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QUALITY ASSESSMENT OF *RATHULŪNU THAILAYA*: A HERBAL OIL FOR *PEENASA* (ALLERGIC RHINITIS)

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ABSTRACT

Rathulūnu thailaya (RT) is a poly herbal medicated oil mentioned in Ayurveda pharmacopeia used to treat all types of *Peenasa* (Allergic rhinitis). The drug formulation consists of eleven herbal compounds including *Allium cepa*, *Zingiber officinale*, *Piper nigrum*, *Piper longum*, *Ferula foetida*, *Nigella sativa*, *Cuminum cyminum*, *Syzygium aromaticum*, *Myristica fragrans* (Nutmeg seed, seed cover) and *Sesamum indicum*. Study mainly focusses on literary survey and analysis of the quality parameters of RT. Literature survey revealed that these ingredients are prominent with *katu rasa* (pungent taste), *laghu*, *theekshna guna* (light, sharp properties) and *ushna veerya* (hot potency) which helps to pacify the pathogenesis of phlegmatic conditions. Organoleptic properties and physico - chemical parameters (Refractive index, Rancidity, Iodine value, pH value, Specific gravity) were determined under standard protocols to assess the quality of the Medicated oil. RT was a brownish colour oil with a pleasant odour and GC–MS (Gas Chromatography - Mass Spectrometry) analysis was done to separate volatile compounds. Sixteen suspected compounds were identified including Sabinene, Eugenol, Zingiberene, Myristicin, Retrofractamide-A, Linoleic and Stearic acid. Refractive Index of 1.4665 at 40^0C was obtained which tallied with standard ranges of medicated oils and RT had a rancid value of 3.4mE/kg. pH was alkaline and specific gravity of RT at 30^oC was 0.9199. Iodine value is a measure of relative degree of unsaturation

in oil components and reading of 87.9 was obtained. Present study disclosed the quality parameters of *Rathulūnu thailaya* (RT) for the first time and the detected parameters can be used for future studies.

KEYWORDS: Allergic rhinitis, *Peenasa*, Physico -chemical parameters, *Rathulūnu thailaya*, Volatile.

INTRODUCTION

Ayurveda, the "science of life" offers a complete system to live a long healthy life by maintaining healthiness and rejuvenating the body through diet and herbal medicines.[1] This alternative type of medicine helps to avoid harmful side-effects of synthetic drugs and the main disadvantage and lacuna of Ayurvedic medicine is the inappropriate data and methods regarding quality control and standardization techniques. To add scientific validity to Ayurvedic drug formulations it's important to analyze and maintain proper quality control studies.

Peenasa is a phlegmatic disease caused due to vitiation of *kapha* and *vātha dōsha*.[2] mentioned in both Ayurveda and Traditional system of medicine of Sri Lanka. This can be correlated with Allergic rhinitis mentioned in Allopathic medicine.[3] This disease can be hereditary, due to an allergic reaction or sometimes may be due to seasonal changes. Ayurveda authentic texts mention this disease as a disease pertaining to nasal area (*Nāsāgatha rōga*) and *Apeenasa* is one of the 31 types of *Nāsāgatha rōga* in *Susrutha Samhithā*.[4] Traditional medical system classifies *peenasa* as a *Sarvāngagatha rōga*.[5] (disease pertaining to the whole body). *Ashtānga Hrda Samhithā*.[6] and *Bhāva parakāsha*.[7] mentions both *peenasa* and *apeenasa* are the same disease condition. Common signs and symptoms of *peenasa* are *Nāsā srāva* (Rhinorrhea), *Kshuth* (Sneezing), *Ānahyathe* (Nasal blockage), *Vidhupyathe (*smoky sensation), *Shirah shūla* (Headache), Heaviness of head (*Shirah gaurava*).[4]

Present study was carried out on *Rathulūnu thailaya*.[8] (RT) which is commonly used in treating *Peenasa* (Allergic rhinitis) in Ayurveda and traditional system of medicine in Sri Lanka. Several drug formulations are mentioned for *Rathulūnu thailaya* (RT) and drug recipe mentioned in Ayurveda Pharmacopoeia is used in this study. This oil is also known as *Peenas thailaya* due to the higher success rate obtained by treating *peenas rōga*. It's commonly

applied on head as an external treatment and can also be used as *Pāna* (Internal medicine) and *Nasya* (Errhine therapy) as well.

Though the medicinal properties mentioned in ancient medical books on different drug formulas used for many years with higher success rate cannot be totally tested by modern techniques, assessment of quality parameters can give an overall idea about these medicines in another way. These results can be used to compare the quality parameters mentioned in authentic texts to some extent. Adulteration, substitution, and lack of skilled personnel are the main reasons for unavailability of genuine herbal drugs. Standardization is a system to ensure that every prepared drug is having specific qualities in an equal way. By use of advanced quality control technique and suitable standards, quality assurance of herbal products can be guaranteed. Present study mainly focused on analyzing literature of the *Rathulūnu thailaya* (RT), its ingredients, *Peenas rōga* (Allergic rhinitis) along with the evaluation of physico-chemical parameters such as GCMS analysis, Iodine value, Specific gravity and Refractory Index of *Rathulūnu thailaya* (RT).

Justification

Literature analysis is one of the main methods of identifying the validity and importance of herbal drugs and it gives a vast knowledge about the therapeutic benefits of medicines as well as the different indications, method of usage as well as the correct dosages. Assessment of quality parameters and standardization is also an important component in maintain proper quality of medicines. The main disadvantage and lacuna of Ayurvedic medicine is the inappropriate data and methods regarding quality control and standardization techniques. To add scientific validity to Ayurvedic drug formulations it's important to analyze and maintain proper quality control studies.

Therefore present study aims to analyze the literature and quality parameters of the poly herbal oil, *Rathulūnu thailaya* (RT).

Objectives

The General objective was to analyze the literature and quality parameters of *Rathulūnu thailaya* (RT) and the specific objectives were to search literature on *Rathulūnu thailaya* and *Peenasa* (Allergic rhinitis) mentioned in Ayurveda, traditional authentic texts, modern literature research articles, to evaluate the pharmacological properties *Rathulūnu thailaya* drug formula according to Ayurveda and to determine the quality parameters of prepared

Rathulūnu thailaya according to modern laboratory tests and analyze the Ayurvedic properties and quality parameters of the polyherbal oil.

METERIALS AND METHODS

Literature study on *Peenasa* and *Rathulunu thailaya* (RT) was conducted using Ayurveda medical texts such as *Charaka samhithā, Susrutha samhithā, Ahtangahrda samhithā, Bhāva prakāsha, Shārangadhara Samhithā. Mādhava Nidāna* and traditional medical texts such as *Deshiya hastha sāra sangrahaya, Parani peenas wedapotha, Deshiya guli kalka potha, Thalpathe piliyam.*[11] and *Ayurveda aushadha sangraha* (Ayurveda Pharmacopoeia – Volume 1,2,3). Modern medical concepts on Allergic rhinitis was collected using modern medical books like Robbin's Basic Pathology, Ganong's Review of Medical Physiology, Davidson's principles of Clinical Medicine,[12] Hutchison's clinical methods and more data was gathered from internet and research articles published about physico-chemical analysis of herbal oils and properties of chemical constituents.

Rathulunu thailaya (RT) was prepared according to the recipe mentioned in Ayurveda Pharmacopeia. The drug formulation consists eleven herbal compounds including Red onion/*Rathu lūnu* (*Allium cepa*), Dried ginger/*Inguru (Zingiber officinale),* Pepper/*Gammiris (Piper nigrum),* Long pepper/Thippili *(Piper longum),* Nutmeg/*Sādikkā,* Nutmeg cover/*Wasāwāsi* (*Myristica fragrans*), Asafoetida/*Perumkāyam* (*Ferula foetida*), Black cumin/*Kalu duru* (*Nigella sativa*), White cumin/*Sūduru* (*Cuminum cyminum*), Clove/*Karābu nati* (*Syzygium aromaticum*) and Sesame oil/*Thala thel* (*Sesamum indicum*). [8] The collected samples were identified and authenticated by their morphological characters at the *Dravyaguna vignana* Department – IIM, by observations with naked eyes and systematically as per the methods described in the textbooks of pharmacognosy. After authentication of raw drugs oil was prepared and 440ml of oil was prepared. Then it was tested for standardization parameters.

Measured the red onions, peeled and cut them. Then the juice was obtained by grinding and filtered the juice. Juice of *Rathu lūnu* (*Allium cepa*) was mixed with Sesame (*Sesamum indicum*) oil and heated to half of initial volume in *Madhya pāka* (moderate heat) in a stainless-steel vessel. Then added the mixture of powdered drugs to the oil and prepared the oil in moderate heat. Oil was taken once the paste (*kalka*) was able to prepare in to a thin rod (*varthi*) and when the wick with oil had no sound once kept in fire.

Table 1: Drugs used to prepare *Rathulūnu thailaya* (RT).[8,9]

Common Name	Sinhala Name	Botanical Name	Family Name	Parts Used	Quantity
Red onion	*Rathu lūnu*	*Allium cepa*	AMARYLLIDACEAE	fruit	1.92 l (*Nali 2*)
Sesame oil	*Thala thel*	*Sesamum indicum*	PEDALIACEAE	Seed oil	480 ml (*Nali*1/2)
Dried ginger	*Wiyali inguru*	*zingiber officinale*	ZINGIBERACEA	rhizome	5g (*Kalan* 1)
Pepper	*Gammiris*	*Piper nigum*	PIPERACEAE	seeds	5g "
Long pepper	*Thippili*	*Piper longum*	PIPERACEAE	seeds	5g "
Nutmeg	*Sādikkā*	*Myristica fragrans*	MYRISTICACEAE	seeds	5g "
Nutmeg cover	*Wasāwāsi*	"	"	Seed cover	5g "
Asafoetida	*Perumkāyam*	*Ferula foetida*	UMBELLIFERS	resin	5g "
Black cumin	*Kalu duru*	*Nigella sativa*	RANUNCULACEAE	seeds	5g "
White cumin	*Sūduru*	*Cuminum* cyminum	APIACEAE	seeds	5g "
Clove	*Karābu nati*	*Syzygium aromaticum*	MYRTACEAE	flower buds	5g "

Prepared oil was then tested for organoleptic properties and quality assessment was undertaken and following test parameters were tested.[10]

- PH value.
- Refractive Index.
- Rancidity Test.
- Iodine value.
- Specific gravity.
- GCMS Analysis.

Figure 1: drugs used in preparation of *rathulūnu thailaya* (rt).

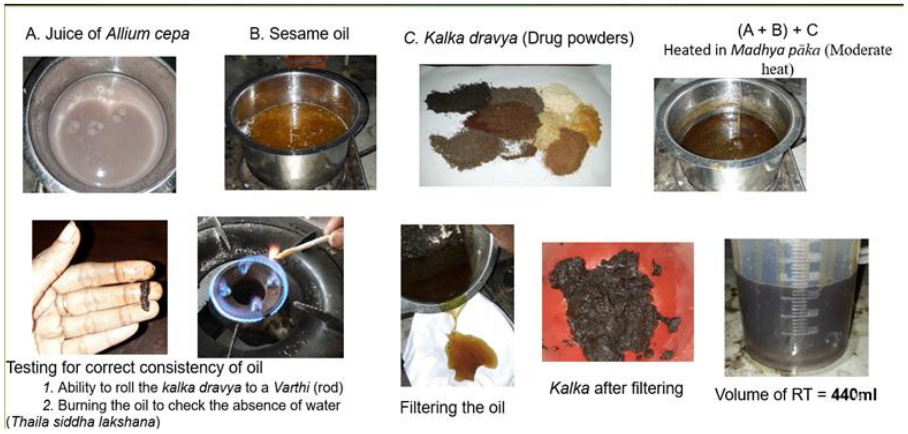


Figure 2: preparation of *rathulūnu thailaya* (rt).

RESULTS AND DISCUSSION

Research was mainly carried out with literature review and quality parameter testing to analyze the pharmacological and therapeutic properties of the *Rathulūnu thailaya* (RT) and it's ingredients.

Literature Analysis

In analysis of Ayurvedic pharmacological properties, 11 drugs in the *Rathulūnu thailaya* (RT) were analyzed. Depending on the commonly found properties of all the 11 ingredients, RT was prominent with *Katu* (pungent), *Thiktha* (bitter), *Kashāya* (astringent) tastes (*Rasa*), *Laghu* (light), *Theekshna* (sharp) properties (*Guna*), *Ushna veerya* (hot potency) and *Katu vipāka* (pungent final digestive taste).[9] All these properties are important in pacifying vitiated *kapha dōsha* according to Ayurveda. The reason for that is *kapha* which has cold (*sheetha*), smooth (*pichchila*), flowing (*sara*) characteristics get pacified by the opposite actions such as sharpness (*theekshna*), hotness (*ushna*) and pungent taste (*katu rasa* and *vipāka*). (Table 2)

Peenasa which can be correlated with allergic rhinitis in modern science is a phlegmatic disease according to Ayurveda. This disease is also mentioned in traditional system of medicine as well. This is basically known to be a long-lasting disease with hereditary factors. Complications such as sinusitis, headache, hearing loss can be occurred due to untreated allergic rhinitis. Other than the internal treatments for *Peenasa*, external treatments such as application of oils like RT can be mentioned to treat patients by considering the *Doshic* condition of the patient and the disease.

Table 2 – Commonly found pharmacological properties of *Rathulūnu thailaya* (RT).

Rasādi Panchakaya	**Commonly found properties**	**Percentage**
Rasa (Taste)	*Katu* (pungent), *Tiktha* (bitter)	***Katu*** = **90.90%**, *Tiktha* = 45.45
Guna (Quality)	*Laghu* (Light), *Theekshna* (Sharpness)	***Laghu*** = **81.81%**, *Theekshna* = 63.63%
Virya (Potency)	*Ushna* (Hot)	***Ushna*** = **100%**
Vipāka (Final taste after digestion)	*Katu* (Pungent)	***Katu*** = **72.72%**
Prabhāva (Specific action)	*Keshya* (good for hair) – [Thila/ Sesame]	1/11 = **9.09%**

- **Analysis of Organoleptic Properties of RT**

Qualities being perceivable by sense organs are known as Organoleptic properties. These include taste, sight, smell, touch in cases where dryness, moisture and stale-fresh factors are to be considered. *Rathulūnu thailaya* (RT) is ayellowish-brown viscous oil with pleasant/sweet odour with bit pungent taste.[13]

- **Assessment of Physico-Chemical Parameters of RT**

This is the field of chemistry dealing with interrelation between the composition and properties of matter. Following parameters were analyzed.

1. pH Value

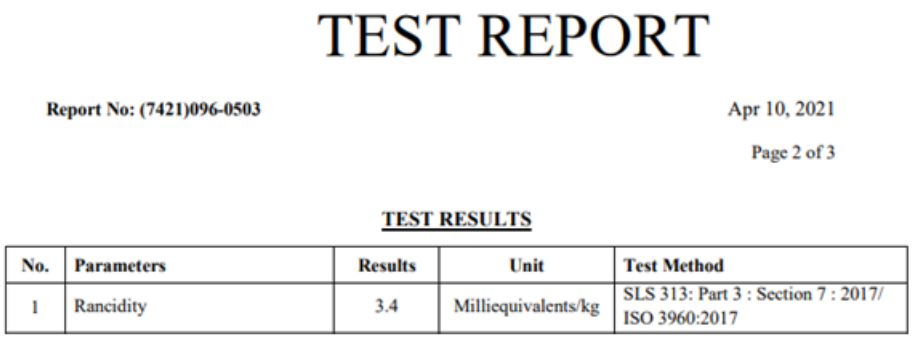
pH is a measure of how acidic/basic the substance is and the range goes from 0 to 14, with 7 being neutral. pH of less than 7 indicate acidity, whereas a pH greater than 7 indicates a base or alkalinity. pH is really a measure of aqueous solution.[14] RT was tested for pH with pH papers and colour indication was slightly alkaline. pH value of 7.2 was obtained which is alkaline. This can be because of the presence of sesame oil and red onion in large quantity which are considered as healthy alkaline food.

2. Refractive Index

Refractive index is an important optical parameter to analyze the light rays traversing through materials medium. In oils this measured by the filtered sample. In oil it indicates the possible chances of rancidity development. Higher the refractive index higher the chances of spoilage due to oxidation. Refractive index of 1.4665 at 40^0C was obtained in RT which is much more similar to the edible oils like vegetable oil.[15] RI range between 1.1460 – 1.1492 is said to be having shelf life up to 12 months.[16]

3. Rancidity Test

Rancidity testing determines the level of oxidation in a sample. When lipids (fats and oils) go rancid, its nutritional value is compromised, and the lipids will take on a rancid taste and odor.[17] This is an essential component in determining the shelf life of the product. Rancidity value of 3.4 Milliequivalents/kg had been obtained with SLS 313: Part 3: Section 7: 2017/ ISO 3960:2017 test method. Peroxide value (PV) analysis can give an accurate value on shelf life of oil. (Figure 3)



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TEST RESULTS

No.	Parameters	Results	Unit	Test Method
1	Rancidity	3.4	Milliequivalents/kg	SLS 313: Part 3 : Section 7 : 2017/ ISO 3960:2017

Figure 3: results of rancidity test.

4. Iodine Value

Used to measure the degree of unsaturation of oils and fats. Unsaturation is in the form of double bonds which react with iodine compounds. Higher the iodine value, the more unsaturated fatty acid bonds are present in a fat. Iodine value of RT was 87.9 Milliequivalents/kg and by this it's clear that indication of RT as *pāna* (Internal medicine) is also appropriate with many other health benefits.[18] Unsaturated fats, which are liquid at room temperature, are considered beneficial fats because they can improve healthy blood cholesterol levels, reduce inflammation, stabilize heart rhythms, and play a number of other beneficial roles. This is normally expressed as the number of grams of iodine absorbed by 100 g of oil or fat, considering the conditions of the test.

5. Specific Gravity

This is an index used to measure the density of a liquid. Oils with a density lower than water, will have a specific gravity between 0.0 and 1.0. This is an important property of fluids being related to density and viscosity.[19] If the specific gravity is less than one, that substance will float on water. This is because the density of water has to be greater than the density of

the subject. Specific gravity (Relative density) of RT at 30^0C = 0.9199 with SLS 313 Part 1 Section 2: 2009 method.

6. GC-MS (Gas Chromatography - Mass Spectrometry)

An analytical method that combines the features of gas-chromatography and mass spectrometry to identify different substances within a test sample. This is an important technique for qualitative and quantitative analysis of contaminants and residue and can be used to separate volatile organic compounds (VOCs).[20] Oils are made from volatile substances. 16 suspected components were identified by GC–MS including Sabinene, Eugenol, Zingiberene, Myristicin, Retrofractamide-A, Linoleic and Stearic acid. Literary survey was conducted to analyze about description and medicinal importance of identified suspected components.

Suspected Compound found in GC-MS Analysis

- Sabinene
- γ-Terpinene
- Terpinen-4-ol
- Cumaldehyde
- Eugenol
- Caryophyllene
- Zingiberene
- Myristicin
- Eugenol acetate
- Elemicin
- Methoxyeugenol
- Apioline
- Hexadecanoic acid
- Linoleic
- Stearic acid
- Retrofractamide-A

Figure 4: Suspected components of RT analyzed by GC-MS.

Data analysis of suspected components were identified by research articles and internet.[21] Chemical description and medicinal importance were checked. Results were analyzed and compared with the pharmacological properties mentioned in Ayurveda authentic texts. (Table 3)

Table 3: Description and Medicinal importance of Suspected components of *Rathulūnu thailaya.*

Chemical compound		Description	Medicinal Importance
1	Eugenol	An allyl chain-substituted guaiacol, a member of the allylbenzene class of chemical compounds.[22]	Used widely as a flavoring agent for foods and teas and as an herbal oil used topically to treat toothache and more rarely to be taken orally to treat

		It is a colorless to pale yellow, aromatic oily liquid extracted from certain essential oils especially from clove oil, nutmeg, cinnamon, basil and bay leaf.	respiratory and gastrointestinal complaints.
2	Zingiberene.[23]	Monocyclic sesquiterpene that is the predominant constituent of the oil of ginger, from which it gets its name. It can contribute up to 30% of the essential oils in ginger rhizomes. This is the compound that gives ginger its distinct flavoring.	In addition to its culinary uses, ginger possesses a wide array of medicinal uses and is observed to be effective against unrelated ailments like arthritis, sprains, muscular aches, pains, sore throats, infectious diseases, hypertension, dementia, fever and helminthiasis
3	Eugenol acetate.[24]	4-Allyl-2-methoxyphenyl acetate. Molecular Weight. 206.24.	Eugenol has different biological properties confirmed: bactericide, antifungal, antioxidant and anti-inflammatory
4	Sabinine.[25]	Natural bicyclic monoterpene with the molecular formula $C_{10}H_{16}$. It is isolated from the essential oils of a variety of plants	Used to treat inflammation on the skin. It is also used for the treatment of dermatophytosis and other inflammatory conditions.
5	Cumaldehyde	Natural organic compound with the molecular formula $C_{10}H_{12}O$. Cuminaldehyde is a constituent of the essential oils of cumin, eucalyptus and others.[26]	Cumin essential oil has multiple pharmacological actions including antioxidant, antidiabetic, anti-inflammatory, antibacterial and anticancer effects
6	Myristicin.[27]	Myristicin is a naturally occurring compound found in common herbs and spices and commonly in nutmeg. It is an insecticide, and has been shown to enhance the effectiveness of other insecticides in combination.	Myristicin has been shown to have potent anti-cancer properties. A 65% inhibition of the tumor multiplicity in the lung of rats was observed as the result of treatment of myristicin in rats. Myristicin showed a 31% inhibition of tumor formation in the forestomach of rats.
7	Elemicin.[28]	Besides nutmeg, other essential oils that contain elemicin are those of parsley.	Anti-inflammatory properties are common.
8	Linoleic acid.[29]	A polyunsaturated omega-6 fatty acid. Colorless or white oil that is virtually insoluble in water but soluble in many organic solvents. It is one of two essential fatty	Reduce inflammation. It is used to prevent heart attacks, lower high blood pressure, lower cholesterol, and reverse "hardening of the blood vessels" (atherosclerosis).

		acids for humans, who must obtain it through their diet.[30] Sesame seed is rich in oil, contains high amounts of (83-90%) unsaturated fatty acids, mainly linoleic acid (37-47%).	
9	Terpinen-4-ol	Terpinen-4-ol is an isomer of terpineol with the chemical formula $C_{10}H_{18}O$.[31] They are all colorless liquids with a turpentine-like odor. A primary constituent of tea tree oil, it is obtained as an extract from the leaves.	Activity involves induction of cell-death rendering this compound as a potential anti-cancer drug alone and in combination in the treatment of numerous malignancies.
10	Retrofractamide - A	Belongs to the class of organic compounds known as benzo-dioxoles.[32] Moderately basic compound (based on its pKa). Has been detected in herbs and spices like pepper, long pepper.	Anti-Inflammatory activity, Hepatoprotective activity, Antiproliferative activity against human A549 cells.
11	Hexadecanoic acid	Also known as Palmitic acid (CH3(CH2)14COOH). This is the most common saturated fatty acid found in animals, plants and microorganisms. Making up to 44% of total fats. The word "napalm" is derived from the word naphthenic acid and palmitic acid.[33]	Palmitic acid has many functions in cosmetics, from detergent cleansing agent to emollient. [34] In moisturizers, palmitic acid is a very good emollient.
12	Gamma-terpinene	One of three isomeric monoterpenes differing in the positions of their two double bonds (alpha- and beta-terpinene being the others). It is a monoterpene and a cyclohexadiene.	It has a role as an antioxidant, [35] a plant metabolite, a volatile oil component and a human xenobiotic metabolite.
13	Stearic Acid	Saturated long-chain fatty acid with an 18-carbon backbone. One of the useful types of saturated fatty acids that comes from many animal and vegetable fats and oils. It is a waxy solid.	Emulsifying agent, solubilizing agent, tablet and capsule lubricant. [36] It is also commonly found in lotions, detergents, soaps, and shampoos.
14	Apiole	Phenylpropene, also known as apiol, parsley apiol, or parsley camphor. Its chemical name is	It is found in the essential oils of celery leaf and all parts of parsley.

		1-allyl-2,5-dimethoxy-3,4-methylenedioxybenzene. [37]	

By this analysis it was cleared that the components have anti-inflammatory, anti-infective and anti-cancerous properties. These actions can be correlated with the pharmacological properties mentioned in Ayurveda authentic texts.

CONCLUSION

Rathulūnu thailaya (RT) is a medicine with a higher prognosis rate in pacifying and treating phlegmatic disease conditions like *Peenasa* (Allergic rhinitis). This has been used for many years in treating *Peenasa* by Ayurvedic & traditional medical practitioners of Sri Lanka from a long time. Due to the effectiveness in treating *Peenasa*, the oil is known as *Peenas Thailaya* as well.

According to the analysis of *Rasādi Panchakaya,* it was cleared that most of the ingredients were having *Katu* (pungent), *Thiktha* (bitter) tastes, *Laghu* (light), *Theekshna* (sharp) properties, *Ushna veerya* (hot potency), *Katu vipāka* (pungent final taste after digestion) which are opposite to the features and actions of *Kapha dōsha* (phlegm) which helps to reduce and treat phlegmatic diseases like *Peenasa.* External application on head (*Sheersha Abhyanga*) of RT is commonly used and other than pacifying the phlegmatic diseases, *Keshya prabhāva* of sesame oil may lead to good health of hair as well. In consideration of results of physico-chemical analysis, slightly Alkaline pH might act against allergens, microbes and can give positive impact on usage as Errhine therapy (*Nasya*) and internal medicine (*Pāna*).

Presence of unsaturated fatty acids has many health benefits and it can be proven with results of Iodine value and it was cleared that RT can be used as an internal medicine (*Pāna*) in relevant conditions. Results of Refractory Index and Rancidity Test gives an idea on shelf life of 6-12 months without destroying the proper medicinal quality. By literature survey of volatile compounds found by GC-MS analysis, many medicinal benefits like anti-inflammatory, anti-infective, anti-microbial, anti-cancerous effects were analyzed. These can give a collective idea of the actions of poly-herbal oil RT. On consideration of data identified on suspected components, it was cleared that the pharmacological properties mentioned in authentic texts can be compared in a scientific way while giving an idea about the overall effect of *Rathulūnu thailaya*.

Further scientific tests can be done to identify more pharmacological properties and actions of RT and clinical trials can be conducted to scientifically test the therapeutic efficacy of this valuable poly-herbal oil, *Rathulūnu thailaya* (RT).

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