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කොළඹ විශ්වවිද්‍යාලයීය දේශීය වෛද්‍ය පීඨයේ මෞලික සිද්ධාන්ත හා ශරීර විඥාන අධ්‍යයනාංශය මගින් එළිදක්වනු 'විමර්ශා' ශාස්ත්‍රීය සංග්‍රහයේ පළමු වෙළුමේ හයවන කලාපය මෙවර ඔබ වෙත ගෙන එන්නේ ඉමහත් සතුටකිනි. ශාස්ත්‍රීය ලෝකයට දැනුම් බිඳක් එක් කිරීම මෙහි අපේක්ෂාවයි. මෙවර කලාපය සඳහා ශාස්ත්‍රීය ලිපි සැපයූ සියලුම විද්වතුනට පළමුව අපගේ කෘතඥතාව පිරි නමමු. මේ සඳහා අවශ්‍ය මාර්ගෝපදේශනය සලසන අධ්‍යයනාංශ ප්‍රධානතුමිය සහ පීඨාධිපතිතුමන් ද කෘතවේදීව සිහිපත් කරමු. ගරු සේවයක් ලෙසින් සලකා ලිපි විමර්ශනය කර දුන් ආචාර්ය මණ්ඩලයේ සාමාජික-සාමාජිකාවෝ ද අපගේ ප්‍රශංසාවට ලක්වෙති. සංස්කාරක මණ්ඩලයේ සියලු දෙනා ද අපගේ ගෞරවාදරයට ලක් වේ. විමර්ශා විද්‍යුත් සඟරාවක් ලෙස ප්‍රකාශයට පත් කිරීමට අවශ්‍ය තාක්ෂණික සහාය ලබා දුන් අප පීඨයේ තොරතුරු තාක්ෂණ ඒකකයේ ඒකක ප්‍රධානතුමිය සහ කාර්ය මණ්ඩලය ද අප සිහිපත් කරන්නේ කෘතවේදීව ය. අධ්‍යයනාංශයේ අනධ්‍යයන කාර්ය මණ්ඩලයෙන් ලද අනගි සහාය ද අපගේ පැසසුමට ලක් වේ.

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පටුන

AN ANATOMICAL AND PHYSIOLOGICAL INDSIGHT INTO DRUG DELIVERY VIA THE ALFACTORY AND TRIGEMINAL PATHWAYS ACROSS THE BLOOD-BRAIN BARRIER WITHSPECIAL REFERENCE TO *NASYA KARMA* AND *SHRINGATAKA MARMA*

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L.A.W.J. Chathurikae
H.L.N.R. Pradeep
Balram Jat
M.R.M. Wickramasinghe

1. INTRODUCTION

The clear description regarding the mode of action of *Nasya Karma* is not extensively detailed in Ayurvedic classics. However, its conceptual foundation strongly suggests a sophisticated understanding of cranial access through the nasal route. According to *Charaka*, *"Nasa hi Shirso Dwaram"*, the nose is the gateway to the head [1]. This establishes the rationale for using the nasal route in treating diseases localized above the clavicle (*Urdhva Jatrugata Rogas*), particularly those involving the central nervous system.

In Ashtanga Samgraha, *Vagbhata* elaborates further: the medicinal substances administered through the nostrils reach a vital point known as *Shringataka*, which is described as a *Sira Marma* situated at the junction of pathways connected to the nose, eyes, ears, tongue, and throat. From there, the drugs spread throughout the cranial region (*Murdha*) and act upon the morbid *Doshas* located in the supraclavicular area [2].

The anatomical and clinical significance of *Shringataka Marma* is further supported by *Sushruta*, who classifies it as a *Sira Marma* formed by the union of vital vessels supplying the nose, eye, ear, and tongue. Injury to this *Marma* is considered immediately fatal, indicating its critical neurological and vascular connections [3].

From a modern anatomical perspective, *Shringataka Marma* is correlated with the pterygopalatine fossa, a region richly innervated and vascularized, housing the pterygopalatine ganglion, branches of the maxillary nerve (V2) of the trigeminal nerve (CN V), and facial nerve (CN VII) fibers. These structures link multiple cranial pathways including olfaction, facial sensation, and autonomic regulation of the head and neck area [4]. This dense neurovascular nexus is considered a potential functional bridge through which intranasal administered drugs can access deeper intracranial regions, including the limbic system and brainstem [5].

The nasal cavity, anatomically divided into vestibular, respiratory, and olfactory regions, plays a central role in the nasal-to-brain drug delivery system. The olfactory epithelium, located at the

superior part of the nasal cavity, directly communicates with the olfactory bulb through the cribriform plate of the ethmoid bone. This unique anatomical arrangement allows certain lipophilic and low-molecular-weight drugs to bypass systemic circulation and the blood-brain barrier (BBB) to reach the central nervous system (CNS) directly [6],[7].

Additionally, the trigeminal nerve, especially its ophthalmic (V1) and maxillary (V2) branches, innervates both the respiratory and olfactory epithelium. These pathways contribute to the peripheral-to-central transmission of molecules via neural connections to the pons, medulla, and limbic structures. Research demonstrates that the transport of intranasal substances occurs via several mechanisms:

- Transcellular and paracellular transport through the olfactory epithelium,
- Axonal transport via olfactory neurons,
- Perineural diffusion along trigeminal nerve fibers [8],[9].

These scientifically validated pathways reflect the Ayurvedic description where the *Nasya Dravya* reaches the *Shringataka Marma*, from where it spreads to *Netra*, *Shrotra*, *Kantha*, and ultimately to the *Shira* (brain). This mode of action supports the efficacy of *Nasya* Karma in neurological and psychosomatic disorders such as *Ardhavabhedaka* (migraine), *Apasmara* (epilepsy), and *Smritibhramsha* (memory loss).

Given the convergence of Ayurvedic principles and modern neuroanatomical understanding, a detailed study of the role of *Shringataka Marma* and the anatomical pathways involved in *Nasya Karma* is essential. This integrated approach bridges ancient wisdom and contemporary science, offering new dimensions to evidence-based Ayurvedic practice.

OBJECTIVES

PRIMARY OBJECTIVES

1. To scientifically analyze the anatomical aspects and physiological mechanisms underlying the correlation between *Nasya Karma*, *Shringataka Marma*, and the nasal-to-brain drug delivery pathways described in modern medicine

SECONDARY OBJECTIVES

1. To study the mode of action of *Nasya Karma* based on classical Ayurvedic references and contemporary neuroanatomical understanding.
2. To evaluate the plausibility of intranasal drug delivery bypassing the blood-brain barrier (BBB) through the olfactory and trigeminal neural pathways.
3. To explore and conceptualize the mechanisms through which *Nasya* therapies may influence central nervous system (CNS) disorders, integrating insights from traditional Ayurvedic texts and modern scientific evidence.

METHODOLOGY

This study was designed as a critical review based on classical Ayurveda literature and modern scientific research.

RESULTS AND DISCUSSIONS

Nasya Karma

Nasya is one of the most important therapeutic procedures among the *Panchakarma* therapies, which form the elimination treatments in Ayurveda. It is primarily indicated for disorders of the *Urdhvajatru* region (above the clavicle) as well as for certain systemic diseases [10].

The nose is regarded as the gateway to the head (*Shirah*). Therefore, drugs administered through the nasal route reach the brain directly and help expel the morbid *Doshas* responsible for various diseases [11].

Nasya is unique as it is the only *Shodhana* (purification) therapy that directly affects the sensory organs (*Indriyas*). The term *Nasya* is derived from the root *Nasa Dhatu*, which means *Gati*, indicating movement, particularly towards internal structures such as the head through the nasal passages and their accessory structures. In classical references like *Vachaspatyam*, *Nasa Dhatu* is specifically used to denote the nose. Thus, the literal meaning of *Nasya* is "pertaining to the nose" or "something beneficial to the nose." *Nasya* has several synonyms, including *Shirovirechana*, *Shirovireka*, *Murdhavirechana*, *Nasta Pracchardana*, *Nasta Karma*, and *Navana* [12]. In definition, *Nasya* refers to the therapeutic procedure wherein medicated oils, ghee, or other herbal preparations are administered through the nostrils [13]. It is a specialized treatment aimed at eliminating the vitiated *Doshas* accumulated in the head region, thereby assisting in the management and cure of related diseases [14].

Classification of *Nasya*

Table 1: Classification of *Nasya Karma*

Sr. No.	Name of Acharya	Basis of Classification	Types / Categories	References
01	Charaka	Mode of Action	*Rechana, Tarpana, Shamana*	Ch. Si. 9/92
		Method of Administration	*Navana, Avapidana, Dhmapana, Dhuma, Pratimarsha*	Ch. Si. 9/89
		Parts of Drug Used	*Phala, Patra, Mula, Kanda, Pushpa, Niryasa, Twaka*	Ch. Vi. 8/151
02	Sushruta	Method	5 types	-

Sr. No.	Name of Acharya	Basis of Classification	Types / Categories	References
03	Ashtanga Samgraha	Function	*Shamana*, *Brumhana*, *Rechana*	AS. Su. 29/4
		Dose	2 types	AS. Su. 29/9
04	Ashtanga Hridaya	Function	*Shamana*, *Brumhana*, *Rechana*	AH. Su. 20/2
		Dose	*Marsha Nasya*, *Pratimarsha Nasya*	AH. Su. 20/7
05	Kashyapa	Function	*Shodhana, Purana*	Ka. Si. 48/30
06	Sharngadhara	Function	*Rechana* (*Karshana*), *Snehana* (*Brumhana*)	Sh. U. 8/11, 24

On the basis of mode of action, *Nasya* is categorized into *Rechana* (elimination of vitiated Doshas from the head and neck region using *Tikshna Sneha*, *Kwatha*, or *Swarasa* preparations like *Apamarga*, *Pippali*, *Maricha*) [15] *Tarpana* (nourishment of the head region using Sneha prepared with *Madhura Skanda* and *Vata-Pittahara Dravyas*), and *Shamana* (pacification of Doshas with suitable palliative drugs) [16],[17].

Technique-wise, it includes *Navana Nasya* (instillation of medicated oils or ghee into nostrils), *Avapida Nasya* (juice extracts instilled through cotton swabs), *Dhmapana Nasya* (blowing medicated powders through pipes), *Dhooma Nasya* (inhalation of medicated smoke to remove Kapha in the oro-pharyngeal region), and *Pratimarsha Nasya* (a milder, daily administration of Sneha without major pre- or post-procedure care) [18].

Based on the parts of plants used, *Nasya* preparations are derived from *Phala* (fruits like *Pippali*), *Patra* (leaves like *Surasa*), *Mula* (roots like *Vacha*), *Kanda* (stems like *Haridra*), *Pushpa* (flowers like *Lodhra*), *Niryasa* (exudates like *Devadaru*), and *Twaka* (barks like *Tejovati*) [19].

Further, as per *Vagbhatacharya*, *Nasya* is functionally divided into *Virechana Nasya* (purificatory type indicated in disorders like *Urdhvajatrugata Vikara* and *Pratishayaya*), *Brumhana Nasya* (nourishing type used for *Vataja* disorders like Suryavarta and Avabahuka), and *Shamana Nasya* (palliative type used for conditions like *Akalavali*, *Palita*, and *Raktapitta*) [20]. In terms of dosage, it is categorized into *Marsha Nasya* (higher doses ranging from 6 to 10 *Bindu* for therapeutic effects but requiring caution to prevent complications) and *Pratimarsha Nasya* (lower daily dose of 1–2 Bindu, safe for regular administration) [21]. Thus, the multifaceted classification of *Nasya* Karma highlights its versatile application in maintaining and restoring health.

Indication of *Nasya*

Sr. No	Disease / Condition	Charaka (Chi. 22)	Sushruta (Su. 40/23)	Sangraha (Su. 29/9)	Hridaya (Su. 16/24)
1	*Shirastambha* (Stiffness of head)	+	+	+	+
2	*Manyastambha* (Stiffness of neck)	+	+	+	+
3	*Hanustambha* (Stiffness of jaw)	+	+	-	-
4	*Galagraha* (Tightness in throat)	+	+	-	-
5	*Hanugraha* (Tightness mandible)	+	+	-	-
6	*Pinasa* (Running nose)	+	+	+	+
7	*Galashundika* Timira (Blindness)	+	+	-	-
8	*Varnamaya* (Disease of eyelids)	+	+	-	-
9	*Upajihva* (Moles)	+	+	-	-
10	*Urdhwajatrugata Vikara* (Diseases above clavicle)	+	+	+	+
11	*Ardhavabhedaka* (Migraine)	+	+	+	+
12	*Grivagraha* (Disease of neck)	+	+	-	-
13	*Skandagraha* (Disease of shoulder)	+	+	-	-
14	*Amsabheda* (Pain in scapular region)	+	+	-	-
15	*Nasaroga* (Diseases of nose)	+	+	+	+
16	*Karna Roga* (Ear diseases)	+	+	+	+
17	*Vistritanga* (Ophthalmic diseases)	+	+	+	+
18	*Mukhroga* (Diseases of mouth)	+	+	+	+
19	*Ardita* (Bell's palsy)	+	+	+	+
20	*Apatanaka* (Tetanus)	+	+	-	-
21	*Galaganda* (Goitre)	+	+	-	-
22	*Dantashoola* (Toothache)	+	+	-	-
23	*Dantaraksha* (Periodontal diseases)	+	+	-	-
24	*Palitachikitsa* (Treatment of premature greying)	+	+	-	-
25	*Arbudha* (Cancer)	+	+	-	-
26	*Shleshmabhivyapta Talu*, *Kantha*, *Shira* (Kapha deposition)	+	+	-	-
27	*Aruchi* (Tastelessness)	+	+	-	-

Sr. No	Disease / Condition	Charaka (Chi. 22)	Sushruta (Su. 40/23)	Sangraha (Su. 29/9)	Hridaya (Su. 16/24)
28	*Kricchra* (Difficulty in supraclavicular region)	+	+	-	-
29	*Pratishyaya* (Rhinitis)	+	+	+	+
30	*Swarabhanga*, *Vakgraha* (Hoarseness, difficulty in speech)	+	+	+	+
31	*Galagraha* (Dysarthria)	+	+	-	-
32	*Kantharoga* (Throat diseases)	+	+	+	+
33	*Swarasadana* (Low pitch voice disorders)	+	+	-	-
34	*Nidranasha* (Insomnia)	+	+	-	-
35	*Jagarana* (Difficulty staying awake)	+	+	-	-

Contra indications of *Nasya*

Sr. No	Condition (*Nasya Ayoga*)	Charaka (Chi. 22/20)	Sushruta (Chi. 40/47)	Ashtanga Hridaya Sutra (20/11-13)	Sharangadhara	Bhaishajya Ratnavali (B.P.)
1	*Ajirna* (Indigestion)	+	+	+	+	+
2	*Bhuktamatraka* (After meals)	+	+	+	+	+
3	*Shonitpita*	+	-	-	-	-
4	*Madatyaya* (Post alcohol intake)	+	-	+	-	-
5	*Toyapana* (Post water intake)	+	-	+	-	-
6	*Snehad Parimajjan* (After taking *Snehana*)	+	-	+	-	-
7	*Snana*, *Svedana* (After bath/steam bath)	+	+	+	-	-
8	*Kshudharta* (Hunger)	+	+	+	-	-
9	*Trishnarta* (Thirsty)	+	+	+	-	-
10	*Shramarta* (Exhausted)	+	+	+	-	-
11	*Murcchita* (Unconscious)	+	+	+	-	-

Sr. No	Condition (*Nasya Ayoga*)	Charaka (Chi. 22/20)	Sushruta (Chi. 40/47)	Ashtanga Hridaya Sutra (20/11-13)	Sharangadhara	Bhaishajya Ratnavali (B.P.)
12	*Masta*	+	-	-	-	-
13	*Viddha* (Pierced by weapon)	+	-	-	-	-
14	*Vyayamatapta* (Post heavy exercise)	+	+	+	-	-
15	*Vyavayamatapta* (Post sexual intercourse)	+	+	+	-	-
16	*Vyayamakarshita* (Exhausted by gym)	+	+	+	-	-
17	*Vyavayamakarshita* (Post sexual exhaustion)	+	+	+	-	-
18	*Bhojanakarshita* (Post heavy meals)	+	+	+	-	-
19	*Shokakarshita* (Grieved)	+	+	+	-	-
20	*Udvega* (Anxious)	+	-	-	-	-
21	*Pariklinna* (Post *astaravana*)	+	-	-	-	-
22	*Garbhini* (Pregnant lady)	+	+	+	-	-
23	*Unmattavastha* (Insanity)	+	+	+	-	-
24	*Navajata Shishu* (Newborn)	+	+	+	-	-
25	*Durdina* (Unsuitable atmosphere)	+	+	+	-	-
26	*Pipasita* (Post thirst)	+	-	-	-	-
27	*Pidarita* (Post intake of liquid)	+	-	-	-	-
28	*Gararata* (Poison intake)	+	+	+	-	-
29	*Mada* (Intoxicated)	+	+	+	-	-
30	*Esha* (Epileptic)	+	+	+	-	-
31	*Vruddha* (Senile)	+	+	+	-	-

Sr. No	Condition (*Nasya Ayoga*)	Charaka (Chi. 22/20)	Sushruta (Chi. 40/47)	Ashtanga Hridaya Sutra (20/11-13)	Sharangadhara	Bhaishajya Ratnavali (B.P.)
32	*Vegavarodha* (Suppressed urges)	+	+	+	-	-
33	*Marmaabhighata* (Injury to vital parts)	+	-	-	-	-
34	*Raktakshetra* (Bloodletting)	+	+	+	-	-
35	*Sura* (Alcohol intoxicated)	+	-	-	-	-
36	*Svaravyapat* (Voice disorder)	+	+	+	-	-
37	*Kasapida* (Cough)	+	+	+	-	-
38	*Pinasa* (Chronic cold)	+	+	+	-	-

Significance of *Srungataka Marma* and modern anatomical correlation

Acharya Sushruta described *Marmas* as critical anatomical sites where life is intimately bound to the underlying structural components. According to Sushruta, a Marma represents a point of union where muscle (*Mamsa*), vessels (*Sira*), ligaments and tendons (*Snayu*), bones (*Asthi*), and joints (*Sandhi*) converge [22]. Further, Acharya Sushruta emphasized that *Marmas* are regions where the three *Doshas* (*Vata*, *Pitta*, *Kapha*) and the three *Mahagunas* (*Sattva*, *Rajas*, *Tamas*) meet [23].

The term *"Shringataka"* refers to a site where four pathways converge, symbolizing a crucial anatomical and physiological junction [24]. It is located at the intersection of vascular networks supplying the nose (*Ghrana*), ears (*Shrota*), eyes (*Akshi*), and tongue (*Jivha*) [25]. Structurally, it is categorized as a *Sira Marma*, a vital point predominantly involving vascular elements [26]. There are four such major converging channels associated with *Shringataka*, and its dimensional extent is described as approximately four Angula in measurement [25]. Prognostically, *Shringataka* is classified as a *Sadhyapranahara Marma*, meaning that any injury to this point gives immediate death. Functionally, it serves as a richly interconnected vascular network that nourishes the sensory organs, tongue, ears, nose, and eyes, reinforcing its critical role in sustaining life and sensory integrity. The *Shringataka Marma*, located within the nasal region, is anatomically positioned at the intersection of venous channels associated with the nose (*Ghrana*), ear passages (*Shrota*), eyes (Akshi), and tongue (*Jivha*). Owing to its vascular dominance, it is classified as a *Sira Marma*. Functionally, it plays a crucial role in nourishing these sensory structures. Classical Ayurvedic texts describe *Sadhyapranahara Marma* as vital points whose injury results in immediate death, and *Shringataka* is recognized under this category [27].

From a functional and anatomical perspective, the *Shringataka Marma* can be correlated with the region encompassing the cavernous sinus and intercavernous sinuses. The cavernous sinus, a major venous plexus, drains blood from the brain, meninges, and skull bones, and it is connected to external veins via emissary veins. It also occasionally receives drainage from the central vein of the retina and the superior ophthalmic vein, eventually emptying into the facial vein, the largest vein of the face, which collects blood from the mouth, nose, and ears. This intricate vascular network conceptually parallels the Ayurvedic idea of "*Santarpana*" (nourishment) of the sensory organs.

In Ayurvedic physiology, it is proposed that medicinal substances administered through *Nasya Karma* reach the *Shringataka Marma*, and from there, diffuse through the vascular and neural networks to nourish and therapeutically influence the eyes, ears, nose, and throat [2]. This highlights the physiological mechanism underlying both local and systemic actions of *Nasya*.

Modern anatomists have provided further insight into the structures corresponding to the *Shringataka Marma*. According to Dr. Avinash Lele, important associated structures include the supraorbital artery, Frontal diploic vein, Superior sagittal sinus, Occipitofrontalis muscle, and the ophthalmic nerve [28]. Dr. Sandip Sahmrao Lanje identifies the Cavernous sinus, Intercavernous sinuses, ophthalmic nerve, and supraorbital artery as critical components in this area [29]. Similarly, Dr. A. K. Pathak emphasizes the Cavernous sinus and Intercavernous sinus as the primary anatomical correlates [30]. Functionally, the *Shringataka Marma* corresponds closely with the cavernous sinus. It is surrounded by cranial nerves III, IV, and VI, which control eye movements, and cranial nerve V (Trigeminal nerve), responsible for sensory and motor functions of the face. The internal carotid artery passing through this region underscores its anatomical significance beneath the *Shringataka Marma*. The cavernous sinus, formed by the convergence of the superior and inferior ophthalmic sinuses along with the superior pterygoid sinus, has a triangular shape.

From a practical anatomical perspective, the *Shringataka Marma* area is related to important brain centers such as the speech (motor) centers, visual (sensory and psychic) centers, auditory centers, gustatory centers, and olfactory centers. This supports the concept that *Nasya* therapy, through its action on the *Shringataka Marma*, can influence a wide range of neurological functions.

As *Shringataka Marma* is four in *Anguli* the Vascular structures which are having very close relation with the nose, tongue, ear and eyes to be considered as anatomical correlations of it.

Dural venous sinuses are a network of venous channels located between the two layers of the dura mater. They are responsible for draining blood from the brain and cranial bones. These sinuses are lined with endothelium, lack valves, and have walls that are devoid of muscular tissue.

The cavernous sinus is a large venous plexus positioned on either side of the body of the sphenoid bone. It extends from the superior orbital fissure to the apex of the petrous temporal bone, measuring approximately 2 cm in length and 1 cm in width. Medially, it is related to the sphenoidal air sinus and the pituitary gland. Posterolaterally, it is related to the trigeminal cave, which encloses

the trigeminal ganglion. Tributaries of the cavernous sinus include the superior ophthalmic vein, a branch from the inferior ophthalmic vein (or sometimes the entire vessel), the superficial middle cerebral vein, inferior cerebral veins, and the sphenoparietal sinus. The cavernous sinus ultimately drains to the transverse sinus via the superior petrosal sinus, to the internal jugular vein via the inferior petrosal sinus and a venous plexus around the internal carotid artery, to the pterygoid plexus via veins passing through the sphenoidal emissary foramen, foramen ovale, and foramen lacerum, and to the facial vein via the superior ophthalmic vein.

The inferior petrosal sinus serves as a major drainage route from the cavernous sinus to the internal jugular vein. It also receives tributaries such as the labyrinthine veins via the cochlear canaliculus and the vestibular aqueduct [31].

The pterygoid venous plexus is a complex network of veins located partly between the temporalis and lateral pterygoid muscles, and partly between the two pterygoid muscles. It receives tributaries from the sphenopalatine, deep temporal, pterygoid, masseteric, buccal, alveolar (dental), greater palatine, and middle meningeal veins, as well as branches from the inferior ophthalmic vein. The pterygoid plexus connects anteriorly with the facial vein via the deep facial vein and communicates with the cavernous sinus through emissary veins that traverse the sphenoidal emissary foramen, foramen ovale, and foramen lacerum.

Veins from the nose exhibit a well-organized drainage pattern. Posterior nasal veins pass into the sphenopalatine vein, which subsequently drains into the pterygoid venous plexus. In contrast, anterior nasal veins follow the course of the anterior ethmoidal arteries and drain into either the ophthalmic or facial veins. Some veins also traverse the cribriform plate to connect with the orbital surfaces of the frontal lobes.

Venous drainage from the eyes is notably abundant. The veins draining the eyelids are larger and more numerous than the corresponding arteries, and they either pass superficially into the veins of the face and forehead or deeply into the ophthalmic veins within the orbit. The bulbar conjunctival veins pass toward the orbital surfaces of the rectus muscles and join either the superior or inferior ophthalmic vein. The central retinal vein drains into the cavernous sinus directly or into the superior ophthalmic vein [31].

Absorption of drugs and mode of action as per Ayurveda and modern aspects [32].

Anatomically, the nasal tract is divided into three functional zones: the vestibular region, the respiratory region, and the olfactory region. The vestibular region, located at the entrance of the nasal passage, is primarily responsible for filtering the air as it enters the nasal cavity. However, with regard to drug absorption, it holds the least significance among the three regions.

The respiratory region plays the most critical role in systemic drug absorption due to its extensive vascular network. Its rich blood supply facilitates efficient uptake of medications into the systemic circulation, making it the principal site for drug delivery via the nasal route.

The olfactory region, although smaller in surface area, approximately 10 cm^2, plays a particularly important role in the direct transport of drugs to the brain and cerebrospinal fluid (CSF). This region provides a unique pathway for certain drugs to bypass the blood-brain barrier, making it valuable in targeting central nervous system conditions.

Mode of Action as per Ayurveda [33,34]

Nasya is regarded as the most effective method for eliminating and pacifying vitiated doshas located in the regions above the clavicle (*Urdhwanga*) and is considered a unique procedure for cleansing and purifying the head (*Uttamanga Shuddhi*). *Nasya* can be applied in different therapeutic forms, such as powders (*Churna*) and pastes (*Kalka*), depending on the strength of the disease (*Rogabala*) and the patient (*Rogibala*). This therapy also enhances the absorption of administered drugs, ensuring better therapeutic outcomes.

According to Charaka, the nose is described as the gateway to the head (*Siras*). Drugs administered through the nasal route directly reach the brain and help eliminate only the morbid doshas responsible for disease manifestation. In the Astanga Samgraha, it is explained that as the nose leads to the head, the medicine administered through the nostrils travels via the nasal channels (*Nasa Srotas*) to the *Sringataka*, a vital junction of major blood vessels (*Sira Marma*)—and spreads throughout the brain (*Murdha*). From there, it reaches critical junctions associated with the eyes (*Netra*), ears (*Srotra*), throat (*Kantha*), and blood vessel openings (*Siramukhas*), facilitating the expulsion of vitiated doshas from the regions above the supraclavicular area. Charaka further illustrates that medicines administered through *Nasya* penetrate the head, pulling out only the diseased material, just as the fibrous covering (*Isika*) tied around the *Munja* grass is separated when properly treated. Sushruta adds to this by explaining that the *Sringataka Marma* is a vital vascular confluence that nourishes the nose, ears, eyes, and tongue.

Mode of Action as per Modern View with Anatomical and Physiological Relevance [35,36]

Nasal drug delivery has emerged as a promising alternative to intravenous administration for achieving systemic effects, owing to the unique anatomical and physiological features of the nasal cavity. Key advantages include a large absorptive surface area (~150 cm^2), a highly vascularized respiratory mucosa**,** rapid blood flow**,** and the bypass of first-pass hepatic metabolism**,** all of which contribute to enhanced drug absorption and bioavailability.

Key features supporting nasal absorption include the specialized structure of the nasal cavity, particularly the respiratory region, which consists of the inferior, middle, and superior turbinates lined by pseudostratified ciliated columnar epithelium rich in blood vessels and glands, thereby optimizing drug uptake. Additionally, the olfactory region located at the roof of the nasal cavity connects directly to the central nervous system (CNS) via the olfactory bulb, providing a unique

"nose-to-brain" pathway for drug delivery. However, after intranasal administration, drugs are rapidly cleared by mucociliary movement, with the cilia beating at a frequency of 12–15 Hz toward the nasopharynx, a natural defense mechanism that protects against pathogens but simultaneously limits the residence time available for drug absorption.

Mechanisms of drug absorption across the nasal mucosa [37]

1. Transcellular passive diffusion: Passage directly through the lipid membranes of epithelial cells; preferred by lipophilic molecules.
2. Paracellular passive diffusion: Movement between cells via tight junctions; mainly for hydrophilic, low molecular weight molecules (<1000 Daltons).
3. Carrier-mediated transport: Involves specific transporter proteins that facilitate the entry of particular substrates.
4. Transcytosis: Endocytosis and vesicle-mediated transport, important for larger biomolecules like peptides and proteins.

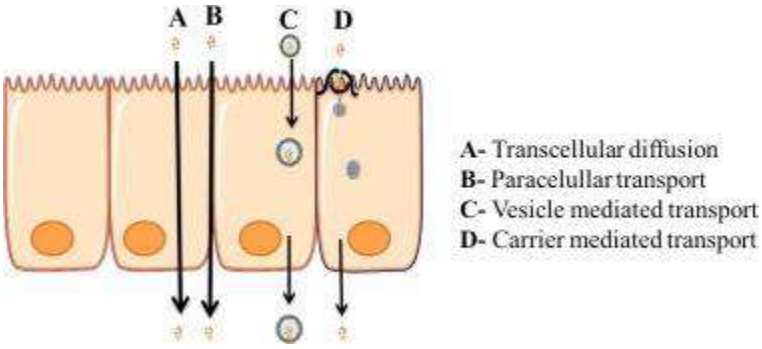

Diagram 01: Mechanisms of drug absorption across the nasal mucosa

However, the nasal mucosa also expresses efflux transporters (e.g., P-glycoprotein), which can reduce the absorption of certain substrates by actively pumping them back into the nasal cavity. Several factors influence nasal absorption, including nasal blood flow, the integrity of the nasal epithelium, the molecular size and lipophilicity of the drug, and the properties of the formulation such as pH, viscosity, and mucoadhesiveness. However, natural barriers also exist that can limit the efficiency of nasal drug absorption. Enzymatic degradation due to the presence of peptidases and proteases in the nasal epithelium can metabolize certain drugs before they are absorbed. Mucociliary clearance acts to quickly remove foreign substances from the nasal cavity, thereby reducing the contact time between the drug and the epithelial surface. Additionally, the olfactory region, which offers a potential route for drug absorption directly into the brain, constitutes only about 5% of the total nasal cavity surface area, further limiting the absorption capacity.

Drug Delivery via the Olfactory and Trigeminal Pathways across the Blood-Brain Barrier

The nasal-to-brain drug transport can occur through several specific pathways. Firstly, through the neurological pathway, drugs utilize the olfactory neurons, entering via processes such as endocytosis or pinocytosis, and are transported intracellularly to the olfactory bulb. Although this mechanism is relatively slow, often taking hours to days, it provides a direct anatomical connection to the brain (Thorne et al., 2004). Secondly, the perineural paracellular transport pathway allows substances to travel through the perineural spaces surrounding the olfactory nerve fibers, facilitating a much faster bulk flow route to the central nervous system (CNS). Thirdly, there is the vascular pathway, where drugs are initially absorbed into the systemic circulation via the rich capillary network in the nasal mucosa and subsequently cross the blood-brain barrier (BBB) to reach the CNS indirectly. Each of these pathways presents unique advantages and challenges, influencing the efficiency and speed of drug delivery to the brain.

The nasal cavity offers a unique and promising route for drug delivery to the central nervous system (CNS) by bypassing the blood-brain barrier (BBB). This is primarily achieved through two anatomical pathways: the olfactory nerve pathway and the trigeminal nerve pathway. Both these pathways provide direct access from the nasal cavity to different regions of the brain, enabling rapid and targeted drug delivery.

The olfactory region is located at the roof of the nasal cavity and contains the specialized olfactory epithelium, which covers approximately 5–8% of the nasal surface area in humans. This neuroepithelium consists of olfactory receptor neurons (ORNs) that project their axons directly through the cribriform plate into the olfactory bulb of the brain. Drugs can be transported along these olfactory neurons by two main mechanisms: intracellular axonal transport, involving endocytosis and slow axonal movement, and paracellular diffusion through the perineural spaces surrounding the axons, allowing faster drug delivery via bulk flow [38].

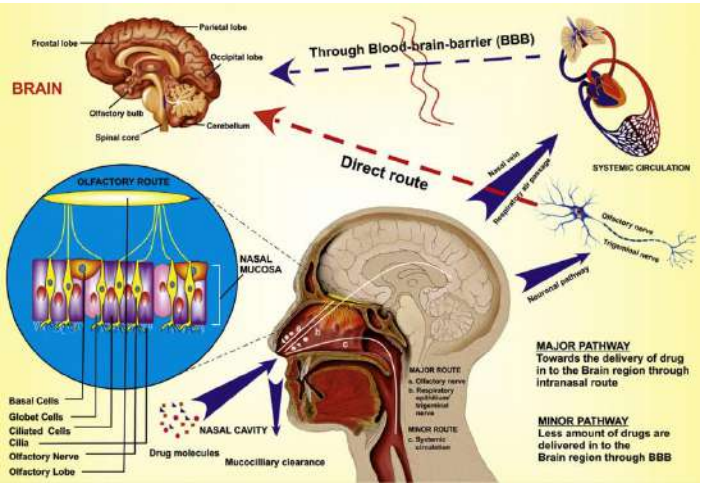

Diagram 02: Drug Delivery via the olfactory pathway

In addition to the olfactory pathway, the trigeminal nerve pathway also plays a significant role. The trigeminal nerve (cranial nerve V) innervates both the respiratory and olfactory regions of the nasal mucosa through its ophthalmic (V1) and maxillary (V2) branches. Substances can be

transported from the nasal mucosa along the trigeminal nerve fibers to the brainstem (pons) and then disseminated to deeper brain structures. In this pathway, drug transport is largely paracellular, occurring through the extracellular spaces around the nerve fibers [39].

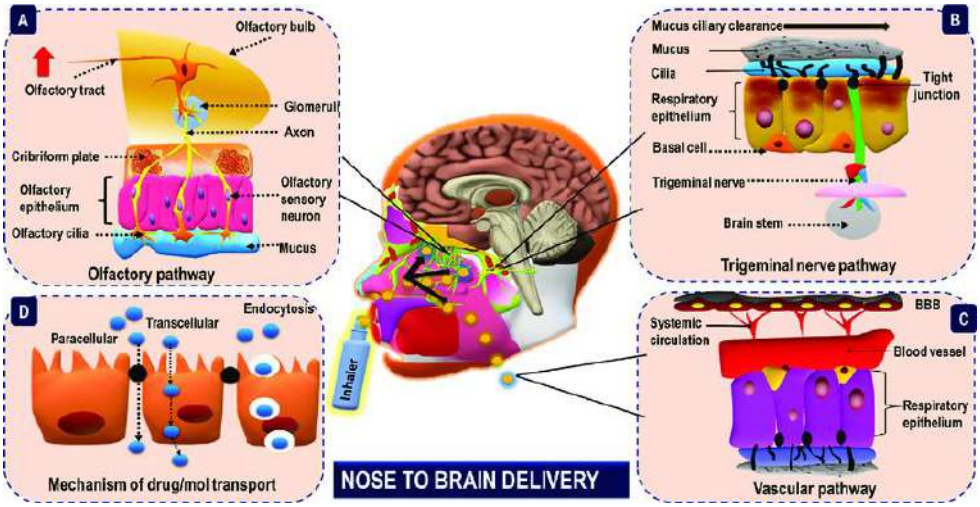

Diagram 03: Several pathways of nose to brain drug delivery including olfactory and trigeminal pathways

The mechanisms of drug transport across the nasal epithelium involve several processes: transcellular transport where lipophilic drugs passively diffuse across epithelial cells, paracellular transport where hydrophilic molecules move through tight junctions, and neuronal pathways including intracellular axonal transport and extracellular perineural transport. Once in the brain, drugs can spread to various regions via cerebrospinal fluid (CSF) circulation and interstitial fluid movement, facilitating wider CNS distribution.

The ability to bypass the blood-brain barrier is a major advantage of nasal drug delivery. The BBB, formed by tight junctions between endothelial cells of cerebral capillaries, restricts the entry of most therapeutic agents (~98% of small molecules and nearly 100% of large molecules). Nasal administration through the olfactory and trigeminal pathways offers a non-invasive, direct method to deliver drugs to the brain, achieving a rapid onset of action with reduced systemic exposure and minimized peripheral side effects.

Overall, the olfactory and trigeminal pathways represent promising routes for brain-targeted drug delivery. Understanding their anatomical and physiological basis allows for the design of more effective intranasal formulations and therapeutic strategies [40].

Critical appraisal of Ayurveda and Modern aspects

The nasal route of drug administration has gained significant attention in modern medicine due to it's potential to directly deliver therapeutic agents to the brain, bypassing the blood-brain barrier (BBB). Two major anatomical pathways facilitating this delivery are well recognized, the olfactory pathway and the trigeminal neural pathway.

These discoveries in contemporary science mirror the classical Ayurvedic wisdom articulated by Acharya Vagbhata, who described that *Nasya* (nasal administration of medicine) exerts its effects by reaching the *Shringataka Marma*, a vital point located at the meeting of key channels within the cranial base.

Modern anatomical studies reveal that the olfactory nerve fibers, passing through the cribriform plate, allow direct access of inhaled drugs to the olfactory bulb and subsequently to deeper brain structures like the limbic system and cerebral cortex. The trigeminal nerve branches, particularly the ophthalmic (V1) and maxillary (V2) divisions, innervate the nasal mucosa and provide another pathway through which molecules can reach the brainstem and thalamic regions. Venous sinuses and the rich capillary plexus at the base of the brain, such as the cavernous sinus, further support the possibility of systemic absorption and neurovascular access from the nasal cavity.

In Ayurveda, *Shringataka Marma* is described as a vital anatomical center approximately four *angula* (around 8 cm) in extent, located in the cranial region. Textual interpretations suggest it is the convergence point of key channels (*Siras* or vessels) related to *Netra* (eye), *Shrotra* (ear), *Nasika* (nose), and *Jihva* (tongue), all sensory organs associated with the cranial nerves, vascular sinuses, and the anterior cranial fossa. When critically examined, the *Shringataka Marma* aligns anatomically and functionally with the olfactory region of the nasal cavity linked with smell perception and direct brain access, the trigeminal pathways supplying the nasal mucosa and surrounding cranial structures, the venous sinuses such as the cavernous sinus that facilitate the drainage and distribution of substances from the nasal area, and the vascular capillary networks at the cranial base that contribute to the rapid uptake and dissemination of substances.

Thus, *Shringataka Marma* can be seen as an ancient description encompassing the neurovascular complex at the cranial base involving the olfactory bulbs, trigeminal nerve endings, and venous sinuses. The Ayurvedic concept is remarkably holistic and anticipatory of modern findings, recognizing that a well-planned nasal therapy (*Nasya* Karma) can reach and therapeutically influence the central nervous system by accessing this strategic area. Furthermore, considering the size (8 cm spread) and the physiological breadth described in Ayurveda, it is clear that *Shringataka Marma* represents a functional zone rather than a singular point, encompassing multiple critical neural and vascular structures involved in nasal-to-brain drug delivery.

Nasya karma, an Ayurvedic therapeutic procedure involving the administration of herbal medicines through the nasal route, is believed to have profound effects on neurophysiology. It stimulates the olfactory and trigeminal pathways, promoting the regulation of the autonomic nervous system, enhancing cerebral circulation, and potentially influencing neurotransmitter activity, thereby supporting cognitive function and emotional balance [41].

Hence, *Nasya* Karma as proposed by Ayurveda, and intranasal drug delivery in modern science, share a common anatomical and physiological basis. Ayurveda, through the concept of *Shringataka Marma*, inherently identified the potential of the nasal cavity as a gateway to brain therapy, a concept validated and elaborated by modern neuroscientific research today.

CONCLUSION

The correlation between Ayurvedic concepts and modern anatomical and physiological understanding regarding nasal drug delivery is profound and well-structured. In Ayurveda, the concept of *Nasya* Karma and the description of *Shringataka Marma* illustrate an advanced recognition of the nasal cavity as a therapeutic gateway to the brain. Acharya Vagbhata's identification of *Shringataka Marma* as the convergence point of vital channels related to sensory organs mirrors the modern identification of key neurovascular structures — including the olfactory pathways, trigeminal nerve branches, venous sinuses, and cranial capillary networks — that are anatomically and physiologically involved in intranasal drug transport to the central nervous system. The ancient description of *Shringataka Marma* encompassing an area approximately 8 cm wide corresponds strikingly with the spatial distribution of the olfactory bulbs, trigeminal ganglia, venous sinuses, and related vascular plexuses at the cranial base. This clearly indicates that Ayurveda had an early holistic understanding of a functional zone facilitating brain access via the nasal route, which modern neuroscience now elaborates with microscopic and imaging techniques. The olfactory and trigeminal neural pathways, currently acknowledged as primary routes for bypassing the blood-brain barrier in nasal drug delivery, find their parallel in the Ayurvedic pathways described through the *Marma* system. Thus, the convergence of these perspectives validates that the ancient Ayurvedic model of *Nasya Karma* and *Shringataka Marma* not only aligns with but also anticipates modern anatomical and physiological findings, demonstrating a strong and undeniable relationship between the two knowledge systems.

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AN ETHNOBOTANICAL PILOT STUDY TO ASSESS THE AWARENESS, IDENTIFICATION ABILITY, AND KNOLEDGE OF VILLAGERS REGARDING SELECTED HOME GARDEN HERBAL PLANTS IN KATAPITIYA VILLAGE, KANDY

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D. A. L Munasinghe
J.M Dahanayake

ABSTRACT

This pilot study assessed the awareness, identification ability, and knowledge of villagers regarding selected home garden herbal plants in Katapitiya Village, Kandy District, Sri Lanka. The research aimed to document local herbal knowledge, evaluate community awareness toward conservation, and assess the potential role of medicinal plants in local health care. A cross-sectional survey was conducted (February to August 2025 among 30 participants aged 18 - 60 years using a structured self-administered questionnaire. Results indicated that overall awareness was moderate (50-75%), with higher knowledge among older and more educated participants. Gender and occupation also influenced plant identification ability. These findings emphasize the importance of community education programs, capacity-building initiatives, and sustainable cultivation practices. Promoting knowledge of herbal plants could contribute not only to health care but also to local economic development.

Keywords: Ethnobotanical pilot study, Awareness, Knowledge, Identification ability, Herbal plants, Katapitiya Village,

INTRODUCTION

Health is a multidimensional concept that extends beyond the mere absence of disease. The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being, emphasizing the holistic nature of human health and the interrelationship between biological, psychological, and social dimensions of life [1]. This definition has guided global health discourse for decades and continues to shape modern public health policies and research. Throughout human history, the pursuit of health, longevity, and quality of life has been a fundamental concern of societies across cultures. In response to this universal aspiration, diverse systems of traditional medicine have evolved, drawing upon empirical observations, indigenous knowledge, and locally available natural resources.

Traditional medicinal systems have played a crucial role in maintaining community health, particularly in regions where access to modern health-care facilities has historically been limited. Among these systems, Ayurveda stands out as one of the oldest and most comprehensive medical traditions still in active practice. Originating in the Indian subcontinent more than 3,000 years ago, Ayurveda is derived from the Sanskrit words *Ayu* (life) and *Veda* (knowledge), collectively meaning the "science of life." Unlike biomedical models that often focus primarily on disease diagnosis and treatment, Ayurveda emphasizes the preservation of health through balance and harmony among the body, mind, and spirit. It promotes a preventive approach to health, integrating diet, lifestyle regulation, herbal medicine, and ethical conduct as essential elements of well-being [2].

Medicinal plants form the backbone of Ayurvedic practice, serving as the primary raw materials for therapeutic preparations. It is estimated that nearly 90% of Ayurvedic formulations rely on plant-based ingredients, underscoring the vital role of medicinal flora in both preventive and curative health care [3]. These plants are valued not only for their therapeutic efficacy but also for their accessibility, affordability, and cultural acceptance. In many parts of the world, especially in developing countries, medicinal plants continue to serve as a cornerstone of primary health care. According to global estimates, approximately 80–85% of the population in developing regions depends on traditional medicine, predominantly herbal remedies, to meet their basic health-care needs [4]. This widespread reliance highlights the enduring relevance of traditional medicinal knowledge in addressing contemporary health challenges.

Sri Lanka possesses a rich and diverse tradition of herbal medicine, shaped by Ayurveda, indigenous *Deshiya Chikitsa*, Siddha, and Unani systems. The country's unique geographical location, varied climatic zones, and high level of biodiversity have contributed to the availability of a wide range of medicinal plant species. Historically, Sri Lankan communities have relied on plant-based remedies for the treatment of common ailments, chronic diseases, and preventive health care. Among the various contexts in which medicinal plants are cultivated and utilized, home gardens play a particularly significant role. These home gardens function as living repositories of medicinal plant biodiversity, enabling households to maintain easy access to herbal remedies for everyday health concerns.

Beyond their medicinal value, home gardens in Sri Lanka contribute to multiple social, economic, and environmental benefits. They support ecological sustainability by conserving plant diversity, enhance household food security, preserve traditional knowledge systems, and provide opportunities for supplementary income generation. Moreover, home gardens serve as important spaces for intergenerational knowledge transmission, where traditional medicinal practices are passed from elders to younger family members. However, this process of knowledge transfer is increasingly threatened by rapid social and cultural changes, including urbanization, modernization, formal education systems that undervalue indigenous knowledge, and reduced interest among younger generations in traditional practices.

The sustainability of medicinal plant use is therefore closely linked to the awareness, identification ability, and depth of knowledge possessed by local communities. Accurate identification of medicinal plants is essential to ensure their safe and effective use. Inadequate knowledge or misidentification can lead to improper usage, reduced therapeutic efficacy, or potential health risks. Recent studies emphasize that declining ethnobotanical knowledge poses a serious challenge to the conservation and sustainable utilization of medicinal plant resources [5]. Despite the acknowledged importance of herbal medicine in Sri Lanka, empirical research examining villagers' knowledge, awareness, and plant identification skills remains limited, particularly at the community level in rural settings.

In many rural areas, traditional medicinal knowledge is unevenly distributed within communities and influenced by demographic factors such as age, gender, education level, and occupation. Older individuals often possess a deeper understanding of herbal practices due to lifelong exposure and experience, while younger generations may demonstrate declining familiarity with medicinal plants. Gender roles may also shape medicinal plant knowledge, as women are frequently involved in household health care and home garden management, whereas men may engage in plant collection or cultivation. Understanding these demographic influences is essential for designing effective conservation strategies and educational interventions aimed at preserving traditional knowledge.

Against this background, the present study focuses on assessing the awareness, identification ability, and knowledge of villagers regarding selected home garden herbal plants in Katapitiya Village, located in the Kandy District of Sri Lanka. The study seeks to document the extent of community knowledge related to commonly used medicinal plants and to evaluate the accuracy of plant identification among villagers. In addition, the research aims to examine the influence of demographic factors such as age, gender, educational attainment, and occupation on herbal plant knowledge. By generating empirical evidence at the village level, this study contributes to a better understanding of community-based ethnobotanical knowledge systems.

The findings of this research are expected to provide valuable insights for policymakers, health practitioners, and conservationists. By identifying gaps in knowledge and awareness, the study may inform the development of targeted community education programs, promote sustainable use of medicinal plants, and support the conservation of Sri Lanka's rich ethnobotanical heritage. Ultimately, strengthening community knowledge of medicinal plants can enhance primary health care, preserve cultural traditions, and contribute to sustainable rural development.

MATERIALS AND METHODS

Study Design

A community-based cross-sectional survey was conducted from February to August 2025 to assess villagers' awareness, identification ability, and knowledge of home garden herbal plants.

Study Population

The study population consisted of adult residents aged 18–60 years living in Katapitiya Village, Kandy District, Sri Lanka. Participants represented diverse occupations, educational backgrounds, and household roles, ensuring a representative sample of the community.

Sample Size and Sampling Technique

Using the formula described by Naing [6] for prevalence studies, the estimated sample size for the main study was 300 participants, based on a 90% confidence level and 4.7% absolute precision. For this pilot study, a sub-sample of 30 participants was selected using systematic sampling from the same village registry to pretest and refine the questionnaire for clarity, cultural relevance, and content validity.

Inclusion and Exclusion Criteria

Adult residents of Katapitiya Village who were willing to participate and provided informed consent were included. Individuals with physical or psychological limitations that could affect participation were excluded.

Data Collection Tools and Procedure

Data were collected using a structured self-administered questionnaire developed based on previous studies [7,8]. The questionnaire included sections on demographic characteristics, awareness of herbal plants, plant identification ability, and knowledge of medicinal uses. The principal investigator personally approached participants, explained study objectives, and obtained informed consent. Participants completed questionnaires under supervision to ensure accuracy and completeness. Ethical approval was obtained from the Ethics review committee of Faculty Indigenous Medicine, University of Colombo, prior to data collection.

RESULTS AND DISCUSSION

Participant Characteristics

Of the 30 distributed questionnaires, 30 valid responses were obtained, yielding a response rate of 100%. The participant group consisted of 52% females and 48% males. Age distribution showed that the majority (56%) were between 31–50 years. Education levels varied, with 40% completing secondary education, 20% holding tertiary qualifications, and 10% having no formal education.

Agricultural occupations were most common (45%), followed by non-agricultural laborers (30%) and small-scale business owners (25%).

Awareness of home garden herbal plants
Identification Ability

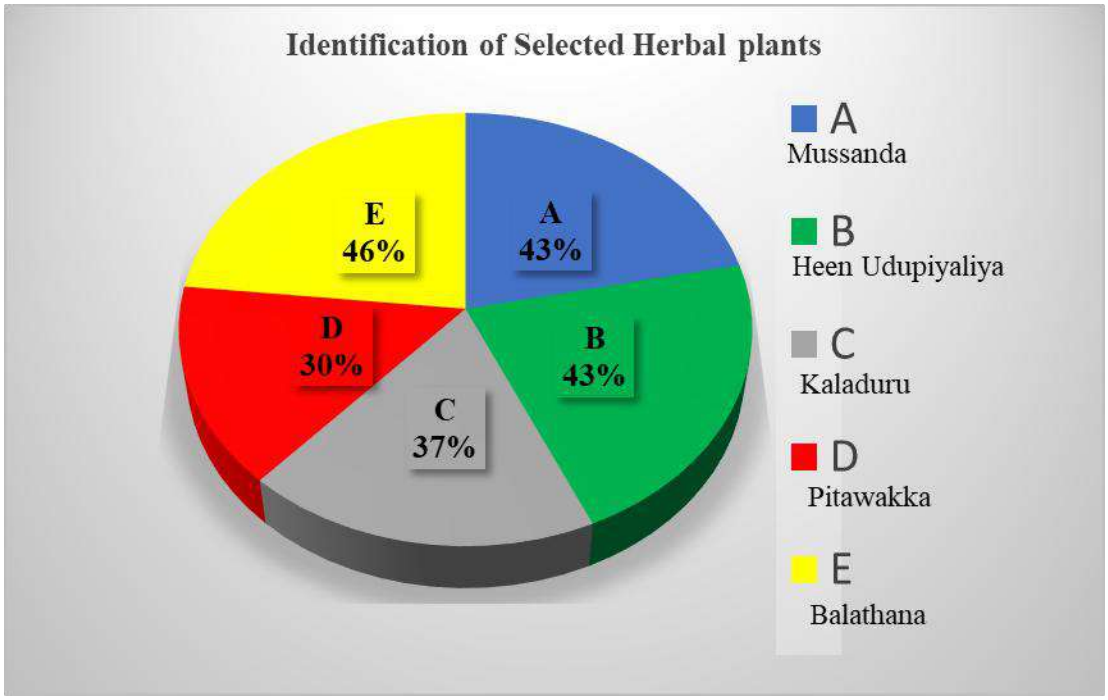

Figure 1: Identification ability of participants on selected herbal plants home garden plants

Moderate (50-75%) overall awareness was observed in participants' ability to identify selected home garden herbal plants. *Balathana* (*Eleusine indica*) was the most recognized (46%), followed by *Mussenda* (*Mussaenda frondosa*) and *Heen Udupiyaliya* (*Desmodium triflorum*) at 43% each, while *Kaladuru* (*Cyperus rotundus*) and *Pitawakka* (*Phyllanthus niruri*) had lower recognition, at 37% and 30%, respectively. Identification skills varied with occupation, age, and gender: agricultural workers and older participants demonstrated higher accuracy indicated by a significant positive Pearson correlation ($p < 0.05$), whereas younger and non-agricultural participants showed lower recognition. Gender differences were also observed, with women more familiar with medicinal uses and men more likely to identify plants by physical traits.

Knowledge of Medicinal Uses

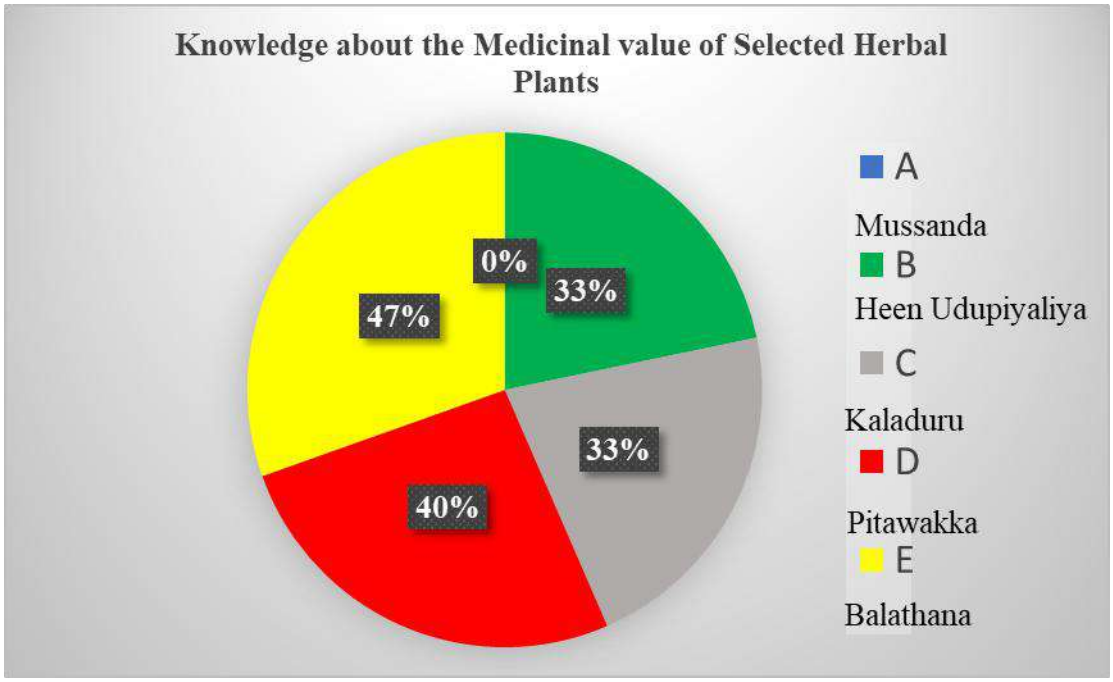

Figure 2: Knowledge on medicinal uses of selected herbal plants

Knowledge of medicinal uses among participants was generally moderate, with familiarity primarily for common home remedies addressing fever, digestive disorders, skin conditions, and respiratory problems. Higher knowledge scores were positively associated with education and agricultural experience as indicated by a significant positive Pearson correlation ($p < 0.05$), while participants with no formal education demonstrated lower awareness, highlighting the role of formal and informal learning in retaining traditional knowledge.

The study revealed variability in awareness of five home garden plants in Katapitiya, Kandy. *Mussanda* (*Mussaenda frondosa*) had no reported medicinal use, despite its documented applications for coughs, liver disorders, and skin ailments [12] suggesting potential erosion of local knowledge. Moderate (50-75%) awareness was observed for *Heen Udupiyaliya* (*Desmodium triflorum*) and *Kaladuru* (*Cyperus rotundus*), recognized by 33% of participants, reflecting their continued but less widespread use in remedies for infant care, bone healing, lactation support, and gastrointestinal and respiratory conditions [13]. *Pitawakka* (*Phyllanthus niruri*) and *Balathana* (*Eleusine indica*) showed higher recognition (40% and 47%, respectively), consistent with their frequent use for diabetes management, wound healing, and common ailments in Sri Lankan households [14]. The variation in knowledge suggests selective retention of ethnomedicinal information, influenced by generational knowledge transfer, gendered caregiving roles, and exposure to modern medicine [15]. Species such as *Mussaenda* (Family-Rubiaceae) may be at particular risk of knowledge loss, emphasizing the need for documentation and conservation of traditional medicinal plant knowledge.

Usage of selected herbal plants

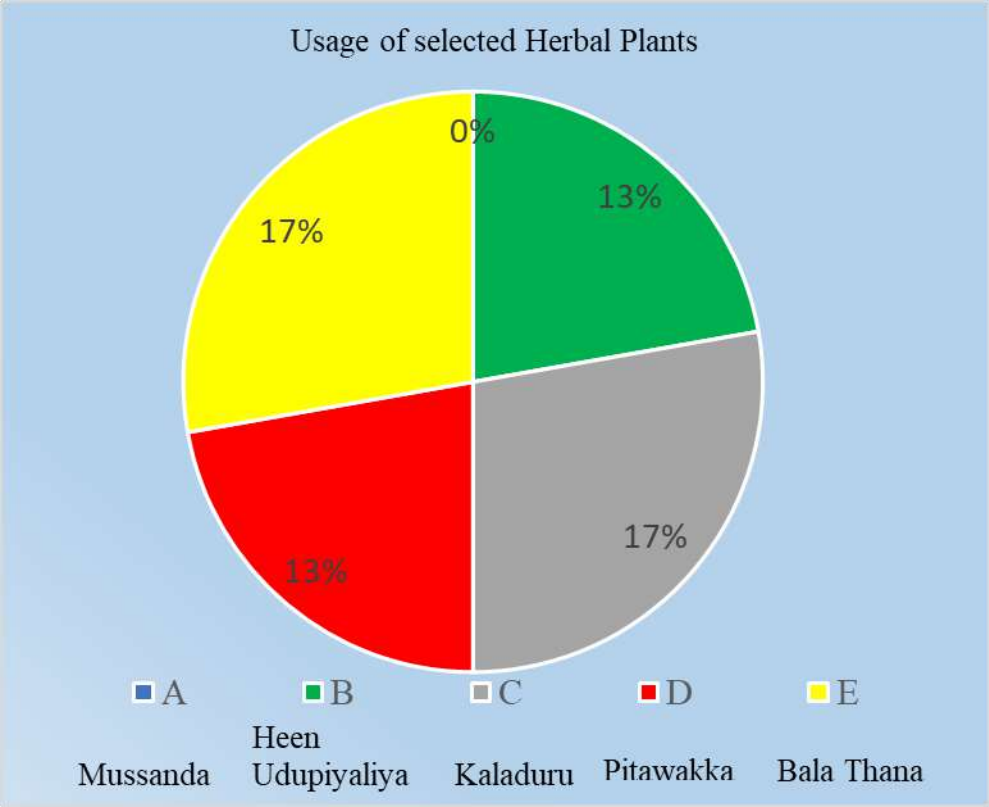

Figure 3: Usage of selected herbal plants

The study assessed participants' actual use of selected home garden medicinal plants in Katapitiya, Kandy. Overall, the reported usage of these plants was relatively low, reflecting limited reliance on traditional remedies in daily practice. *Mussaenda frondosa* (*Mussanda*, family-Rubiaceae) was not used by any participants, despite its known therapeutic applications, indicating either a lack of familiarity or reduced cultural relevance. *Desmodium triflorum* (*Heen Udupiyaliya*) and *Phyllanthus niruri* (*Pitawakka*) were each used by 13% of participants, while *Cyperus rotundus* (*Kaladuru*) and *Eleusine indica* (*Balathana*) were used by 17%, suggesting these species are slightly more incorporated into local medicinal practices.

The relatively low usage rates may be influenced by multiple factors, including access to modern healthcare, changes in lifestyle, generational knowledge transfer, and differences in perceived efficacy. These findings highlight a potential gap between ethnobotanical knowledge and practical application, emphasizing the need for documentation and awareness programs to preserve traditional medicinal practices. Similar patterns of limited use despite known medicinal potential have been reported in rural Sri Lankan communities [10,11].

Awareness and Attitudes toward Conservation of Selected Herbal Plants

Table 1: Response on conservation of selected herbal plants

Response on Conservation	No of participants	Percentage
Yes	6	20%
No	24	80%

The study also explored participants' awareness and attitudes toward the conservation of the five selected home garden medicinal plants in Katapitiya, Kandy. A majority of participants (80%) indicated that they do not actively consider conserving these plants, while only 20% recognized the importance of preservation and reported that they attempt to protect or cultivate them. This finding suggests a limited perception of conservation priorities among local communities, despite the recognized ethnomedicinal value of these species. Low conservation awareness may result from several factors, including lack of formal education on environmental stewardship, reduced reliance on traditional remedies due to the availability of modern medicine, and limited exposure to initiatives promoting sustainable use of medicinal plants. Species such as *Mussaenda frondosa*, which showed negligible usage, may be particularly at risk of local decline or knowledge erosion if conservation measures are not adopted. The observed trend aligns with previous studies in Sri Lanka, which reported that knowledge of medicinal plants does not always translate into conservation practices, emphasizing the need for educational programs and community-based initiatives to promote sustainable management [11,15]. Encouraging active cultivation and protection of these plants within home gardens could enhance both biodiversity conservation and retention of traditional ethnomedicinal knowledge.

CONCLUSION

Villagers in Katapitiya, Kandy, demonstrate moderate awareness and knowledge of home garden herbal plants, with older and formally educated individuals showing higher familiarity. While plant recognition is generally good, understanding of medicinal uses, actual application, and conservation practices remains limited. Gender, age, education, and agricultural experience influence knowledge levels, though gaps persist across the community. This underscores the need for targeted educational programs, documentation projects, and support for sustainable cultivation and small-scale herbal enterprises. Future research should focus on comprehensive ethnobotanical documentation, evaluating educational interventions, and exploring commercial potential to ensure the preservation and practical use of local medicinal plants.

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SRI LANKAN TRADITIONAL MEDICINE FOR CHILD IMMUNITY: *LEHANA YOGAS* WITH MODERN SCIENTIFIC VALIDATION – A REVIEW

HBD Kaushalya
RMR Gunawardhana
WASS Weerakoon

ABSTRACT

Lehana Yoga (Licking of Medicine) is a treatment method and traditional birthing rite outlined in the Sri Lankan Traditional Medical system. It aims to improve children's nutrition, immunity, and cognitive function. Honey, ghee, and medicinal herbs are commonly used in formulations to enhance a child's immunity against illnesses and promote overall health. This study explores the traditional use of *Lehana Yogas* in Sri Lankan medicine to enhance infant immunity, focusing on essential constituents and their therapeutic functions. The study was carried out as a review study and data was collected from authentic Ayurveda texts and previously published research papers. As per the findings, Sri Lankan texts such as Sarartha Samgrahaya, Varayoga Saraya, Yogarnawaya, Kumara Tantraya, and Kaumarabrutya provide detailed formulations for *Lehana*, which often consist of herbal ingredients combined with *Swarna Bhasma* (gold ash), *Gritha* (Ghee), and *Madhu* (bee's honey). These ingredients are known for their immune-boosting, cognitive-enhancing, and nutritional properties. *Swarna Bhasma* is an immunomodulator, memory enhancer, and antioxidant. *Madhu* is an immunomodulator, memory enhancer, and antioxidant. *Gritha* rich in beta-carotene and vitamin E, is an antioxidant, immunomodulatory, and anti-cancer agent. *Brahami (Bacopa monnieri)*, is a memory enhancer, antidepressant, and neuroprotective agent that enhances motor learning, retention, and cognitive functions. *Lehana Yoga* offers a holistic approach to paediatric care in Sri Lankan traditional medicine, providing essential nutrients, and boosting immunity, cognitive abilities, and overall health.

Keywords: Child immunity, Herbal immunostimulants, *Lehana Yogas*, Modern scientific validation, Sri Lankan traditional medicine

INTRODUCTION

Traditional medical systems like Ayurveda and Sri Lankan indigenous medicine (*Hela Wedakama*) have long emphasized holistic approaches to child health, focusing on physical and mental well-being. Among the various preventive and curative measures described in these systems, Lehana Karma (Licking Therapy), known in Sri Lanka as *Rankiri Kata Gema*, stands out as a time-honoured practice to enhance a child's immunity, digestion, and overall development. Rooted in centuries of empirical knowledge, this therapeutic approach involves administering carefully selected herbal, mineral, and natural formulations to infants and young children to strengthen their immune system and promote optimal growth.

With increasing global interest in traditional medicine, modern scientific research has begun to explore the biochemical and immunological basis of such ancient practices. Investigating the pharmacological properties of the ingredients used in *Lehana Yogas* could offer valuable insights into their role in immune modulation, gut microbiome enhancement, and neurodevelopmental benefits. Scientific validation of these traditional formulations could bridge the gap between ancient wisdom and modern medicine, paving the way for integrative healthcare approaches that combine the best of both worlds.

This study explores the traditional use of *Lehana Yogas* in Sri Lankan traditional medicine to enhance infant immunity, focusing on essential constituents and their therapeutic action.

AIMS AND OBJECTIVES

The objective of this study was systematically review he traditional use and modern scientific validation of *Lehana Yogas* in Sri Lankan medicine with respect to enhancing immunity in children.

MTHODOLOGY

The study was carried out as a review study and data was collected from Sri Lankan Traditional authentic texts, previously published research papers, and journal articles.

RESULTS AND DISCUSSION

According to Sri Lanka's traditional medical system, *Lehana* formulations are a specific class of herbal preparations that are mostly given to newborns and young children. Usually produced as semi-solid pastes, these formulations are intended to boost immunity, promote growth, and improve digestion. *Lehana* preparations, which have their roots in centuries of indigenous knowledge and Ayurvedic principles, use a range of natural ingredients, such as herbs, spices, and minerals, all of which have been chosen for their therapeutic qualities. These formulations' preparation and administration are based on oral traditions and classical texts that have been handed down through the generations of traditional healers in Sri Lanka.

1. Sarartha Samgrahaya [1],[2]

The fifth-century CE text Mahavamsa the Great Chronicle states that Sri Lankan King Buddhadasa (340–398 CE), who lived in Sri Lanka, respected both people and animals. The title of his comprehensive treatise on medicine, Sarartha Sangrahaya (390 CE), is "An Essence of Medicine-A Compilation." It provides information on bacterial psoriasis, syphilis, leprosy, eczema, furunculosis, fungal infections, and viruses about skin problems.[2] Sarartha Sangrahaya has a wealth of knowledge about medicinal plants. The Sarartha Sangrahaya lists 170 medicinal plants that have been scientifically recognized. They include 51 species of grain, 61 species of herbs, 10 species of shrubs, 20 species of trees, 7 species of tubers, and 1 species of mushroom. It is commonly known that Sarartha Sangrahaya has a more thorough and detailed categorization.
Here, King Buddadasa mentioned Sri Lankan *Jatakarma Vidhi* or the birth rituals that are special and unique to Sri Lankan culture. In *Jatakarma Sanskara* he mentioned that immediately after cleaning the newborn baby, the Lehana Karma offers a mixture of *Swarna bhashma*, bee honey, and ghee. Also, he mentioned another *Lehana yoga* made up of *Lunuvila (Bacopa monnieri),* and *Rat Hadun (Pterocarpus santalinus* Roxb.) can promote memory power.
He also discussed the advantages of feeding the aforementioned formulae to newborn children. These formulas enhance knowledge, elegance, and a life that is healthy and long-lasting. He also explained the preparation of a mixture employing the ingredients *Swarna bhashma, Aralu (Terminalia chebula), Lunuvila (Bacopa monnieri), Gritha*, and *Madhu*. *Swarna Bhashma* needs to consume one *Gunja* (1 *Gunja* measures approximately 120 mg), while the other components need to consume one *Karsha* each (1 *Karsha* measures approximately 12g).

2. Varayoga Saraya [1],[2]

One of the medicinal texts produced in Sri Lankan traditional medicine is called Varayoga Saraya. *Jatakarma Sanskara* was also referenced by Varayoga Saraya. According to the author, a newborn infant should be cleansed with warm, mild water once the umbilical cord has been severed. Then, when the infant is administered, bee honey and ghee are used in the Lehana yoga. He also offered three more *Lehana yogas* that might be practiced up until the commencement of breastfeeding.

- *Kasa (Casuarina equisetifolia), Vada (Acorus calamus* (Linn)), *Aralu (Terminalia chebula), Iramusu Mul* (root of *Hemidesmus indicus*), *Baminithira Mul (Bacopa monnieri)*, and *Githel (ghee)*
  The first four components should be finely pulverized before being combined with *Githel* and *Baminithira mul (Bacopa monnieri)* juice.
- *Ran Sunu* (gold powder), *Vada (Acorus calamus* (Linn)), *Baminithira (Bacopa monnieri), Aralu (Terminalia chebula), Vagapul* (*Molineria capitulate), Githel*, and *Mee* (bee honey)
- *Ran Sunu* and *Baminithira (Bacopa monnieri)*

These formulations aid in improving memory.

3. Yogarnawaya [1],[4]

A remarkable book called "Yogarnawaya" was written in ancient Sinhala by Ven. Buddaputra Thero, who at the time served as the Head of Mayurapada Dhamma Academy. His creation of the " Yogarnawaya," a pair of medicinal texts, contributed to the literature of medicine. The first medical theory to be written in Sinhalese was referred to as Yogarnawaya. Yogarnawaya also

specified a few Lehana yoga poses to enhance the newborn baby's immune system, memory, digestive fire, strength, complexion, clear voice, and long life. Additionally, he noted that doing traditional Lehana yoga, which helps defend against ailments brought on by microorganisms known as *Graha roga*.

- *Vada* (*Acorus calamus* (Linn), *Ran sunu* (gold powder), *Baminithiri* (*Bacopa monnieri*), *Duhudu thel* (oil made up with *Celastrus paniculatus* Willd.), *Madhu* (bee honey), Githel(ghee)
- *Vada* (*Acorus calamus* (Linn), *Ran sunu* (gold powder), *Mee* (bee honey)

4. **Kumara Tantraya** [1]

It was reportedly said that Emperor Ravana had written five medicinal books. These writings were known by the titles "Arka prakasha," "Nadi prakasha," "Kumara tantra," "Uddisha tantra," and "Shivatandavastotra." In addition to other medical literature, they disclose alchemy and fermented concoctions, the study of pulses, pediatrics, rituals and recitations, and the worship of God Shiva. The Kumara Tantra contains information on pediatric disorder treatment methods, medication dosages, pediatric disorder causes, and diseases brought on by microorganisms. He mentioned several Lehana yoga for pediatric disorders.

Table 01: *Lehana yoga* mentioned in the Kumara tantra with its indications. [5]-[12]

Ingredients of the *Lehana yoga*	Indication
Dhataki (Woodfordia fruticosa (L.) Kurz.*)* *Bilva (Aegle marmelos)* *Lodra (Symplocos racemosa roxb)* *Indrayava (Holarrhena antidysentrica)* *Kshudra* (bee honey)	*Atisara* (dysentery)
Vidaga (Embelia ribes) *Ajamoda (Trachyspermum ammi)* *Pippali (Piper longum)*	*Atisara* (dysentery)
Lodra (Symplocos racemosa roxb) *Indrayava (Holarrhena antidysentrica)* *Dhanyaka (Coriandrum sativum)* *Dhatri (Phyllanthus emblica)* *Hribera (Plectranthus zatarhendi var. tomentosa.)* *Mustaka (Cyperus rotundus)* *Madhu* (bee honey)	*Atisara* (dysentery)

Krushna (Piper longum) *Mahaushadha (Zingiber officinale* ROSC.)- dry *Bilva (Aegle marmelos)* *Yawanika (Trachyspermum ammi)* *Nagara yusha (Zingiber officinale ROSC.)*- juice	*Grahani roga* (Malabsorption Syndrome)

Madhu (bee honey) *Sarpi* (ghee)	
Vyagri Kusuma keshara (Solanum virginianum) Stamens *Vyagri (Solanum virginianum)* *Kusuma (Syzygium aromaticum)* *Kaisharai (Mesua ferrea)* *Madhu* (bee honey)	*Kasa* (cough)
Mulaka phala (Raphanus sativus) *Ekagruhi* (*Pistacia integerrima)* *Gritha* (ghee) *Madhu* (bee honey)	*Kasa* (cough)
Mustaka (Cyperus rotundus) *Ativisha (Aconitum heterophyllum)* *Vasa (Justicia adhatoda)* *Kanha (Piper longum)* *Srungi (Pistacia integerrima)* *Madhu* (bee honey)	*Kasa* (cough)
Shilajathu (Asphaltum Punjabianum) *Vyama (*Biotite mica) *Vidanga (Embelia ribes)* *Lahua* (iron oxide) *Tapasa* $CuFeS_2$ (chalcopyrite) *Abhaya (Terminalia chebula)* *Sarpi* (ghee) *Madhu* (bee honey)	*Kshaya roga* (tuberculosis)
*Swarna gairiyaka (*red oxide of iron*)* *Madhu (*bee honey*)*	*Hikka* (hiccough)
Pippali (Piper longum) *Madhuka (Glycyrrhiza glabra)* *Jambu (Syzygium cumini)*	*Pipasa* (thirst)

Rasalatharu pallawa (Mangifera indica) *Madhu* (bee honey)	
Hingu (Ferula assafoetida) *Saihindhava* (rock salt) *Palasha (Butea monosperma)* *Makshika* (bee honey)	*Pipasa* (thirst)

5. Kaumarabrutya [13]

Another few *Lehana yogas* that were employed in Sri Lanka's traditional medical system were listed in a pediatric book on pediatric care and nutrition written by Dr. D.M. Jayasinghe. All forms of *Lehana yoga* include ghee and honey in addition to herbal ingredients with a variety of medicinal and pharmacological effects that protect against pathogens and provide newborns the nutrients they need. The majority of plants have antimicrobial, antioxidative, and memory-boosting properties.

- *Lunuvila (Bacopa monnieri), Gotukola (Centella asiatica), Tripal- Amalaki (Emblica officinalis), Vibhitaki (Terminalia bellirica), and Haritaki (Terminalia chebula), Ratnetul (Plumbago indica* L.*), Vadakaha (Acorus calamus* (Linn)*, Shatapushpa (Pimpinella anisum), Hatavariya ala (Asparagus racemosus), Detta ala (Boehmeria nivea), Sirivedi bebila (Bombyx micranthus), Tirassawalu (Operculina turpethum), Mee peni (bee honey), Gitel (ghee)*
- *Vel madata (Rubia cordifolia* L.*), Tripal - Amalaki (Emblica officinalis), Vibhitaki (Terminalia bellirica), and Haritaki (Terminalia chebula), Lunuvila (Bacopa monnieri), Bebila (Sida cordifolia* L.*), Behet anoda (Abutilon guineense* (Schumach.) Baker f. & Exell*), Ratnetul (Plumbago indica* L.*), Mee peni (bee honey), Gitel (ghee)*
- *Kottam (Dolomiaea costus), Nuga karati (Ficus benghalensis), Aba (Brassica juncea), Tippili (Piper longum), Tripal- Amalaki (Emblica officinalis), Vibhitaki (Terminalia bellirica), and Haritaki (Terminalia chebula), Vadakaha (Acorus calamus* (Linn)*, sahinda lunu (rock salt), Mee peni (bee honey), Gitel (ghee)*
- *Gon kekiri ala (Cucumis maderaspatanus* L.*), lunuvila (Bacopa monnieri), Shankhapushpi (Convolvulus pluricaulis), Vadakaha (Acorus calamus* (Linn)*, Mee peni (bee honey), Gitel (ghee)*

Therapeutic evaluation of important ingredients of *Lehana Karma*

Many Acharyas, those who practiced Ayurveda and Sri Lankan traditional medicine, employed *Swarna bhashma*, *Gritha*, and bee honey as components in *Lehana yoga* by taking into account the aforementioned formulations. They also employed popular herbal compounds like *Brahami (Bacopa monnieri)*, *Shankapushpi* (*Convolvulus prostratus*), and *Vacha (Acorus calamus* (Linn). All of these play a significant role in improving immunity. Numerous studies have been conducted to demonstrate the effectiveness of *Swarna bhasma* and *Lehana karma* in boosting children's immune systems and encouraging development.

Swarna bhashma

Gold is a transition metal and it belongs to group eleven of the Periodic Table. It's a chemical element that is the least reactive after noble gases. *Swarna bhasmikarana* (made into powder form) is therefore performed to make it somewhat reactive so that it can demonstrate its pharmacological qualities. When burning *Swarna bhasmikarana*, it was assumed that the size of gold particles could be reduced. According to the studies conducted on this subject, *Bhasma* creates an organic form of nanoparticles. It has been revealed by atomic absorption spectroscopy to have a gold content of approximately 92% in *Swarna Bhasma*. The absence of mercury, as demonstrated by the Cold Vapor Atomic Absorption Spectroscopy method, is considered to be a sign of proper incineration. In the infrared spectrum, no organic substances were visible in *Swarna bhasma*. [14]

Table 02: Pharmacological importance of the *Swarna Bhasma* which was already proven by *In vitro* and *In vivo* studies.

Pharmacological property	*In vitro/In vivo*	Findings
Immune-modulator properties	*In vivo*	*Swarna bhasma* significantly increased the number of peritoneal macrophages and improved the macrophage phagocytic index in male mice over a duration of 10 days, indicating its potential to reduce non-specific immunity. A single-blind study including 102 healthy neonates revealed substantial changes in IgG levels before and after *Swarna bhasma* treatment.[15].
Antioxidant properties	*In vitro*	*Swarna bhasma,* a prolonged intervention for stroke, has been associated with heightened activity of superoxide dismutase and catalase enzymes, yielding antioxidant and therapeutic advantages[16].
Memory enhancing properties	*In vivo*	According to an investigation involving three groups of Swiss albino mice, *Swarna bhasma*, a natural treatment, markedly improved memory and learning capabilities. The research indicated that *Swarna bhasma* markedly reduced transfer latency in mice, suggesting its potential for memory enhancement.[17].
Toxicology Studies	*In vivo*	*Swarna bhasma,* a Swarna herb, has demonstrated no toxicity in mice, as indicated by histological examinations, SGPT, SGOT, and serum creatinine levels.[18].

Analgesic activity	*In vivo*	A study conducted on mice demonstrated that *Swarna bashma* possesses notable analgesic qualities.[19].

Madhu

Honey is a carbohydrate-rich liquid created by honey bees from the nectar and pollen of different plants. Honey's chemical composition is dominated by the two sugars fructose and glucose, although a number of other compounds can be found in trace amounts. The specific composition of honey is influenced by the plant from which it is produced, the season, and the method of production. Honey is the most potentiating agent, according to Acharya Charaka, because it is derived from a multitude of sources. Honey appears to be curative in a range of conditions when coupled with many different medications and medical therapies because it shares some of the attributes of the pharmaceuticals or chemicals it is taken with (*Yoga-vahika*). It is a wonderful synergist because of this. [20]

Table 03: Pharmacological importance of the Honey which was already proven by *In vitro* and *In vivo* studies.

Pharmacological property	*In vitro/In vivo*	Findings
Immune-modulator properties	*In vitro*	Honey exhibits immunomodulatory effects by reducing reactive oxygen species (ROS) and enhancing the production of proinflammatory cytokines. Research indicates that honey therapy in rats with stomach ulcers can decrease levels of nitric oxide, glutathione, and superoxide dismutase, as well as lower plasma concentrations of pro-inflammatory cytokines. [21]
Antioxidant properties	*In vitro*	*In vitro* studies on honey's antioxidant properties demonstrated a substantial relationship between flavonoids and their antioxidant concentration. Stingless bee honey, a robust source of natural phenolic acids and flavonoids, exhibited a greater concentration of antioxidant activity than Apis honey, underscoring its potential as an antioxidant.[22]

Memory enhancing properties	*In vivo*	Honey, abundant in antioxidants, has demonstrated the ability to avert dementia and cognitive deterioration in adults aged 65 and above. Consuming honey for five years enhanced memory and cerebral blood circulation.[23]
Toxicology Studies	*In vivo*	Honey rarely produces adverse effects; rather, it can be calming, analgesic, and non-irritating. It seldom induces allergies; nonetheless, excessive application may result in dehydration. Gamma radiation can diminish the risk of wound botulism caused by Clostridia spores while preserving the antibacterial properties of honey. Nonetheless, excessive consumption may elevate blood glucose levels.[24]
Antimicrobial activity	*In vitro*	Honey suppresses microbial proliferation by elevating osmotic pressure due to its low water content, hence extracting moisture from the microorganisms. The water content of honey generally varies from 13% to 25%, with 17% being optimal for osmophilic yeasts. Elevated sugar concentration inhibits bacteria from accessing water for their growth.[25]

Apoptotic activity	*In vitro*	Honey, a natural material rich in phenolic compounds, triggers apoptosis in cancer cells by causing mitochondrial membrane depolarization and enhancing caspase 3 activation and poly (ADP-ribose) polymerase (PARP) breakage. It regulates the expression of pro- and anti-apoptotic proteins, such as p53, caspase 3, and the pro-apoptotic protein Bax. Honey generates reactive oxygen species (ROS), which activate p53, hence influencing the production of pro-apoptotic and anti-apoptotic proteins. Honey may serve as a potential natural anti-cancer agent.[26]

Gritha

In South Asian and Middle Eastern countries, *Ghrita* (ghee), a kind of clarified butter with roots in the Indian Subcontinent, is commonly consumed. It has long been a crucial ingredient in Indian cuisine. The Ayurvedic idea of *Maha sneha* includes ghee in addition to *Taila* (oil), *Vasa* (fat), and *Majja* (marrow). It's believed that *Ghrita* is the finest of the bunch. Even though it shares aspects with *Kapha, Ghrita's* unctuous and cooling qualities, when combined with the correct medications, may calm it down. It also calms down *Vata.* Ghee is the only butter-based product that mimics medication grade as closely as it does. Ghee is therefore regarded as the best of all opulent meals.[27]

Table 04: Pharmacological importance of the *Gritha* which was already proven by *In vitro* and *In vivo* studies. [28]

Pharmacological property	*In vitro/In vivo*	Findings
Anti-cancer activity	*In vivo*	Cow ghee had anticancer activity in rats subjected to DMBA-induced mammary carcinogenesis, exhibiting increased tumor incidence, weight, and volume relative to soybean oil, along with an extended tumor latency period.
Immunomodulatory properties	*In vitro*	Distillation of cow ghee enhances the proliferation and blastogenesis of T and B lymphocytes, resulting in elevated IgG levels in mice and chickens. The human protective characteristics of ghee distillate were evaluated in comparison to genotoxic substances.
Antioxidant Effect	*In vivo*	Ghee, abundant in beta-carotene and vitamin E, possesses free radical scavenging properties that inhibit the formation of detrimental lipid peroxides resulting from oxidative stress, so safeguarding the body against oxidative damage.

Brahami- Bacopa monniera

Table 05: Pharmacological importance of the *Brahami- Bacopa monniera* which was already proven by *In vitro* and *In vivo* studies.

Pharmacological property	*In vitro/In vivo*	Findings
Memory Enhancement	*In vivo*	Research on animal behavior indicates that bacopa improves motor learning and retention while prolonging the extinction of newly acquired behaviors. The methanol extract and B. monniera fractions exhibited antidepressant effects in mice by decreasing immobility durations, although did not affect locomotor activity. Bacosides mitigated experimental amnesia and improved anterograde memory. [29]

Antidepression properties	*In vitro*	*Bacopa monnieri* extract, together with bacopasides A, B, I, II, and bacopasaponin C, exhibits antidepressant properties, although forced animal trials indicate that bacopaside VII lacks such benefits.[30]
Antioxidant activity	*In vitro*	The anti-stress effects of bacosides from *Bacopa monnieri* were examined in rats, utilizing daily dosages of 20 and 40 mg/kg. Stress alone markedly increased Hsp70 expression in all brain regions, however neither dosage significantly altered its level. The lower dosage reduced superoxide dismutase activity in the hippocampus, but the higher dosage significantly increased SOD activity. Stress levels decreased in rats following a 7-day bacoside pretreatment.[31]

Antimicrobial effect	*In vivo*	Methanol extracts had the highest antibacterial efficacy, while no microorganisms were able to target aqueous extracts. Nevertheless, hexane and petroleum ether extracts shown reduced efficacy against *Staphylococcus aureus, Salmonella typhimurium, E. coli*, and *Salmonella typhi*. The methanolic extract of *Bacopa monnieri* callus effectively inhibits bacteria such as *Candida albicans, P. aeruginosa*, and *Vibrio cholera*. [32]
Gastrointestinal effect	*In vivo*	The ethanol extract of *Bacopa monnieri* exhibited antidiarrheal effects in rats, enhancing latent duration and reducing defecation frequency. It demonstrated significant antiulcerogenic properties, safeguarding and repairing gastric ulcers. Rats demonstrated that *Bacopa* extract improved the mucosal barrier, reduced exfoliation, and cured penetrating wounds induced by acetic acid.[33]
Anticonvulsant effect	*In vivo*	The extract of *Bacopa monnieri*, containing bacosides, has demonstrated anticonvulsant properties, potentially averting cognitive deficits associated with pilocarpine-induced epilepsy and glutamate-mediated excitotoxicity during seizures. [34]

Shankhapushpi- Convolvulus prostratus

Table 06: Pharmacological importance of the *Shankhapushpi- Convolvulus prostrates* which was already proven by *In vitro* and *In vivo* studies. [35]

Pharmacological property	*In vitro/In vivo*	Findings
Neuroprotective Activity	*In vivo*	Studies indicate that rats administered an oral dose of *C. prostratus* root extract exhibit decreased tau protein mRNA levels, hence ameliorating amyloid beta-induced impairments in neurodegenerative disorders such as Alzheimer's disease. This indicates that phytoconstituents such as convolvine modulate neuronal factors, proteins, and enzymes.
Anti-Convulsant Activity	*In vivo*	Extracts of *C. prostratus* exhibit anticonvulsant effects against seizures generated by strychnine and pentylene tetrazol in animal models. At a dosage of 500 mg/Kg, they inhibited clonic convulsions, whereas the methanolic extract decreased the recovery period after convulsions in mice.
Antidepressant activity	*In vivo*	The ethanolic extract of *C. prostratus*, when mixed with other plants, has been shown to counteract the elongation of immobility period induced by reserpine in mice, demonstrating anti-depressant properties. This effect was noted in multiple tests including a polyherbal formulation, Trans-01, which demonstrated a dose-dependent reduction in the duration of immobility.
Antioxidant activity	*In vivo*	The in vivo *C. prostratus* plant includes polyphenols, flavonoids, and vitamin E, which reduce lipid levels. Peroxidation and the scavenging of reactive oxygen species, hence affirming its antioxidant capabilities. The plant's extracts exhibit significant outcomes in DPPH and FRAP assays, indicating its substantial antioxidant ability.

Toxicology study	*In vivo*	The leaves of *C. prostratus* have undergone evaluation for acute oral toxicity in albino Wistar rats and Swiss albino mice, demonstrating no detrimental effects. The delivery of iron oxide nanoparticles derived from the plant had no clinically significant adverse effects, confirming their safety for essential organs throughout the treatment period.

***Vacha - Acorus calamus* Linn.**

Table 08: Pharmacological importance of the *Vacha - Acorus calamus Linn.* which was already proven by *In vitro* and *In vivo* studies. [36]

Pharmacological property	*In vitro/In vivo*	Findings
Cardioprotective activity	*In vivo*	The alcoholic extract of *A. calamus* rhizome markedly diminished isoproterenol-induced cardiomyopathy in rats, lowering serum levels of calcineurin, nitric oxide, LDH, and TBARS. Nonetheless, levels of antioxidant enzymes rose with larger dosages. The extract diminished the force of forced vital capacity, hazard ratio, and cystic fibrosis in rabbit hearts, demonstrating cardioprotective potential by lowering serum enzyme levels and protecting the myocardium against DOX.
Anti-inflammatory and Immunomodulatory Effects	*In vitro*	The methanolic extract of *A. calamus* rhizome efficiently inhibited VCAP-1 and intercellular expression in mice with myeloid leukemia and endothelial cells. It had modest efficacy in inhibiting hemolysis and stabilizing RBC membranes. The extract also reduced IL-8, IL-6, IRF3, and NF-kB activity in HaCaT cells.
Anticonvulsant Activity	*In vivo*	The research assesses the effectiveness of *Acorus calamus* extract in diminishing seizures in albino mice. The medicine was delivered in both acute and chronic doses, with AEAC exhibiting effects comparable to sodium valproate regarding dosage dependence. Nonetheless, it also elevated mortality in PTZ-induced seizures.

Neuromodulator Activity	*In vivo*	Mice were administered *A. calamus* methanolic extract (ACME) and acetone extract (ACAE) to mitigate stereotyped behavior and catalepsy induced by apomorphine and haloperidol. ACME mitigated APM stereotypy, whereas ACAE exacerbated haloperidol-induced catalepsy.

Lehana formulations, as described in the Sri Lankan traditional medical system, are deeply rooted in ancient texts such as the Sarartha Sangrahaya, Varayoga Saraya, Yogarnawaya, and Kumara Tantraya. These texts highlight the use of *Lehana yoga*, a practice involving the administration of medicinal formulations to newborns and children, aimed at enhancing immunity, memory, digestion, and overall health. The formulations typically consist of ingredients such as *Swarna bhashma* (gold ash), ghee (clarified butter), honey, and various medicinal herbs like *Bacopa monnieri* (*Brahmi*), *Acorus calamus* (*Vacha*), and *Terminalia chebula* (*Aralu*). These ingredients are chosen for their pharmacological properties, which have been validated through both traditional use and modern scientific studies.

Therapeutic Applications of *Lehana Yoga* is primarily administered to newborns and children to promote physical and mental development, enhance immunity, and prevent infections. The formulations are tailored to address specific health concerns, such as dysentery, cough, malabsorption syndrome, and cognitive disorders. For instance, formulations containing *Swarna bhashma*, ghee, and honey are used to boost immunity and cognitive function, while those with Brahmi and Vacha are employed for memory enhancement and neuroprotection.

The therapeutic efficacy of Lehana yoga is supported by both traditional knowledge and modern scientific research. For example, the immune-modulatory effects of *Swarna bhashma* and ghee have been validated in animal studies, while the antioxidant and antimicrobial properties of honey and *Brahmi* have been demonstrated in vitro and in vivo. These findings underscore the potential of *Lehana yoga* as a holistic approach to pediatric care.

The integration of Lehana yoga with modern medical practices offers a promising avenue for enhancing child health. Given the rising prevalence of immunodeficiency disorders and lifestyle-related health issues in children, Lehana yoga can serve as a complementary therapy to conventional treatments. For instance, the immune-boosting properties of *Swarna bhashma* and ghee can be leveraged to reduce the incidence of infections in immunocompromised children. Similarly, the memory-enhancing effects of *Brahmi* and *Vacha* can be utilized to support cognitive development in children with learning disabilities.

Moreover, *Lehana yoga* in conjunction with national nutritional programs can help address malnutrition and its associated health complications. By incorporating traditional medicinal practices into public health initiatives, better health outcomes for children and societal well-being can be achieved.

CONCLUSION

Lehana yoga, as described in the Sri Lankan traditional medical system, represents a holistic approach to paediatric care, emphasizing the use of natural ingredients to promote physical and mental well-being.

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PREPARATION AND PRELIMINARY INVESTIGATION OF RATHAROGA TREATING OIL GIVEN IN TRADITIONAL MEDICINE

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ABSTRACT

Ayurveda emphasizes the prevention and treatment of diseases, and in Sri Lanka, traditional medicine is practiced alongside Indian Ayurveda. *Rathagaya*, a skin disorder primarily affecting infants and children, is correlated with *Charmadala* in Ayurveda and atopic dermatitis in modern medicine. Effective management involves both internal and external therapies. This study aimed to prepare a traditional *Ratha Thaila* from *Thaila Pancha Shathakaya Hevath Beheth Thel Potha* and evaluate its physicochemical and phytochemical properties**.** The prepared oil was dark green, aromatic, bitter, and slightly rough and oily in texture. Physicochemical analysis revealed a pH of 6.5**,** density of 0.8375 g/mL**,** and refractive index of 1.46061 (68%)**.** Ayurvedic properties such as *Tikta* and *Madhura Rasa, Guru, Snigdha,* and *Ruksha Guna, Sheetha Veerya*, and *Katu Vipaka* support *Pitta*-pacifying, *Raktha*-purifying, *Tvachya, Shothahara, Kushtaghna, Krimighna*, and *Vishaghna* actions**.** Preliminary phytochemical screening indicated the presence of tannins, alkaloids, and flavonoids, compounds with anti-inflammatory, antimicrobial, antioxidant, and antiulcer activities**.** These findings suggest that the prepared *Ratha Thaila* is potentially effective for external management of *Rathagaya***,** providing a foundation for future clinical validation**.**

Keywords:- Pharmacological properties, Phytochemical analysis, *Ratharoga, Ratha Thaila*

INTRODUCTION

Every country has its own traditional medicinal system that contributes significantly to primary healthcare. Sri Lanka possesses a rich traditional medical heritage dating back to the era of King Ravana, consisting of several specialized disciplines such as *Ratha Vedakama, Mandam Vedakama,* and *Sarpa Visha Vedakama*. With the arrival of Arahath Mahinda, Ayurveda medicine spread across the country and eventually integrated with traditional practices. Among these systems, *Ratha Vedakama* and *Mandam Vedakama* mainly focus on treating childhood diseases. *Ratharoga* (or *Rathagaya*) is a skin disorder seen in children, caused by the vitiation of *Pitta dosha* and *Raktha dhathu*, with contributing factors such as maternal conditions, environmental influences, and infections [(1)]. Traditional practitioners used various internal and external treatments to manage *Ratharoga*, though these practices are now less common. Currently, *Ratha kalka* (internal) and *Ratha thaila* (external) are mainly used. In the Traditional medicinal system, the oil prepared under following formula is commonly used for *Ratharoga.*

Ingredients [(2)];

1. *Hathavariya kola (Asparagus racemosus)*
2. *Murva kola (Marsdenia tenacissima)*
3. *Ankenda kola, Pothu (Acronychia pedunculata)*
4. *Madatiya kola (Adenanthera pavonine)*
5. *Thembili pol kiri (Cocos nucifera)*

This study focuses on preparing a traditional herbal oil used for *Ratharoga*, identifying its phytochemical constituents, and evaluating its therapeutic potential based on Ayurveda concepts and the pharmacological properties of its ingredients.

OBJECTIVES

GENERAL OBJECTIVE

- To prepare a *Ratharoga* treating oil mentioned in Traditional medical system, according to a traditional preparatory method and screening of it for selected phytochemicals.

SPECIFIC OBJECTIVE

- To evaluate the action of prepared oil in *Ratharoga* according to Ayurveda concepts.

LITERATURE REVIEW

The term *Ratha* means blood, and *Gaya* means disease. Thus, *Rathagaya* generally refers to a disease condition caused by vitiated blood (*vitiated Raktha Dhathu*). Rathagaya mainly occurs in infants and children due to the vitiation of *Pitta Dosha* and *Raktha Dhathu*. The disease condition called *Charmadala*, described in *Kashyapa Samhitha*, is considered to be correlated with *Rathagaya*. In the traditional medicinal system, *Rathagaya* is also known by several other

names such as *Rathe, Rathaga, Wadamalwangatha, Egathrath Mala Vilasina, Rathambala Malavangatha*, etc. [1].

Rathagaya mainly occurs due to two factors:

1. Conditions of the pregnant or lactating mother
2. Conditions of the infant

Conditions related to the pregnant or lactating mother

- Improper adherence to *Garbhini Paricharya* (antenatal regimen).
- Excessive intake of foods with *Amla Rasa* (sour taste) and *Lavana Rasa* (salty taste).
- Excessive mental stress or emotional disturbances.
- Suffering from diseases such as *Kushta*, *Peenasa*, or other conditions associated with vitiated *Rasa* and *Raktha Dhathu*.

Conditions related to the infant

- Consumption of vitiated breast milk (*Sthanya Dosha*).
- Errors in supplementary milk (*Adeshaka Ksheera*).
- Unhealthy or improper dietary habits.
- Poor hygiene or unhygienic surroundings.
- Microbial infections.
- Malnutrition.

Ratha Thaila

Classical texts such as *Ratha Weda Potha*, *Thalpathe Piliyam*, *Thaila Pancha Shathakaya Hevath Beheth Thel Potha*, and *Sarartha Sangrahaya* have described several formulations of Kashaya, Thaila, and Lepa for the treatment of *Rathagaya*. However, in current traditional clinical practice, physicians mainly use *Ratha Kalka* and *Ratha Thaila*, as mentioned in the *Ayurveda Aushadha Sangrahaya*. In addition, classical texts such as *Sharangadhara Samhitha*, *Svadeshiya Bhaisajjya Vishvakoshaya*, and *Purana Rahas Thel Beheth Potha* describe various methods of preparing medicinal oils (*Thaila Kalpana*). Ratha Thaila consists of ingredients such as *Hathavariya Kola Yusha*, *Murva Kola Yusha*, *Ankenda Kola Yusha*, *Pothu Yusha*, *Madatiya Kola Yusha*, and *Thembili Pol Kiri*. Among these, *Ankenda* one of the main ingredients of *Ratharoga Thaila* has been reported to possess anti-inflammatory and antibacterial properties[3]. *Hathavariya* also exhibits anti-inflammatory, antimicrobial, and antioxidant effects[4].

METHODS AND METHODOLOGY

The preparation of *Ratharoga* oil was carried out at the Faculty of Indigenous Medicine during the period of June to August 2024. The method described in *Thaila Pancha Shathakaya* (also known as *Beheth Thel Potha*) was followed for the preparation, as it is recognized as one of the most effective *Ratha Thaila* formulations [2].

Ladaruvanta rathathela

1) *Hathavariya kola*
   Saha murvadul kola
   Pothu Ankenda kola
   Regena meda yushada madatiya kola
2) *Thembili pol samagina*
   Samva thel sinda ganimina
   Siyalu ratha dutu thena
   Pamana dena thela yodanu manamena
3) *Duvana paninaa ratha*
   Asa diyavana galratha
   Daruta pemununahotha
   Methela di suvakaranu yahapatha

Table 1: The ingredients described in the stanza

Ingredients	Botanical name	Quantity
Hathavariya kola yusha	*Asparagus racemosus*	750ml
Murva kola yusha	*Marsdenia tenacissima*	750ml
Ankenda kola and *pothu yusha*	*Acronychia pedunculata*	750ml
Madatiya kola yusha	*Adenanthera pavonina*	750ml
Thembili pol kiri	*Cocos nucifera var.aurantiaca*	4500ml

Preparation of Oil

First, the raw plant materials were authenticated**,** and then washed separately, and ground into a coarse paste**.** From each plant material**,** 750mL of extract was obtained by squeezing the ground material. In addition, 4500mL of coconut milk was prepared by scraping and pressing 16 well-ripened king coconuts (*Cocos nucifera*). All the extracts and the coconut milk were then mixed thoroughly, and the mixture was heated over a low flame**.** The heating was continued until the appearance of Thaila Siddha Lakshana**,** at which point the mixture was removed from the flame**.** According to *Sharangadhara Samhitha*, this stage is known as Madhyama Paka Avastha, where the Kalka (paste) becomes firm and can be rolled into a *Varti* (wick-like shape).

Determination of Organoleptic Properties

Ratha Thaila was evaluated for its color, odor, texture, and taste according to standard organoleptic assessment methods.

Determination of Physicochemical Parameters

The density, refractive index, and pH of *Ratha Thaila* were determined according to the methods described by AOAC[5].

Density

A watch glass was placed on the balance and weight was obtained. Then, 2.00ml of oil was placed in the watch glass carefully with measuring cylinder and total weight was obtained. The density of the oil was calculated as follows.

$$\text{Density} = \frac{\text{Weight of the oil}}{\text{Volume of the oil}}$$

$$= \frac{w_2 - w_1}{V}$$

$$= \frac{(20.475 - 18.800)\ g}{2ml}$$

Refractive index

Refractive index was measured by using the refractometer. number of 3 (three) drops of oil were evenly distributed over the prism surface of the instrument and the prism cap was closed. Looking through the eyepiece, the measurement was read.

pH

pH value was measured with pH papers.

Determination of Phytochemical parameters

Preparation of extract

Methanol extraction of the oil was prepared for the phytochemical tests. Volume of 50ml oil was measured and transferred to a 250ml capacity separating funnel and added 25ml of methanol. Mixture was shaken slowly for 5 minutes taking precautions till that no emulsion formation would take place. Mixture was stand for 15 minutes till both layers were separated out. Finally, the methanolic layer was separated[6].

Saponins

The extract (2ml) and water (5ml) were added to a test tube, the mixture was shaken vigorously and kept for 10 minutes (Persistence of forth for at least 10 minutes indicated the presence of saponins) [7].

Tannins

$FeCl_3$ (5 drops) were added into 2ml of extract and mixed well (Appearance of a blue-black precipitate indicates the presence of tannins) [7].

Alkaloids

Two drops of Wagner's reagent were added to 2ml of extract and mixed well. (Appearance of a reddish color indicates the presence of alkaloids) [7].

Flavonoids

Diluted ammonia solution (5ml) was added to 3ml of extract and followed by the Conc.H_2SO_4. (Appearance of yellow color, and get disappearance of it on standing, may indicate the presence of flavonoids) [7].

Analysis of pharmacological and therapeutic actions of prepared *Ratha thaila*

Analysis of pharmacological and therapeutic actions was carried out by studying *Ayuveda* text books, relevant research articles.

RESULT AND DISCUSSION

Table 2: Organoleptic properties of oil

Parameter	Result
Color	Dark green
Odour	Pleasant, Aromatic
Texture	Oily, Bit rough
Taste	Bitter

The prepared oil was dark green in color and had a pleasant, aromatic odour. It was bitter in taste and bit oily, and rough in texture. Because of this oily texture, oil does not possess irritation to the skin. Due to pleasant, aromatic odour, oil has no irritation to mind too. In addition, the bit rough texture gives unwholesome environment for microorganism.

Table 3: Physicochemical properties of oil

Parameter	Result
pH	6.5
Density	0.8375 gml^{-1}
Refractive index	68% (1.46061)

The physicochemical analysis of *Ratha Thaila* showed a pH of 6.5**,** density of 0.8375 g/mL**,** and a refractive index of 1.46061 (68%)**.** According to Yosipovitch et al.[8] the surface pH of neonatal skin ranges from 6.6 to 7.5, and after about one year of age, it decreases to 4.5–6.7**.** This indicates that normal skin is mildly acidic, which helps it function as a protective barrier against microbial invasion. Since microbial infection is one of the main causative factors of *Ratharoga*, the mildly acidic pH (6.5) of *Ratha Thaila* suggests that it may also help inhibit the growth of microorganisms and thus support the natural protective function of the skin**.** The refractive index (RI) of an oil is an indicator of its susceptibility to rancidity. A higher RI generally reflects a higher degree of unsaturation, which increases the likelihood of oxidative spoilage. In the case of *Ratha Thaila*, the moderate RI value suggests a lower tendency for rancidity**,** indicating better stability and shelf life [9].

Table 4: Result of phytochemical analysis

Phytochemical	Availability	Image
Saponins	Negative	
Tannins	Positive	
Alkaloid	Positive	
Flavonoid	Positive	

According to the results of the preliminary phytochemical analysis, *Ratha Thaila* contains tannins, alkaloids**,** and flavonoids in the methanol extract. These phytochemicals are known to possess significant physiological and pharmacological properties**,** including antioxidant, anti-inflammatory, antibacterial, antiparasitic**,** antiviral, antifungal**,** and antimicrobial activities. Such properties make the oil particularly suitable for the management of *Ratharoga* [10,11].

Table 5: Pharmacological actions according to Ayurveda [12,13]

Ingredient	*Rasa*	*Guna*	*Veerya*	*Vipaka*	*Prabhava*	*Doshanurupa karma*
Hathavariya	*Madhura Tiktha*	*Guru Snigdha*	*Sheetha*	*Madhura*	-	*Vata pitta shamaka*
Murva	*Madhura Tiktha*	*Guru Ruksha*	*Ushna*	*Katu*	-	*Tridosha shamaka*
Ankenda	*Amla Thiktha kashaya*	*Thikshna Ruksha*	*Ushna*	*Katu*	-	*Vata kapha shamaka*
Madatiya	*Thiktha Katu*	*Laghu*	*Sheetha*	*Katu*	-	*Pitta shamaka*

Thembili pol	*Madhura*	*Guru Snigdha*	*Sheetha*	*Madhura*	*Keshya*	*Vata pitta shamaka*

According to the analysis of previous findings, regarding the plant materials presence in the mixture, the highest *Rasa* observed was *Tikta* (bitter), while the lowest *Rasa* was *Kashaya* (astringent). The predominant Guna was *Guru* (heavy), whereas the least expressed *Guna* was *Tikshna* (sharp). The most dominant *Veerya* was *Ushna* (hot potency). According to the textbooks of *Dravyaguna Vijnana,* it has mentioned that *Tiktha rasa* having *Vishaghna* (anti poisonous), *Krimighna* (anthelmintic), *Kandughna* (anti itching), *Kushtaghna* (skin disease resistant actions), *Jwaraghna* (antipyretic), *Lekhana* (removing of unwanted tissue), *Twak mamsaya sthirikarana* (making the skin firm) which are helpful in curing *Rathagaya. Guru guna,* help to pacify the aggravated *Pitta dosha* and *Raktha dhathu* which are most causative for occurring *Ratharoga*. Thus, based on the above findings, it is evident that the prepared *Ratha Thaila* has potential for use in the treatment of *Ratharoga*. However, its efficacy should be confirmed through future clinical studies.

CONCLUSION

The prepared *Ratha Thaila* exhibits favorable organoleptic, physicochemical, and phytochemical properties, including mildly acidic pH, moderate refractive index, and the presence of tannins, alkaloids, and flavonoids. Its *Tikta Rasa, Guru Guna,* and *Ushna Veerya* support its therapeutic potential by pacifying aggravated *Pitta Dosha* and vitiated *Raktha Dhathu*, while providing antioxidant, anti-inflammatory, and antimicrobial effects. These findings suggest that *Ratha Thaila* is suitable for managing *Ratharoga*, although clinical studies are required to confirm its efficacy.

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A COMPARATIVE REVIEW ON PĪNAS TAILA ACCORDING TO ĀYURVEDA AND TRADITIONAL MEDICAL COMPENDIA

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ABSTRACT

Pīnasa is a disorder of the nasal tract described in *Āyurveda* and Sri Lankan Traditional Medicine, clinically comparable to Allergic Rhinitis and Chronic Sinusitis. *Pīnasa* (*Catarrh*) is an inflammatory disease of respiratory mucosa. Some common clinical features of *Pīnasa* include Sneezing, coughing, headache, difficult in swallowing, *Gala, Tālu*, *Oṣṭa Śoṣa* (dryness of throat, palate and lips), loss of taste and also smell, itching in throat and eyes. The studies relieved that the *Pīnasa* has been considered as collective phenomena of *Pratiśya. Sinhala Yoga Ratnakra* has been describing fourteen types of nasal diseases including *Pīnasa*. *Bhaisajya Kalpanā*, the pharmaceutics branch of *Āyurveda*, focuses on preparation and standardization of medicines including *Sneha Kalpanā* (oleaginous formulations). Among these, *Taila Kalpanā* (medicated oils) plays a central role in both internal and external applications. *Pīnas Taila*, specialized medicated oil, is repeatedly cited in both classical *Āyurveda* and Sri Lankan traditional texts. This review comparatively analyzes ten formulations described in nine authoritative compendia using the *Rasādi Pañcaka* framework (*Rasa, Guṇa, Vīrya, Vipāka, and Doṣa Karma*). The findings reveal predominance of *Kaṭu–Tikta Rasa, Laghu–Rūkṣa Guṇa,* and *Uṣṇa Vīrya*, and *Kaṭu Vipāka* across formulations, indicating strong *Kapha vilayana* and *Vāta Śamana* properties. Despite variations in ingredient combinations, a clear therapeutic convergence is observed. Modern pharmacological evidence supports the anti-inflammatory, antimicrobial, and mucolytic activities of frequent used ingredients such as *Zingiber officinale*, *Piper nigrum*, *Allium sativum*, and *Curcuma longa*. This explains the long-standing use of *Pīnas Taila* in *Pīnas Roga* (nasal catarrh), as well as in *Śiro Roga*, *Karṇa Śūla*, and *Akṣi Roga*. This review emphasizes the importance of integrating classical wisdom with modern pharmacological validation. Future work should focus on standardizing preparation methods and conducting controlled clinical trials to strengthen the evidence base.

Keywords: *Pīnas Taila, Pīnas Roga,* Allergic Rhinitis, Sinusitis, *Rasādi Pañcaka, Bhaisajya Kalpanā*

INTRODUCTION

Āyurveda derived from the *Sanskṛt* words '*Āyuṣ'* (life) and '*Veda'* (knowledge), is the science of life [1]. Its origins are traced to divine revelation by *Brahma* and transmission through sages. In Sri Lanka, *Āyurveda* co-exists with a rich traditional system, associated with legendary physicians such as King *Rāvana*. The two systems have influenced each other, creating a hybrid therapeutic culture. Among *Āyurvedic* dosage forms, *Sneha Kalpanā* is regarded as highly effective because lipids are capable of extracting both fat-soluble and water-soluble constituents. *Taila Kalpanā [2]* (medicated oils) is one of the most widely used types of *Sneha Kalpanā*. These oils are employed through *Nasya* (nasal administration), *Abhyanga* (massage), and Oral use.

Most of the Traditional literatures mention about the *Pīnas Tailaya* in different names and also with different *wattoru* (resipes) under name of *pīnas Taila. Pīnas Taila* called as *ratu lūṇu Taila* in *Āyurveda Auṣadha Sangrahaya*. *Pīnas Tailaya* mostly use for treat *Nāsa* Roga (disease of the nose), Apart from that *Pīnas Tailaya* use for treat *karṇa roga* (disease of ear), *Śiro roga* (disease of head*), Akṣi roga* [3] (diseases of the eye) also. Among that *pīnasa roga* is takes first place. In *Āyurveda Auṣadha Sangrahaya* mention that *Pīnas Tailaya* use for all type of *pīnasa Roga* for *Nasya* (drug administration through the nasal route), for *Abhyanga* [4] (oil massage) and also use in internally.

Sinhala Yoga Ratnākara has been described fourteen types of nasal disease including *Pīnasa*. *Pīnasa* (Catarrh) is an inflammatory disease of respiratory mucosa. Some common clinical features of *Pīnasa* include sneezing, coughing, headache, difficult in swallowing, *gala*, *thālu*, *oṣṭa śoṣa* (dryness of throat, palate and lips), loss of taste and also smell, itching in throat and eyes [4]. The studies revealed that the *Pīnasa* has been considered as collective phenomena of *Prathiṣyà*, *Duṣṭa Prathiṣya* and *Apīnasa* in *Āyurveda* medicine [5]. A similarity has been found in etiology, clinical features and treatment strategies in Sri Lankan Traditional Medicine and *Āyurveda* Medicine but type of the disease is varying. *Pīnasa* was classified in to 12 and 19 sub types in Sri Lankan Traditional Medicine while 5 sub types of *Prathiṣya* have been described in *Āyurveda* Medicine. (According to *Susṛta Ācārya* 1. *Vātaja Prathiṣya*, 2. *Pittaja Prathiṣya* 3. *Kaphaja Prathiṣya*, 4. *Sannipàthaja Prathiṣya,* 5. *Rakthaja Prathiṣya*. *Duṣṭa Prathiṣya* [6]. According to *Caraka Ācharya* he is not mention about *Raktaja Prathiṣya*. *Snehana* (oliation), *Swedana* (fomentation), and *Nasya* (inhalation) were mentioned as external treatment modalities in *Āyurveda* medicine while same regimen is mentioned in Sri Lankan Traditional Medicine but in different medical terminologies.

Āyurveda gives vast range of natural remedies for *pīnasa* including various herbs, oils, and formulations as well as the Traditional medicine for centuries. Among the numerous *Āyurveda* and Traditional remedies available, by conducting this review of *Pīnas Taila* in different *Āyurveda* and traditional compendia is there are many recipes (*wattoru*) mention in different Traditional and *Āyurveda* fields.

Although numerous classical and traditional texts describe various formulations of *Pīnas Taila* a systematic comparative analysis based on *Rasādi Pañcaka* highlighting their pharmacodynamics variations and therapeutic convergence has not been sufficiently explored. Therefore, this review attempts to fill this gap by comparatively analysing the formulations across selected compendia.

REASERCH OBJECTIVES

GENERAL OBJECTIVES

To conduct a comparative review of *Pīnas Taila* describe in *Āyurveda* and Traditional Medical Compendia.

SPECIFIC POBJECTIVES

To identify the different formulations mentioned for *Pīnas Taila* in *Āyurveda* and Traditional compendia.

To analyze the pharmacodynamics properties of the ingredients used in different formulations.

To compare Similarities and differences among formulations a cross texts

To evaluate therapeutic relevance based on traditional and modern perspectives.

METHODS AND MATERIALS

A literary review approach was adopted. Primary and Secondary classical text and research articles were reviewed. Primary sources included *Āyurveda Auṣadha Sangrahaya, Siḍḍha Auṣadhawali, Taila Pancha śatakaya, Purāna Rahas Thel Beheth Potha, Mahā Sinhale Thel Beheth Potha, Swadeshi Bhaisajya Viśwakoṣa, Sneha Shathaka, and Yoga Jnana Dīpani.* Secondary sources included *Āyurveda Samīkṣā*, *Bhāva Prakāśa*, *Susṛta Samhitā*, *Aṣtanga Hridaya*, and case reports published in journals. For each formulation, *Rasa*, *Guṇa*, *Vīrya*, *Vipāka*, and *Doṣa Karma* were systematically extracted and comparatively analyzed.

The selected nine compendia were chosen based on their historical authority, inclusion in the Sri Lankan traditional medical curriculum, and their detailed reference to *Pīnas Taila* formulations. Texts without explicit mention of *Pīnas Taila* were excluded from this comparative review.

RESULTS AND DISCUSSION

The findings demonstrate that *Pīnas Taila* is consistently positioned as a remedy for *Pīnas Roga* (catarrh and nasal disorders). *Āyurveda* medical system and Traditional medical system both mention this oil preparation in their texts. From that text, they mention different formulas as *Pīnas Taila*.

TABLE I - *RASĀDĪ PAÑCAKA* OF EACH INGREDIENT OF *PĪNAS TAILA* ACCORDING TO *ĀYURVEDA AUṢADHA SANGRAHAYA* [7][8][9][10][11]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Karma*
Inguru	*Kaṭu* (Pungent)	*Laghu*(light), *Snigdha* (Unctuous)	*Uṣṇa* (Hot)	Madhura (Sweet)	*Anulomana*,*Vātak apha paha*,*Dãpana*, *Hṛdya*

Gammiris	*Kaṭu* (Pungent)	*Laghu*(light), *Tīkṣṇa* (Piercing), *Sūkṣma* (Enter deep and minute body chanel)	*Uṣṇa* (Hot)	*Kaṭu* (pungent)	*Śvāsahara,Kaphahara*
Thippili	*Kaṭu* (Pungent)	*Laghu* (Light)	*Uṣṇa* (Hot)	*Kaṭu* (Pungent)	*Dãpana* (Digestive)
Kaluduru	*Tikta* (Bitter)	*Laghu* (Light)	*Uṣṇa* (Hot)	*Kaṭu* (Pungent)	*Kaṇdugna* (Relives itching)
Karabunati	*Kaṭu* (Pungent), *Tikta*(bitter)	*Laghu* (Light), *Snigdha*(unctuous), *Tīkṣṇa*	*Śīta* (Cool)	*Kaṭu* (Pungent)	*Kapha pitta hara*
Wasà wàsi	*Tikta* (Bitter), *Kaṭu* (Pungent)	*Laghu* (Light), *Snigdha* (Unctuous)	*Uṣṇa* (Hot)	*Kaṭu* (Pungent)	*Kāsahara*, *Śvāsahara. Hṛdya*
Sàdikkà	*Tikta* (Bitter), *Kaṭu* (Pungent)	*Laghu* (Light), *Snigdha* (Unctuous)	*Uṣṇa* (Hot)	*Kaṭu* (Pungent)	*Kāsahara*, *Śvāsahara. Hṛdya*
Såduru	*Madhura* (Sweet)	*Laghu* (Light)	*Uṣṇa* (Hot)	*Madhura* (Sweet)	*Dīpana* (Appetizer) *Pācana* (Digestive)
Perunkàyam	*Kaṭu* (Pungent)	*Guru* (Heavy) *Rūkṣa* (Dry)	*Uṣṇa* (Hot)	*Kaṭu* (Pungent)	*Vātahara* (Allivates vāta)
Ratu lūnu	*Madhura*	*Guru*, *Snigdha*, *Tīkṣṇa*	*Uṣṇa*	*Madhura*	*Kapha nissāraka*, *Vāta Śāmaka*
Tala	*Madhura*	*Guru*, *Snigdha*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*

Siddha Auṣadhāwali and other traditional texts add herbs like *Katurumuruñgā*, *Ranawarā,* and *Komārikā*, expanding the scope of action to include eye and head diseases.

TABLEII- RASĀDĪ PAÑCAKA OF EACH INGREDIENT OF PĪNAS TAILA ACCORDING TO SIDDHA AUṢADHĀWALI [13][8][9][10][11][12]

Dravya	*Rasa*	*Guṇa*	*VĪrya*	*Vipāka*	*Doṣa karma*
Katurumurungā (Sefbania grandiflora)	*Tikta*	*Laghu, Rūkṣa*	*Śīta*	*Kaṭu*	*Kaph piitta Śāmaka.*
Ranawara (Cassia auriculata)	*Kaṣāya Tikta*	*Laghu, Rūkṣa*	*Śīta*	*Kaṭu*	*Kapha pitta Śāmaka.*
Kãkirindiya (Eclipta prostrata)	*Kaṭu Tikta*	*Rūkṣa, laghu*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Watake Aralu (Pandanus kaida)	*Tikta, Madhura, Kaṭu*	*Laghu, Snigdha*	*Anuṣṇa*	*Kaṭu*	*Kapha pitta Śāmaka*

Siyambalà	*Madhura, amla*	*Guru, Rūkṣa*	*Uṣṇa*	*Amla*	*Kapha Vāta hara*
Lunuvila (Bacopa monnieri)	*Tikta*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Nāśaka,*
Amu Inguru	*Kaṭu (*Pungent*)*	*Laghu(*light*), Snigdha (*unctuous*)*	*Uṣṇa (*Hot*)*	*Madhura*Sweet*)*	*Anulomana, Vāta kaphahara, Dãpana,Hridya*
Kaha (Curcuma longa)	*Kaṭu, Tikta.*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Vāta kapha hara.*
Dodam (Citrus aurantium)	*Amla*	*Guru, Tãkùõa*	*Uṣṇa*	*Amla*	*Kapha Vāta Śāmaka.*
Dehi (Citrus aurantifolia)	*Amla*	*Laghu*	*Uṣṇa*	*Madhura*	*Kapha Vāta Śāmaka, Kapaha nissàraka.*
Kapparavalliya (Plectranthus amboinicus)	*Kaṭu Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta kapha hara.*
Ratu lūnu (Allium cepa)	*Madhura*	*Guru, snigdha, Tīkṣṇa*	*Uṣṇa*	*Madhura*	*Kaphanissraka, Vāta shamana*
Nika (Vitex nigundo)	*Tikta, Kaṭu, Kaṣāya*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Beli (Aegle marmelos)	*Kaṣāya Tikta*	*Rūkṣa, Laghu*	*Uṣṇa*	*Kaṭu*	*Kapha Śāmaka*
Goat milk	*Madhura, Kaṣāya*	*Laghu*	*Śīta*		*Kapha Vāta Śāmaka*
Sesame oil (Sesamum indicum)	*Madhura*	*Guru, Snigdha*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*
Gammiris	*Kaṭu*	*Laghu(*light*), Tīkṣṇa (*Piercing*), Sūkṣma(*Enter deep and minute body channel*)*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Aba (Brassica juncea)	*Kaṭu Tikta.*	*Tīkṣṇa, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka, pitta vardaka.*
Wada kaha (Acorus calamus)	*Tikta, Kaṭu*	*Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha hara, Vāta Śāmaka*
Sudulūnu (Allium sativum)	*Madhura, Amla, Lavana, Kaṭu*	*Snigdha, Tīkṣṇa, Piccila, Guru, Sara.*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka, pitta kophakāra.*
Kaluduru(Carmum carvi)	*Kaṭu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*

Sududuru (Cuminum cyminum)	*Kaṭu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara, Pitta Vardaka.*
Enasāl (Elettaria cardamomum)	*Kaṭu, Tikta.*	*Laghu, Rūkṣa.*	*Uṣṇa*	*Kaṭu*	*Tridoṣahara.*
Asamodagam (Trachyspermum involucratum)	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vàta Śāmaka.*
Welmee (Glycyrrhiza glabra)	*Madhura*	*Guru, Snigdha*	*Śīta*	*Madhura*	*Vāta pitta hara*
Savandarā (Vetiveria zizanioides)	*Tikta, Madhura.*	*Rūkṣa, Laghu.*	*Śīta*	*Kaṭu*	*Kapha and Pitta Śāmaka.*
Gugul (Commiphora mukul)	*Tikta, Kaṭu, Madhura, Kaṣāya*	*Laghu, Tīkṣṇa, Snigdha, Picchila, Sūkṣma, Sara*	*Uṣṇa*	*Kaṭu*	*Tridoṣahara*

TABLE III- *RASĀDĪ PAÑCAKA* OF EACH INGREDIENT OF *PĪNAS TAILA* ACCORDING TO *TAILA PAÑCAŚATAKAYA* [14][8][9][10][11][12]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa karma*
Kaṭuvelbaṭu	*Kaṭu, tikta*	*Laghu, Rūkṣa,Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Vadakaha	*Tikta, Kaṭu*	*Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha hara, Vāta Śāmaka*
Gammiris	*Kaṭu*	*Laghu(*light*), Tīkṣṇa (*Piercing*),Sūkṣma (*Enter deep and minute body channel*)*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Thippili	*Kaṭu*	*Laghu*	*Uṣṇa*	*Kaṭu*	*Vāta kapha Śāmaka*
Inguru	*Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Madhura*	*Anulomana, Vāta kaphahara Dīpana,Hṛdya*
Tala	*Madhura*	*Guru, Snigdha*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*

In this book, in addition to *Pīnas Taila, Sulu Pīnas Taila and Podi Pīnas Taila* are also mentioned. *Purāna Rahas Tel Beheth Potha* [15] emphasizes combinations with cow's milk and ghee, shifting the balance slightly toward nourishing and cooling properties.

TABLE IV- *RASĀDĪ PAÑCAKA* OF EACH INGREDIENT OF *PĪNAS TAILA* ACCORDING TO *PURĀNA RAHAS TEL BEHETH POTHA*[15][8][9][10][11]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa karma*
Nika	*Tikta, Kaṭu,Kaṣāya*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Dehi ambul	*Amla*	*Laghu*	*Uṣṇa*	*Madhura*	*Kaph Vāta Śāmaka, Kapaha Nissaraka.*
Mukuṇuwenna	*Tikta, Kaṣāya, Madhura*	*Lagu*	*Śīta*	*Kaṭu*	*Kapha pitta Śāmaka.*
Rathulūnu	*Madhura*	*Guru, Snigdha, Tīkṣṇa*	*Uṣṇa*	*Madhura*	*Kapha Nissraka, Vāta Śāmaka*
Tala	*Madhura*	*Guru, Snigdha*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*
Ghithel	*Madhura*		*Śīta*		*Vāta kapha hara*
Cow;s milk	*Madhura*	*Mrudhura, Snigdha, Bahala, Ślakṣṇa, Guru, Piccila, Manda*	*Śīta*	*Madhura*	*Vāta pitta hara, kaphakāra*

***TABLE V-- RASĀDĪ PAÑCAKA OF EACH INGREDIENT OF PĪNAS TAILA ACCORDING TO MAHÀ SINHALE TEL BEHETH POTA* [16][8][9][10][11][12]**

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa Karma*
Mukuṇuwenna	*Tikta, Kaṣāya, Madhura*	*Laghu*	*Śīta*	*Kaṭu*	*Kapha Pitta Śāmaka*
Hātavāriya	*Madhura Tikta*	*Guru, Snigdha*	*Śīta*	*Madhura*	*Vātapitta Śāmaka,kapha Vardhaka*

Olinda	*Tikta, Kaṣāya*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Tridoùahara*
Komàrikà	*Tikta, Kañu*	*Guru, Snigdha, Piccila*	*Śīta*	*Kaṭu*	*Tridoùahara*
Tala	*Madhura*	*Guru, Snigdha*	*Uṣṇa*	*Madhura*	*VātaŚāmaka*
kaluduru	*Kañu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha VātaŚāmaka*
Sududuru	*Kañu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*KaphaVāta Śāmaka*
Sudulånu	*Madhura, Amla, Lavana, Kañu*	*Snigdha, Tīkṣṇa, Piccila, Guru, Sara*	*Uṣṇa*	*Kaṭu*	*Kapha VātaŚāmaka, Pitta kophakara.*
Thippili	*Kañu*	*Laghu*	*Uṣṇa*	*Kaṭu*	*Vātakapha hara*
Asamodagam	*Kañu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha VātaŚāmaka.*
Kottamalli	*Kaṣāya, Tikta*	*Laghu, snigdha*	*Uṣṇa*	*Madhura*	*Tridoùhara*
Kurundu	*Kañu, Tikta, Madhura*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha VātaŚāmaka*
Aralu	*Kaṣāya, Kaṭu,Amla , Tikta*	*Laghu, Rūkṣa*	*Uṣṇa*	*Madhura*	*Tridoùahara*
Miris	*Kaṭu*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Inguru	*Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Madhura*	*Anulomana, Vāta Kaphahara,Dīpana,Hridya*
Aba	*Kaṭu, Tikta.*	*Tīkṣṇa, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka, Pitta Vardaka.*

Swadeśī Baisajya Wiśwakoṣa mention*5 types of Pīnas Taila*. Apart from that it metion *Nandanādī Pīnas Taila, Pīnas ratnāddḍ Taila, Pīnas Dūma* are mentioned [17].

TABLEVI- *RASĀDĪ PAÑCAKA* OF *PÃNAS TAILA* NO 1 ACCORDING TO *SWADEṢĪ BAISAJYA WIŚWAKOṢA* [17][8][9][10][11][12]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa karma*
Siviya	*Kaṭu*	*Rūkṣa, Laghu*	*Uṣṇa*	*Kaṭu*	*Kapha Vàta Śāmaka, Pitta Vadhaka*
Savandara	*Tikta*	*Śīta, Laghu*			
Sapsanda	*Kaṭu, Tikta, Kaṣāya*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Tridoùahara*
Kudu mirissa	*Tikta*	*Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Tridoùahara*
Beli	*Kaṣāya, Tikta*	*Rūkṣa, Laghu*	*Uṣṇa*	*Kaṭu*	*Kapha Śāmaka*
Haran kaha	*Kaṭu, Tikta*	*Laghu, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta kapha har*
Pol	*Madhura*	*Guru Snigdha*	*Śīta*	*Madhura*	*Vāta Pitta hara*
Inguru	*Kaṭu*	*Laghu,Snigdha*	*Uṣṇa*	*Madhura*	*Anulomana, Vāta Kaphahara.*
Gammiris	*Kaṭu*	*Laghu(*light*), Tīkṣṇa (P*iercing,*Sūkṣma(*Enter deep and minute body channel*)*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Sudulånu	*Madhura, Amla, Kaṭu, Lavana*	*Guru, Snigdha, Tīkṣṇa, Sara, Piccila*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka, Pitta kopakara*
Aba	*Kaṭu, Tikta.* .	*Tīkṣṇa, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka, Pitta Vardaka*
Vadakaha	*Tikta, Kaṭu*	*Tãkùõa*	*Uṣṇa*	*Kaṭu*	*Kapha hara, Vāta Śāmaka*
Suduru	*Kaṭu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Kaluduru	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*

Asamodagam	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta kapha hara*
Valangasahal	*Kaṭu, Kaṣāya*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Uluhāl	*Kaṭu, Tikta*	*Laghu, Snigdha, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Devadāra	*Kaṭu, tikta*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Vāta kaph Śāmaka*
Sādikkā	*Tikta, Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Kāsahara, Śvāsahara.* *Hridya*
Aralu	*Kaṣāya, Kaṭu,Amla, Tikta*	*Laghu, Rūkṣa*	*Uṣṇa*	*Madhura*	*Tridoṣa hara*
Bulu	*Kashaya*	*Laghu, Rūkṣa*	*Uṣṇa*	*Madura*	*Kapha Pitta Śāmaka*
Nelli	*Madhura, Amla, Lavana, Kaṭu, Tikta, Kaṣāya*	*Laghu, Rūkṣa*	*Śīta*	*Madhura*	*Tridoṣa hara*
Tala	*Madhura*	*Guru, Snigdha.*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*
Endaru	*Madhura*	*Snigdha*	*Śīta*		*Kapha Vāta Śāmaka*
Elangi Tel	*Madhura*	*Snigdha,*	*Śīta*		*Vāta kapha Śāmaka*

TABLE VII- *RASĀDĪ PAÑCAKA* OF *PĀNAS TAILA* NO 2 ACCORDING TO *SWADEŚĪ BAISAJYA WIŚWAKOṢA*[17][8][9][10][11][12]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa karma*
Varā	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta Kapha hara*
Dummalla	*Tikta*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Tridosha Śāmaka*
Karanda	*Tikta, Kaṭu, Kaùàya*	*Laghu, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*

Pol	*Madhura*	*Guru snigdha*	*Śīta*	*Madhura*	*Vāta pitta hara*
Suduru	*Kaṭu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Kaluduru	*Kaṭu, Tikta*	*laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Asamodagam	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta Kapha hara*
Thippili	*Kaṭu*	*Laghu*	*Uṣṇa*	*Kaṭu*	*Vāta Kapha hara*
Karabu nati	*Kaṭu, Tikta*	*Laghu,Snigdha, Tīkṣṇa*	*Śīta*	*Kaṭu*	*Kapha Pitta hara*
Sādikka	*Tikta, Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Kāsahara,Śvāsahara. Hṛdya*
Wasāwāsi	*Tikta, Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Kāsahara,Śvāsahara. Hṛdya*
Valmee	*Madhura*	*Guru, Snigdha*	*Śīta*	*Madhura*	*Vāta Pitta hara*
Gammiris	*Kaṭu*	*Laghu(light),* *Tīkṣṇa (Piercing,Sūkṣma(Enter deep and minute body channel)*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Inguru	*Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Madhura*	*Anulomana, Vāta Kaphahara.*
Vada kaha	*Tikta, Kaṭu*	*Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha hara, Vāta Śāmaka*
Tala	*Madhura*	*Guru, Snigdha.*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*
Endaru	*Madhura*	*Snigdha*	*Śīta*		*Kapha Vāta Śāmaka*
Aba	*Kaṭu, Tikta. .*	*Tīkṣṇa, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka, Pitta Vardaka*
Mee	*Madhura, Kaśāya*	*Guru, Snigdha*	*Śīta*	*Madhura*	*Vāta Pitta Śāmaka*
Kohomba	*Tikta, Kaśāya*	*Laghu, Rūkṣa*	*Śīta*	*Kaṭu*	*Pitta kapha hara*

TABLE VIII- RASĀDĪ PAÑCAKA OF PĀNAS TAILA NO 3 ACCORDING TO SWADEŚĪ BAISAJYA WIŚWAKOṢA [17][8][9][10][11][12]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa Karma*
Beli	*Kaśāya, Tikta*	*Rūkṣa, Laghu*	*Uṣṇa*	*Kaṭu*	*Kapha Śāmaka*
Yakinaran					*Kapha Vāta Śāmaka*
Sapu	*Tikta, Kaṭu, Kaśāya*	*Lahgu, Rūkṣa*	*Śīta*	*Kaṭu*	*Tridoùa Śāmaka*
Erabadu	*Tikta, Kaṭu*	*Laghu*	*Uṣṇa*	*Kaṭu*	*Tridoùa Śāmaka*
Na	*Kaśāya, Tikta*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Pitta Śāmaka*
Haran kaha	*Kaṭu, Tikta*	*Laghu, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta kaphahara*
Kaluwa ala	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Inguru	*Kaṭu*	*Laghu,Snigdha*	*Uṣṇa*	*Madhura*	*Anulomana, Vāta Kaphahara.*
Nelli	*Madhura, Amla, Lavana, Kaṭu, Tikta, Kaśāya*	*Laghu, Rūkṣa*	*Śīta*	*Madhura*	*Tridoṣahara*
Aralu	*Kaśāya, Kaṭu,Amla, Tikta*	*Laghu, Rūkṣa*	*Uṣṇa*	*Madhura*	*Tridoṣahara*
Asamodagam	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Vāta Kaphahara*
Pol	*Madhura*	*Guru snigdha*	*Śīta*	*Madhura*	*Vāta Pittahara*
Walangasahal	*Kaṭu Kaśāya*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Athividayan	*Kaṭu, Tikta*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Tridoṣā Śāmaka*
Kaluduru	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Sūduru	*Kaṭu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Sādikka	*Tikta, Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Kāsahara,Śvāsahara Hṛdya*

Devadāra	*Kaṭu, Tikta*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Vāta Kaph Śāmaka*
Tala	*Madhura*	*Guru, Snigdha.*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*
Mee	*Madhura, Kaśāya*	*Guru, Snigdha*	*Śīta*	*Madhura*	*Vāta Pitta Śāmaka*
Edaru	*Madhura*	*Snigdha*	*Śīta*		*Kapha Vāta Śāmaka*
Kohomba	*Tikta, Kaśāya*	*Laghu, Rūkṣa*	*Śīta*	*Kaṭu*	*Pitta Kaphahara*

TABLE IX- RASĀDĪ PAÑCAKA* OF *PĀNAS TAILA* NO 4 ACCORDING TO *SWADEŚĪ BAISAJYA WIŚWAKOṢA [17][8][9][10][11][12]

Dravya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa Karma*
Rathu lūnu	*Madhura*	*Guru, Snigdha, Tīkṣṇa*	*Uṣṇa*	*Madhura*	*Kapha Nissraka, Vāta Śāmaka*
Thala	*Madhura*	*Guru, snidha.*	*Uṣṇa*	*Madhura*	*Vāta Śāmaka*
Inguru	*Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Madhura*	*Anulomana, Vāta kaphahara.*
Perunkayam	*Kaṭu (Pungent)*	*Guru (Heavy), Rūkṣa (Dry)*	*Uṣṇa (Hot)*	*Kaṭu (Pungent)*	*Vāta hara (Allivates vaata)*
Kaluduru	*Kaṭu, Tikta*	*Laghu, Rūkṣa, Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Sududuru	*Katu*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta Śāmaka*
Karabu nati	*Kañu, Tikta*	*Laghu,snigdha, Tīkṣṇa*	*Śīta*	*Kaṭu*	*KaphaPitta hara*
Gammiris	*Kaṭu*	*Laghu(light), Tīkṣṇa (Piercing, Sūkṣma (Enter deep and minute body chanel)*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Thippili	*Kaṭu*	*Laghu*	*Uṣṇa*	*Kaṭu*	*Vāta Kapha hara*
Sadikka	*Tikta, Kaṭu*	*Laghu, Snigdha*	*Uṣṇa*	*Kaṭu*	*Kāsahara,Śvāsahara Hridya*

Walmee	*Madhura*	*Guru, snigdha*	*Śīta*	*Madhura*	*Vāta Pittahara*
Ghee	*Madhura*	*Snigdha,*	*Śīta*		*Vāta Kapha Śāmaka*

TABLE X- *RASĀDĪ PAÑCAKA* OF *PĪNAS TAILA* NO 5 ACCORDING TO *SWADEŚĪ BAISAJYA WIŚWAKOṢA* [17][8][9][10][11][12]

Drvya	*Rasa*	*Guṇa*	*Vīrya*	*Vipāka*	*Doṣa Karma*
Nika	*Tikta, Kaṭu, Kaśāya.*	*Laghu, Rūkṣa*	*Uṣṇa*	*Kaṭu*	*Kapha Vāta hara.*
Dehi	*Amla*	*Laghu*	*Uṣṇa*	*Madhura*	*Kaph Vāta Śāmaka, Kapaha Nissaraka.*
Rathulūnu	*Madhura*	*Guru, Snigdha, Tīkṣṇa*	*Uṣṇa*	*Madhura*	*Kapha Nissraka, Vāta Śāmaka*
Gow's milk	*Madhura*	*Mrudhu, Snigdha, Bahala, Ślakṣṇa, Guru, Piccila, Manda*	*Śīta*	*Madhura*	*Vāta Pitta hara, Kaphakara*
Ghee	*Madhura*	*Snigdha,*	*Śīta*		*Vāta Kapha Śāmaka*
Mukuṇuwenna	*Tikta, Rūkṣa, Madhura*	*Laghu*	*Śīta*	*Kaṭu*	*Kapha pitta Śāmaka*
Wada kaha	*Tikta, Kaṭu*	*Tīkṣṇa*	*Uṣṇa*	*Kaṭu*	*Kaphahara, Vāta Śāmaka*

Pīnas Taila is mentioned in the book called as *Sneha Śataka* [18]. The ingredients related to it are the same as the ingredients in *Āyurveda Auṣaḍha Sangrahaya.* But in addition to those ingredients, *Mee (Madhuca longifolia)* is mentioned in the book of *Sneha Śataka. PīnasTaila* also mentioned in the book *Yoga Jnāna Dīpani* [19]. But the ingredients mentioned in it are the same as the ingredients mentioned in *Āyurveda Auṣaḍha Sangrahaya.* Based on the properties outlined above, *PīnasTaila* is beneficial for the management of *PīnasRoga*.

Aacross different *Āyurveda* and Traditional Medical Compendia, *Pīnas Taila* formulations show a strong Pharmacodynamic convergence despite vatiations in ingredients and preparation methods.

A detailed comparative analysis reveals that most formulations consistently contain *Kaṭu* and *Tikta Rasa*, *Laghu* and *Rūkṣa Guṇa*, *Uṣṇa Vīrya*, and *Kaṭu Vipāka.* These Properties collectively contribute to *Kapha-Vāta* alleviation, which is the primary pathological basis of *Pīnasa*. From a modern scientific perspective key ingredients such as *Zingiber officinale* (Ginger), *Piper nigrum* (Black Pepper), *Curcuma longa* (Turmeric), and *Allium sativum* (Garlic) contain bioactive compounds like piperine, curcumin, and allicin. These compounds exhibit anti-inflammatory, antimicrobial, antioxidant, and mucolytic effects. Such properties provide scientific plausibility for the traditional use of Pīnas Taila in conditions analogous to Allergic Rhinitis and Sinusitis.

Despite variations in ingredients, all recipes converge on treating *Vāta-Kaphaja* nasal disorders.

Tables summarizing the *Rasādi Pañcaka* of different formulations reveal striking overlaps. Some text describes variation in the *Drava dravya* used in preparation, including *Swarasa* (fresh juice), *Kvātha* (decoction), and *Ksheera* (milk). Also most recipes use Sesame oil as a base, while some employ additional oils like Castor oil or Neem oil. Certain formulations also incorporate Ghrita, suggesting nutritional and cooling modulation in pitta associated presentations. Traditional Sri Lankan versions frequently add locally available herbs, reflecting adaptation to regional flora. The therapeutic convergence lies not in identical recipes but in consistent pharmacodynamic targeting of *Kapha* and *Vāta doṣa*. Clinical studies, though limited, suggest positive outcomes when traditional oils are applied via *Nasya* or *Abhyanga* [20] for Sinusitis and Allergic Rhinitis. This calls for well-designed trials to substantiate efficacy.

According to *Āyurveda Auṣadha Sangrahaya*, the preparation of medicated oils (*Taila kalpanā*) follows the classical principles of *Sneha Kalpanā*. In this pharmaceutical process three main components are involved: *Sneha Dravya* (based oil), *Kalka dravya* (herbal paste) and *Drava dravya* (liquid medium). Generally *Tila Taila* (sesame oil) is used as the sneha dravya due to its ability to absorbed and retain the therapeutic properties of medicinal substances.

TABLE XI- COMPARISION OF SNEHA DRAVYA, KALKA DRAVYA AND DRAVA DRAVYA
[7][13][14][15][16][17]

Text	*Sneha dravya*	*Kalka dravya*	*Drava dravya*
1) *Āyurveda Auṣadha Sangrahaya*	*Tila Taila*	*Inguru, Gammiris, Thippili, Kaluduru, Karābu nati, Wasāwasi, Sādikka, Suduru,Perunkāyam*	*Rathu lūnu Swarasa*
2) *Siḍḍha Auṣadhawali*	*Tila Taila*	*Inguru, Gammiris ,Aba, Wada kaha ,Sudulūnu, Kaluduru, Valmolagu, Enasāl, Viyali dehi leli Dodam leli ,Asamodakam, Walmee ,Savandara, Gugul,Kattakumanjal*	*Kathurumurunga, Ranawarā, Keekrindiya, Vatake aralu, Lunuvila , Siyambala pothu, Amu ingurur, Amu kaha, Dehi leli, Dodam leli Kpparawalliya, Rathulūnu, Nika pothu ,Beli kola ,*

			Goat milk
Taila Pancha śatakaya	*Tila Taila*		*Katuwelbatu mul Wadakaha, Gammiris, Thippili, Viyali inguru, Mirikulu, Daththala, Sahinda lunu.*
Purāna Rahas Thel Beheth Potha	*TilaTaila Ghitel*	*Wada kaha*	*Nika kola yuṣa,Yakwanassa kola yuṣa, Dehi ambul,Mukunuwanna kola yuṣa, Rathulunu yuṣa , Cow's milk*
Mahā Sinhale Thel Beheth Potha	*Thala thel*	*Kaluduru,Sududuru, Sudulūnu, Thippili, Asamodagam, Kottamalli, Kurundu pothu,Aralu, Inguru, Miris, Aba*	*Mukunuwenna mul, Hathawariya mul, Olinda mul ,Komārika*
Swadeshi Bhaisajya Viśwakoṣa	*Thala thel, Endaru thel, Elangi thel*	*Inguru, Gammiris, Sudulūnu, Aba, Wadakaha , Suduru, Kluduru, Asamodagam, Walagasahal, Uluhal, Dewadara, Sadikka, Aralu,Bulu, Nelli*	*Siviya mul,Savandara mul, Sathsanda mul, Kudu miris mul,Beli mul,Haran kaha, Scraped coconut*

Prior to the preparation of medicated oils, the base oil may undergo a preliminary processing metehod known as *Taila Mūrchana* [7]. This process help to remove undesirable odor, improve the quality and stability of the oil, and enhance its therapeutic potency.

During the preparation process, the selected herbal ingredients are cleaned and ground into a fine paste (*Kalka*). The *Kalka* is then mixed with the *Sneha Dravya* together with a suitable liquid medium such as *Svarasa*, Herbal decoction or other liquids. The mixture is heated slowly with continuous stirring until the required stage of *Sneha Pāka* is achievd.

According to classical description, *Sneha Pāka* can be categorized into three stages: *Mṛdu Pāka*, *Maddhya Pāka* and *Khara Pāka*. Among these, *Madhyama Pāka* is generally considered the most suitable stage for therapeutic oil preparations because it ensures proper extractionof the active principles of the herbal ingredients into the oil medium. The characteristics of these stages can be identified mainly by observing the condition of the *Kalka* and the oil, asa shown in the following table.

TABLE XII - SNEHA PĀKA LAKṢAṆA [7]

Pāka Avasthā	*Kalka Lakṣaṇa*
Mṛdu Pāka	*Kalka* remainins soft and slightly moist, when pressed a small amount of oilmay come out.

Madhyama Pāka	*Kalka* become soft but non-sticky and can be rolled into a wick like form (*Varti*), no oil comes out when pressed
Khara Pāka	*Kalka* become dry, rough and hard

These classical pharmaceutical principles are widely applied in the preparation of various medicated oils described in *Āyurveda* literature.

Although this study discussed in sveral different formulations of *Pīnas Taila* described in several *Āyurveda* and Traditional compendia, the general pharamaceutical method of oil preparation described abaove is based specifically on the explanation provide in *Āyurveda Auṣadha Sangrahaya*.

CONCLUSION

This review synthesizes data from *Āyurveda* and Sri Lankan traditional texts to provide a consolidated view of *Pīnas Taila*. The pharmacodynamic analysis confirms that across variations, *Kaṭu Rasa, Laghu Guṇa*, and *Uṣṇa Vīrya* dominates, explaining its efficacy in *Vāta-Kaphaja* disorders. Differences in formulations reflect local adaptations and available herbs, yet therapeutic convergence remains strong. *Pīnas Taila*'s primary indication is *Pīnas Roga*, but secondary uses include Headache, Ear Pain, and Eye Conditions. The evidence strongly suggests that *PīnasTaila* is an important contribution of traditional pharmaceutics with contemporary relevance. Based on ingredient recurrence and pharmacodynamic strength, the formulation described in *Āyurveda Auṣadha Sangrahaya* may be considered a practical reference model for standardization, as it balances potency and classical authority. Future research should focus on pharmaceutical standardization, safety evaluation, and controlled clinical trials to strengthen evidence-based integration.

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A SYSTEMATIC REVIEW OF VICHARCHIKA IN AYURVEDA

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I.A.M. Leena

ABSTRACT

Kushtha Roga (skin diseases) are considered challenging, and frequently incurable conditions. *Vicharchika*, classified under *Kshudra Kushtha Roga* (minor skin diseases), is identified as a specific type of *Kushtha* that closely resembles eczema as understood in allopathic medicine. This literature review study was conducted according to the PRISMA method using authentic Ayurveda texts and Google Scholar and PubMed online research articles. The selected time frame is from 2015 to 2025, with the finally chosen 16 records eligibility as the inclusion criteria and final report included 16 records of data. According to classical Ayurvedic texts, *kushtha* arises from multiple causative factors, including improper dietary habits, misconduct, excessive physical activities, and inappropriate purification therapies (*Shodhana*). According to ancient texts and research articles, t*ridosha* manifested symptoms had *Vichrachika* although Charaka Acharya and Vagbhata Acharya said *kapha dosha* predominant, Sushruta Acharya said *vata dosha* are predominant and, *Kashyapa* said *pitta dosha* is predominant, and also according to *Madhawa kapha* and *vata dosha* are predominant. *Vicharchika*'s main symptoms are *kandu* (itching)*, pidaka* (papuules)*, shyawa warna* (black color discoloration)*, raajyah* (crack striae or lines), *ruja* (pain)*, ruksha* (dry), *bahu srava* (excessive discharge)*,* and *daha* (burning sensation). Common etiology is vitiated *sapta dravya* such as *tri dosha* and *rasa, rakta, mamsa* and *ambu*. Vitiated *dosha* caused by *agnimandya*, and that leads to the formation of vitiated *dushya* such as *rasa, rakta, mamsa,* and *ambu*, vitiated *srotas*, and that invades the skin leads to *Vicharchika* symptoms occurred. According to the main results, comparatively, *Vicharchika* symptoms and etiopathogenesis are similar to each other in texts and, some symptoms were deviated.

Key words: *Kushta Roga, Vicharchika*, etiopathogenesis, PRISMA

INTRODUCTION

Vicharchika (Eczema) is a one type of skin disease and it's comparable to eczema in allopathic medicine. (1) Mostly which its onset in infancy and childhood.(1) At the present life style changes, environmental factors, bad food habits, insanitary conditions of life, and various drugs consumption caused to eczema increased in globally.(2) This article consists of literature reviews of *Vicharchika* in Ayurveda.

OBJECTIVES

1. To define etiopathogenesis of *Vicharhika*.
2. To compare clinical features of *Vicharchika* in Ayurveda

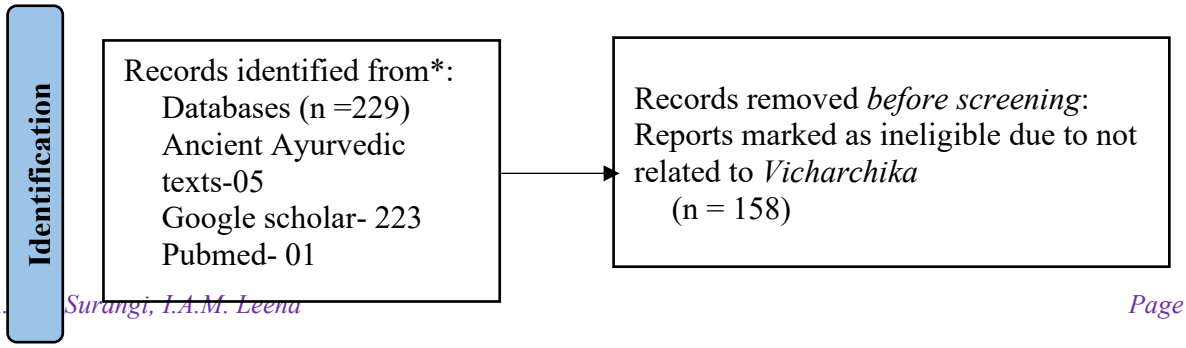
METHODOLOGY

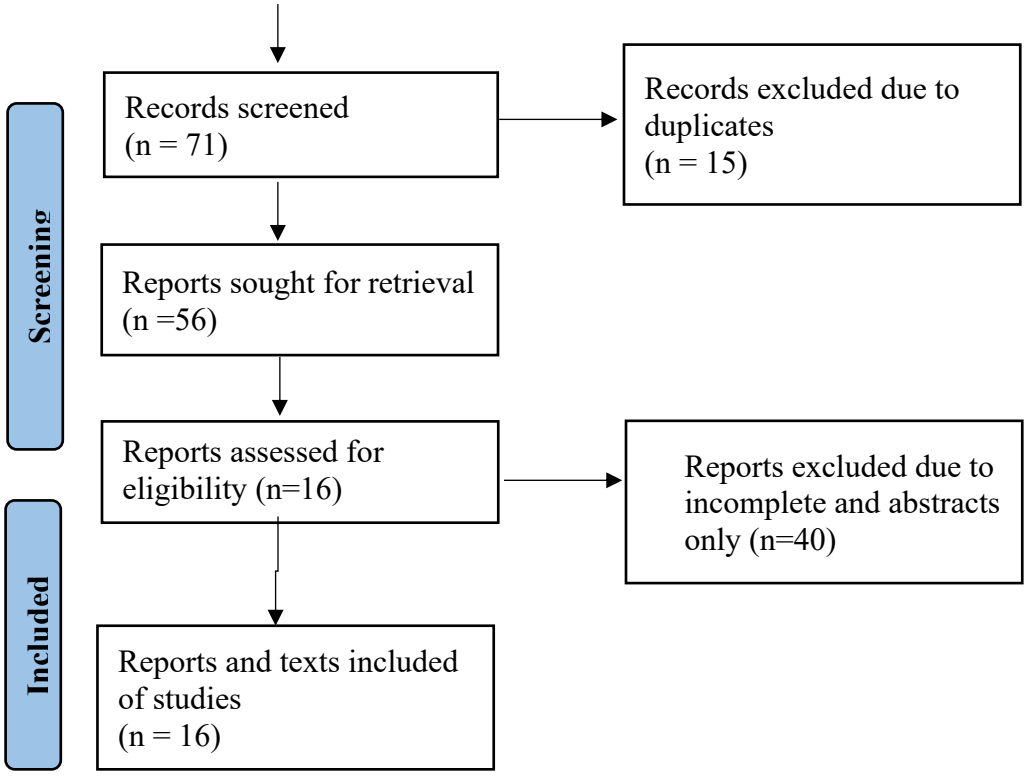
This systematic review was conducted using PRISMA methodology. Meaning of PRISMA process is Preferred Reporting Items for Systematic Reviews and Meta-Analysis.(3) This methodology included four steps such as, identified records, screening of records, removed duplicates, full text screening, and final data included reports writing. (3) Data collected from Ayurvedic main texts and Google Scholar and, PubMed websites from 2015 and 2025 published journal articles in English. Studies conducted only children; and a focus on etiopathogenesis, and symptoms of *Vicharchika*.

As well as adult population involved case studies, and abstracts excluded this study and removed duplicate papers and also screened out *Vicharchika*-not-related papers and incomplete papers. Key words were "*Vicharchika*", "etiopathogenesis', "symptoms", and "*samprapthi*" and a total of 229 records were found. At the results, repots marked as ineligible due to not related childhood and *Vichrchika* and 158 reports removed, 15 papers were removed as duplicates, and 56 papers were screened and 40 papers removed due to incomplete and abstract only papers. The final study included 16 number of data records but final report included 11 completed research papers and 05 main Ayurvedic texts only. Main texts such as Charaka Samhita, Sushruta Samhita, Ashtanga Samgraha, *Kashyapa Samhita, and Madhawa Nidana*.

RESULTS

Identification of studies via databases and Ayurvedic Texts





(Figure 1- PRISMA Methodology)

Vicharchika (Eczema) in Ayurveda

In Ayurveda classics, *Vicharchika* is described under *Kushta Roga* (Skin Diseases) which *Kushta Roga* considered as *Mahagada* (great dreadful diseases or incurable diseases) in Ayurveda. (4, 5) correspondingly, also it is classified as one of the "*Ashta Mahagada*" (Eight incurable diseases) (4, 6). *Kushta* is mainly divided into *Kshudra Kushta* and *Maha Kushta* (Major skin diseases), which are further classified as seven types of *Maha Kushta* and eleven types of *Kshudra Kushta,*.(7)

Table 1- Causes of *Kushta* in Ayurveda (8, 9, 10, 11)

Ahara (Food)	*Viharana* (Life style)	Others
Excessive intake of *viruddha* (opposite), *vidahi (burning sensation)*, *guru* (heavy), *snigdha* (unctuous), *drava* (liquid), *ajeerna* (indigested food), indulgence in unsuitable foods, unaccustomed, uncooked, persons who have consumed fats for oleation therapy,	Continuous exposure to sudden interchange use of cold and hot without following gradual change rule, sunbathing after a heavy meal, drinking cold water right away after feeling scared or exhausted, repressing one's natural desires (eg; vomiting urge),	Improper body purification methods, *beeja dosha* (genetic disorders), person who have vomited just then indulge more in physical activities and copulation, without vomiting out undigested food, if a person consumes food

asathmya ahara (allergic foods), *ahita asana* (unhealthy) foods, excessive intake of honey, pendium, fish, *lakucha*, *mulaka*, *kakamach,* consume meat of animals of domestic and of marshy land along with milk constantly, sudden interchange/ alternate consumption of nourishing and depleting diets, continuous overeating, eating while in state of indigestion, intake of foods mostly consisting of cereals like *hayanaka, yavaka, chinaka, uddalaka, koradusha* along with *kshira, dadhi, takra, kola, kulattha, masha, atasi, kusumbha,* and unctuous articles, excessive intake of food preparations of freshly harvested grains, curd, fish, salt, and sour substances	engaging in *papakarma* (bad things), *ushna sheeta viparyaya* (transgression of the prescribed order concerning hot and cold), broken *achaara hetu* (disciplines), excessive indulgence in sexual intercourse, excessive done physical exercise, performance of sexual act in the state of indigestion of food, who immerses himself in water immediately, after getting fatigued by exposure to heat, or he who suppresses the bouts of vomiting suddenly, abusing the ascetics and good persons, insult to brahmas, and preceptors, and other sinful acts, committing murder, usurping the properties of others and such other sinful acts pertaining to the present life and effects of actions of past lives all together	which causes burning sensation,

Purvarupa of *Vicharchika* is not manifested in the classical texts as premonitory signs and symptoms of *vicharchika*, but as it is classified as one of the *kshudra kushtha roga* (6, 1), so one can take the premonitory syndrome of the *kushtha vyadhi* to that of *Vicharchika*. (6) According to the main classics of Ayurveda, such as, Charaka Acharya (Cha/ chi/ 7/11-12) (12) *kushta* premonitory symptoms are decreased touch sensation, excessive sweating or absence of sweating (which may be localized or generalized), change in color, papules on skin, horripilation, pruritus, pricking pain, physical exertion, mental fatigue, severe pain in ulcerated area, sudden appearance and chronic ulcers, burning sensation, and numbness. According to Charaka *Chikitsa sthana* vitiated *sapta dravya* lead to formation of *kushtha* (skin diseases). *Sapta dravya* such as, vitiated vata, *pitta, kapha, rasa, rakta, mamsa*, and *ambu*. (13)

Classical Definition of *Vicharchika* according to Charaka Acharya in Charaka Samhita *Vicharchika* "exhibits symptoms of itching *(kandu*), pimples (*pidaka*), blackish color discoloration (*shyawa),* and with excessive discharge (*bahu srawa*)" (Charaka Chikitsa, 7/26) (14). According to Charaka, *Vicharchika* predominant *dosha* (humor) is a *kapha* and its describe wet type of *Vicharchika*. (5, 15, 16, 17, 18, 19)

On the other hand Sushruta Samhita (*Sushruta Nidana*, 5/12) symptoms of *Vicharchika* is "excessive pain and itching and gives rise to extremely dry crack-like marks on the body". (20) According to Sushruta, *Vicharchika* predominant *doshas (*humors) are *vata* and *kapha* and its also described dry type of *Vicharchika.* The same form of disease consisted with pain, burning and itching, and restricting itself solely to the lower extremities, is called *Vipadika*" (*Sushruta Nidana*, 5/18). (20) According to previous researches *vata* and *kapha dosha* is predominant in *vicharchika.* (21, 22)

Comparatively, Vagbhata *Vicharchika* characterized by skin patch immovable, hard, heavy, oily, whitish red, slow in developing, patches fused with one another, elevated, having severe itching, exudation and too much of worms (bacteria), patches being smooth, yellowish edges, circular in shape, studded with painful eruptions which are bluish and full of lymph (Ashtanga Samgraha Nidana, *14/18-19*). (23) According to Vagbhata, *Vicharchika* predominant humors are *vata a*nd *kapha*. *Kustha*, caused by excessive consumption of *Viruddha ahara*, such as dry, stale, cold, salty, spicy, fermented, or fried foods, leads to *Agnimandya* (indigestion of food), which is triggered by excessive physical and mental stress and sexual activities at an improper time. (11) Lead to increase *doshas* and that invaded the *tiryakgata siras* (veins, vessels, channels on the tissues) vitiates skin, lymph, blood, and muscles and making them loose then spread outwards cause discoloration of the skin after a long time of negligence and produce *Kushta*. It's called *kushta* because it lead to ugly of the body. (24) On the other hand *Kashyapa Samhita* mentioned that "black red ulcers with pain, discharges and suppuration is *Vicharchika (Ka. S./Ku.Chi./2*). (25) According to *Madhawa Nidana* "nodules which have itching, black color and copious exudation are seen in *Vicharchika kapha vata* predominant (*Ma. Ni. /Ku. Ni*. /22). (26)

Samprapti (pathogenesis) of Vicharchika or *kusta roga* initiates with *agnimandya* which occurs due to *nidana sewana* lead to form *ama* (indigestion) which progress does *tridoshadushti (vata, pitta & kapha doshas* vitiated), and invade the *srotas & kleda* (moisture) formation and eventually causing vitiates the *tvak* (skin), *rakta* (blood), *mamsa* (muscles), and *lasika* (body fluids) and make them *shithila* (soft) and get *sthanasamsraya* (accumulation) in the skin, causing its discoloration and thus resulting in *kushta roga* (5,7, 25,26,27,29,30,31,32).

DISCUSSION AND CONCLUSION

Vicharchika is one of *kshudra kushtha* and curable disease. It caused causative factors as, various unsuitable food consumption and misconduct behavior lead to vitiated *sapta dravya* such as *tri dosha, rasa, rakta, mamsa,* and *ambu*. Vitiated tridosha and cause *agnimandya*, and that can lead to vitiated rasa, *raktha, mamsa, lasika*, and *ambu* as vitiated *dushya* and *srotas dushti* cause gradually manifested symptoms of *Vicharchika*. *Vicharchika* main symptoms such as, itching, blackish discoloration of skin, watery discharge, pain, crack lines, dry, papules, and burning sensation. According to the main texts and articles (26, 27, 28, 29, 30), tridosha involved symptoms had but *kapha* and *vata doshas* are mostly predominant. *Kapha dosha* presents as itching, papule, and excessive watery discharge. On the other hand dry, crack line, and blackish discoloration present *vata dosha*.

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MADU (CYCAS ZEYLANICA) IN SRI LANKA: AN ETHNOBOTABICAL STUDY OF CULINARY TRADITIONS, MEDICINAL POTENTIAL, AND CONSERVATION CHALLENGES

I.G.P.R. Kulanatha

ABSTRACT

The Madu plant (*Cycas zeylanica*), a culturally significant cycad species in Sri Lanka, is facing numerous ecological threats despite its long history of traditional use. This ethnobotanical study, investigating the relationship between people and plants, aimed to explore the plant's cultural significance, culinary applications, and potential health benefits, as well as the challenges to its conservation. Key informant interviews in the research reviews and a review of historical and botanical literature have been revealed diverse culinary applications of Madu flour derived from the plant's seeds, with regional variations in the preparation of dishes such as Madu Ginipu, Madu Gotu, and Madu Pittu. Additionally, preliminary analyses showed slight differences in the nutritional composition between non-forest and forest varieties of Madu, highlighting the potential impact of environmental factors on its nutritional value. The study also highlighted Madu's potential as a source of nutrients and bioactive compounds with potential antioxidant and anti-inflammatory properties. However, the plant's status as Critically Endangered, due to habitat destruction, overharvesting, and the impact of natural disasters, underscores the urgent need for conservation efforts. Additionally, while Madu has been traditionally used for its medicinal properties, the absence of documented detoxification practices in Sri Lanka, despite reports of toxicity in related species, raises concerns about its safe consumption. This study emphasizes the importance of understanding the complex interplay between cultural practices, traditional knowledge, and ecological conservation in ensuring the sustainable use and preservation of Madu, a valuable component of Sri Lanka's biocultural heritage. Further research is needed to validate traditional knowledge, explore therapeutic applications, and address potential safety concerns related to Madu consumption.

Key Words: *Cycas zeylanica, ethnobotany of Madu , traditional food Sri Lanka, Madu Ginipu, Gotu and Pittu, cycasin, indigenous knowledge, endangered biocultural heritage*

INTRODUCTION

The *Madu* plant (*Cycas zeylanica*), a culturally significant cycad species endemic to Sri Lanka, holds a unique place in the island's rich tapestry of traditional knowledge and practices. This plant, known by various vernacular names such as "*Madugaha*" in Sinhala, "*Salaparai*" in Tamil, "*Varaguna*" or "*Hintalah*" in Sanskrit, and referred to as Ceylon sago, False sago, False sago-palm, Queen sago, or Spiny-leaved cycas in English (Sivapalan & Sanmugarajah, n.d.), has been used as a versatile resource for local communities. This ethnobotanical study delves into the multifaceted relationship between the *Madu* plant and the people of Sri Lanka, examining its diverse roles in culinary traditions,traditional medicine, and cultural heritage.Its seeds, processed into flour, are a key ingredient in various traditional dishes like *Madu Ginipu*, *Madu Gotu*, and *Madu Pittu*, each showcasing regional culinary adaptations and resourcefulness.Preliminary analyses have revealed slight differences in the nutritional composition between non-forest and forest varieties of *Madu*, underscoring the influence of environmental factors on its nutritional value.

Beyond its culinary value, *Madu* has a long-standing history of use in traditional medicine and folklore. Various parts of the plant, including the stem, roots, and leaf bases, have been traditionally harvested for their purported magical and medicinal properties (Whiting, 1963; Jones, 1993; Osborne et al., 1994; Norstog & Nichollas, 1997). Cycad products have been used in diverse forms, such as beverages, teas, purgatives, and pain relievers (Harrison, 1966). In fact, the traditional knowledge surrounding *Madu*'s medicinal properties has even permeated into modern times, with some cycad-derived compounds finding applications in proprietary drugs. In Kerala, India, the fruits of a closely related species, *Cycas circinalis*, have been and continue to be harvested and sold for their medicinal value.

The *Madu* plant (*Cycas zeylanica*) is currently listed as Critically Endangered by the International Union for Conservation of Nature (IUCN), primarily due to habitat destruction, over-harvesting of its seeds, and the devastating impact of the 2004 tsunami (Bösenberg, 2010). Although historically widespread across Sri Lanka, the tsunami severely impacted the remaining populations, leading to its current classification as primarily endemic to the Andaman and Nicobar Islands (Bösenberg, 2010; Christenhusz et al., 2011)

This decline raises significant concerns about the preservation of this culturally important species and the traditional knowledge associated with it. While *Cycas circinalis*, another cycad species culturally significant in Sri Lanka, is not the primary focus of this study, it's worth noting its continued presence in local traditions, such as the folk poetry of the Uva region (Gunatilleke et al., 2008).

Furthermore, the use of *Madu* seeds in culinary preparations raises important questions regarding their safety. While Indian literature documents various processing methods to reduce toxins inherent to cycad seeds (Anitha, 2011), the absence of reported toxicity in Sri Lanka, despite a lack of documented detoxification processes, suggests potential differences in toxin levels between *Cycas zeylanica* and its Indian counterpart, *Cycas circinalis*, or the presence of inherent detoxification mechanisms in traditional Sri Lankan preparation methods.

This study, conducted as part of a broader investigation into the culinary traditions of the Kandy region, examines the *Madu* plant (Cycas zeylanica), with a particular focus on its under-researched data set of culinary and medicinal uses, as well as its status as a red-listed species

By delving into this specific aspect of *Madu*, this study seeks to complement and expand upon the existing body of knowledge on Kandy cuisine while also contributing to a deeper understanding of the plant's significance in Sri Lanka's biocultural heritage. Specifically, this research explores the culinary preparations, potential health benefits, ecological challenges, and safety concerns associated with *Madu*, offering insights into the complex interplay between cultural practices, traditional knowledge, and ecological conservation surrounding this unique plant. Ultimately, this research aims to inform future research directions in plant conservation, sustainable utilization, and safety assessment of *Cycas zeylanica*, including investigations into its genetic diversity, potential therapeutic applications, and the development of standardized protocols for detoxification and consumption.

RESULTS

Key informant interviews have been revealed two primary *Madu*-based dishes in the Kandy region: *Madu Ginipu* and *Madu Gotu*. *Madu Ginipu*, described as a simpler preparation, consists of *Madu* flour, scraped coconut, sugar, and salt, steamed into a flat *Roti* shape on a banana leaf (Key Informant 'P'). *Madu Gotu*, considered richer and more filling, incorporates coconut milk for added texture and flavor (Key Informant 'Q'). Key informants 'K' and 'L', both respected traditional physicians within the Kandy region, had emphasized the historical reliance on the *Madu* plant for its unique flour, used to prepare traditional dishes like *Madu Ginipu* and *Madu Gotu*, which were believed to have Ayurvedic health benefits

The use of *Madu* flour extends beyond these two dishes. In other regions of Sri Lanka, *Madu Pittu*, a steamed dish similar to string hoppers or rice flour *Pittu*, is commonly prepared using *Madu* flour, sometimes in combination with rice flour. Key Informant 'N had mentioned, "*We also add other flours like rice or Kurakkan to Madu Pittu to stretch it further and add different flavors.*" The diverse preparations demonstrate *Madu's* versatility and cultural significance across different regions of Sri Lanka.

In certain regions of Sri Lanka, a variation known as *Madu Roti* has been documented, where rice, finger millet, or wheat flour is combined with *Madu* flour before being cooked on a banana leaf (Key Informant N). This culinary adaptation demonstrates the ingenuity of local communities in utilizing *Madu* while incorporating other readily available grains,highlighting the flexibility of traditional practices in response to resource availability.

Preliminary analyses suggest that *Madu* flour is a good source of carbohydrates and contains potentially bioactive compounds with antioxidant and anti-inflammatory properties (ආයුර්වේද ඖෂධ සංග්‍රහය, 1985). Key informants also highlighted *Madu*'s traditional use for various ailments, including piles, hemorrhoids, and constipation. As Key Informant 'K' explained, "*We've used Madu for generations to address digestive issues. It's a gentle and effective remedy*." These accounts underscore the potential nutritional and therapeutic benefits of *Madu*.

Despite its cultural and potential health significance, the *Madu* plant (Cycas zeylanica), classified within the Cycadales order (Christenhusz et al., 2011), is currently listed as Critically Endangered on the IUCN Red List (Bösenberg, 2010).Habitat destruction, overharvesting of seeds for flour production, and the devastating impact of the 2004 tsunami have severely reduced its population in Sri Lanka. This stark reality highlights the urgent need for conservation efforts to protect this unique species and its associated cultural practices.

DISCUSSION

The diverse culinary applications of *Madu* flour in dishes like *Madu Ginipu*, *Madu Gotu*, and *Madu Pittu* underscore its importance as a traditional food source in Sri Lanka. These dishes not only provide sustenance but also serve as a testament to the resourcefulness and adaptability of local communities in utilizing indigenous ingredients. The regional variations in preparation methods reflect the dynamic nature of culinary traditions and the influence of local preferences and ingredient availability.

The diverse utilization of *Madu* in Sri Lankan cuisine exemplifies the cultural richness and regional adaptability inherent in the island's food traditions. In the Kandy region, *Madu* flour is predominantly used to create sweet snacks like *Madu Gotu* and *Madu Ginipu*, which often serve as sub-meals. Conversely, in regions where *Madu* is also available, the flour finds its way into savory dishes like *Pittu* and *Roti*, commonly served with spicy red chili paste for breakfast or dinner.This culinary diversity not only reflects the versatility of *Madu* as an ingredient but also underscores the distinct flavors and preferences that have evolved across different regions of Sri Lanka.

However, the declining awareness of these traditional dishes, particularly among younger generations, raises concerns about the erosion of cultural knowledge and the potential loss of valuable culinary practices. This loss is compounded by the ecological threats facing the *Madu* plant, which could further limit its availability and cultural significance.Revitalizing interest in *Madu* cuisine could not only preserve cultural heritage but also create economic opportunities for local communities through sustainable cultivation, value-added product development, and culinary tourism initiatives.

The evidence suggesting *Madu*'s potential health benefits underscores the need for further research to validate traditional knowledge and explore its therapeutic applications. Understanding the nutritional and phytochemical composition of *Madu* could lead to the development of novel food products and nutraceuticals that promote health and well-being. Such research could also contribute to evidence-based traditional medicine practices and potentially open new avenues for pharmaceutical development.

Preserving the *Madu* plant and its associated culinary traditions requires a multifaceted, biocultural approach. This includes habitat restoration, sustainable harvesting practices, ex-situ conservation through seed banks and botanical gardens, and robust community engagement. Raising awareness among local communities about *Madu*'s ecological and cultural importance is crucial for fostering a sense of ownership and encouraging active participation in conservation efforts.

The apparent lack of reported toxicity from consuming *Madu* seeds in Sri Lanka, despite the absence of formal detoxification protocols, is a compelling observation that deserves further attention. This discrepancy between documented toxicity in related cycad species and the safe consumption of *Madu* in Sri Lanka, without explicit detoxification steps, raises questions that resonate with both scientific inquiry and cultural heritage. Does this reflect a unique characteristic of the *Cycas zeylanica* species itself, suggesting lower inherent toxin levels compared to its Indian counterpart, *Cycas circinalis*? Or, perhaps, have generations of Sri Lankan communities unknowingly developed and passed down preparation methods that effectively mitigate the potential risks of cycad consumption? This intriguing possibility

highlights the intricate interplay between human ingenuity, cultural practices, and adaptation to local environments.

In addition to investigating the factors contributing to the safe consumption of *Madu* in Sri Lanka, further research is needed to explore the plant's genetic diversity, potential therapeutic applications through clinical trials, and a comprehensive documentation of its traditional uses across different regions of Sri Lanka. By valuing and protecting this indigenous resource, we can ensure that future generations can benefit from its culinary, medicinal, and cultural legacy.

CONCLUSION

The *Madu* plant, a cornerstone of Sri Lankan culinary and medicinal heritage, stands at a crossroads. Its precarious existence, threatened by habitat loss, overharvesting, and climatic shifts, paints a stark picture of vulnerability. Yet, the *Madu*'s story is not solely one of decline. It is a narrative of resilience, a testament to the enduring cultural significance of this ancient cycad.

Our research reveals a fascinating paradox. While *Madu* seeds contain known toxins, their continued consumption in Sri Lanka without documented ill effects challenges conventional understanding. This raises tantalizing questions about potential variations in toxicity levels between *Cycas zeylanica* and its close relatives, or perhaps, the existence of unrecognized detoxification practices embedded within Sri Lankan traditions. Unraveling this mystery is not merely an academic pursuit; it is a matter of cultural preservation and public health.

Indeed, *Madu*'s value extends far beyond its potential as a food source or a medicinal ingredient. It is a living embodiment of the intricate relationship between people and plants, a tangible link to the past that informs our present and shapes our future. As we grapple with the complexities of biodiversity conservation and sustainable utilization, the *Madu* plant emerges as a powerful symbol of the interconnectedness between nature, culture, and human well-being.

To secure a future for *Madu* is to embrace a holistic approach that encompasses scientific inquiry, ecological restoration,sustainable harvesting practices, and the revitalization of traditional knowledge. By recognizing *Madu* as an integral part of Sri Lanka's biocultural heritage, we can inspire a renewed appreciation for this remarkable plant and forge a path towards its conservation. Only through a collective effort, one that bridges the gap between scientific understanding and cultural wisdom, can we ensure that the legacy of *Madu* continues to enrich Sri Lankan lives for generations to come.

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A COMPREHENSIVE ETHNOBOTANICAL AND PHYTOPHARMACOLOGICAL REVIEW INTERGRATING TRADITIONAL CULINARY PRACTICES AND CULTURAL SIGNIFICANCE

I.G.P.R. Kulanatha

Jinendra Disanayaka

ABSTRACT

This study investigates the historical and nutritional significance of leafy vegetables from the Kandyan era, as recounted by 17 informants from three successive generations. Seven specific dishes featuring cooked leafy greens were examined, traditionally termed as Malluma and Ānama: Aba Kola Malluma (*Brassica juncea*), Kalukamberiya Kola Malluma (*Solanum nigrum*), Erabadu Kola Malluma (*Erythrina variegata*), Kurundu Dalu Malluma (*Cinnamomum zeylanicum*), Aththikka Dalu Malluma (*Ficus racemosa*), Alakola Dalu Ānama (*Xanthosoma sagittifolium*), and Kopi Dalu Malluma (*Coffea spp.*). Additionally, Chavya leaves (*Piper retrofractum* / *Piper chaba*) were an unexpected finding, used as a garnish in one of the dishes. Recipes for Aba Kola Malluma, Kalukamberiya Kola Malluma, and Kopi Dalu Malluma were shared by two informants each, while the other four dishes were described by four informants each. This study aims to identify and characterize key bioactive compounds present in these leafy vegetables, analyze the potential health benefits associated with these compounds, and explore Ayurvedic principles regarding their medicinal and culinary uses, thereby highlighting their potential for disease prevention and health promotion. Leafy vegetables were identified from an original dataset based on Kandyan food recipes. Relevant peer-reviewed articles (2014–2024) were sourced from Google Scholar and PubMed, along with Ayurvedic texts from the FIM library, to explore their medicinal applications.*Cinnamomum verum* is celebrated for its anti-inflammatory and antioxidant properties, aiding in blood sugar regulation, digestion, and cardiovascular health. *Coffea arabica* provides antioxidants that enhance cognitive function, boost energy, and offer protection against neurodegenerative diseases. *Solanum nigrum* supports liver health, alleviates skin conditions, and provides relief from respiratory disorders due to its hepatoprotective and anti-inflammatory properties. *Brassica juncea* is rich in vitamins and minerals, promoting bone health, immunity, and detoxification. *Ficus racemosa*, widely used in Ayurveda, aids digestion, manages diabetes, and offers anti-inflammatory benefits. *Erythrina variegata* (Indian Coral Tree) is valued for its analgesic and anti-inflammatory effects, supporting respiratory health, joint pain relief, and better sleep.These plants offer a range of health benefits, including enhanced immunity, improved digestion, and protection against inflammation and chronic diseases, highlighting their importance in traditional and modern health practices, and can be identified as functional food.

Key words: Kandyan Cuisine, Ethnobotany, Ayurvedic Principles, Functional Foods, Nutraceuticals, Traditional Dietary Medicin, Sri Lankan Culinary Heritage, Phytochemicals, Sustainable Food Systems

INTRODUCTION

Sri Lanka's traditional food culture stands as a vibrant testament to the nation's rich cultural heritage, offering a fascinating glimpse into its sociocultural dynamics. Food plays a vital role far beyond sustenance, shaping social relationships and reflecting variations in status and power, suggesting a potential Marxist or structuralize analysis. Analyzing culinary narratives and literary sources allows us to uncover these profound connections, providing invaluable insights into Kandyan folk-life of the pre-colonial era. Within this diverse food landscape, the Kandian culinary tradition occupies a unique position (Edirisuriya, 2012; Walpola Rahula Thera, 2014; Senanayake, 2019).

Collective Biocultural Heritage

This intricate relationship between human societies and their food systems, encompassing both cultural practices and ecological knowledge, is conceptualized as collective biocultural heritage. This refers to the knowledge, innovations, and practices of indigenous peoples and local and mobile communities that are collectively held and inextricably linked to traditional resources and territories, local economies, the diversity of genes, varieties, species and ecosystems, cultural and spiritual values, and customary laws shaped within the socio-ecological context of communities.Sri Lanka's enduring traditional food culture, particularly the Kandyan culinary tradition, serves as a vibrant manifestation of this concept. It acts as a profound lens through which to examine the nation's rich cultural heritage and complex sociocultural dynamics, where food deeply shapes social relationships and signifies variations in status and power. By meticulously analyzing folklore, culinary narratives, and literary sources, this research illuminates these intricate connections, gaining invaluable insights into traditional Kandyan folk-life.

Traditional Dietary Wisdom and Study Focus

Traditional diets, rooted in historical and cultural contexts, hold a wealth of knowledge about sustainable living, nutrition, and ecological balance. Across the globe, communities have relied on indigenous food practices that harmonize with their natural environment, offering insights into sustainable agricultural methods and dietary health. In Sri Lanka, the Kandyan era represents a period where the interplay of culture, agriculture, and cuisine reached a distinctive peak.

Leafy vegetables, often consumed as "Malluma" and "Ānama", ~~which followed distinct preparation technique,~~ were a cornerstone of this diet, valued for their medicinal properties, nutritional richness, and symbolic significance in rituals and everyday life. This study embarks on an exploration of the dietary practices of the Kandyan period, with a focused examination of seven specific leafy vegetable preparations: Aba Kola Malluma (AKM), Kalukamberiya Kola Malluma (KKM), Erabadu Kola Malluma (EbKM), Kurundu Dalu Malluma (KDM), Aththikka Dalu Malluma (ADM), Kopi Dalu Malluma (KDM), and Alakola Dalu Ānama (ADA). This research also includes the unexpected finding of garnishing practices using Chavya leaves (CG).

These dishes, crafted from a variety of indigenous leafy greens, are emblematic of the era's approach to sustainable living and nutritional wisdom. Through this research, we aim to uncover the cultural, nutritional, and agricultural significance of these leafy vegetables. By analyzing their role in the Kandyan diet, this study seeks to highlight their relevance not only in the historical context but also in contemporary discussions on sustainable food practices and traditional knowledge systems. Furthermore, the research delves into the preparation methods,

health benefits, and the sociocultural factors that shaped their prominence in the ~~mixed cultural and~~ historical Kandyan dietary lore.

By bridging these insights with modern nutritional science, this study aspires to contribute to a deeper understanding of traditional dietary practices, fostering a renewed appreciation for Sri Lanka's culinary heritage and its potential implications for sustainable living in the present day. This research sheds light on the preservation of Kandyan culinary traditions and their nutritional value, emphasizing the continuity of these cultural food practices.

Research Queston

What are the cultural, nutritional, and agricultural significances of selected Kandyan era leafy vegetable preparations, and how can this knowledge be applied to improve contemporary dietary practices and promote sustainable food systems?

Significance of the Study

This study is significant for its contribution to preserving and promoting Sri Lanka’s culinary heritage, with a focus on sustainable nutritional health and community well-being. By analyzing the historical context and nutritional value of these seven leafy vegetable preparations, the research highlights the enduring relevance of traditional dietary practices. Additionally, the study sheds light on the sustainable agricultural methods of the Kandyan era, offering valuable lessons for modern food systems in addressing socio-ecological challenges. Furthermore, revitalizing these traditional dishes has the potential to enhance contemporary diets while fostering cultural appreciation. The findings will also provide a foundation for future interdisciplinary research in nutrition, ethnobotany, and sustainable agriculture, contributing to the evolution of food recipes over time.

LITERATURE REVIEW

Theoretical Framework

The theoretical foundation for this study lies in the intersection of ethnobotany, cultural anthropology, and nutritional science. Ethnobotanical theories emphasize the relationship between human societies and their use of plant resources, providing a framework to understand how traditional communities relied on indigenous plants for food and medicine. Cultural anthropology further highlights the role of food in shaping societal identity, rituals, and customs, while nutritional science evaluates the health benefits of traditional diets. Together, these perspectives offer a holistic lens through which the dietary practices of the Kandyan era can be examined, highlighting their ecological, cultural, and nutritional dimensions.

Previous Research Findings

Existing research on traditional Sri Lankan diets underscores the importance of plant-based foods, particularly leafy vegetables, as integral to health and sustainability. Studies have documented the medicinal properties of various indigenous plants and their role in Ayurveda, while others have analyzed the nutrient content of common leafy greens. Historical research has explored the agricultural practices of the Kandyan era, focusing on rice cultivation and irrigation systems. However, specific studies on the culinary traditions of the Kandyan period, particularly regarding leafy vegetable preparations like "Malluma," remain scarce. The available literature largely emphasizes either medicinal or agricultural aspects without delving into the culinary and cultural nuances of these foods.

Gaps in the Literature

Despite the growing body of work on traditional diets and indigenous plants, significant gaps remain in understanding the integration of leafy vegetables into the daily lives and cultural practices of the Kandyan era. Most existing research either overlooks or only briefly mentions the culinary preparations and their sociocultural contexts. Additionally, there is limited analysis of the sustainability of agricultural practices that supported the cultivation of these plants. Furthermore, while modern studies highlight the nutritional value of traditional diets, they rarely connect these findings to specific historical periods or preparations. This study seeks to fill these gaps by providing a focused exploration of the cultural, nutritional, and agricultural dimensions of Kandyan leafy vegetable preparations, thereby contributing to a more comprehensive understanding of traditional Sri Lankan dietary practices.

RESEARCH OBJECTIVES

1. Identification and Characterization of Bioactive Compounds
    - Identify key bioactive compounds present in various leafy vegetables.
    - Characterize their chemical structures and properties using advanced analytical techniques.
2. Analysis of Potential Health Benefits
    - Evaluate the biological activities of the identified bioactive compounds.
    - Investigate their roles in disease prevention and health promotion based on modern scientific evidence.
3. Exploration of Ayurvedic Principles
    - Examine Ayurvedic literature to understand the traditional medicinal uses of leafy vegetables.
    - Correlate Ayurvedic insights with modern scientific findings to highlight the holistic benefits of these vegetables.
4. Promotion of Disease Prevention and Health Promotion
    - Assess the potential of bioactive compounds in leafy vegetables for preventive healthcare strategies.
    - Develop recommendations for incorporating these vegetables into diets for improved public health.

METHODOLOGY

This study used a mixed-methods approach, combining qualitative data from in-depth interviews and a comprehensive literature review to assess the nutritional and health implications of traditional leafy vegetables.

Qualitative Data Collection

The qualitative component involved semi-structured interviews with 17 key informants. These interviews explored the cultural significance, preparation methods, and perceived health benefits of the leafy vegetables. Thematic analysis was used to identify patterns in the data related to nutritional and health aspects.

Literature Review

A thorough review of academic literature from 2014 to 2024 was conducted using Google Scholar and PubMed. The review focused on studies evaluating the pharmacodynamics

properties, phytochemical analysis, and health benefits of the leafy vegetables. The literature provided a scientific basis for the traditional practices discussed in the interviews.

Data Synthesis

The qualitative findings were synthesized with insights from the literature review to identify connections between traditional knowledge and modern scientific evidence. This integrated analysis allowed for a comprehensive evaluation of the role of these leafy vegetables in contemporary diets and informed culturally relevant dietary recommendations.

Data Presentation

Data were primarily presented in tables and figures to summarize quantitative findings and highlight key trends. Thematic narratives, derived from qualitative analysis, were concurrently used to illustrate and elaborate on key findings, providing rich contextual detail.

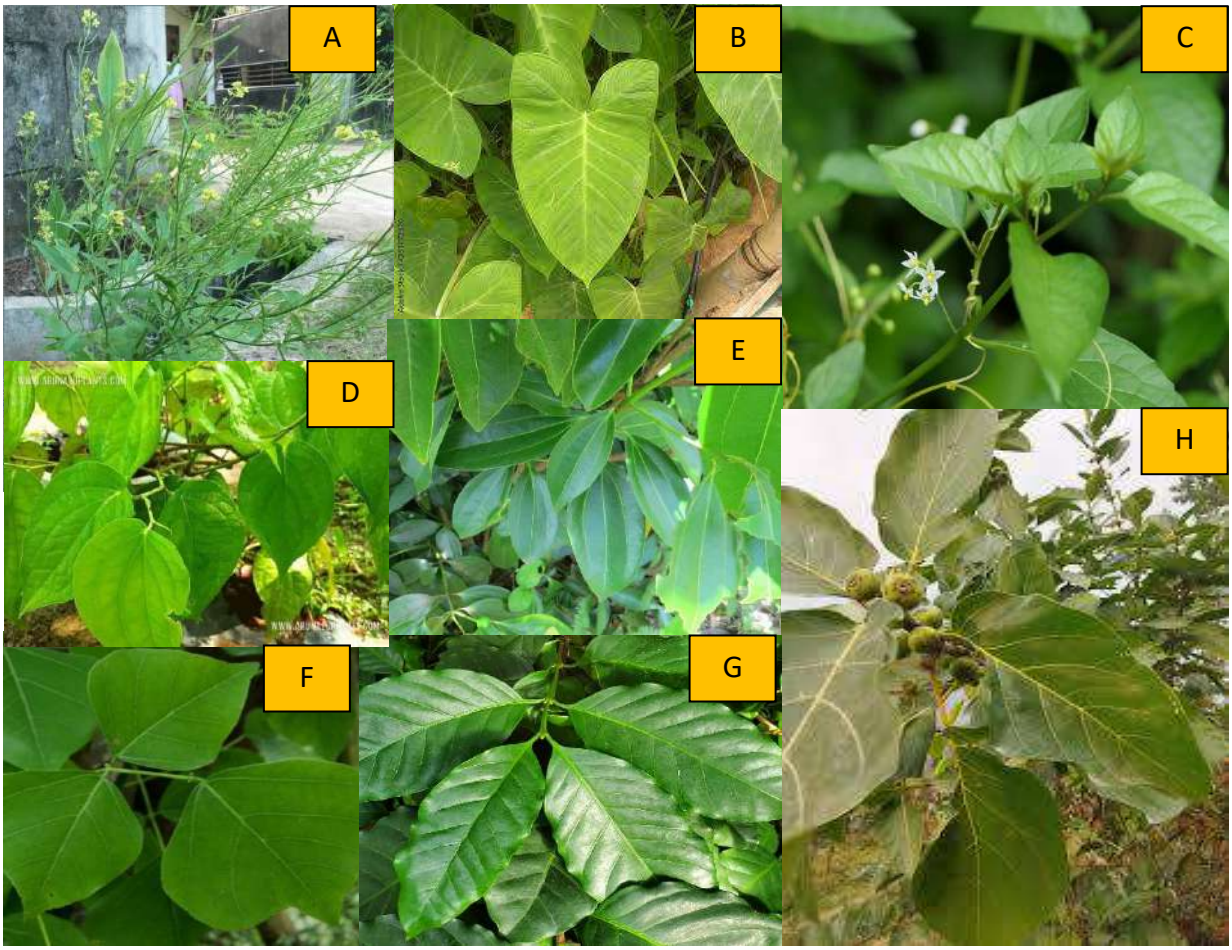

Fig. Seven Culinary Leaves found in Kandyan Dishes Data set

A. Aba (*Brassica nigra/juncea*), **B.** Ala kola (*Xanthosoma sagittifolium*), **C.** Kalukamberiya (*Solanum americanum*), **D.**Siviya (*Piper retrofractum/Piper chaba*), **E.** Kurundu

(*Cinnamomum zeylanicum*), **F.** Erabadu (*Erythrina variegata*), **G.**Kopi (*Coffea spp.*), **H.** Aththikka (*Ficus racemosa*)

Separate finding:
Chavya leaves (*Piper chaba* / *Piper retrofractrum*, Piperaceae) are incorporated as a garnish in Polos ānama (dish number 4). However, the number of key informants specifically mentioning the use of Chavya leaves for this purpose was not recorded as a distinct data point.

RESULTS AND DISCUSSION

This section explores the nutritional composition and health benefits of traditional Kandyan leafy vegetables. The investigation draws from interviews with knowledgeable individuals, alongside a comprehensive review of scientific literature. By examining the specific nutrients, health advantages, and cultural significance of each leafy vegetable, the aim is to provide a deeper understanding of their role in promoting well-being. This exploration uncovers the nutritional power of these and discusses their relevance in modern diets.

Overview of Findings

Seven leafy vegetable preparations comprised 21.875% of the 32 dishes. "Ala kola dalu Ānama" was most frequently mentioned (31.25%), followed by "Thamberiya (Kalukammaeriya)kola Malluma" (9.375%); the other five were mentioned ~6.25% each. Two main Malluma preparation methods were identified: untampered (e.g., Aba Kola) and oil-tempered (e.g., Kopi Dalu). These preparations offer rich nutritional benefits. Chavaya (Siviya) leaves as a garnish (3.125%) highlighted Ayurvedic digestive practices.

Dish Name / Scientific Code	Common Names	Botanical Name & Family	District/Area	Number of Key Informants	Key Informant Codes
Alakola Dalu Ānama (ADA – 18)	Arum, Aroid, Taro	Xanthosoma sagittifolium (L.) Schott (Araceae)	Matale Kandy	3	M, N, O
Aba Kola Malluma (AKM – 25)	Mustard Greens	Brassica juncea (L.) Czern. (Brassicaceae)	Kandy	1	P
Aththikka Dalu Malluma (ADM – 30)	Cluster Fig, Red River Fig, Gular Fig	Ficus racemosa (Moraceae)	Badulla	2	P, Q
Chavya leaves (garnish) (CG – 4)	Long Pepper	Piper retrofractum/Piper chaba (Piperaceae)	Various	Not separately recorded	Not separately recorded
Erabadu Kola Malluma (EbKM – 28)	Indian Coral Tree,	Erythrina variegata (Fabaceae)	Madagama (Ūva Province)	2	Q, O

	Tiger's Claw				
Kurundu Dalu Malluma (KDM – 29)	Cinnamon	Cinnamomum zeylanicum (Lauraceae)	Badulla	2	P, Q
Kalukamberiya Kola Malluma (KKM – 26)	American black nightshade	Solanum nigrum (Solanaceae)	Matale	1	P
Kopi Dalu Malluma (KDM – 31)	Coffee	Coffea spp. (Rubiaceae)	Badulla	1	P
Koora thampala (EKM-KT-28)	Spiny amaranth	Amaranthus viridis (Amaranthaceae)	N/A	N/A	N/A

Table 2: Culinary Leaf Species — Botanical Details, Phytochemistry, and Ayurvedic Properties

Sinhala Name	Botanical Name	Key Phytochemicals	Ayurvedic Tridosha Effects & Uses
Kalukamberiya	Solanum nigrum	Alkaloids (solanine, solasodine), flavonoids, saponins, phenolic compounds, steroidal alkaloids.	Pacifies Kapha and Pitta doshas. Used as an anti-inflammatory, anti-diabetic, and anthelmintic agent. Traditionally used for otalgia, asthma, skin disorders, and diabetes.
Erabadu	Erythrina variegata	Alkaloids, flavonoids, steroids, terpenoids, saponins, tannins.	Balances Kapha and Vata doshas, increases Pitta dosha. Enhances digestive fire. Used as an anthelmintic and anti-inflammatory. Treats respiratory and digestive issues.
Kurundu Dalu	Cinnamomum zeylanicum	Flavonoids, saponins, alkaloids, phenolic compounds.	Pacifies Kapha and Vata doshas. Used as an anti-inflammatory, antimicrobial, and blood purifier. Treats skin diseases and respiratory/gastrointestinal disorders.
Aththikka Dalu	Ficus racemosa	Sugars, proteins, alkaloids, flavonoids, sterols, glycosides.	Balances Kapha and Vata doshas. Enhances digestive fire. Used as a digestive stimulant, carminative, and respiratory aid.
Kopi Dalu	Coffea spp.	Caffeine, chlorogenic acids,	Pacifies Kapha and Vata. Used as an anti-inflammatory, analgesic, and nervine tonic.

		diterpenes, flavonoids.	
Ala Kola Dalu	Xanthosoma sagittifolium	Phenolic compounds, flavonoids, tannins.	Reduces Kapha and enhances digestive fire. Used as a lunch dish for adults.
Chavaya / Siviya	Piper chaba / P. retrofractum	Piperine, essential oils, alkaloids, lignans.	Balances Kapha and Vata. Used as a digestive stimulant, anti-inflammatory, and wound healing agent. Recommended to promote wakefulness.

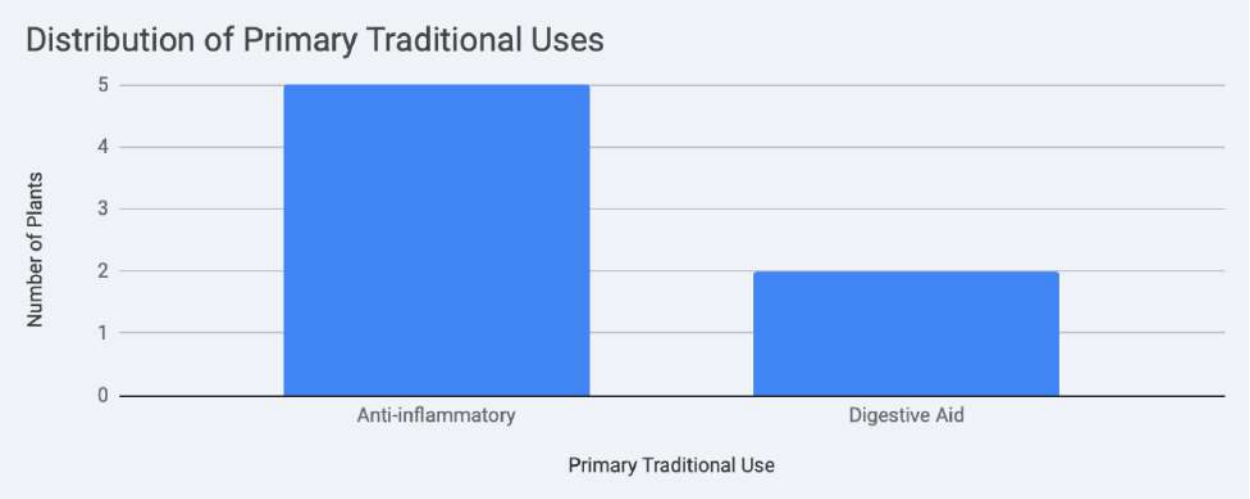

Fig 1 'Distribution of Primary Traditional Uses; '

- Anti-inflammatory' is the most common primary traditional use, accounting for 5 plants.
- 'Digestive Aid' is the second most common primary traditional use, accounting for 2 plants.

Table 3: Comprehensive Nomenclature and Sources for Culinary Plants

Common Name	Botanical Name	Sanskrit Name	Sinhala Name	Tamil Name	Key Source
Night Shade	Solanum americanum	Kakamachi	Kalukamberiya	Manal-takalli	Solanum nigrum complex sources
Indian Coral Tree	Erythrina variegata	Paribhadra	Erabadu	N/A	Erythrina variegata reviews
Spiny Amaranth	Celosia argentea	Vitunna	Kurundu Dalu	N/A	Celosia argentea reviews

Cluster Fig	Ficus racemosa	Udumbara	Aththikka Dalu	Ah-ththi-kaa	Ficus racemosa reviews
Coffee	Coffea spp.	Kāphī	Kopi Dalu	Kaapi	Coffea species studies
Taro / Elephant Ear	Colocasia esculenta	Kacchu	Ala kola	Chembu	Colocasia esculenta reviews
Long Pepper	Piper retrofractum	Chavya	Chavaya / Siviya	Thippili	Piper retrofractum reviews
Mustard Greens	Brassica nigra	N/A	Kalukamberiya	N/A	Brassica species studies

Culinary and Cultural Integration

In the Sri Lankan context, particularly within Kandyan traditional cuisine, the use of leaves as food encompasses a rich variety of preparations, deeply intertwined with geo-cultural identity, social status, and overall well-being. These leafy preparations are not merely culinary items but are fundamental expressions of ancestral foodways, esteemed for their medicinal and nutritional benefits.

Common leafy preparations include:

- **Malluma:** Leaves mixed with scraped coconut, typically mildly heated.
- **Oil Tempering:** Leaves prepared with specific spices, without scraped coconut, and often with less heat. This process enhances spice flavor by releasing fat-soluble aroma compounds and bioactive phytochemicals, improving both taste and health benefits. Additionally, spices' natural antioxidants stabilize cooking oils during heating, reducing oxidation and prolonging shelf life (Jaswir et al., 2000; Upadhyay & Mishra, 2016; Wijesundara et al., 2020).
- **Ānama:** Dishes where leaves are a major component, often cooked with coconut milk and fresh or dry spices to a creamy consistency, receiving a bit more heat than Malluma or oil tempering.
- **Vyanjana:** A curry, similar to Ānama, that involves coconut milk and spices with moderate heat.

These dishes are generally suitable for both lunch and dinner. Our research corroborates that these plants have historically been acclaimed for their medicinal and nutritional benefits. Studies show that approximately 22% of 32 traditional dishes in Kandyan cuisine were leafy preparations, highlighting their prevalence. Key informants frequently revealed 'Malluma' and 'Ānama' as high-frequency preparations.

A particularly unique application observed is the garnishing of certain dishes with specific leaves for their medicinal benefits, functioning as nutraceuticals where the leaves form a smaller portion of the dish. For instance, Chavaya / Siviya (*Piper chaba* / *Piper retrofractum*) leaves are used as a garnish, signifying Ayurvedic benefits for digestion (Research & Reviews:

Research Journal of Biology, 2016; Earthstoriez, n.d.). This practice is notably seen in 'Polos Ānama'.

Polos Ānama (tender jackfruit preparation) consists of tender jackfruit, coconut milk, garlic, Siviya (*Piper chaba*/ *Piper retrofractum*), ginger, and salt. Its preparation involves cooking tempered and boiled jackfruit pieces with these ingredients, specifically garnished with small pieces of Chavaya leaves. This dish is consumed for both lunch and dinner, is suitable for all age groups, and is recognized for its Dhatuposhaka (tissue-nourishing) and agnidipthaka (digestive fire enhancing) effects. Among 17 key informants, 6 mentioned "Polos Ānama," indicating its notable frequency. However, the available data do not explicitly confirm if all 6 informants specified the use of Chavaya leaves as a garnish for "Polos Ānama."

As one informant narrated: "Ah, 'Polos Ānama'—that's made with tender jackfruit, tempered and boiled, cooked down with coconut milk, garlic, ginger, and salt. But the special touch, you see, is the Chavaya leaves; we always garnish it with small pieces of Siviya. It's a dish for any age, good for both lunch and dinner. It truly is Dhatuposhaka, nourishing the body, and it strengthens your agni—your digestive fire."

Ala Kola Dalu Ānama (derived from finely cut yam leaves, Ala Kola Dalu (*Xanthosoma sagittifolium* / *Colocasia esculenta*), with stems removed) is prepared by cooking with coconut milk, salt, pepper powder, and turmeric over moderate heat until a thick gravy forms. Tempering further enhances this preparation. It is traditionally consumed for lunch by any age group and is highly valued for its Dhatuposhaka (tissue-nourishing) properties.

Another informant described: "For 'Ala Kola Dalu Ānama,' we take tender yam leaves – a special variety called 'Ala' – and remove their stems. We cook these finely cut leaves in just a little coconut milk with salt, pepper, and turmeric until it thickens into a nice gravy. It's even better when it's tempered. We usually have it for lunch, and it's good for everyone. It's known to be Dhatuposhaka, meaning it really nourishes the body."

'Ānama' preparations specifically stand out due to their distinct preparation methods, offering rapid nourishment, promoting satiety (Thrupthi), and supporting the body's primary tissues (Dhātu) according to Ayurvedic principles. Reinvigorating these ancestral foodways provides crucial insights for contemporary diets, fostering improved health, biodiversity, sustainable living, and the preservation of Sri Lanka's rich culinary heritage.

Key Observations

Rich Phytochemical Diversity: All plants examined are rich in broad classes of phytochemicals, including alkaloids, flavonoids, saponins, and phenolic compounds (Keerthana et al., 2024; Ahmad, 2018; Jayawardena & Fernando, 2020; Rull & Sani, 2020). This commonality suggests shared underlying mechanisms, particularly for antioxidant and anti-inflammatory effects. The detailed breakdown of specific compounds, such as solanine in Kalukamberiya (*Solanum nigrum*) (Ahmad, 2018; Easy Ayurveda, 2017; Khan et al., 2023), specific isoflavonoids in Erabadu (*Erythrina variegata*) (Surbhi & Senthil kumar, 2024; Palani & Anitha, 2020; Nakra, n.d.), and cinnamaldehyde/eugenol in Kurundu Dalu (*Cinnamomum zeylanicum*) (Ali & Das, 2023; Pathirana & Jayasinghe, 2021) provides a more precise understanding of their bioactivity. The discovery of mangiferin as a unique and potent compound in Kopi Dalu (*Coffea spp.*) leaves, notably absent in beans, significantly re-evaluates

the economic and health potential of the entire coffee plant (Maimaiti & Li, 2024; Rull & Sani, 2020; Jayasinghe & Abeysekera, 2021).

Plant Part Specificity: The analysis consistently demonstrates that different parts of the same plant (e.g., leaves, bark, roots, fruits, latex) often possess distinct phytochemical profiles and, consequently, different therapeutic applications. This validates the precision of traditional knowledge, which often dictates which specific part to use for a particular ailment. For example, Kurundu Dalu (*Cinnamomum zeylanicum*)'s bark, leaf, and root have different primary active constituents (Jayawardena & Fernando, 2020; Pathirana & Jayasinghe, 2021; Ali & Das, 2023), necessitating precise sourcing for targeted therapeutic outcomes. Similarly, Aththikka Dalu (*Ficus racemosa*) utilizes its leaves, bark, roots, fruits, and latex, each with unique chemical signatures and uses (Chandra & Sharma, 2018), which highlights the inherent sophistication of traditional practices in discerning subtle differences in plant efficacy.

Corroboration of Traditional Uses: A remarkable number of traditional Ayurvedic uses for these plants are corroborated by modern pharmacological studies. This includes anti-inflammatory, antimicrobial, hepatoprotective, antidiabetic, and analgesic activities across various species (Abeywickrama, 2020; Ahmad, 2018; Khan et al., 2023; Surbhi & Senthil kumar, 2024; Palani & Anitha, 2020; Jayawardena & Fernando, 2020; Pathirana & Jayasinghe, 2021; Chandra & Sharma, 2018; Earthstoriez, n.d.; Rull & Sani, 2020). This scientific validation reinforces the empirical efficacy of traditional medicine and provides a robust foundation for further drug discovery and development.

Nuances and Contradictions in Ayurvedic Pharmacodynamics: While many Ayurvedic properties align with observed pharmacological actions, some discrepancies were noted, particularly concerning the precise Rasa, Guna, Virya, and Vipaka for some plants like Kalukamberiya (*Solanum nigrum*) (Ahmad, 2018; Easy Ayurveda, 2017; IAFA for Allergy, n.d.; Khan et al., 2023) and Erabadu (*Erythrina variegata*) (Keerthana et al., 2024; Nakra, n.d.; Palani & Anitha, 2020; Surbhi & Senthil kumar, 2024). For instance, conflicting descriptions of Virya (hot vs. cooling) and their effects on Pitta dosha highlight the complexity of synthesizing information from diverse traditional sources or regional variations (Abeywickrama, 2020). Similarly, the Ayurvedic properties of Ala Kola Dalu (*Xanthosoma sagittifolium* / *Colocasia esculenta*) (Institute of Ayurveda and Alternative Medicine, n.d.; Ranasinghe & Jayawardena, 2020) appear to contradict the general Kapha-reducing and Agni-enhancing claims for the common name. This is because Ayurwiki notes that Colocasia esculenta is understood in Ayurveda to increase Kapha (Ayurwiki, n.d.), which emphasizes the ambiguity of common names and the critical need for rigorous botanical identification and deeper textual analysis in Ayurvedic studies (Atlantis Press, 2020; Divya, n.d.) to resolve such inconsistencies for precise therapeutic application.

Multi-Target Therapeutic Potential: Many of these plants, including Kalukamberiya (*Solanum nigrum*) and Aththikka Dalu (*Ficus racemosa*), demonstrate a broad spectrum of pharmacological activities, suggesting their utility as "poly-pharmacological agents" for complex chronic diseases like diabetes, inflammatory disorders, and cancer (Ahmad, 2018; Chandra & Sharma, 2018; Kumar et al., 2011; Pathirana & Jayasinghe, 2021). This aligns seamlessly with the holistic approach of traditional medicine, where a single plant may address multiple symptoms or underlying imbalances, offering a promising avenue for integrated healthcare solutions.

Dual Role as Food and Medicine: The dual role of these plants as both food and medicine is profoundly evident in Sri Lankan culinary traditions, particularly in Kandyan cuisine. Leafy green preparations are fundamental to geo-cultural identity and well-being, valued for their nutritional content and specific medicinal benefits as nutraceuticals. This highlights the Ayurvedic concept of "food as medicine," where regular dietary intake contributes to long-term health maintenance and disease prevention, thereby opening significant avenues for the development of functional foods and nutraceuticals.

Safety Considerations: The discussion consistently points to the importance of safety considerations. While these plants offer immense therapeutic value, potential toxicities (e.g., unripened fruits of Kalukamberiya (*Solanum nigrum*)) (Ahmad, 2018; Khan et al., 2023; Wikipedia, n.d.) or specific dosha aggravations (e.g., Pitta aggravation by Chavaya / Siviya (*Piper chaba* / *Piper retrofractum*)) (Molecules, 2019; Research & Reviews: Research Journal of Biology, 2016) necessitate careful adherence to traditional knowledge regarding preparation and dosage. This underscores the critical need for rigorous toxicological studies and standardization in modern applications.

Local Community Narratives and Folklore: Beyond their documented medicinal and culinary uses, these plants are deeply interwoven with the local community narratives and folklore of Sri Lanka, reflecting their geo-cultural identity and historical significance. Traditional culinary practices, such as the use of Chavaya / Siviya (*Piper chaba* / *Piper retrofractum*) as a garnish for its digestive benefits, highlight a nuanced understanding of food as medicine within the community. Folklore links Kurundu Dalu (*Cinnamomum zeylanicum*) to the ancient name of Sri Lanka and notes its historical medicinal use (Jayawardena & Fernando, 2020). Aththikka Dalu (*Ficus racemosa*) holds profound spiritual significance in Theravada Buddhism (Earthstoriez, n.d.). Broader traditional narratives exist for Kopi Dalu (*Coffea spp.*) (Earthstoriez, n.d.) and Kalukamberiya (*Solanum nigrum*) (Ahmad, 2018; Wikipedia, n.d.) in other regions, underscoring the deep cultural integration of these plants. Further ethnographic research, including interviews with local elders and knowledge keepers, would be invaluable in uncovering more specific and nuanced Sri Lankan folklore associated with these leaves and their traditional uses, such as beliefs about their protective powers, their role in rituals, or specific stories explaining their medicinal properties or origins.

Emerging Applications: Beyond direct human health, some plants show unexpected potential, such as Erabadu (*Erythrina variegata*)'s capacity for heavy metal removal (phytoremediation) (Surbhi & Senthil kumar, 2024; Palani & Anitha, 2020). The valorization of Kopi Dalu (*Coffea spp.*) leaves into novel functional beverages, as recognized by EU approval, further demonstrates the ongoing potential for these botanical resources to contribute to both public health and sustainable economic practices (Maimaiti & Li, 2024; Rull & Sani, 2020; Jayasinghe & Abeysekera, 2021).

Future Directions and Recommendations: The findings of this analysis underscore several critical areas for future research. To address the ambiguities in Ayurvedic pharmacodynamics and common names, comprehensive studies focused on the precise botanical identification and phytochemical profiling of these plants are necessary. Furthermore, rigorous toxicological and clinical trials are required to validate the traditional uses and to establish standardized dosage protocols, particularly given the safety considerations noted. The documented ethnobotanical knowledge, folklore, and specific preparation methods of the Kandyan community provide a valuable foundation for these investigations. Capturing this heritage through further

ethnographic research will be vital for preserving this knowledge and for developing sustainable, culturally relevant nutraceuticals and functional food products.

CONCLUSION

This report provides a comprehensive analysis of seven significant Sri Lankan medicinal plants, integrating their ethnobotanical context with detailed phytochemical and pharmacological evidence, and is significant for its contribution to preserving and promoting Sri Lanka's culinary heritage, particularly by highlighting the unique regional food varieties found in the Kandyan region. In essence, the selected Sri Lankan medicinal plants represent a rich and underexplored reservoir of therapeutic agents. The integration of traditional Ayurvedic knowledge with modern scientific inquiry not only validates ancient wisdom but also provides a robust framework for identifying novel bioactive compounds, elucidating their mechanisms of action, and developing new pharmaceutical, nutraceutical, and functional food products. Continued interdisciplinary research, addressing existing ambiguities and focusing on standardization and safety, is crucial to fully harness the therapeutic value of these remarkable botanical resources for global health.

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