for its purification needs to be established with proper research and drug quality testing at present times. This kind of scientific approach could pave the way for newer and safer avenues for using sulphur for medicinal purposes.

AKNOWLEDGEMENTS

The authors thank Dr. P. N. Vinaya, Ayurvedic Physician, for her valuable suggestions.

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Cite this article as:

Sreedevi Kasavajjhala, J. S. R. A. Prasad. Purificatory processes of gandhaka (sulphur) as described in the medieval Indian text Anandakanda. Int. Res. J. Pharm. 2014; 5(5):438-443 http://dx.doi.org/10.7897/2230-8407.050590

Source of support: Nil, Conflict of interest: None Declared