



Quality assessment of *Gruhadhooma Taila*: Indigenous oil used in nasal polyposis (*Nasarshas*)

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ABSTRACT: An attempt was made to assess the quality of *Gruhadhooma taila* which is used for Nasal polyposis (*Nasarshas*). Quality control parameters such as physico-chemical, microbial counts, and heavy metals were determined. In addition, phytochemical screening and development of Thin Layer Chromatography (TLC) fingerprint for the *Gruhadhooma Taila* were carried out. Results revealed that the peroxide value, acid value, iodine value, saponification value, moisture content, and reflective index of the *Gruhadhooma Taila* were 13.4±0.8 milliequivalents/kg, 16.9±0.4 mg KOH/g, 62.4±0.4 % by mass, 193.1±1.2 mg KOH/g, 0.3% by mass, and 1.470±0.2 at 40 °C respectively. Moreover, micro-organisms (Mesophilic bacteria, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Candida albicans*) and heavy metals (Hg, As, Pd, and Cd) were not detected. Eleven and fourteen spots were observed in the Thin Layer Chromatography fingerprint of the *Gruhadhooma Taila* before and after spraying vanillin sulphate respectively. Therapeutically important phytochemicals were found in *Gruhadhooma Taila*. In conclusion, an attempt was made to establish the quality control parameters of *Gruhadhooma Taila* for the first time in Sri Lanka.

KEYWORDS: Gruhadhooma Taila, physicochemical parameters, phytochemicals

INTRODUCTION

Nasal polyps are mucosal lesions of the nasal or paranasal sinuses that can result from a response to inflammatory or infectious stimuli [1]. They appear as smooth, round, semi-translucent masses that are most commonly found in the middle meatus and ethmoid sinuses and affect 1% to 4% of the population [2]. Males are affected more than females and adults more than children [3]. Patients with nasal polyposis may present clinically with complaints of nasal obstruction, congestion, hyposmia, rhinorrhea, epistaxis, postnasal drip, headaches, and snoring [4]. Although nasal polyps more commonly appear bilaterally, they can also present unilaterally. In unilateral nasal masses, benign or malignant pathologies must be considered and distinguished by nasal endoscopy, CT scan, and biopsy [5]. Signs and symptoms of Nasal polyposis can be correlated with *Nasarshas* [6]. In Ayurveda, *Nasarshas* is one of the most common Nasal disorders and it is one of the challenging problems of all Ear, nose and throat (ENT) surgeon's. The disease looks simple but it doesn't bring satisfactory relief to the patients after repeated visiting to the ENT clinic. Thus, the treatment adopted for *Nasarshas* in modern system of medicine has not been satisfactory till date. Besides these, Ayurveda also offers different kind of

treatment modalities in the management of *Nasarshas*. Therefore, in ENT (Shalaky) clinic of Gampaha Wickramarachchi Ayurveda Teaching Hospital has been used since a long time a local application of an oil namely *Gruhadhooma Taila* as an effective treatment of *Nasarshas*. However, its quality assessment is not validated till date. Herbal medicinal products such as medicated oils, powders, decoctions, etc are obtained from the plant resources for the treatment and wellbeing of mankind. [7]. However, at present herbal medicines have not been fully accepted in some countries, due to their safety and efficacy evaluation information [8]. Therefore, the present study assesses the quality of *Gruhadhooma Taila* via TLC fingerprint, evaluation of physicochemical properties, phytochemical screening, microbiological counts, and heavy metals analysis according to standard protocols.

MATERIALS AND METHODS

Preparation of *Gruhadhooma Taila*

All the ingredients of *Gruhadhooma Taila* were identified and authenticated by a senior lecturer of the Department of *Dravyaguna*, Faculty of Indigenous Medicine, Gampaha Wickramarachchi University, Sri Lanka (Table 1). *Gruhadhooma Taila* was prepared by an Ayurvedic physician of

Gampaha Wickramarachchi University of Indigenous Medicine, Sri Lanka according to the method described in *Sharangadhara Samhita Sneha paribhasha* [9]. Moreover, six *Gruhadhuma Taila* samples were subjected to quality assessment parameters.

Table 1. Ingredients of *Gruhadhooma Taila*

Botanical name	Part used
Soot	Ash
<i>Piper Longum</i> Linn.	Fruits
<i>Cedrus Deodera</i> (Roxb.) Loud.	Bark
<i>Hordeum Vulgare</i>	Whole Plant
<i>Pongamia Pinnata</i> Pierre.	Seed
Rock salt	-
<i>Achyranthes aspera</i> Linn.	Seed
<i>Sesamum indicum</i> L	Seed oil

Chemical and physical testing of *Gruhadhooma Taila*

Peroxide value and acid value (SLS 313 Part 3/Section 7:2009), iodine value (SLS 313 part 2/ Section 2:2014), and saponification value (SLS 313 part 2/ Section 1:2014), Refractive index at 40 °C (SLS 313 part 1/Section 5:2009) and moisture (SLS 313 part 3/Section 5:2009) were determined according to the standard protocols [10, 11, 12].

Determination of microbial limits and heavy metals

The presence or absence of selected microbes and selected heavy metals which are known to be highly harmful to human beings were determined using standard protocols [13].

Development of Thin Layer Chromatography (TLC) fingerprint profile

The active ingredients of the *Gruhadhooma Taila* were extracted into dichloromethane as mentioned in Kumaradharmasena and co-workers in their study in year 2015 [14] and spotted on the TLC plate and developed the TLC fingerprint using the following solvent system:

Ethyl acetate: Dichloromethane: Cyclohexane (0.5:4.5:0.5 v/v)

Observed the spots under UV lamp (at 254 nm and 366 nm) and calculated the R_f values of each spot. Then Vanillin sulphate was sprayed and heated at 110 °C for 5 min, and calculated the R_f values of each spot gave a colour.

Phytochemical screening

The phytochemical screening for *Gruhadhooma Taila* was carried out as described by Karunakaran and co-workers in year 2017 and Dahanayake et al in 2019 [15,16].

Statistical analysis

Data were expressed as Mean±S.E.M. Student t-test was used to analyze the data.

RESULTS AND DISCUSSION

Standardization is a principal factor for herbal medicines to maintain batch-wise consistency. Physico-chemical parameters such as peroxide value, acid value, refractive index, saponification value, iodine value, and moisture content can be considered when standardizing medicated oils. In addition, a TLC fingerprint can be used to detect any chemical variations in the oil samples. Detection of heavy metals and microbial limits also gives quality assurance for the oil samples. The physico-chemical parameters of *Gruhadhooma Taila* are shown in Table 1.

Table 2. Physico-chemical parameters of *Gruhadhooma Taila*

Test / Unit	Test values
Peroxide value, (milliequivalents per kg)	13.4 ±0.8
Acid value, (mg KOH/g)	16.9 ± 0.4
Refractive index at 40 °C	1.470 ±0.200
Saponification value, (mg/KOH/g)	193.1±1.2
Iodine value, percentage by mass	62.4±0.4
Moisture, percentage by mass	0.3±0.0

Results are presented as Mean ± SEM, n =6.

Similar studies have been conducted on medicated oils such as Vipadikahara grita taila [17], Mustadi taila [18], Thoravature taila [19] and Bilvadi taila [20] in Sri Lanka. The quality and stability of an oil depends on its peroxide value, acid value and iodine value. Peroxide value is one of the most typically used quality parameters to monitor lipid oxidation while acid value is a common measure of the breakdown of the triacylglycerols into free fatty acids, which has an adverse effect. Moreover, iodine value is important indicative of the degree of unsaturation of a triacylglycerol oil [21,22]. In addition, no tested micro-organisms and heavy metals were found in *Gruhadhooma Taila* (Table 2). This assures the safety of *Gruhadhooma Taila*.

Phenols are sclerotic agents with very powerful anti-inflammatory and pain-killing properties. Oily phenol injection is used in the treatment of piles therefore, nasal polyposis also a kind of pile in the nasal cavity. This *Gruhadhooma Taila* contains phenols which are effective to reduce the size of the nasal polyposis. Further, certain flavonoids have an inhibiting effect on the development of nasal polyps via anti-oxidant and anti-inflammatory effects [23]. The *Gruhadhooma Taila* also contains flavonoids. According to Pourgholamali and co-workers [24], *Sambucus ebulus* which is used as a treatment for nasal polyposis was rich in phenols and flavonoids similar to the present study. Moreover, recent research findings have highlighted the beneficial roles of secondary metabolites such as tannins [25, 26] and alkaloids [27] for the treatment of nasal polyposis. Therefore, the presence of tannins in the *Gruhadhooma Taila* may also play a major role in the treatment of nasal polyposis. However, alkaloids were absent in

Gruhadhooma Taila, even though alkaloids are reported to be beneficial for nasal polyposis. In addition, phytochemicals such as terpenoids and saponins were found to be present in *Gruhadhooma Taila* while steroids, carbohydrates, proteins and reducing sugar were absent (Table 3).

Table 3. Phytochemicals of *Gruhadhooma Taila*

Phytochemicals	Test	Result
Tannins	Ferric chloride test	++
	Lead acetate test	++
	Vanillin test	-
Phenols	Lead acetate test	++
	Vanillin test	-
Flavonoids	Dil ammonia+conc sulfuric acid	++
	Zn+conc HCl	+
Alkaloids	Wagner reagent	-
Terpenoids	Salkowski test	++
	Test for sesquiterpenes	++
Steroids	Acetic anhydride +Conc sulfuric acid	-
	Liberman Burchard test	-
Saponins	Froth test	+
Carbohydrates	Iodine test	-
Proteins	Biuret test	-
Reducing Sugars	Fehling's test	-

+ +: Present at high amount; +: Present at moderate amount; -: Absent

Many researchers have proven the toxic impact of heavy metals such as Cd, Pb, Hg and As in herbal products [28, 29]. Microbial contamination is also a huge drawback in herbal medicines [30]. This may be due to the presence of microbes on the surfaces of leaves, stems, flowers, seeds, and roots and during the harvesting and processing steps of the medicinal plants [31]. However, in the present study, pathogenic microorganisms and heavy metals were not detected (Table 4).

TLC fingerprint is used to identify the chemical compound/s of the claimed herbs in the herbal products. In addition, TLC fingerprints can be used to detect adulteration or substitutions of plants [32].

Table 4. Microbial counts and heavy metals in *Gruhadhooma Taila*

Test / Unit	Test values
Mesophilic bacteria, per g	Absent
<i>Staphylococcus aureus</i> , per 10 g	Absent
<i>Pseudomonas aeruginosa</i> , per 10 g	Absent
<i>E. coli</i> count, per 10 g	Absent
<i>Candida albicans</i> , per 10 g	Absent
Cadmium (as Cd), mg/kg	Not detected
Lead (as Pb), mg/kg	Not detected
Mercury (as Hg), mg/kg	Not detected
Arsenic (as As), mg/kg	Not detected

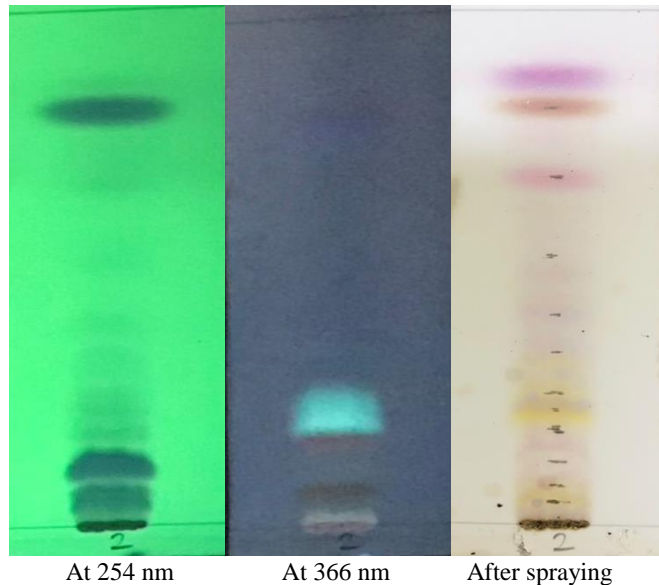


Figure 1. TLC fingerprint profiles of *Gruhadhooma Taila*

The TLC fingerprint of *Gruhadhooma Taila* is illustrated in Figure 1. Moreover, 11 and 14 spots appeared after observing under UV light (under 254 nm and 366 nm) and after spraying Vanillin sulphate respectively. In the present study, an attempt was made to assess the quality of a polyherbal medicated oil. However, quality assessment of raw materials is also very important and research has been conducted to evaluate the quality of raw materials too [33,34]. In the present study, we limited to assess the quality of *Gruhadhooma Taila* prepared at Gampaha Wickramarachchi University of Indigenous Medicine, Sri Lanka. However, in the future hope to collect the market samples of *Gruhadhooma Taila* and carry out quality assessment studies. Therefore, by keeping the quality assessment results of the present study as a benchmark and comparison can be done with the market samples of *Gruhadhooma Taila*.

CONCLUSION

An attempt was made to establish the quality control parameters of *Gruhadhooma Taila* for the first time in Sri Lanka. The data of the present study can be used by industrialists and Ayurvedic physicians who engage in the manufacturing of *Gruhadhooma Taila*.

DECLARATION

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Authorship Contributions

Concept and Writing: Prof. K.P.P Peiris and Dr. L.D.A.M. Arawwawala;

Data Collection and Interpretation: Miss.P.H.S.N.J. Punchedhewa;
Drug Preparation: Prof. K.P.P Peiris and Dr.K.K. Biyanwila

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Ethics approval and consent to participate

The study was conducted without human beings & animals. Ethical approval is not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declared that there is no conflict of interest.

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