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Paspanguwa Herbal Formula, a Traditional Medicine of Sri Lanka: A Critical Review

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Abstract

The Sri Lankan traditional medicinal system reaches back over 3000 years. The traditional medicines of Sri Lanka have gained an impressive level of acceptance over their more 'Western' counterparts, despite the lack of substantial scientific evidence. This is due mainly to cultural, folklore, habitual use, and ethological reasoning. One well respected traditional formula, the 'paspanguwa' herbal formulation has found its way to modern times, due to its repositioning with a modern outlook in the current consumer market. However, scientific investigations on its effectiveness against disease conditions are scarce, but this void has not posed any threat to its position as an herbal beverage, which imparts health and wellness aspects in general. The 'paspanguwa' formulation consists of five ingredients, namely Ginger (*Zingiber officinale*), 'Pathpadagam' (*Hedyotis corymbosa*), 'Katuwalbatu' (*Solanum xanthocarpum*), 'Veniwalgata' (*Coscinium fenestratum*) and Coriander (*Coriandrum sativum*). In some instances other herbs such as 'Thippili' (*Piper longum*), Thai eggplant (*Solanum melongena*), Black pepper (*Piper nigrum*), Wishnukranthiya (*Evolvulus alsinoides*) and Pawatta (*Justicia adhatoda*) may also be used. Nevertheless, for potential acceptance of the herbal formula on a global basis, much more research is needed and the scientific voids should be sufficiently filled in order to substantiate its standing as an effective medicine even for minor ailments such as the common cold.

Keywords: Ayurveda; Coriander; Paspanguwa; Sri Lanka; Thai eggplant

Traditional Medicines in Modern Times

With the advent of a myriad of diseases for which the pharmaceutical industry has been unable to find effective remedies, the quest for complementary and alternative medicines - especially of traditional medicinal origin, has been on the rise. Coupled with this shortcoming of the pharmaceutical industry, a significant lag in productivity exists even though 'pharma' companies have invested prodigious amounts in novel discovery technologies, such as structure-based drug design, combinatorial chemistry, high-throughput screening (HTS) and genomics, which were sold on the promise of improving productivity [1]. The use of synthetic, or rather 'Western' medicine only started to gain popularity in the late nineteenth century; before that, herbs were primarily used as remedies in the treatment of a wide range of disease conditions [2]. Most of these traditional medicinal plants are readily available and are cheap; hence it is easily accessible and easily consumable. Additionally, due to their more 'natural' predisposition, when administered at the correct dosage, the side-effects from consuming these remedies are minimal [3] However, these may not be the true reasons why complementary and alternative herbal medicines are more popular among patients worldwide. A study by Astin [4] revealed that the majority of users of complementary and alternative medicines – whether it be herbal or not, appear to be doing so, not so much as a result of being dissatisfied with conventional medicine, but rather because they find these alternatives to be more congruent with their own values, beliefs and philosophies towards health and life.

Nevertheless, traditional medicines compete with science and the hurdles they pose for their proper recognition as valid remedies. For instance, as stated by Fontanarosa and Lundberg [5], 'there is no alternative medicine; there is only scientifically-proven, evidence-based medicine, for which the scientific evidence is lacking'. Sanctioning and obtaining support for the propagation of traditional medicinal remedies within the scientific frame of investigation has been scarce, although the use of many traditional medicinal products by indigenous cultures

for centuries, and the belief that they are safe and beneficial, represent the opportunities for further improving health and well-being and for preventing and treating disease [6]. However, within the modern process and procedures of drug development and clinical research, substantiating the efficacy of these traditional remedies is a complex endeavor in general. Despite the constant battle between traditional medicinal practices and science, only few studies have nevertheless shown that traditional medicinal systems should not be taken lightly even though the lengthy procedure for providing evidence of efficacy may demonstrate the already-proven benefits of traditional medicines [7-9].

The Traditional Medicinal System of Sri Lanka

The Sri Lanka Ayurvedic medicinal system has gradually developed towards approaching the scientific realms for recognition, but nevertheless, has a wide appreciation and consumerism among its natives. This system goes back 3000 years or more - according to local myths and legends which are transmitted verbally [10]. In the present scenario, it is divided into four main domains, namely Siddha and Ayurveda, both of which originated in India, Unani - A Perso-Arabic traditional medicine system, and an indigenous medicine system in Sri Lanka, known as 'Deshiya Chikitsa' [10]. In Sri Lanka, about 60 – 70% of the rural population use Ayurvedic medicines for curing and prevention of diseases. Most of these medicines are consumed in the form of concoctions or decoctions - methods of preparation, which continue to be practiced in modern times. When it comes to the local population, despite being a developing country, there is a significant rate of urbanization in Sri Lanka, which comes hand-in-hand with an increased literacy level and a wider exposure to science and technology [11]. Thus, traditional Ayurvedic medicines of Sri Lanka have gained acceptance over their more 'Western' counterparts, despite the lack of substantial scientific evidence.

Before describing in detail about the 'paspanguwa' herbal formula, it is firstly necessary to introduce the Sri Lankan medicinal system in brief, which in its nature is extremely diversified and has not lost its appeal despite the 3000-year-old history [10,12,13].Many of the traditional medicinal recipes were either verbally handed down across generations, or written down in the native languages - most commonly Sinhala. Overall, written documents, which are intact, or translations of these documents, are scarce. In many instances, there are no fixed formulae for the medicines, since the dosages and combinations are customized according to the physiology of the diseased. This is mostly owing to the philosophy of targeting the whole body not each organ in isolation [13]. Thus, the holistic approach, which is commonly observed in other traditional medicinal systems, is found in the Sri Lankan traditional medicinal system as well. Most of the traditional medicines in Sri Lanka are based on natural remedies from trees and plants and their appendages, such as the bark, flowers, leaves, fruits, seeds, stems, root, rhizomes and bulbs [10,14,15]. Although the scientific elucidations were absent during the inception of this medicinal system, the medicinal value of plants are currently well recognized because of the presence of many natural bioactive substances, which are capable of disease prevention [16-19]. These compounds are normally synthesized due to secondary metabolic activities [20-23]. Possibly owing to the existence of a variety of bioactive compounds, the traditional medicine system of Sri Lanka always believed complex disease are best treated with complex combinations of botanical and non-botanical remedies [24]. This could be the reason why herbal combinations such as the 'paspanguwa' are deemed more effective than a single herb-based remedy.

Introduction to 'Paspanguwa'

Figure 1: List of ingredients mentioned in the packaging containing the 'paspanguwa' herbal formula which can be bought off supermarket shelves in Sri Lanka.

The 'paspanguwa' traditional medicinal formula can be obtained as air-tight sachets or packets as an over-the counter medicine in pharmacies and supermarkets. The ailments, for which this can be used as per the instructions in the packaging, are colds, coughs, headaches, fever, and overall body aches. Although the herbal formulation itself has not been clinically evaluated, its constituents possess significant evidence as to their respective efficacies against a myriad of disease conditions. 'Paspanguwa' is commonly consumed as an herbal tea preparation. The name, which means five portions in the vernacular language of Sinhala, is made by the combination of five main herbs. The five ingredients, which make up the formula commonly, consist of Ginger (*Zingiber officinale*), 'Pathpadagam' (*Hedyotis corymbosa*),

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'Katuwalbatu' (*Solanum xanthocarpum*), 'Veniwalgata' (*Coscinium fenestratum*) and Coriander (*Coriandrum sativum*). In some instances other herbs such as 'Thippili' (*Piper longum*), Thai eggplant (*Solanum melongena*), Black pepper (*Piper nigrum*), Wishnukranthiya (*Evolvulus alsinoides*) and Pawatta (*Justicia adhatoda*) may also be used. Figure 1 shows a commercially available 'paspanguwa' package, and the ingredients used. The resulting herbal tea from this decoction is bitter in taste, thus, it is often taken together with sugar or juggery. To date, there has been only one in vitro study performed to explore the antioxidant and starch hydrolyses inhibitory properties of one form of the 'paspanguwa' herbal formula [25]. However, it should be noted that the major constituents in these herbsin this herbal formula have been systematically studied for their efficacy against a variety of ailments, thus it may be deemed reasonable to review existing scientific material on these individual herbs. Overall, the purpose of this review is to (1) describe the formula (2) assess the 'paspanguwa' herbal formula and its constituents and (3) promote the argument whether scientific validation is truly required for traditional medicinal recipes, such as these, which have gained so much popularity even without the scientific rigor.

Therapeutic Effects of the Constituent Herbs of ohe 'Paspanguwa' Formula

As previously mentioned, there are five 'major' constituents in the 'paspanguwa' formula, followed by minor ones which are incorporated primarily to boost the strength and effectiveness of the major components. The 'major' herbs are those, which are considered to contain the highest ability to prevent ailments such as coughs, colds, fever, and body aches. The rest do not necessarily target these diseases; however, as per traditional medicinal records, they are able to prevent these ailments when used in combination with another 'major' herb, rather than in isolation [10] (Figure 2).

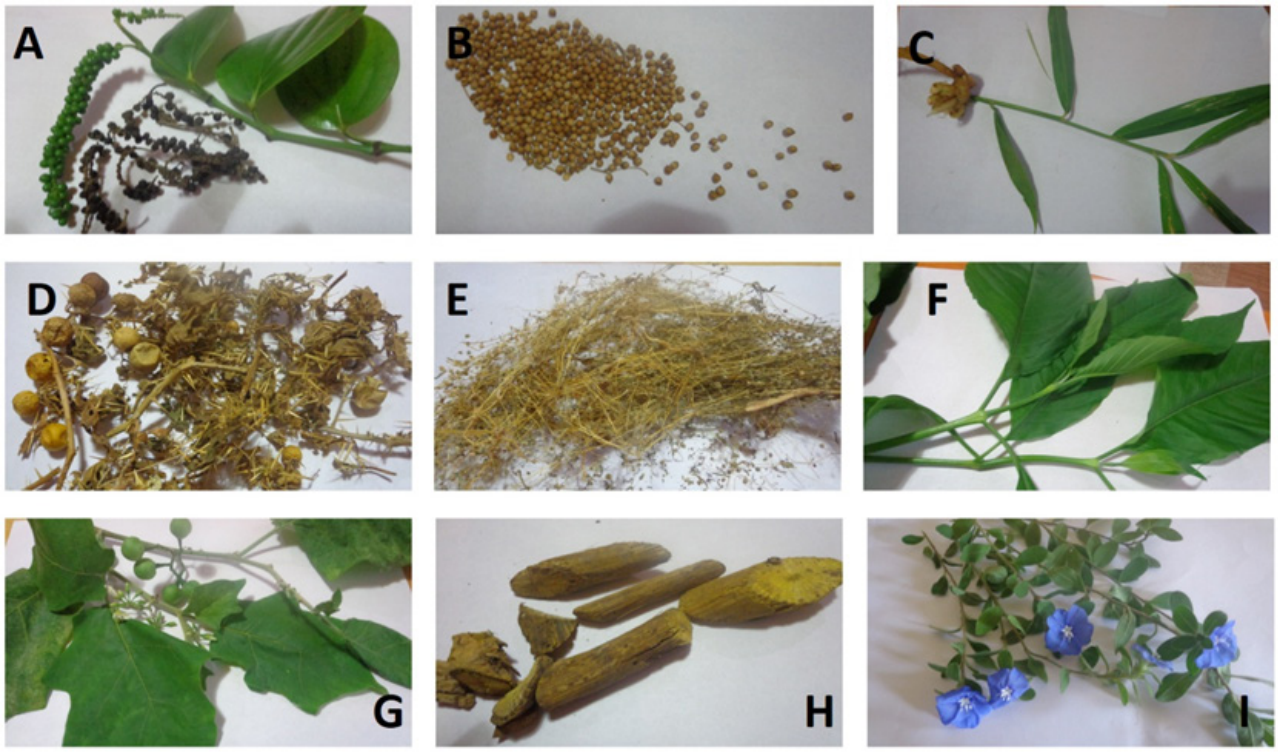

Figure 2: Images of the major and minor ingredients used for the preparation of the 'paspanguwa': (A) Black Pepper (B) Coriander seeds (C) Ginger plant with its rhizome (D) Dried Katuwelbatu (E) Dried Pathpadagam (F) Fresh leaves of Pawatta (G) Thai Eggplant (H) Dried veniwelgata root bark (I) Vishnukranthiya plant.

Ginger (*Zingiber officinale*)

Ginger rhizomes are commonly used as a spice for preparing baked products, soups, pickles, puddings, and fermented beverages such as beer. In addition, it is used to obtain essential oil and oleoresin, which are internationally commercialized for use in the food and pharmaceutical industries [26]. In traditional medicinal the dried ginger rhizomes are widely used as a home remedy to act against diseases such as vomiting, nausea and morning sickness during pregnancy, and also are used in the treatment of heart attack and stroke [26]. In Ayurveda, ginger is also mentioned as an appetiser and could be used as an ointment for pains and for the treatment of digestive disorders and arthritis [27,28]. Due to the versatility of ginger and its usage in many ailments, it is known as a universal treatment [28,29]. Dried ginger rhizomes, which have been pulverized into powder is one of the five major ingredients of the 'paspanguwa' formula.

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Pathpadagam (*Hedyotis corymbosa*)

This is a very common medicinal herb used in traditional as well as modern medicinal systems throughout the world. The plant is used as a treatment for skin aliments, appendicitis, viral infections, acne, venomous bites and eye disease [30]. A decoction of the aerial part of this plant is used in the treatment of diseases such as a cough, bronchitis, necrosis, leprosy, giddiness, jaundice and nervous depression [31]. Additionally, the herb is also known to possess anti-inflammatory, antioxidant, hepato-protective and fever-reducing effects [32,33]. The leaves of the plant are known to possess iridoid glucosides in the form of anthraquinones and triterpenoids [34-38]. The leaves and stems of this herb are incorporated into the 'paspanguwa' recipe as one of the five major ingredients.

Katuwalbatu (*Solanum xanthocarpum*)

This herb is commonly used in the traditional medicinal system in Sri Lanka for a variety of ailments. It is known to contain a high amount of alkaloids and flavonoids [39]. It is known for its anti-asthmatic, hepato protective, hypoglycemic, anti-inflammation, and anti hyperlipidemic properties and it is used for the treatment of fever, asthma, bronchitis, urinary disease, heart diseases and reduce and physical pain [40]. Solasodine is the primary bioactive compound in S. *xanthocarpum*, which possesses the antipyretic property [41-43]. Dried berries of this herb are incorporated into the 'paspanguwa' formula as one of the five major ingredients.

Veniwalgata(*Coscinium fenestratum*)

This is a flowering woody climber with a high amount of antioxidant [44], anti-diabetic [45] and anti-cancer effects [46]. Berberine is one of the major bioactive compounds found in the stem of *C. fenestratum*, which is known to possess a wide range of pharmacological activities. [45] In addition, a small portion of protoberberine is also present [47,48]. *C. fenestratum* which is commonly used in Western medicine as an anti-cancer [46], antioxidant [44], hypoglycemic [49] and antibacterial agent [50]. In the traditional 'paspanguwa' the dried stem of this plant is used as one of the five major ingredients.

Coriander (*Coriandrum sativum*)

Coriander is one of the most common herbs used in many traditional systems to treat many disorders [51]. In traditional medicinal systems, coriander is given to reduce the pain of rheumatism by pounding the seeds and combining them with hot water to make a paste and applied topicallyon the affected area [51]. The seeds are used for health attributes such as improving diseases related to the gastro-intestinal tract and diabetes [52-56]. Al-Mofleh et al. [57] have demonstrated that Coriander seed powder protects the gastric mucosa in rats from ethanol-induced damage and also inhibit the formation of ulcers in rats. Another study demonstrated that the extract made from Coriander seeds has been used as a protective agent for gastric mucosa [58]. The powder of dried Coriander seeds is typically added to the 'paspanguwa' herbal formula as one of the five major ingredients.

Thippili' (*Piper longum*)

P. longum is a medicinal herb commonly used in traditional medicine and has a distinct odor and a pungent bitter taste. It is known as a remedy against gonorrhea, menstrual pain, viral hepatitis, tuberculosis, chronic malaria, sleeping problems, chronic bronchitis, asthma, chronic gut-related pain paralysis of the tongue, diseases of the spleen, cough, tumors and arthritis [59-62]. It is able to directly affect the central nervous system [59,63]. In traditional Ayurvedic medicine, this is considered as a good rejuvenator [60,64-76]. The dried fruit of *P. longum* is sometimes added to the 'paspanguwa' formulation, and is not considered as one of the five major ingredients but rather a complementary agent.

Thai eggplant (*Solanum melongena*)

Thai egg plant is cultivated worldwide as a vegetable crop and is rich in polyphenols [77]. It is rich in other nutrients, essentially minerals and vitamins as well as proteins, riboflavin, thiamine iron, calcium, nicotinemide, carbohydrate, vitamin C, fibre, fat and carotenes [78,79]. It is typically used in the treatment of skin infections, gonorrhea, diabetes, rheumatic disease and swollen joint pains [78,80]. The dried vegetable is sometimes added to the 'paspanguwa' herbal formula as a complementary boosting agent.

Black pepper (*Piper nigrum*)

P. nigrum is a widely used spice, consisting of piperine as the main bioactive compound. Other biologically active compounds in *P. nigrum* include monoterpenes, sesquiterpenes, curcumin and vasicine [81]. It has immunomodulatory, anti-carcinogenic, anti-asthmatic, stimulatory, hepatoprotective, anti-inflammatory, antimicrobial spices, anti-ulcer activities, antioxidant and bio transformative effects, and is also known to enhance the absorption of drugs such as rifampicin, sulphadiazine, tetracyline, and phenytoin [81-84]. In the Sri Lankan traditional medicinal system, *P. nigrum* is used to treat chills, rheumatism, flu, muscular aches, colds, exhaustion and fevers as well as to increase circulation of blood, increase the flow of saliva, stimulate the appetite, and to encourage peristalsis [81,85,86]. *P. nigrum* is also used as a boosting agent in the 'paspanguwa' herbal formula.

Wishnukranthiya (*Evolvulus alsinoides*)

E. alsinoides is a medicinal herb, which is well documented in the Sri Lankan traditional medicinal system as having immunomodulatory, cytoprotective, adaptogenic, antiamnesic properties and antioxidant properties [87-90]. This herb is used to promote adaptogenic, anti-phlogistic, antipyretic, antiseptic, aphrodisiac, febrifuge, stomachic, tonic and vermifuge effects [91-94]. *E. alsinoides* is used as a supplementary herb in the 'paspanguwa' herbal formula.

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Pawatta (*Justicia adhatoda*)

J. adhatoda is a medicinal shrub widespread throughout the tropical regions of South-East Asia [95]. Its leaves and roots are commonly used in the Sri Lankan traditional medicinal system, which are known to possesstwo major alkaloids, vasicine and vasicinone along with some minor components such as vasicoline [96,97]. The extract of the leaves of *J. adhatoda* has the ability to act as an anti-spasmodic, fever-reducing, anti-inflammatory, anti-bleeding, bronchodilatory, anti-diabetic, disinfectant, anti-jaundice, oxytocic and anti-helminticagent [97,98]. In the traditional medicinal system of Sri Lanka, this is used to treat cold, cough, pneumonia, fever, jaundice, joint pain, catarrh, whooping cough, asthma and tuberculosis [97]. Although *J. adhatoda* is used only as a supplementary herb in the 'paspanguwa' formula, it is used as the major ingredient in many other traditional medicinal recipes of Sri Lanka

Traditional Methods of Preparation and Consumption of the 'Paspanguwa'

There are several ways of preparing the 'paspanguwa' by locals as well as by traditional medicinal practitioners, where in all methods, addition of water and heat is the most frequent way of obtaining the extract. Cold water may be added to the ingredients until boiling temperature is reached, or boiled water may be added to the ingredients and left in a closed container (typically, made from clay) for 10-15mins. The duration of boiling or exposure to boiled water may vary, mostly depending on the combination of ingredients used. The steam generated during the boiling process may also be used for inhalations to obtain relief from coughs and colds. The extract is recommended to be used at least 2-3 times per day, depending on the severity of the ailment. The traditional method of preparation has not been adequately documented and is passed down orally from one generation to another. Nevertheless, as one of the more 'simpler' forms of herbal formula in the traditional medicinal system of Sri Lanka, consultations with traditional medicinal practitioners revealed that the method of preparation does not vary all that much, other than the duration of boiling.

Quality of Preparation, Standards, and Dosages for Modern Times

One aspect of the 'paspanguwa' formula, if it were to be sent out to a global market, would be to enhance the quality of preparation, determine the standards and dosages a practice which has not been fully ascertained by modern day manufacturers of traditional medicines. The need for these aspects, especially Total Quality Management (TQM) has been emphasized in a recent publication by Cooper [99]. While this paper focuses on Traditional Chinese Medicine (TCM), there is a need for all traditional medicinal systems to adapt to a more scientific means of verification, so that the health claims can be substantiated, including the 'paspanguwa' formula. Especially for Europe and the United States, acceptability of traditional herbal medicines requires evaluation of dosages to assure safety and efficacy [100]. At this time, only a traditional medicinal practitioner's word defines the currently accepted dosage of one 'portion' of each of the major herbs to varying amounts of the minor herbs, where 'portion' is simply a term of measurement of strength. For scientific investigations, researchers also need to bear in mind that the 'paspanguwa' formula is a combination of herbs, and thus, a reductionist approach may not work in fully determining its effectiveness. For this, modern advents such as use of a biomarker, linking a biological effect to a chemical marker and standardizing the levels of bio-actives, will go a long way to an improved quality product. Finally, newer processes such as systems biology, metabolomics and chemo metrics may be used to evaluate the biological responses of the formula more effectively [101-103], leading to a clinical trial.

Conclusion

In conclusion, herbal formula such as the 'paspanguwa' has been accepted by local people in Sri Lanka, despite the absence of systematic scientific elucidations, owing to its extensive history of application, as well as the effectiveness for several ailments across generations. It is available as a commercial product, which can be bought off the shelf and thus, has found acceptance into the modern consumer market while obtaining a similar status as a typical pain-killer. To provide a more value-added effectiveness, scientific investigations need to be carried out, so that its applications are more disease-specific – especially pandemics such as diabetes, cardiovascular disease, and cancer, given the recently discovered ability of the formula to possess antioxidant and starch hydrolase inhibitory activities. The safety and efficacy of the formula needs to be scientifically established, if it is to be promoted into the global market, where regions such as Europe and the United States might require rigorous examination of this aspect. On a more traditional and cultural note, the 'paspanguwa' story also infers the importance of inter-connectivity of medicines, recognizing the ingredients used in the formulation and the potency of the individual medicines have combined into a unique remedy, which can be used for many disease conditions as well as for maintaining overall health and wellness. Given certain shortcomings of 'western' medicines, the holistic approach is an aspect, which can be learned and adapted, for physiological systems operate in harmony, and thus, offers these medicines and remedies to be a part of our wellness arsenal.

Conflicts of Interest

The authors report no conflicts of interest, financial or otherwise.

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