

## Analytical Study of *Gandhaka Taila*- An Approach to Standardization of Topically Applied Medicated Oil

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### ABSTRACT

In *Ayurvedic* practice of medicines *Gandhaka taila* (oil dosage form containing sulphur) has very significant role for treating different types of skin diseases of various etiology, applied topically. Potential therapeutic effect of *Gandhaka* is extensively described in various rasa literatures. The effectiveness of *Gandhaka* in skin disease is augmented when it is processed with butter and/or milk because both butter and milk both nourishes the skin and also is a favorable base for holding the active principle of *Gandhaka*. In current study *Gandhaka Taila* prepared by following the reference of Rasaratna Samuchhaya and Rasendra chintamani are physico-chemically analyzed in contemporary parameters for its standardization in current language. Specific gravity, refractive index, acid values, saponification values of both the sample were analyzed and fingerprints were prepared for its further research in laboratories and clinics.

**Key words:** *Ayurvedic* oil, drug standardization, *Gandhaka Taila*

### INTRODUCTION

In *Ayurvedic* literature *Gandhaka* has been described as a very effective medicine in various skin diseases such as *kustha* (skin diseases), *kandu* (itching), *visarpa* (psoriasis), <sup>[1]</sup> etc. *Gandhaka Taila* has been used for treating skin diseases since hundreds of years in *Ayurvedic* clinics. *Gandhaka taila* is potential *Ayurvedic* oil mostly applied topically, in which *shuddha Gandhaka* is liquified and held with the sesame oil as base. Sesame oil has also been admired for its therapeutic effect and as an effective nourishment for skin. Because of lipid soluble in nature oils are easily absorbed through skin. So, identifying the significant therapeutic index of *Gandhaka* and sesame oil ancient researchers had tried to integrate their effectiveness and formulated the dosage form named '*Gandhaka Taila*'.

But in current era of evidence based medicine it is very necessary to validate the medicines with respect to its physico-chemical nature and biological properties. Acid value signifies age of the oil, saponification value tells about the alkalinity of the oil where as specific gravity and refractive index indicates about the weight and density of the oil. All these characters of the oils have

very much significant role towards its shelf life, absorption rate, assimilation rate and the rancidity. Hence various physical and chemical quality control parameters of *Gandhaka Taila* need to be analyzed and documented. Most of the *Ayurvedic* practitioners use preparation of *Gandhaka Taila* as described in R.R.S (Rasa Ratna Samuchhaya) or R.Chi. (Rasendra Chintamani). Hence in present study, *Gandhaka Taila* was prepared by above methods and assessed for their physical and chemical values. The data obtained were then analyzed to prepare a finger print for the standardization of the said *Taila* and for looking into the differences between two working principles.

### MATERIALS AND METHODS

#### Materials

#### Drug sample

Sample No.-01:	<i>Gandhaka Taila</i> -1,
Sample No.-02:	<i>Gandhaka Taila</i> -2

#### Equipments

pH meter, Pycnometer, weighing machine, Abbes Refractometer, Glass beaker, stand, glass tube etc.

#### Chemicals

Ethanol, ether, potassium hydroxide (KOH), phenolphthalein solution, ethanolic potassium hydroxide, hydrochloric acid, Carbon tetrachloride, pyridine bromide, potassium iodide, distilled water, sodium thiosulphate, starch solution etc.

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## Methods

### Preparation of *Gandhaka Taila*

#### First Method (*Gandhaka Taila-1*):<sup>[2]</sup>

By following R.R.S., *Gandhaka Taila-1* was prepared. Coarse powder of *Shuddha Gandhaka* was mixed with butter and triturated. After this, the mixture obtained was applied to the cotton cloth, which was coated by *Arka* and *Snuhi ksheera* in a thick layer. Then the cotton cloth was rolled and tied by a thread around it. Then holding the roll by clamp at one end, the other end was ignited. As the fire goes up, the drops of *Gandhaka Taila* emerged and these were collected in a clean glass container.

#### Second Method (*Gandhaka Taila-2*):<sup>[3]</sup>

*Gandhaka Taila* was prepared as per R.Ci. Coarse powder of measured quantity of *Shuddha Gandhaka* was added to boiling milk followed by further boiling till all the *Gandhaka* gets melted. Then curd is prepared out of this milk. After this, the butter prepared out of curd is called as '*Gandhaka Taila-2*', which is the second research drug for the present analytical study.

### Analysis of *Gandhaka Taila*<sup>[4, 5]</sup>

The *Gandhaka Taila* prepared from both the above methods was analyzed on following parameters in Bio Lab, Bhilai, Chhatisgarh:

- 1) Organoleptic features
- 2) pH value
- 3) Specific gravity
- 4) Refractive index
- 5) Acid value
- 6) Saponification value
- 7) Iodine value

#### 1) Organoleptic features

Samples of *Gandhaka Taila* obtained from both the methods were assessed physically for their colour, odour, touch and taste as organoleptic features and the data obtained were documented.

#### 2) pH value

- Firstly pH meter was calibrated by using standard buffers of known pH 4.0 and 9.2 at 30 °C. Then the reference electrode was washed with distilled water and the water was drained by filter paper.
- Then the *Gandhaka Taila-1* sample was shaking well and homogenized well.
- Electrode was dipped into the sample. Reading was observed on the digital meter.

In the same manner pH value for *Gandhaka Taila-2* was also measured.

#### 3) Specific gravity

- At first empty Pycnometer was taken and weighed accurately. Then Pycnometer was filled with water and weighed. After that weight of water was calculated by subtracting the weight of empty Pycnometer from the weight of Pycnometer filled with water.
- Then this Pycnometer was filled with sample of *Gandhaka*

*Taila-1* and weighed. After that weight of sample of *Gandhaka Taila-1* was calculated by subtracting the weight of empty Pycnometer from the weight of Pycnometer filled with *Gandhaka Taila-1*.

- The same procedure was adopted for *Gandhaka Taila-2*

Then the specific gravity of both the samples was calculated by the formula:

$$\text{“Specific gravity} = \text{wt of sample/ wt of water”}$$

Results obtained were recorded.

#### 4) Refractive Index (RI)

- Initially refractometer was standardized by calculating RI of water at 20°C which was 1.330. After that, those samples of *Gandhaka Taila* was heated in water bath at 40°C.
- Then drop of *Gandhaka Taila-1* was inserted in the refractometer with thin dropper and reading was noted.
- In the same manner RI value of *Gandhaka Taila-2* was also calculated.

#### 5) Acid value

- At firstly 25 ml of ethanol was mixed with 25 ml of ether. This 50 ml of mixture was then 10gm of sample was added to it.
- 1 ml of phenolphthalein solution was added to it and titration was done with 0.1N KOH solution until the solution remained faint pink after shaking for 30 seconds.

Then the acid value was calculated by following formula—

$$\text{“Acid value} = 5.61 \times (\text{no. of ml of KOH required} / \text{wt. of sample)”}$$

In the same manner acid value for the sample *Gandhaka Taila-2* was also calculated.

#### 6) Saponification value

- Firstly 2 gm of *Gandhaka Taila-1* was taken in a 200 ml capacity of flask. Then 25 ml of 0.5M ethanolic KOH was added to it.
- This mixture was boiled on a water bath for 1 hr and was then cooled. 1 ml of phenolphthalein solution was added into it. Then titration was done with 0.5N hydrochloric acid.

The saponification value was then calculated by formula –

$$\text{“Saponification value} = 28.05 (b-a)/w”$$

where-

w= weight of sample of *Gandhaka Taila-1*

a= No. of ml of hydrochloric acid required with sample,

b= no. of ml of hydrochloric acid required without sample.

In the same manner, saponification value of *Gandhaka Taila -2* was also calculated.

#### 7) Iodine Value

Firstly 2 gm of *Gandhaka Taila -1* sample was taken in an iodine flask. To this 10 ml of carbon tetrachloride was added and uniform mixture was done. After that 25 ml of pyridine bromide was added to it and whole mixture was allowed to stand for 15 minutes in a dark place. 15 ml of potassium iodide was mixed with 100 ml of distilled water and shake until proper mixing. Then this solution was mixed with above solution which was

kept in a dark place before. After that, whole solution was titrated with 0.1N sodium thiosulphate and starch solution was added towards end point of the titration as an indicator.

The iodine value was then calculated by-

$$\text{“Iodine value} = 1.269 (b - a)/w\text{”}$$

where-

w = weight of drug,

a = no. of ml of 0.1N sodium thiosulphate required,

b = no. of ml of sodium thiosulphate required after omitting the sample.

In the same manner, iodine value for the *Gandhaka Taila-2* was also calculated.

## OBSERVATIONS AND RESULTS

After analyzing both the samples through various quality control parameters as described earlier, following results were obtained and observed values were documented to prepare a finger print of the research drug candidates by following the declared pharmaceutical and analytical working principles.

It is observed that the *Gandhaka Taila-1* was dark brown in colour having rotten egg like odour where as *Gandhaka Taila-2* was having faint brown in colour and odour was like ghee. Both the samples were semisolid in nature having bitter taste and slippery touch [Table 1].

**Table 1: Organoleptic features of both samples of *Gandhaka Taila***

Sr. No.	Sample	Colour	Odour	Touch	Taste	Appearance
1	<i>Gandhaka Taila-1</i>	Dark brown	Rotten egg smell	Slippery	Bitter	Semisolid
2	<i>Gandhaka Taila-2</i>	Faint brown	Ghrita smell	Slippery	Bitter	Semisolid

When the pH values for both samples were analyzed by following the standard method of pH analysis through digital pH. meter with calibrated electrodes, it was observed that the pH values of both the samples were same [Table 2]. Specific gravity is very important parameter for quality control of oil or oil like products. Specific gravities of both the sample were measured with Pycnometer by following standard operative procedure. It was observed that the specific gravity of *Gandhaka Taila-1* is higher than *Gandhaka Taila -2*. It indicates that the *Gandhaka Taila* prepared by following R.R.S. is heavier [Table 3]. When both the samples were measured for their refractive index (RI) by Abe's Refractometer, it was observed that the R.I. of *Gandhaka Taila-1* is little higher than *Gandhaka Taila-2* [Table 4].

**Table 2: pH of *Gandhaka Taila***

	<i>Gandhaka Taila-</i>	<i>Gandhaka Taila-2</i>
pH value	16.0	6.0

**Table 3: Specific gravity of *Gandhaka Taila***

	<i>Gandhaka Taila-1</i>	<i>Gandhaka Taila-2</i>
Specific gravity	1.043	1.030

**Table 4: Refractive Index of *Gandhaka Taila***

	<i>Gandhaka Taila-1</i>	<i>Gandhaka Taila-2</i>
R.I. value	1.470	1.458

Acid value signifies about the age of the sample i.e. it is very much significant towards the measure of shelf life of an oil or ghee preparation. When both the samples were measured for their acid values, it was observed that the *Gandhaka Taila-1* is having higher acid value in comparison to *Gandhaka Taila-2* [Table 5]. Saponification value signifies about the alkalinity of the sample. When both the samples were measured for their saponification values, it was observed that the *Gandhaka Taila-2* is having little higher saponification value in comparison to *Gandhaka Taila-2* [Table 6]. When both the samples were measured for their iodine values, it was observed that the *Gandhaka Taila-2* is having little higher saponification value in comparison to *Gandhaka Taila-2* [Table 7].

**Table 5: Acid value of *Gandhaka Taila***

	<i>Gandhaka Taila-1</i>	<i>Gandhaka Taila-2</i>
Acid Value	1.16	1.07

**Table 6: Saponification value of *Gandhaka Taila***

	<i>Gandhaka Taila-1</i>	<i>Gandhaka Taila-2</i>
Saponification value	45.28	45.75

**Table 7: Iodine value of *Gandhaka Taila***

	<i>Gandhaka Taila-1</i>	<i>Gandhaka Taila-2</i>
Iodine value	58.40	48.22

From the above obtained results it is observed that the analytical reports of the quality control parameters like pH value, Sp. gravity, refractive index, acid value, saponification value and iodine values of both the samples are different [Table 8], but the differences are statistically insignificant (unpaired 't' test).

**Table 8: Analytical results of *Gandhaka Taila-1* and *Gandhaka Taila-2***

Sample	pH Value	Sp. Gravity	R.I	Acid Value	Sap. Value	Iodine Value
<i>GandhakaTaila-1</i>	6.0	1.043	1.470	1.16	45.28	58.40
<i>Gandhaka Taila-2</i>	6.0	1.030	1.458	1.07	45.75	48.22

## DISCUSSION

*Gandhaka* and sesame oil have been used since many hundreds of years for treating various types of skin disorders both on internal and external application. *Taila kalpana/ Sneha kalpana* (oleaginous preparation) is a unique dosage form that contains both lipid soluble and water soluble medicaments to provide a very broad spectrum therapeutic index for the intended disease. One of the consequences of *sneha kalpana* is formation of liposomal drug delivery system which is used in manufacturing of allopathic medicines where lipid soluble medicaments are located in outer layer of dosage form, whereas inner core is formed with water soluble medicaments. In the current research work two types of *Gandhaka Taila* were prepared and named *Gandhaka Taila-1* and *Gandhaka Taila-2*. In former preparation, Rasa ratna samuchhaya is followed as textual reference, in which other than *Shuddha Gandhaka* and butter, herbal materials like *Snuhi ksheera* and *Arka ksheera* were used. In latter method, Rasendra chintamani is followed in which only *Shuddha Gandhaka* and milk are used. In first case, directly butter is used as the source of *sneha*, whereas in second case milk is used as source of *sneha* from which *sneha* is extracted after addition of *Shuddha Gandhaka*.

When both the samples are analyzed for their different scientific standards like pH value, Sp. gravity, R.I., acid value, saponification value and iodine values, it is observed that both the samples have different values but the differences are statistically insignificant [Table 8]. However *Gandhaka Taila-1* has higher iodine value signifying higher degree of unsaturation, i.e. more unsaturated fatty acids are present in it in comparison to *Gandhaka Taila-2*. It is also observed that *Gandhaka Taila-1* has higher specific gravity and acid value indicating that it tends to have more rancidity, i.e. it may have shorter shelf life.

## CONCLUSIONS

It is observed that the analytical reports of the standardizing parameters like pH value, Sp. gravity, Refractive index, acid value,

saponification value and iodine values of both the samples are different, but the differences are statistically insignificant. However *Gandhaka Taila-1* shows higher iodine value, higher sp. gravity and higher acid values. This indicates that *Gandhaka Taila-1* may have more unsaturated fatty acids and also higher tendency to rancidity and hence shorter life span. The data generated is documented and could have immense help for further research in this regard with more advanced tools and technology to validate and rationalize the time tested potent *Ayurvedic* medicine, *Gandhaka Taila*.

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**How to cite this article:** Verma H, Masand S, Mohapatra S. Analytical Study of *Gandhaka Taila*- An Approach to Standardization of Topically Applied Medicated Oil. Int J Ayurveda & Med Sc 2018; 3(2): 11-14.

**Source of Support:** Nil      **Conflict of Interest:** None declared