Traditional medicinal benefits of *Caryota urens:* A review article

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Abstract

Caryota urens which belongs to the Palmae family is used as a food, beverage, fiber, timber and for ornamental purposes in Sri Lanka. Jaggery and treacle made out from *Caryota. urens* is very abundantly used in the Sri Lankan communities since a long ago. Even though its usage as a food article has been broadly described in many instances, its medicinal usage has not been mentioned clearly with regard to Traditional Medicinal aspects of Sri Lanka. The aim of this paper was to review the relevant literature from authentic texts in Traditional Medicine such as Ayurveda pharmacopoeia, *"Deshiya chikitsa samgrahaya"* and *"Osuthuru wisithuru"* as well as published research articles in the data bases such as Science direct, PubMed and Google scholar to provide a summary on potential medicinal benefits of *Caryota urens*. The results revealed that the used parts of this plant are leaves, bark, root bark, flowers as well as toddy and starch. It gives beneficial health effects such as anti-microbial, anti-oxidant, anti-inflammatory, anti-parasitic, anti-cancer and analgesic properties. The most common herbal preparations made out from this plant were herbal gruel and *"Basna"* (A nutritional preparation specific to Sri Lankan traditional medicine). Apart from that, the use of *Caryota. urens* in diseases such as diarrhea, parasitic infestations, anemia, jaundice, burning sensation was also identified through this review. It can be concluded that *Caryota. urens* is a functional herbal food and herbal ingredient which has many favorable health effects and further studies will be needed to determine these effects thoroughly.

Keywords: *Caryota urens*, Medicinal properties, Functional food, Traditional Medicine

Introduction

Caryota urens (*C. urens*) is a palm tree, which belongs to PALMAE family. This plant is native to Sri *Lanka*, India and Nepal[1]. This tree was first observed in Cambodia[2]. *C. urens* is traditionally tapped for sap from which sweet syrup (treacle), sugar (jaggery) and alcoholic beverages (toddy) are prepared. The treacle and jaggery are highly valued for culinary purposes in Sri Lanka3. *C. urens* is a tall unarmed, trunk which is 13 - 20m tall and 0.3m in diameter, cylindrical, annulated, flowering when full grown from axils of leaves begin with the upper and the thence successively downward, leaves large, flowers crowded[4]. As synonyms for *C. urens* in different languages, *"Krushna kanthu, Sthulathala"* is used in Sanskrit, *"Heenthala"* is used in Hindi and *"Tobby palm, Jaggery palm"* is used in English and locally it is known as *"Kithul"*. Chemical composition of *C. urens* is palm sugar content of the flower juice (*Meera*)[1]. *C. urens* is a plant which has a great nutritional as well as a medicinal value. When it comes to functional food, the most important are *Kithul* flowers obtained from the *Kithul* tree, especially prepared *Kithul* treacle, jaggery and flour. The medicinal components here are fermented toddy, treacle, jaggery and flour obtained from flowers (*Meera*), bark and roots.

Considering its medicinal value, it stimulates appetite[6]. This improves the digestive energy and also helps in the improvement of *Agni* (digestive fire) and relives constipation and facilitates

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defecation[6]. The root bark and the cabbage of the palm are used for the treatment of rheumatic swellings and snake- bite poisoning[4]. The inflorescences are tapped for toddy, treacle and jaggery made from it. The wood is used for building purposes. The pith yields starch which is eaten. Commercially *Kithul* fiber is produce by using leaves of the tree[4]. The cabbage of this palm before flowering is a food for elephant. It is used medicinally for gastric ulcers[4]. The root is employed for tooth ailments and the bark and seed on boils and the tender flowers for promoting growth of hair[4]. Several research studies have emphasized the pharmacological actions or beneficial health effects of *C. urens* such as anti-inflammatory, anti-oxidant, anti-microbial, anti-diabetic and anti-cancer properties.

The aim of this review was to provide a comprehensive summary of pharmacological actions, medicinal benefits and traditional medicinal formulae of *C. urens.* Those preparations which are available in Traditional texts play a major role in the treatment of various kinds of diseases. Therefore, it is important to review medicinal aspect of *C. urens* for future treatment as it will be a great subscription to healthcare system. Because the proper usage of this plant can be used as a remedy for many ailments, it would be beneficial for the people in the society to get a clear view about the therapeutic properties of *C. urens* and the disease conditions which it can be used for, in order to get rid of them. Therefore, this research was conducted with the aim of discovering the formulae and regarding the above-mentioned facts by using both Ayurveda and western medicinal approaches.

Methodology

Method of data collection

This review was conducted by using Sri Lankan authentic traditional texts such as *"Deshiya chikithsa samgrahaya", "Aushda samgrhaya"* to find out the *Kithul* containing medicinal formulae mentioned in traditional texts and to identify the composition, mode of administration and indications of *Kithul* from above mentioned formulae. Further published articles which report about the medicinal effects of *C. urens* were searched and a comprehensive review was conducted by using the data bases; Pub Med, Science direct and Google scholar for studies published regarding *C. urens.* The search terms used were *C. urens,* medicinal properties, nutritional properties and health benefits. Only the studies published in English language were considered in the electronic data bases. Apart from that, relevant texts and internet sources were also used for the purpose of gathering necessary facts about *C. urens* plant. Interpreted data were presented in scientific methods by using tables etc.

Results

Results of traditional authentic texts

Several indications mentioned according to its used parts were identified by observing traditional authentic texts such as *Deshiya chikithsa samgrahaya, Aushada samgrahaya, Osuthuru wisithru*.

Indications according to the used part of Caryota urens

The collected data revealed that, various used parts of *C. urens* were mostly used for snake venom, *Pandu* (Anemia), *Kamala* (Jaundice) and in *Pitta doshic* involvement. It was also revealed that *Kithul* treacle and *Kithul* jaggery are most commonly used for these preparations. Table 01 shows the traditional medicine indications of *C. urens* according to its used part.

Caryota urens containing formulae mentioned in traditional authentic texts

Sixteen medicinal formulae were found which containing *Kithul*. Among these formulae, *Basna* (A nutritional preparation) is the most abundantly mentioned preparation mode and *Kithul* treacle and jaggery are widely used for these preparations. All the formulae are used as internal preparations (Table 02). Figure 01 shown the pharmacological action of *C. urens.*

Table 01: Traditional medicine indications of *Caryota urens* according to its used part

Used part	Indication
Leaves	Burning sensation, General weakness[5]
Bark	Grind the bark and take the juice. Pour into the ear – relives earache[6]
Root bark	For rheumatic swelling snake bite poisoning[4]
Seeds	Boils[4]
Flower	Promotes hair growth (tender flowers)[4]
Treacle	*Kamala* (Jaundice)[7]
Jaggery	*Pandu* (Anemia), *Kamala* (Jaundice), *Rathpita* (Bleeding from various parts of the body)[7]
Cabbage	For rheumatic swelling snake bite poisoning, Gastric ulcers[4]
Toddy	Constipation, Increase digestive power[2]
Starch	Hemorrhoids[6]

Table 02: *Caryota urens* containing formulae mentioned in traditional authentic texts

Type of the preparation	Formulation			Indication
	Ingredients	Method	Mode of administration	
Gruel[8]	*Mussenda (Mussaenda frondosa)* leaves, *Bakmi (Nauclea orientalis)* bark, *Hathawariya (Asparagus racemosus)* tuberous roots,	Take the juice extract (*Swarasa)* of these ingredients and add *Hinati hal* (Traditional rice variety) and prepare gruel. Take this with ***Kithul* jiggery**	Use this day and night for three days	*Pandu* (Anemia) *Kamala* (Jaundice)
Gruel[8]	*Yakinaran (Atalantia ceylanica)* leaves	Prepare a gruel and take it with ***Kithul* jiggery**		*Pandu* (Anemia) *Kamala* (Jaundice)
Beverages [8] *(Paana)*	Lime juice, water of *Mung* bean (Green gram), King coconut water, ***Kithul* treacle**	Boil these ingredients	Use two tablespoon day and night	*Kamala* (Jaundice)
Thala Behetha[9]	*Sadikka (Myristica fragrans), Karabuneti (Syzygium aromaticum), Vasavasi* - Mace *(Semen myristicae), Thippili (Piper longum), Sududuru (Cuminum cyminum), Kaluduru (Nigella sativa), Dewadara (Cedrus deodara), Kothaburu (Coriandrum sativum),*	Grind the all ingredients and take fine powder. Separate into 14 parts.	Use this day and night for one week. Use it with Cow's milk	*Pandu* (Anemia) *Kamala* (Jaundice) *Rathpita* (Bleeding from various parts of the body) *Prameha* (Diabetes) *Shotha*

	Welmi (Glycyrrhiza glabra): *Kalan* 1 (5g) of each ingredient Red Onion*: Kalan* 9 (45g) ***Kithul* jaggery:** *Kalan* 10 (50g) *Kalu thala* (Black sesame seeds)*:* 960ml			(Edema) *Arshas* (Piles)
Virekaya [10] (Purgative)	*Detta (Boehmeria nivea) ala, Aralu (Terminalia chebula), Bulu (Terminalia bellirica), Nelli (Phyllanthus emblica), Maduru (Fructus Foeniculi), Jayapala (Croton tiglium): Kalan* 01 (5g) *Siyabala (Tamarindus indica) bora* (juice): *Kalan* 03 (15g) *Thirasthawalu (Operculina turpethum): Kalan* 7 (35g) ***Kithul* jaggery*:*** *Kalan* 16 (80g)	Grinding all ingredients and make a pill	Use in the morning	*Pandu* (Anemia)
Yabora Lehaya [11]	*Yabora* (Iron preparation), *Inguru (Zingiber officinale), Gammiris (Piper nigrum) Thippili: Paln* 1 (60g) ***Kithul* jaggery*:*** *Palan* 2 (120g) *Kikirindiya (Eclipta prostrata)* juice*: Mana* 1 (480 ml)	Make a paste and use		*Pandu* (Anemia)
Yahunu Lehaya (I)[11]	*Kikirindiya (Eclipta prostrata) juice: patha* 1 (240ml) *Uk (Saccharum officinarum)* **treacle***: patha* 1 (240ml) *Cow's milk: Mana* 1 (480ml) ***Kithul* jaggery*:*** *Palan* 3 (180g) Sesame oil*: ½ Patha* (120 ml) *Yahunu: Karsha* 1 (15g) ***Kithul* jaggery*:*** *Palan* 3 (180g) Sesame oil*: ½ Patha* (120 ml) *Yahunu: Karsha* 1 (15g)	Cook it until it comes for thick paste like semi-solid (*Leha padama)*		*Pandu* (Anemia)

Yahunu Lehaya (II)[11]	*Kikirindiya (Eclipta prostrata), Kalu Uk (Saccharum officinarum)* **treacle***: Mana* (480ml) Cow's milk: *Neli* 1 (960ml) ***Kithul* jaggery*:*** *Palan* 7 (420g) Sesame oil: ¼ *Patha* (60ml) *Yahunu: Karsha* 6 (90g)	Cook it until it comes for paste like semi-solid (*Leha padama)*		*Pandu* (Anemia) *Shotha* (Edema)
Puhul Basna[12] (A nutritional preparation)	***Kithul* Treacle**, Coconut Treacle. Lime juice: 2 bottles Ginger Juice: 1 bottle *Yabora: Kalan* 36 (180g)	Took an ash gourd and cut a piece from top (lid). Remove the flesh inside and filled with ingredients. Replaced the lid and covered the fruit with layer of mud. Leave beside a hearth for 5 days	Filter the juice and use	
Maha Basna[12]	Juice of *Kapu (Gossypium arboreum)* leaves and, Tamarind leaves, *Kikirindiya (Eclipta prostrate)* juice: *Patha* 1 (240ml) Lime juice and orange juice, ***Kithul* Treacle,** Coconut Treacle, *Uk (Saccharum officinarum)* **treacle**, Bee honey: *Patha* ½ **(**120ml) *Aralu (Terminalia chebula), Nelli (Phyllanthus emblica), Inguru (Zingiber officinale), Gammiris (Piper nigrum), Thippili (Piper longum), Sadikka (Myristica fragrans), Karabuneti (Syzygium aromaticum), Vasavasi- Mace (Semen myristicae), Garlic, Sududuru (Cuminum cyminum), Kaluduru (Nigella sativa), Wada kaha (Acorus calamus), Welmi (Glycyrrhiza glabra), Asamoda (Trachyspermum roxburghianum) , Kottam (Saussurea costus),Kottamalli (Coriandrum sativum), Yahunu , Yabora : Kalan 1(5g) of each ingredient*	Took an ash gourd and cut a piece from top (lid). Remove the flesh inside and filled with ingredients. Replaced the lid and covered the fruit with layer of mud and buried under ground. Give heat for 2 days.	Use this day and night for one week	Fever, Constipation, Headache, *Ashmari*, (Calculi) *Pittaja Pandu*, (Anemia) *Daha*, (Burning sensation) *Shotha*, (Edema), *Vata raktta Brama* (Dizziness) *Anaha*, (Distention of abdomen)

Yusa Basna [12]	Juice of *Kapu (Gossypium arboreum)* leaves and, Tamarind leaves, Lime juice: *Nali* 1 (960ml) *Sududuru (Cuminum cyminum), Kaluduru (Nigella sativa), Nelli (Phyllanthus emblica), Thippili (Piper longum), Asamoda (Trachyspermum roxburghianum), Sadikka (Myristica fragrans), Karabuneti (Syzygium aromaticum), Vasavasi* – Mace *(Semen myristicae) : Kalan* 1(5g) of each ingredient ***Kithul* jaggery**	Put all ingredients into a pot and sealed it with mud and buried under ground for 3 days. Give heat.		*Pandu* (Anemia) *Rathpita* (Bleeding from various parts of the body)
Ra Bassna [12]	*Ra* (toddy*): Neli* 02 (1960ml) Lime juice: *Mana* 01 (480ml) ***Kithul* jaggery:** *Palam* 1 (60g) *Yahunu: Palam* 1 (60g) *Kaluduru (Nigella sativa) : Palam* 1 (60g)	Put all ingredients into a pot and sealed it with mud and buried under ground for 3 days. Give heat.		*Pandu* (Anemia)
Dehi Bassna[12]	Lime juice, Ginger juice, Bee honey, **Kithul jaggery,** *Uk (Saccharum officinarum)* **treacle**: Patha 1 (240ml) *Welmi (Glycyrrhiza glabra), Sahinda lunu; Kalan* 1 (5g)	Took an ash gourd and cut a piece from top (lid). Remove the flesh inside and filled with ingredients. Replaced the lid and keep it in water container.	Use this for 7 days	*Pandu* (Anemia) *Shotha* (Edema) *Prameha* (Diabetes)
Beverages *(Paana)*[13]	*Siyabala kola: Kalan* 12 (60g) *Aralu (Terminalia chebula) Kalan:* 3 (15g) *Gole pethi: Kalan* 3 (15g) Water*: Neli* 2 (1920ml)	Took all ingredients and boil into 1 *Neli* (960 ml) and filter. Then add 64 *Kalan* (320g) of sugar, ***Kithul* jaggery,** tamarind juice. Stir well and boil again. When in use add some sahinda lunu	Use for 4 times	*Pandu* (Anemia) *Shotha* (Edema) *Udara* (Distention of abdomen)
Beverages *(Paana)*[13]	*Aralu (Terminalia chebula), Inguru (Zingiber officinale), Karunka puwak: Kalan* 4 (5g) Tamarind: *Kalan* 12 (60g) Water: *Mana* 1 (480ml)	Took all ingredients and boil down 4*mana* of water in to 1 *mana*. Then add; ***Kithul* jaggery:** *Kalan* 6 (30g), Tamarind juice: *Kalan* 4 (20g), *Sahinda lunu: Kalan* 2		*Pandu* (Anemia)

Pharmacological actions of C. urens according to modern science (Figure 01)

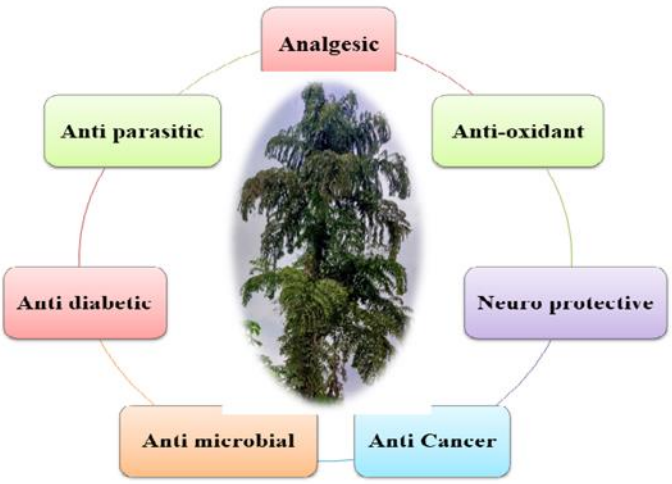

Fig. 01: Pharmacological action of *Caryota urens*

Anti-inflammatory properties

Balaji et al. investigated the anti-inflammatory effects of *C. urens* by evaluating the Nitric Oxide (NO) production mediated by Inducible Nitric Oxide Synthase (iNOS) and revealed that the hydroalcoholic leaf extract of *C. urens* (CULHA) can be developed as a new therapeutic agent against inflammatory diseases[14]. Sujitha *et. al.* investigated if the active constituents of *C. urens* leaf hydro alcoholic extract (CULHA) umbelliferone and rutin has the ability to inhibit rheumatoid arthritis by blocking TNF-alpha and the results suggested that the presence of rutin and umbelliferone in *C. urens* could be responsible for its anti-inflammatory activity[15].

Anti-oxidant properties

The anti-oxidant properties of *C. urens* was investigated by Ananth *et. al.* revealed that the antioxidant activity of immature fruit and leaf extracts yielded high activity when compared to its fruit skin and the bioactive compounds of *C. urens* could be attributed to its anti-oxidant properties[16]. *Sharmin* et al. evaluated the anti-oxidant activity of fruit extract of *C. urens* by using the total phenolic content and the results showed that its fruit extract consists of a significant anti-oxidant activity[17].

Anti-microbial effects

Ananth *et. al.* demonstrated the anti-bacterial activities of *C. urens* against the tested pathogens *E.coli, Vibrion cholerae, Salmonella typhii, Staphylococcus aureus* and *Shigella flexneri* and stated that fruit skin and immature fruit of *C. urens* exhibited strong anti-bacterial activities than leaf [18]. The antimicrobial activity of *C. urens* samples was analyzed against five gram positive and eight-gram negative bacteria by using the disc diffusion method by Sharmin *et. al.* revealed that among all the samples, the largest zone of inhibition (13.0 mm) against *Shigella dysenteriae*[19].

Anti-parasitic effects

A study was undertaken to assess the larvicidal potential of *C. urens* against dengue vector *Aedes aegypti. (A. aegypti)*. For that purpose, the larvicidal activity of methanol leaf extracts of *C. urens* at various concentrations was studied by *Vanaja* et al. and the results revealed that *C. urens* can serve as a potential larvicidal agent against the dengue vector *A. aegypti*[20].

Anti-diabetic effects

Ferreres *et. al.* demonstrated the anti-diabetic properties of inflorescence extract of *C. urens* and suggested that *C. urens* inflorescences can support the development of new functional foods with α-glucosidase inhibitory activity[21]. Anti-diabetic properties of *C. urens* flour was estimated by Wimlasiri *et. al.* by making use of alpha amylase and alpha glucosidase enzyme inhibition assays and they stated that it did not contain marked anti-diabetic properties[22].

Anti-cancer properties

The potential cancer chemo preventive action of *C. urens* and *C. mitis* was evaluated by El-Akad *et. al.* by analyzing the leaf and fruit metabolites of both varieties[23].

Neuro protective effects

A study was carried out by Ravindran to prove the memory enhancement and cognitive effect of *C. urens* on Alzheimer's induced mice using various memory retention experiments such as Y maze, Morris water maze, Passive avoidance etc. and it was concluded that *C. urens* possesses a remarkable

effect in memory enhancement in Alzheimer's disease[24].

Analgesic effects

Patel *et. al.* analyzed the *C. urens* methanol extract of leaves for giving the analgesic effect by using the Hot plate method and Tail flick method. Their results suggested that *C. urens* extracts showed the presence of phytosterols, tepenoids, tannins, flavonoids and phenolic compounds which has been responsible for the analgesic effect[25].

Effects on lipids

Ranasingha *et. al.* examined the effect of *C. urens* treacle on serum lipid profile using Wister rats by making use of Randox test kits to calculate Total Cholesterol (TC), High Density Lipoprotein (HDL) and Triglyceride (TG) contents in serum and Friedewald equation to calculate Low Density Lipoprotein (LDL) content. The results revealed that treacle has a significant beneficial effect on serum lipid profile[26].

Discussion

Caryota urens (Kitul) is a palm tree. In general, even though it is common that palm trees do not have much of a medicinal value, when thoroughly researched, coconut, *Thal* palm as well as *Kitul* offer many medicinal benefits. *C. urens* is one of the most important multipurpose medicinal plants. Each part of the plant has some important medicinal value.

According to the collected data *C. urens* has widely used for the treatment of *Pandu* (anemia), *Kamala* (Jaundice) and in Diseases occurs due to vitiated *Pitta dosha* such as *Daha* (burning sensation), *Brama* (dizziness), *Rathpita* (bleeding from various parts of the body) etc. Considering the properties of *C. urens*; *Madura rasa* (sweet taste) improves the *Rasa* (essence part soon after digestion), *Raktha* (blood), *Mansa* (muscle), *Meda* (fat), *Asthi* (bone), *Majja* (bone marrow) and *Ojas* (essence in every tissue). It has *Balakaraka* (improves the strength of the body) and *Bhagna sndhanakara* (heal the fractures) actions as well. Considering the *sheetha veerya* (cold potency), it helps to pacify the *Pitta dosha*. Altogether all the properties contribute to pacify the *Pitta* and *Vata dosha* and provide strength to the body. *C. urens* has anti-microbial, anti-parasitic, anti-oxidant, anti-inflammatory, anti-cancer and analgesic properties. In addition, it seems to lower blood glucose and serum cholesterol levels while giving neuro-protection actions too. It acts on different systems of the body in numerous ways which aids in relieving plenty of diseases such as diarrhea, migraine headaches, snake bite poisoning, rheumatic swellings, Alzheimer's disease etc.

Conclusion

Therefore, it can be concluded that *C. urens* is a plant very much useful in the traditional medicine in order to alleviate from many diseases and furthermore it is a valuable natural source which can be used to obtain multiple therapeutic effects in curing and the prevention of diseases. It is an effective food article and a medicinal drug which can be used by the people in all the ages.

Recommendations

Further clinical and experimental studies need to be carried out to evaluate the efficacy of therapeutic potentials in Sri Lankan traditional medicinal use of *C. urens* in the health care system.

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