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RESEARCH PAPER ON MACROSCOPIC AND PHYSIOCHEMICAL PROPERTIES OF NIRGUNDYADI TAILA

Dr. Poonam Kamal*[1], Dr. Akanksha[2], Prof. Dr. Vijayant Bhardwaj[3]

[1,2]PG Scholar, Dept. of Shalakya Tantra, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Distt. Kangra, Himachal Pradesh.
[3]HOD, Dept. of Shalakya Tantra, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Distt. Kangra, Himachal Pradesh.

***Corresponding Author: Dr. Poonam Kamal**

PG Scholar, Dept. of Shalakya Tantra, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Distt. Kangra, Himachal Pradesh.
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ABSTRACT

Nirgundyadi Taila is a classical *Ayurvedic* formulation comprising ingredients such as *Nirgundi*, *Jaati*, *Arka*, *Rasona*, *Bhringaraja*, *Karpasa*, *Sahijana*, *Tulsi*, *Ardraka*, *Karvellaka*, *Vatsanabha*, and *Tila Taila* as the base. The study aims to evaluate its physicochemical, microscopic, and identification characteristics to validate its quality and authenticity. The formulation was prepared under standardized conditions and subjected to macroscopic and physicochemical analysis. Results indicated that *Nirgundyadi Taila* exhibited Reddish yellow colour, with characterstic smell. Tests were conducted on physiochemical parameters significant such as specific gravity, loss on drying, refractive index, saponification value of *Nirgundyadi Taila* where as lower acid value of the Taila suggests a lower likelihood of *Taila* decomposition. In conclusion, *Nirgundyadi Taila* is mostly recommended in *Karna Nada* because of its *Vata-Shamaka* properties. Because local applications shield the mucosal barrier, facilitate the percutaneous absorption of the integrated medicine, and are rapidly absorbed, they are advantageous. The preliminary standards for manufacturing *Nirgundyadi Taila. Taila* can be derived from the findings of the pharmaceutical and analytical investigation conducted on the plant. The findings of this study can be used as a standard reference.

KEYWORDS: *Nirgundyadi Taila, Karna Nada*, Macroscopic parameters, Physio-chemical parameters.

INTRODUCTION

In *Ayurveda*, medicated oils are primarily employed in disorders associated with *Vata Dosha* vitiation. *Nirgundyadi Taila* is a classical medicated oil described in *Yogratnakara*, *Uttarardha* in *Karna Rogadhika*[1] *Chikitsa* for various *Karna Roga*, particularly those of *Vataja* origin, such as *Karna Nada*. The formulation composed of drugs possessing *Vata-hara*, *Shothahara*, *Vednasthapana* and *Nadivardhaka*, (nervine) properties, making it suitable for the management of Tinnitus. The formulation comprises *Nirgundi* (*Vitex negundo*), *Jaati* (*Jasminum officinale*), *Arka* (*Calotropis gigantea*), *Rasona* (*Allium sativum*), *Bhringaraja* (*Eclipta alba*), *Karpasa* (*Gossypium herbaceum*), *Sahijana* (*Moringa oleifera*), *Tulsi* (*Ocimum sanctum*), *Ardraka* (*Zingiber officinale*), *Karvellaka* (*Momordica charantia*), *Vatsanabha* (*Aconitum ferox*), and *Tila Taila* (*Sesamum indicum*) as the base. The ingredients predominantly exhibit *Vata-Kapha Dosha Shamaka* and *Shothahara* (anti-inflammatory) nervine tonic, immunomodulator, neuro-protective activity that preserve the structure and function of nerve cells against damage or degeneration, anti-inflamatory, anti-oxidant, CNS Depressants and has sedative effects, properties. The formulation was prepared using the classical *Taila Paka Kalpana* method as per the Ayurvedic Pharmacopoeia of India and standardized through physicochemical analysis.

METHODOLOGY

Pharmaceutical study Collection of drugs

The raw material like *Nirgundi*, *Jati*, *Arka*, *Rasona*, *Bhringaraja*, *Karpasa*, *Sahijana*, *Tulsi*, *Ardraka*,

Karvellaka, *Vatsanabha*, and *Tila Taila* (Table 1) for the preparation of *Nirgundyadi Taila* was collected from the market and after proper verification in the Dept. of Dravya Guna, the final drug was prepared under the guidelines of the Dept. Of Rasa Shastra and Bhaisajya Kalpana in Rajiv Gandhi Government Postgraduate Ayurvedic Medical College pharmacy, Paprola.

Table no. 1- Ingredients of *Nirgundyadi Taila*.

Sr. No.	Name of plant	Botanical name	Family	Part Used	Composition
1.	*Nirgundi*	*Vitex negundo* Linn.	Verbenaceae	Leaf	350gm
2.	*Jati*	*Jasminum officinale Linn.*	Oleaceae	Leaf	350gm
3.	*Arka*	*Calotropis procera (Ait)R.Br.*	Asclepiadaceace	Leaf	350gm
4.	*Bhringraja*	*Eclipta alba Hassk*	Asteraceae	*Panchang*	350gm
5.	*Rasona*	*Allium sativum Linn.*	Alliaceae	*Kand*	350gm
6.	*Karpasa*	*Gossypium herbaceum Linn.*	Malvaceae	Seed	350gm
7.	*Shigru*	*Moringa oleifera Lam.*	Moringaceae	Seed	350gm
8.	*Tulsi*	*Ocimum sanctum Linn.*	Lamiaceae	Leaf	350gm
9.	*Karvellaka*	*Momordia charantia Linn.*	Cucurbitaceae	*Panchang*	350gm
10.	*Vatsnabha*	*Aconitum ferox Wall ex Seringe*	Ranunculaceae	Root	1kg
11.	*Adraka*	*Zingiber officinale Roxb.*	Zingiberaceae	Rhizome	350gm
12.	*Tila*	*Sesamum indicum Linn.*	Pedaliaceae	*Murchita Tila Taila*	3L
13.	*Kadali*	*Musa paradasica*	Musaceae	Leaf	350gm

Preparation of *Nirgundyadi Taila*

Nirgundyadi Taila was prepared in the pharmacy of Department of Rasa Shastra and Bhaishajya Kalpana, Rajiv Gandhi Government Postgraduate Ayurvedic Medical College pharmacy, Paprola.

Preparation of *Nirgundyadi Taila* was done as per the general method of preparation of *Taila Kalpana* i.e. 1/4th part of *Kalka* (paste), 1 part of *Tila Taila* (sesame oil) and 4 parts of *Drava Dravya* (liquid) (1/4:1:4).

METHOD OF PREPARATION

1. The raw *Dravyas* required for the preparation were first cleaned and coarsely powdered using a pulverizer.
2. 3 L of *Tila Taila* was subjected to *Murchana* as per classical references to enhance its therapeutic efficacy and shelf life.
3. After *Murchana*, the oil was filtered and kept ready for further processing.
4. The *Murchita Taila* was then combined with the prepared *Kashaya Dravya* and *Kalka Dravya* as per the classical *Taila Paka Vidhi*.
5. The mixture was heated over mild fire and stirred continuously until the attainment of appropriate *Taila Paka Lakṣaṇa* (classical signs of proper oil processing).
6. Upon completion, the oil was filtered using a clean cloth to remove any residual particles.

Taila Siddhi Lakshana

- *Vartivat Sneha Kalka* - able to role the *Varti* of *Kalka*
- Shabdahino Agni Nikshipta- No crackling sound heard on heating over the fire
- *Phenodgama Taila Siddhi Lakshana*: frothing at the end of *Taila*
- *Gandha Utpatti* - mild alkaline odour was appreciated
- *Varna Utpatti* - green colour of *Taila* noted
- *Rasa Utpatti* - not tasted.[2]

Table 2: Quantity of *Taila* taken and loss.

Taila	Quantity
Total *Tila Taila* taken	3.0 L
Obtained Taila	2.5 L
Loss	0.5 L

Analytical Study

A. Macroscopic Description (Organoleptic characters)

Various parameters of the material such as appearance, colour, odour of the formulations was observed and recorded.

B. Physio-Chemical Analysis

Physio-chemical analysis was carried out based on the following parameters.

1. Loss on drying
2. Specific gravity
3. R.I.
4. Saponification value
5. Acid value.

C. Identification Tests

1. Qualitative test
2. Thin layer chromatography.

1. Loss on drying (Determination of Moisture Content)

The Procedure here determines the amount of volatile matter (i.e., water drying off from the drug). For substances appearing to contain water as the only volatile constituent, the procedure given below is appropriately used. Place about 10 g of the drug (without preliminary drying) after accurately weighing (accurately weighed to within 0.01 g) it in a tared evaporating dish. After placing the above said amount of the drug in the tared

evaporating dish, dry at 105^0 C for 5 hours, and weigh. Continue the drying and weighing at one-hour intervals until the difference between two successive weighing corresponds to not more than 0.25 percent. Constant weight is reached when two consecutive weighs after drying for 30 minutes and cooling for 30 minutes in a desiccator, show not more than 0.01 g difference. The petri dish was taken out, self-cooled and weighed immediately. The weight loss i.e. loss on drying was calculated and expressed as % w/w.[3]

2. Specific gravity

The specific gravity of a liquid is the weight of a given volume of the liquid at 250C (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighing being taken in air.

Method: Proceed as described under wt. per ml. Obtain the specific gravity of the liquid by dividing the weight of the liquid contained in the pycnometer by the weight of water contained, both determined at 250 C unless otherwise directed in the individual monograph.[4]

3. RI (Refractive Index)

The refractive index (η) of a substance regarding air is the ratio of the sine of the angle of incidence to the sine of the angle of refraction of a beam of light passing from air into the substance. It varies with the wavelength of the light used in its measurement. It is measured with an Abbemat refractometer.[5]

4. Saponification value

The saponification value is the number of mg of potassium hydroxide required to neutralize the fatty acids, resulting from the complete hydrolysis of 1 g of the oil or fat, when determined by the following method.

Dissolve 35 to 40 g of potassium hydroxide in 20 ml water, and add sufficient alcohol to make 1,000 ml. Allow it to stand overnight, and pour off the clear liquor. Weigh accurately about 2 g of the substance in a tared 250 ml flask, add 25 ml of the alcoholic solution of potassium hydroxide, attach a reflux condenser, and boil on a water-bath for one hour, frequently rotating the contents of the flask cool and add 1 ml of solution of phenolphthalein and titrate the excess of alkali with 0.5 N hydrochloric acid. Note the number of ml required.

(a)Repeat the experiment with the same quantities of the same reagents in the manner omitting the substance. Note the number of ml required

(b)Calculate the saponification value from the following formula

$$\text{Saponification Value} = \frac{(b-a) \times 0.02805 \times 1.000}{W}$$

Where 'W' is the weight in g of the substance taken.[6]

5. Acid value

The acid value is the number of mg of potassium hydroxide required to neutralize the free acids in 1 g of the substance, when determined by the following method: Weigh accurately about 10 g of the substance (1 to 5) in the case of a resin into a 250 ml flask and add 50 ml of a mixture of equal volumes of alcohol and solvent ether, which has been neutralized after the addition of 1 ml of solution of phenolphthalein. Heat gently on a water bath, if necessary until the substance has completely melted, titrate with 0.1 N potassium hydroxide, shaking constantly until a pink colour which persists for fifteen seconds is obtained. Note the number of ml required.

Calculate the acid value from the following formula

$$\text{Acid Value} = \frac{a \times 0.00561 \times 1000}{W}$$

Where 'a' is the number of ml of 0.1 N potassiumhydroxide required and 'W' is the weight in g of the substance taken.[7]

Identification tests

1. Qualitative test

It is a chemical test for the screening and identification of bioactive chemical constituents like alkaloids, carbohydrates, glycosides, saponins, phenolic compounds phytosterols, proteins, amino acids, flavonoids, and tannins in drugs. Different methods are used for different constituents.

2. Thin layer chromatography (TLC)

Thin-layer chromatography is a technique in which a solute undergoes distribution between two phases, stationary phase acting through adsorption and a mobile phase in the form of a liquid. The adsorbent is a relatively thin, uniform layer of dry finely powdered material applied to a glass, plastic, or metal sheet or plate. Precoated plates are most commonly used. Separation may also be achieved based on partition or a combination of partition and adsorption, depending on the particular type of support, its preparation, and its use with different solvent. Identification can be effected by observation of spots of identical Rf value and about equal magnitude obtained, respectively, with an unknown and a reference sample chromatographed on the same plate. A visual comparison of the size and intensity of the spots usually serves for semi-quantitative estimation.[8]

OBSERVATIONS AND RESULTS

The analytical studies like macroscopic and physio-chemical were carried out results are given in Table 3.

Table no.3

Sr. No.	Test	DTL Result
1.	**Macroscopic tests**	
a.	Appearance	Medicated oil
b.	Colour	Reddish yellow
c.	Odour	Characterstics
2.	**Physiochemical tests**	
a.	Loss on drying	0.60%
b.	Specific Gravity	0.918
c.	RI	1.472
d.	Saponification Value	199
e.	Acid Value	2.23
3.	**Identification tests**	
a.	Qualitative test	-ve test for mineral oil
b.	Thin Layer Chromatography	Rf Value 0.20, 0.26,0.32,0.41, 0.45, 0.67,0.73, 0.87 Shows the presence of Til oil, Nirgundi

DISCUSSION

The results of the physicochemical tests indicate that *Nirgundyadi Taila* has a high saponification value, which suggests its potential for quick absorption and penetration into the skin. The low acid value indicates the oil's stability and minimal risk of decomposition. The TLC results confirm the presence of *Tila Taila*, which is a key ingredient in the preparation of *Nirgundyadi Taila*. The Rf values obtained are consistent with the expected values for *Tila Taila*, further validating the identity of the oil. The absence of mineral oil in the identification tests ensures the safety and efficacy of the preparation. Overall, the results demonstrate the quality and authenticity of *Nirgundyadi Taila*, supporting its traditional use in *Ayurvedic* medicine for various conditions.

CONCLUSION

The macroscopic tests revealed that the medicated oil, *Nirgundyadi Taila* has a reddish-yellow color and a characteristic odor. The physicochemical tests showed a loss on drying of 0.60%, specific gravity of 0.918, and refractive index (RI) of 1.472. The saponification value was found to be 199, and the acid value was 2.23. The identification tests confirmed the absence of mineral oil, and the Thin Layer Chromatography (TLC) revealed the presence of *Tila Taila*, with Rf values of 0.20,0.26, 0.32, 0.41, 0.45, 0.67, 0.73 and 0.87.

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