Bridging traditional knowledge and usage of *Anupana* for "*Gopalu guliya*": Review on Traditional Polyherbal Formulation

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Abstract

Sri Lanka has a distinctive system of traditional medicine, which has a considerable impact on the cultural and medical history of the island. The *Gopalu guliya* is one of the most effective traditional formulations. It has been used in many disease conditions with different *Anupana* (Drug delivery vehicles) in Sri Lankan traditional medicine (SLTM), but now it is rare. The objectives of the study are to explore the traditional knowledge of *Gopalu guliya*, and *Xylocarpus rumphii* (Kostel.) Mabb (*Konthalan*) and their uses in various disease conditions, to examine drug delivery approaches and their impact on medicinal efficacy, and to emphasize the importance of conserving *X. rumphii*. The study is based on 4 original texts and 13 previously published journal articles from databases including Scopus, Web of Science, PubMed, and Lens.Org using search terms "*Xylocarpus rumphii*" from 2010 to 2023. This article includes the formulations, therapeutic applications, and drug delivery approaches of *Gopalu guliya* in Sri Lankan Ayurveda Pharmacopoeia, Desheeya Guli Kalka Sagaraya, Visha Veda Muthu hara, and Aushadeeya Shaka Sangrahaya. *X. rumphii*, the most weighted ingredient of *Gopalu guliya*, is the primary contributor to its distinguishing characteristics. The ethnomedicinal properties of *Gopalu guliya* and *X. rumphii* are also discussed, highlighting their significance. The Red Data Book (2022) lists *X. rumphii*, highlighting its importance in conservation. The study highlights the propagation methods of *X. rumphii*, urging for conservative measures, research, and collaborative initiatives to protect these valuable resources and ensure sustainable healthcare with traditional polyherbal formulation *Gopalu guliya.*

Keywords: *Anupana*, *Gopalu guliya*, Traditional Medicinal Knowledge, *Xylocarpus rumphii* (Kostel.) Mabb

Introduction

Sri Lanka has a distinctive system of traditional medicine, which has a considerable impact on the cultural and medical history of the island. Sri Lankan traditional medicine (SLTM) has a long heritage and was carefully developed among local populations. It is closely related to the culture and ecology of the country. Many of the herbal medications, treatments, and treatment modalities used in SLTM have been passed down through oral tradition for many generations by practitioners of the discipline. Despite efforts to record and preserve this wealth of information, many undiscovered techniques and treatments remain. This healthcare system, a vital component of the healthcare and wellness environment of the country, is essentially a tribute to the rich cultural heritage of the island and its enduring relationship to nature.

The *Gopalu guliya* is one of the most effective traditional formulations and has been used in many disease conditions with different *Anupana* in SLTM[1]. Though *Gopalu guliya* is a very effective drug, at present its usage has not been usually that of the early days[3]. In the past, it was more commonly used as a home remedy in the southern area of Sri Lanka than in other regions of the island as a readily

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available medicine in almost every household[2].

X. rumphii, which is the most weighted ingredient of *Gopalu guliya* also known as *Konthalan, Muhudu Delum*, *Gopalu,* and *Kandalan* in traditional documents, is a vital mangrove species abundant along the shores of Sri Lanka[2.5]. It holds a significant history of medicinal usage. However, as *X. rumphii* is a mangrove with the deterioration of mangrove habitat, this plant gradually decreases, highlighting the essential need for its conservation. The Coastline of Sri Lanka is the primary place where the plant is located, making it especially significant to SLTM, especially to the Southern area. Although *Gopalu Guliya* has substantial therapeutic potential, its potency has declined as a result of the growing difficulties in obtaining the *X. rumphii* plant, which is necessary for its manufacture. To protect priceless therapeutic capabilities, conservation efforts of the rare medicinal plant *X. rumphii*, which is also classified as highly endangered, are of the utmost importance.

Anupana of this traditional polyherbal formulation plays a significant role in its therapeutic applications. As per authentic textbooks, *Anupana* is a substance that is consumed with or after consuming medicine or food. It improves the action of the drug with which it is provided, achieving the intended effect rapidly by transporting the drug to the target site, increasing bioavailability, and facilitating easy absorption. *Anupana* also improves the taste and masks the bad odour of the drug, but it is primarily given to transport the essential substance to the desired location. As per Caraka Samhita, a specific *Anupana* with a specific drug gives a specific effect, and with different *Anupanas*, a single drug can be given in different disease conditions[6]. Acharya Sharangadhara has mentioned that the medicine spreads in the body due to the influence of *Anupana,* just as a drop of oil swiftly spreads over the water[7].

The main goal of the study is to comprehensively investigate the traditional knowledge of *Gopalu guliya* and the wide variety of diseases for which it is traditionally utilized. Additionally, the study will focus on the various *Anupana* used in conjunction with *Gopalu guliya* and their impact on enhancing medicinal efficacy. In parallel, the research aims to emphasize the critical importance of conserving *X. rumphii* based on its medicinal values. Furthermore, the study seeks to enhance the propagation, availability, and cultivation of *X. rumphii*, with the goal of increasing its yield and economic potential while promoting biodiversity conservation.

This study paper provides an in-depth study of the ethnomedical insights on the traditional polyherbal formulation, *Gopalu guliya*, and its associated *Anupana*. The analysis uses an empirical methodology and relies on original texts and 13 previously published journal articles from reliable databases including Scopus, Web of Science, PubMed, and Lens.Org using search terms "*Xylocarpus rumphii"* from 2010 to 2023.

In the context of the study, it describes the ethnomedicinal significance of *Gopalu guliya* and also delves into the utilization of the most weighted ingredient of it which is, *X. rumphii* in conjunction with this traditional pill. Additionally, it explores the concept of *Anupana*, denoting the utilization of complementary substances to enhance therapeutic outcomes when administering *Gopalu guliya*-based remedies. Furthermore, describes the propagation, availability, and cultivation of *X. rumphii*.

***Konthalan* (*Xylocarpus rumphii* (Kostel.) Mabb)**

Many of the therapeutic indications connected with the traditional polyherbal formulation *Gopalu guliya* are mostly determined by its main ingredient *X.rumphii,* which is also the most weighted ingredient. The sustainability of this formulation is also in danger due to the irregular fruiting pattern and constrained supply of *X.rumphii*. The name *Gopalu guliya* is derived from the word "*Gopalu*," which is a synonym of *Konthalan*. The limited availability of this plant makes it challenging to maintain this invaluable traditional medicine within the practice in this era.

Taxonomic classification of the Plant X. rumphii[8]

Kingdom - Plantae,
Subkingdom - Viridiplantae, Streptophyta - Infrakingdom,
Phylum (Division) - Tracheophyta,
Subphylum (Subdivision) - Spermatophytina,
Class - Magnoliopsida,
Superorder - Rosanae,
Order - Sapindales,
Family- Meliaceae,
Genus – *Xylocarpus*,
Species - *rumphii*

Scientific name and synonyms of *X. rumphii*: (8)
Scientific Name - *Xylocarpus rumphii* (Kostel.) Mabb.
Homotypic Synonym - *Carapa rumphii* Kostel.
Heterotypic Synonyms - *Aglaia zollingeri*, *Xylocarpus forstenii*, *Xylocarpus zollingeri*

Morphological characteristics of Xylocarpus rumphii (Kostel.) Mabb[9]

X. rumphii generally grows to a height of 4 to 12 meters, occasionally up to 18 meters, and is a small tree or shrub. Although it is primarily evergreen, it can turn deciduous in areas with seasonal weather. The trunk of the tree frequently has an unfavourable shape with ash colour patches and can measure up to 50 cm in diameter. It is notable for not having any obvious buttresses or pneumatophores. The bark is reddish or pinkish colour.

***Habitat of Xylocarpus rumphii* (Kostel.) Mabb**:[8,9]

A well-known species of coastal plant, *X. rumphii*, is remarkably adaptable to a variety of coastal environments. It thrives in harsh coastal environments including cliffs, rocks, and sandy substrates close to the sea, frequently just above high water. The shoreline is stabilized by *X. rumphii* in dynamic and frequently difficult settings. Additionally, it exhibits ecological adaptability by surviving close to mangrove swamps, where zone where terrestrial and aquatic ecosystems meet. But *X. rumphii* is a less common mangrove plant. This plant is native to Sri Lanka, Andaman Islands, Bismarck Archipelago, Borneo, Cambodia, Fiji, Jawa, Laos, Lesser Sunda Island, Madagascar, Malaya, Maluku, New Caledonia, New Guinea, Nicobar Islands, Philippines, Solomon Island, Sulawesi, Sumatera, Thailand, Tonga, Vanuatu and Vietnam

Inclusion of Xylocarpus rumphii (Kostel.) Mabb in red data book [5,10]

The Red Data Book of 2012 lists *X. rumphii*, often known as the Cannonball Mangrove, as being highly endangered. Mangrove trees of the *X. rumphii* species can be found in coastal areas. Instead of being used for its ethnomedical characteristics, these play a critical role in preserving coastal ecosystems and offering other ecological and economic benefits. This species encounters dangers such as habitat degradation, pollution, and climate change, which are evidenced by the fact that it is listed as severely endangered.

To maintain and restore the habitat of this plant and to increase the general awareness of the value of mangrove conservation, conservation initiatives are hence crucial.

***Conservation strategies of Xylocarpus rumphii* (Kostel.) Mabb**:[2]

Ex-situ conservation initiatives are being carried out at a number of significant locations in Sri Lanka, including the Unawatuna Wella Devala and the Seenigama Devala premises. The Royal Botanical Garden in Peradeniya, the Bandaranayaka Memorial Research Institute Navinna, the Medicinal Gardens at Haldummulla, and Giraduru Kotte are live plant conservation locations in Sri Lanka for this plant. Dry specimens from the plants are preserved at the National Herbarium in the Royal Botanical Garden, Peradeniya, as well as at the herbarium within the Bandaranayaka Memorial Research Institute in Navinna.

Poisonous Nature of Xylocarpus rumphii (Kostel.) Mabb:[2,4]

Within the context of SLTM, the bitter-tasting cotyledon of *X. rumphii* seeds is considered to have toxic qualities. A careful preparation procedure is

recommended to make it suitable for medicinal purposes. To prepare the cotyledon for use in pharmaceutical formulations, it must first be cut into pieces, boiled in cow's milk, rinsed with boiled cool water, and allowed to dry. According to the traditional text *Deshiya Guli Kalka Sagaraya*, the cotyledon should not be purified in *X. rumphii* in treating venomous snake bites. This specific feature emphasizes a unique and specialized concept in SLTM, with the treatment of venomous snakebites.

***Ethnomedicinal uses of Xylocarpus rumphii (Kostel.) Mabb*[10]**

In addition to the ethnomedicinal uses for the *Gopalu Guliya* formulation that have been documented in the literature, it has been reported people also independently use the plant *X. rumphii* for a wide range of purposes. This further explains the unique therapeutic properties and the efficacy of the plant as a single drug. In ancient practices, the dried fruit peel was used as an appetizer by adding it to soups before the main meals in order to improve flavor and arouse appetite. The astringent bark of *X. rumphii* is also used to cure dysentery, diarrhoea, and other stomach issues. A unique traditional treatment for backaches and vertebral inflammation requires boiling a significant portion of the bark and tying it over the back area of the patient before bedtime. Soft *X. rumphii* leaves are chewed and ingested for general well-being and body rejuvenation. Additionally, the leaves are boiled in water and let to cool to be applied as a calming mouthwash (*Gandusha*) in instances of severe coughs. These numerous applications illustrate the extensive traditional medical knowledge connected to *X. rumphii* and *Gopalu Guliya*. Therefore, it is clear that although the cotyledon of the plant is poisonous, other parts of the plant are not toxic and can be safely used without the need of purifying procedures.

***Other day to day applications of Xylocarpus rumphii* (Kostel.) Mabb[10]**

In addition to serving a significant role as an ethnomedicine, *X. rumphii* also demonstrates outstanding economic and practical applications. The bark of the plant is an excellent source of Tannins, which are necessary for reinforcing water-resistant ropes and can even be used as a natural fabric dye. Additionally, the plant produces wood that is tough and long-lasting, with properties similar to mahogany (*Swietenia macrophylla*).

***Propagation of Xylocarpus rumphii* (Kostel.) Mabb [11]**

X. rumphii propagates through seeds, which are difficult to separate due to their unique interlocking property. Seedlings are planted in nurseries, and damaged fruit is collected for seed collection. Mature fruits distinguish themselves from immature ones by floating, while immature ones sink and break down. Viable seeds float to the surface as fruits disintegrate. Seeds germinate three weeks after sown, with a 60%-65% success rate. They become ready for out planting, when reach 80-120 cm in about 10 months. Depending on the need's smaller seedlings up to 40 cm tall can also be used. For future growth and conservation efforts, this technique of propagation guarantees the development of healthy *X. rumphii* seedlings.

***Description of Gopalu guliya as per Sri Lankan Ayurveda Pharmacopoeia*[12]**

The preparation method of *Gopalu guliya* is as follows. The ingredients mentioned are as follows: 1 *Kalan* (5g)[13] of Rhizome of *Inguru (Zingiber officinale*), Seeds of *Gammiris (Piper nigrum*), Dried fruit of *Tippili (Piper longum)*, Pericarp of *Aralu (Terminalia chebula*), Pericarp of *Bulu (Terminalia bellirica)*, Pericarp of *Nelli (Phyllanthus emblica*), Seeds of *Aba (Brassica juncea*), *Suduluunu* (Cloves of *Allium Sativum*), *Sududuru* (seeds of *Cuminum cyminum*), seeds of *Kaluduru (Nigella sativa)*, seeds of *Asamodagam (Trachyspermum ammi)*, Roots of *Suwandakottan (Saussurea lappa*), Rhizome of *Vadakaha (Acorus*

calamus), Seeds of *Kelindahaal (Holarrhena antidysenterica*), Roots tubers of *Athividayan (Aconitum heterophyllum)*, Seeds of *Valangasal (Embelia ribes*), *Sadikka (Myristica fragrans*), *Vasavasi (Myristica fragrans*), *Karambu neti (Eugenia caryophyllus*), and 19 *Kalan* (95 g) of cotyledon of *Koonthalan (X. rumphii)* which is equal to the weight of other ingredients. To prepare this formulation, the ingredients should be thoroughly washed and dried until a constant weight is achieved. Each dried ingredient is ground separately to obtain a crude powder. *X. rumphii* must be boiled in Cow's milk before being added as an ingredient in *Gopalu guliya*. All the ingredients that have been mentioned must be ground with the *Nika swarasa* (Juice of *Vitex negundo* leaves) in order to prepare *Gopalu guliya*.

The resulting mixture is shaped into pills, each approximately the size of one *Rakthika* (125mg)[13]. *X.rumphii* weight should equal the weight of nineteen ingredients. Table 1 summarizes the *Anupana* of *Gopalu guliya* in detail, along with each unique indications as described in the Sri Lankan Ayurveda Pharmacopoeia.

This elaborate preparatory method reflects the traditional and precise techniques used in Sri Lankan Ayurveda for manufacturing therapeutic formulations, ensuring the correct combination and processing of these natural ingredients for medicinal purposes**.**

The inclusion of *Gopalu guliya* in traditional and authentic books rather than Sri Lankan Ayurveda Pharmacopeia such as *Deshiya Guli Kalka Sagaraya* [4] and *Visha Veda Muthuhara hewath Thelijjawila visa wedakama,*[14] adds significant depth to the exploration of its medicinal properties. These texts likely provide valuable insights into the preparation procedures and potential applications of this plant in an engaging and poetic manner, enhancing the richness of the traditional knowledge associated with *Gopalu guliya*. The use of poetic elements in these texts not only makes the information more attractive but also reflects the cultural and historical significance of the plant in the regions where it is traditionally used.

***Description of Gopalu guliya as per stanzas in Deshiya Guli Kalka Sagaraya*[4]**

1. අසමොද අබ තිපල් තිකුළු දුරුදෙක හෙල ලුහුනු රැගෙන
තිවගද කොට්ටම් වදකහ කෙළිඳ ඇටත් ඉවද රැගෙන
වළගද පණු සතුරු ද ගෙන සමබාගන කිරා රැගෙන
කිරි මැද ළා ගොපලු මද ද මෙහැම බරට සම වැ රැගෙන

2. නිකත් බුලත් යුසිනඹරා මුං පමණින් ගුලි ගත්තේ
මරුත් උණට තොටිළ මුලේ ඉස්මෙන් දිය කැර ගත්තේ
පිතත් කිපී පැමිණි උණට පැපිළිය වතුරින් දෙන්නේ
යළිත් තම්බමින් රසකිඳ එහි වතුරට ලා දෙන්නේ

3. සෙම් උණ ආවොත් කළුදුරු තැම්බූ වතුරින් දෙන්නේ
මුර උණ නම් ඉඟුරු යුසින් දිය කරමින් ගුලි දෙන්නේ
බඩ යන විට ලිමු කොළ ඉස්මට ගුලි ලා දෙන්නේ
අරගෙන දුටු සතුටු ඉස්ම පිත් අතිසාරෙට දෙන්නේ

4. උඳුපියලිය ඉස්ම රැගෙන සෙම් අතිසාරෙට දෙන්නේ
රඹුක් ගසේ ඉස්ම රැගෙන ප්‍රවාහිකාවට දෙන්නේ
ග්‍රහණි අතීසාරය දැන කෙළිඳ කසායෙන් දෙන්නේ
දෙහි යුස මී සහ ගුලි දුන වමනය නැත යළි එන්නේ

5. අතීසාර සන්නිය අමු ඉඟුරු ලුහුනු නික ඉස්මෙන
පිපාසාව තදබල වූව පෝටා මුල් වල ඉස්මෙන
බඩේ රුදා නැත දුන හොත් අත්තික්කා පොතු ඉස්මෙන
මුතුරු දාහ නැත දුන්නොත් කැබැල්ල දළුවේ ඉස්මෙන

6. මාලේ අව කහපොල්මල් කසාය කැර ගුලි දෙන්නේ
ඇවිලිල්ලට ලුහුනු යුසින් මේ ගුළි දිය කර දෙන්නේ
මුතුරු බැඳුම අපහසුකම් ඇතොත් බන්දන ගන්නේ
කසාය කැර එහි වතුරට ගුළි ලා දිය කැර දෙන්නේ

7. අමාතිසාර ඇතොත් දියමිනි මුල් සම ගින්නේ
වම්මුතු සහ කෙළිඳ ඇටත් කසාය කැර ගුළි දෙන්නේ
නැතහොත් වදකසා වළඟ කුළුරුහැණත් අර ගන්නේ
කසාය කැර සිදුලුණු සහ ගුලි දිය කරලා දෙන්නේ

8. බාලයන්ගෙ මුකපාකෙට උල්ලෝගම් සන්නි දුකට
ගුළියක් තන කිරි සමගින් පෙව්වොතින් ලැබේ සතුට
වම්මුතු තැම්බූ වතුරින් දිය කැරලා ගුලි දුන් වීට
බිළිදුන්නේ කිරි අජීණර් දෝසය පහ වෙයි විගසට

9. ළදරු අතීසාරය අව වඳ වම්මුතු අල අරගෙන
හොඳට තළා ඉස්ම රැගෙන ගුළි දෙක දෙක දිය
කැරදෙන
බාල ග්‍රහණිය ඇත හොත් මහුල්කරඳ පොතු අරගෙන
නැතහොත් අසමොද සිදි දිය ගනිමින් ගුළි දෙක දෙක
දෙන

10.අග්නිය මඳ වුව කුමරුගෙ නගර අසමොද වතුරින
වලිප්පුවට යකවනස්ස නිඹපත් වංඩුවේ රසින
පණුගායට ගොටු කොළ සහ වළඟසාල් තැම්බූ
දියෙන
වමනෙට සාදික්කා මී පැණි දෙසියුස සහ ගුළි දෙන

11. පණු වමනය බලවක් වන මීපැණි එරබදු ඉස්මෙන
කොතඹුරු මත අවහොත් ගල ගෑ සඳුනට ගුලි ලා
දෙන
තදවට හෙම්බිරිස්සාව අවහොත් ගුලි දෙක දෙක
ගෙන
නාගර කොතඹුරු වතුරින් දිය කැර පස් වරක් ම
දෙන

12. නාග ආදි සපුවකු හෝ කුඩා සතකු හෝ විසකුරු
දෂ්ට කරපු විට ගුලි ගෙන දෙසි ඇඹුලින් ගා ලෙස
සරු
විදුරඹ සමගින් බොන්නට දෙනු සැම විස නැසේ
කුරිරු
විස වෙදකම ගෙන පමණින් ගොපළු ඇටේ විස
නොම හරු

13.ගොපළු ගුලිය තැනුමට පෙර ගොපළු කොටස
වෙන්කොට ගෙන
හෙළමින් එළකිරි මැද්දේ මද ගින්නෙන් තම්බා
ගෙන
සෝදා අව්වෙන් වේලා යෙදිය යුතුය අඹරා ගෙන
සියලු ලෙඩට යොදන බෙහෙත ගොපළු ගුලිය බව
දනු මැන

The alignment between the first stanza describing the ingredients and preparatory method of *Gopalu guliya* is the same as per the Sri Lankan Ayurveda Pharmacopoeia, except the usage of *Bulath swarasa* (*Piper betel* leaves juice) with the *Nika swarasa* (juice of *Vitex negundo*) in the preparation of the mixture of the ingredients prior to pill formation. Although the Ayurveda Pharmacopeia specifies the weight of each ingredient to be used in its production of the formulation, *Deshiya Guli Kalka Sagaraya* has mentioned to utilize the equal weight from each of the other nineteen substances and the weight of *X. rumphii* must equal to the weight of other nineteen ingredients. As per *Deshiya Guli Kalka Sagaraya*, the size of the pill equals 01 *Mung* seed (Green gram).

It is needed to highlight that classical texts primarily emphasize the size of *Gopalu guliya* rather than specifying a precise weight. According to these traditional sources, the size equivalence to a green gram is the criterion. However, recognizing the inherent variability in the weight of green grams due to geographical and nutritional factors, the study conducted an experiment involving the weighing of a sample of 50 green grams. The mean weight, averaging 80 milligrams per green gram, was derived from this experiment, serving as the roughly defined weight of a green gram.

Though *X. rumphii* must be purified before preparation of the formulation, according to this text it has mentioned it won't purify by cow's milk in the treatment of venoms. Table 2 summarizes the *Anupana* of *Gopalu guliya* in detail, along with each unique indications as described in *Deshiya Guli Kalka Sagaraya*.

Description of *Gopalu guliya* as per the stanzas in Visa Veda Muthu hara[14]

1.ඉවද දුරු මදුකත් කුට තිපල් තිකුළු මෝදගම් න
අබද කෙළිඳ බිජු වලගය ලසුණු වවා මෙය සමගි න
ඔසුද මෙහැම බරා දෙබර ගොපලු ඇටද සොඳ කරගෙ
න
එලද කිරෙන් තම්බා වියලව මෙය එකතුව ද කර න

2. නිකය කොළ ද යුසයෙන් සිනිඳුව අඹරා පිරිසිදු මෙ න
ඇටය ඉඹුලෙ මෙන් ගුලිකර පවනේ වියලව තබමි න
සැරය සපුගෙ විසට දෙගුලි ඇඹුරු යුසින් දියකර දෙ න
ලනුය නස්න විසමුවර්ා හැර සිහි උපදිය විගසි න

Table 1: *Anupana* of *Gopalu guliya* as per Sri Lankan Ayurveda Pharmacopoeia

	Indications	***Anupana***
1	*Una* (Fever), *Maru una* (High fever)	*Iguru swarasa* (Juice of *Zingiber officinale)* and *Papiliya kashaya* (Decoction of *Oldenlandia corymbosa*)
2	*Wevlum una* (High fever with shivering)	*Thotila pothu kashaya* (Decoction of *Oroxylum indi*cum)
3	*Daha pith una* (Fever due to aggravation of *Pitta Dosha*)	*Kidi kashaya* (Decoction of *Tinospora cordifolia*)
3	*Kaphaja jvara* (Fever due to aggravation of *Kapha Dosha*)	*Kaluduru kashaya* (Decoction of *Nigella sativa*)
4	*Mura una* (Fever that comes with indigestion)	*Inguru isma* (Juice of *Zingiber officinale)*
5	*Ateesara* (Dysentery)	*Lee me swarasa (*Juice of *Vigna marina* leaves*)*
6	*Pittaja atheesara* (Dysentery due to aggravated *Pitta dosha*)	*Dutusathutu swarasa* (Juice of *Dianella ensifolia)*
7	*Ateesara* (Dysentery)	*Udupiyaliya swarasa* (Juice of *Desmodium triflorum)*
8	*Grahani ateesara* (irritable bowel syndrome)	*Kelinda kashaya* (Decoction of *Holarrhena antidysenterica*)
9	*Maale* (Hepatitis)	*Naram mal kashaya* (Decoction of *Citrus mitis* flowers)
10	*Avilili* (Pain)	*Sudu lunu thembu wathura* (Garlic boiled water)
11	*Muthrabadaya* (Urine retention)	*Sudu handun kashaya* (Decoction of *Santalum album*)
12	*Ama athisara* (Dysentery)	*Kaladuru* (*Cyperus rotundus*), (*Diyamitta Cissampelos pareira)* and *Kelinda eta (Holarrhena antidysenterica) Kashaya* (Decoction).
13	*Lee athisara* (Dysentery with bleeding)	*Kiri aguna* (*Vincetoxicum bracteatum*), *Velmee* (*Glycyrrhiza glabra*), *Loth* (*Symplocos racemose*) *and Vel madata* (*Rubia cordifolia*) *Kashaya* (Decoction).

Table 2: *Anupana* of *Gopalu Guliya* as per *Deshiya Guli Kalka Sagaraya*.

	Indications	***Anupana***
1	*Maruth una* (High fever)	*Thotila mul swarasa* (Juice of *Oroxylum indi*cum)
2	*Pittaja jvara* (Fever due to aggravation of *Pitta dosha*)	*Pepiliya wathura (Pathpadagam)* (*Oldenlandia Corymbosa* boiled water)
		Pepiliya, rasakinda thembu wathura (*Oldenlandia corymbose* and *Tinospora cordifolia* boiled water)
3	*Kaphaja jvara* (Fever due to aggravation of *Kapha dosha*)	*Kaluduru thembu wathura* (*Nigella sativa* boiled water)
4	*Mura una* (Fever that comes with indigestion)	*Inguru yusha* (Juice of *Zingiber officinale)*
5	*Ateesara* (Dysentery)	*Lee me kola isma (*Leaves juice of *Vigna marina)*

6	*Pittaja atheesara* (Dysentery due to aggravated *Pitta dosha*)	*Dutusathutu isma* (Juice of *Dianella ensifolia)*
7	*Kaphaja ateesara* (Dysentery due to aggravated *Kapha dosha*)	*Udupiyaliya isma* (Juice of *Desmodium triflorum)*
8	*Pravaahika* (*Bacillary dysentery*)	*Rambukgase isma* (Juice of *Saccharum arundinaceum)*
9	*Grahani ateesara* (irritable bowel syndrome)	*Kelinda kashaya* (Decoction of *Holarrhena antidysenterica)*
10	*Vamana* (Vomiting)	*Desi yusha, Mee* (Lime juice with bee's honey)
11	*Ateesara sanniya* (Fever with chills and rigors due to Dysentery	*Amu inguru Luhunu Nika isma* (Juice of raw *Zingiber officinale, Allium sativum, Vitex negundo*)
12	*Pipasawa* (Thirst)	*Pota mul isma* (Juice of *Pothos hoockeri* roots*)*
13	*Bade ruda* (Stomach ache)	*Attikka pothu isma* (Juice of *Ficus racemose* bark*)*
14	*Muthuru daha* (Burning sensation due to bloating)	*Kebella dalu isma* (Juice of tender leaves of *Aporusa lindlleyana)*
15	*Male* (Hepatitis)	*Pol mal kashaya* (Decoction of *Cocos nucifera* flowers)
16	*Awilla* (Burning sensation of flanks)	*Luhunu yusha* (Juice of *Allium cepa*)
17	*Amateesara* (Dysentery due to indigestion)	*Diyamitta mul, Vammuthu, Kelinda eta kashaya* (Decoction of *Cissampelos pareira* roots, *Cyperus rotundus* and seeds *Holarrhena antidysenterica*
		Wadakaha, valagasahal, Kulurena kashaya with *Sidulunu (*Decoction of *Acorus calamus, Coscinium fenestratum, Picrorhiza scrophulariflora,* with rock salt)
18	*Bala muka paka* (Oral ulcers of children) or *Ullogam* (Oral candiditis).	*Tana kiri* (Breast milk)
19	*Ajeerna* (Indigestion of children).	*Vammuthu thembu wathura* (*Cyperus rotundus* Boiled water).
20	*Ladaru ateesaraya* (Dysentery of children)	*Wadakaha, Vammuthu isma* (Juice of *Acorus calamus* and *Cyperus rotundus).*
21	*Bala grahani* (irritable bowel syndrome) of children.	*Magulkarada pothu* or *Asamoda sidi diya* (Bark of *Pongamia pinnata* and *Thachyspermum ammi* boiled water*)*
22	*Agni mandaya* of children (slowness of digestion, loss of appetite, dyspepsia.)	*Nagara, Asamodagam watura* (Dry *Zingiber officinale* and *Thachyspermum ammi* boiled water) with 2 pills of *Gopalu Guliya*
23	*Walippuwa* (seizures/fits)	*Nibha path, Yakiwanessa swarasa* (Leaves juice of *Azadirachta indica, Anisomeles indica)*
24	*Panu gaaya* (Worm infestation)	*Gotukola, Valagasaha thembu diya* (*Centella asiatica and Embelia ribes* boiled water)
25	*Vamanaya* (vomiting)	*Sadikka, Meepeni, Dehi yusha* (Juice of *Myristica fragrans,* Honey and Lime)
26	*Balawath panu vamanaya* (Severe Vomiting due to worm infestation)	*Erabadu isma, Mee* (Juice of *Erythrina variegata* and honey)
26	*Tadawata hembirissawa* (Severe cold)	*Nagara, Kothamburu watura* (Dried *Zingiber officinale* and *Coriandrum sativum* boiled water) with 2 pills of *Gopalu guliya* 5 times a day
27	Cobra bites and bites of other venomous creatures	Grind 2 pills with Lime juice and drink with cow's urine

3.ගිතෙල මින් සම සිවි ගුලි දියකරමින් රෑගෙන පොවනු
එකල පසුව කුර යුසින් කැද පිසගෙන ගිතෙල දමනු
කසල මගින් ලේ යන විට තුන් වරුවට මෙය කැද දෙනු
බැසිල යතිය සපු කෑ විස සැක නොව මෙකී ලෙසට කරනු

The ingredients mentioned are as follows, Roots tubers of *Athividayan (Aconitum heterophyllum)*, seeds of *Sududuru* (*Cuminum cyminum*), seeds of *Kaluduru (Nigella sativa)*, *Velmi* (*Glycerrhiza glabra*), Roots of *Suwandakottan (Saussurea lappa*), Pericarp of *Aralu (Terminalia chebula*), Pericarp of *Bulu (Terminalia bellirica)*, Pericarp of *Nelli (Phyllanthus emblica*), Rhizome of *Inguru (Zingiber officinale*), Seeds of *Gammiris (Piper nigrum*), Dried fruit of *Tippili (Piper longum)*, seeds of *Asamodagam (Trachyspermum ammi)*, Seeds of *Aba (Brassica juncea*), Seeds of *Kelindahaal (Holarrhena antidysenterica*), Seeds of *Valangasal (Embelia ribes*), *Suduluunu* (Cloves of *Allium Sativum*), Rhizome of *Vadakaha (Acorus calamus)*equal weights and Purified cotyledon of *X. rumphii* with cow's milk equal to the twice the weight of the other ingredients. The ingredient mixture should be ground with *Vitex negundo* juice and should make pills equal to the size of *Imbul eta* (seeds of *Bombax Gossypium*).

The text *Visha Veda Muthu Hara* does not include all of the ingredients that are stated as per the Sri Lankan Ayurveda Pharmacopoeia and *Deshiya Guli Kalka Sagaraya*. Notably, *Visha Veda Muthu Hara* has included *Glycerrhiza glabra*, while not included in the Sri Lankan Ayurveda Pharmacopoeia. Additionally, the *Visha Veda Muthu Hara* does not contain *Sadikka (Myristica fragrans*), *Vasavasi (Myristica fragrans*) and *Karambu neti (Eugenia caryophyllus*) that are present in the Sri Lankan Ayurveda Pharmacopoeia and *Deshiya Guli Kalka Sagaraya*. Consequently, *Visha Veda Muthu Hara* contains 18 ingredients, compared to 20 ingredients in Sri Lankan Ayurveda Pharmacopoeia and *Deshiya Guli kalka Sagaraya*. Table 3 summarizes the *Anupana* of *Gopalu Guliya* in detail, along with each unique indications as described in *Visha Veda Muthu Hara*.

Table 3: *Anupana* of *Gopalu guliya* as per *Visha Veda Muthu Hara*.

	Indications	*Anupana*
1	*Seraya sapuge visa* (Suppurated nasal blocks)	*Nasana* with *Nika kola yusha (*Nasal instillation of *Vitex negundo* leaves juice)
2	*Kasala magin le yema* (Dysentery)	Dissolve *Gopalu guliya* pills in Ghee and drink with porridge made from *Kura* leaves. (*Amaranthus viridis* L.) and administer three times a day.

Description of *Gopalu guliya* in *Aushadeeya Shaka Sangrahaya*, Volume IV[2]

As per *Aushadeeya Shaka Sangrahaya* the only formulation produced from the plant *X. rumphii* is *Gopalu guliya*.

Table 4 summarizes the different drug delivery vehicles of *Gopalu guliya* with different therapeutic indications as described in *Aushadeeya Shaka Sangrahaya.*

Table 4: *Anupana* of *Gopalu guliya* as per *Aushadeeya Shaka Sangrahaya*

	Indications	*Anupana*
1	*Prathishya* (Common cold)	*Kottamalli thembu watura* (*Coriandrum sativum* boiled water)
2	*Shula* (Pain)	*Nika kola swarasa* (*Vitex negundo* leaves juice)
3	*Vata roga* (Disease conditions due to aggravation of *Vata dosha)*	*Nika swarasa* (*Vitex negundo* root juice*)*
4	*Udarabada* (Stomachache)	Lemon juice.
5	*Visha* (Drug poisoning)	Application of the mixture of *Sudu hadun (Santalum album*), King coconut water and lime juice
6	*Math visha* (Intoxication)	*Kottamalli thembu wathura* (*Coriandrum sativum* boiled water)

Conclusion

The traditional polyherbal formulation *Gopalu guliya* and *X. Rumphii*, has shown its importance in traditional medical practices with appropriate drug delivery approaches and insight into its diverse value in various disease conditions. The rich ethnomedical traditions connected to both of them emphasize its potential to be an important resource in Sri Lankan Traditional Medicine. The primary objective this review was to protect these precious therapeutic effects in the different ancient traditional classical texts and highlights conservation efforts of this rare and highly endangered medicinal plant *X. rumphii*.

Furthermore, the inclusion of *X. rumphii*, a vital component in this formulation, revealed not only its ethnomedicinal contributions but also its varied ecological roles. The prevalence of *X. rumphii* in coastal habitats and the difficulties it faces in conservation and reproduction have revealed the importance of using sustainable management techniques to protect this invaluable species. Further research and collaborative efforts are required to maximize the use of these resources while preserving their sustainability and benefits for traditional and modern healthcare procedures.

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