

**REVIEW ARTICLE**

**Therapeutic and Nutritional Values of *Narikelodaka*  
(Tender Coconut Water) - A Review**

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**ABSTRACT:**

**Background:** Tender coconut water is a wholesome and nutritious drink. It has an important role to play in the fast-developing functional foods market particularly nutraceuticals and pharmaceuticals. The resurgence of interest in the coconut generated due to the awareness of people about the possible hazards from soft drinks and the promotional measures taken by government have contributed to the growth of market for tender coconut water. Value-added products presents an opportunity for intensifying and building on past research and development work. Coconut water is one of the world's most versatile natural product with increasing scientific evidence that support the role of coconut water in health and medicinal application. Medicinally, it has been proven to possess various pharmacological activities like hepatoprotective, anti-inflammatory, antipyretic, wound healing, anti thrombotic, antioxidant, Hypolipidaemic, Antihypertensive, diuretic, hypoglycemic, renal regenerative actions. Over the past decades, many reports have appeared in mainstream scientific journals describing its nutritional and medicinal properties. Glimpse of the classical Ayurvedic texts gives us an insight into the medicinal properties of coconut that is in tune with the scientific findings of today. This review attempts to reiterate and appraise the therapeutic and nutritional values of coconut water.

**KEYWORDS:** Tender coconut water, *Narikelodaka*, Coconut juice, Ayurveda, Nutrition

**1.INTRODUCTION:**

Coconut is the most extensively grown and used nut in the world, playing a significant role in the economic, cultural, and social life of over 80 tropical countries<sup>1</sup>. There is both scientific and abundant anecdotal evidence for coconut's significant nutritional, health and healing benefits<sup>2</sup>.

Coconut, (*Cocos nucifera* L), belonging to the family Palmae, is a tree that is cultivated for its multiple utilities, mainly for its nutritional and medicinal values. It has been described as the most important and extensively grown palm tree worldwide. Coconut is a member of the monocotyledonous family Arecaceae (Palmaeae), subfamily Cocoideae and the monospecific genus *Cocos*<sup>1</sup>.

In Sanskrit, it is known as *Narikela*, *Kalpa vriksha*, *Sriphala*, Coconut palm in English, *Nariyal*, *Khopra* in Hindi, *Thengina kayi* in Kannada, *Kobbari kaayi*, *Tenkai* in Telugu, *Tennai* in Tamil, *Tenga* in Malayalam. In the Malay language, it is *pokok seribu guna* ('the tree of a thousand uses'). In the Philippines, the coconut is commonly called the 'tree of life.'

Coconut Water is the nutritious clear liquid inside the coconut fruit which is rich in vitamins and minerals. The water of tender coconut, technically the liquid endosperm, is the most nutritious wholesome beverage that the nature has provided for the people of the tropics to fight the sultry heat having a caloric value of 17.4 per 100gm<sup>3</sup>. Tender coconut water later matures into the flesh or the coconut meat. Tender coconut water is the liquid or juice and not the milk of the coconut.

#### **Vedic references of narikelodaka:**

Ancient literature of India and elsewhere portray the historical traditional use of coconuts and coconut products for more vigorous health. Narikela is cited in Vishnu Dharmashastra and Vishnu Purana, the ancient religious Hindu texts. Banabhatta (Sanskrit prose writer and poet of India) and Varahamihira (the ancient Indian astronomer, mathematician, and astrologer) have also mentioned it<sup>4</sup>.

#### **Traditional uses of tender coconut water:**

From fertility taboos to unseen magical forces, fascinating folklore practices revolving around the coconut have evolved throughout the tropical regions. According to popular folklore (*Janakatha*), an ancient king of Ceylon lost interest in life because of a severe skin rash and recovered completely by the intake of coconut water. Young coconut juice has been used in folk healing for a number of ailments: relieving fevers, headaches, stomach upsets, diarrhoea and dysentery. The juice is also given to strengthen the heart and restore energy to the ill<sup>5</sup>. Tender coconut water extract along with citrus aurantium is used for soaking the affected parts of fractures and sprains in Cook Islands, tender coconut water for kidney problems in Fiji are some of the traditional uses of coconut water<sup>2</sup>.

In India, Coconut water is used for puja rituals as it is sacred, clean, and pure and health giving. The 3 marks on the coconut are said to represent the three eyed Lord Shiva and therefore it is considered as a means to fulfill our desires. In Asia, and especially in India, tender, i.e., immature, coconuts are offered as ceremonial gifts and serve as purification media at traditional events<sup>6</sup>. Hindus often initiate the beginning of any new activity by breaking a coconut to ensure the blessings of the gods and successful completion of the activity. Tender coconut water is used in abhisheka rituals since it is believed to bestow spiritual growth on the seeker. The coconut also symbolizes selfless service.

The association of human fertility with coconut is prominently manifested during the wedding rituals across India. The fruit often placed on the pot is a metaphor for the womb, while the nut itself, a symbol of life, confers fertility on the bridal couple. On the contrary, women in Tropical Asia, especially in Southeast Asia were prohibited from drinking coconut juice because it disrupts their natural menstrual cycle. Accordingly, folk medicine postulated that young coconut juice has phytoestrogen-like effect<sup>7</sup>. Coconut water is not only used in traditional medicine but also a tropical beverage and also used as a microbiological growth medium. As a beverage, the water of the unripe coconut has the advantage of being sterile and forms a refreshing drink. It is used as a medicine in different regions of the world and during World War II, coconut water was used as a short-term intravenous hydration and resuscitation fluid. It is also believed that coconut water could be used as an important alternative for oral rehydration and even so for intravenous hydration of patients in remote regions. It is very effective especially in diarrhoea and excellent tonic for the old and sick<sup>8</sup>.

In Coimbatore and Palghat Districts of Tamil Nadu and Kerala, Folk-Lore Medicines for Jaundice include Turbinella rapa (Shell of the conch) made into paste with tender coconut water and given internally twice a day. One square inch shell is prescribed at a time. Another recipe involves a handful of tender leaves of *Ricinus communis* L. (red variety) which are made into paste mixed in tender coconut water and administered internally twice a day for three days<sup>9</sup>. Folklore healers of Udupi, Karnataka use tender coconut and Red Ochre (Gairika) made into a paste as an external application in case of herpes to relieve the burning sensation.

Fresh coconut milk mixed and heated together with rice flour is applied to gangrenous ulcers and skin boils. Fresh juice of young coconuts is recommended for reducing fevers and relieving headaches, stomach upsets, diarrhea and dysentery and strengthening the heart and for restoring energy to the patients recovered from illness. It is believed that expectant mothers who regularly drink coconut juice will help the foetus grow stronger and with greater vitality<sup>10</sup>.

#### **Tender coconut water - an Ayurvedic perspective:**

The Ayurvedic system of medicine has documented the uses of tender coconut water 4000 years ago. In Sanskrit, the coconut palm is called the "Kalpavriksha" which means the tree that provides all that is needed for life. The fruit narikela is mentioned in Madhuravarga and among Asavas<sup>11</sup>. The coconut is cited among the Amradhi Phala varga in Bhavaprakasha Nighantu. Interestingly, it is regarded as Tunga (tall tree) belonging to the group of Truna (grass). It is noteworthy to acknowledge the ancient wisdom and the rationale behind the inclusion of coconut tree under the Truna (grass family) based on its features, which is relevant even according to the modern botanical classification. It has synonymms like Dakshinatyaka (grows mainly in South) India, Skandhaphala (fruits appearing on the trunk), Sadaphala (the fruits appear throughout the year). The fruits are Drudhaphala (hard) and have tryaksha (three eyes).

Coconut is sweet, oily, tonic and diuretic. The coconut water is said to be Sheetala (Cold), hrudya (cardioprotective), deepana (digestive stimulant), shukrala (Aphrodisiac) (Promoting semen), laghu (light). It relieves pitta, pipasa (thirst) and bastishuddhikara (diuretic). Raja nighantu specially cites that the Coconut water is madhura (Sweet to taste) and guru in paka (Causes heaviness during post digestive phase. It is also indicated in Pinasa (Common cold), shrama (Fatigue), Daha (Burning sensation). Young (Immature) narikela is indicated in shosha (Emaciation) whereas mature ones are said to be virya vardhanam (Enhancing the potency of an individual)<sup>13</sup>. According to Nighantu ratnakar, which gives a vivid description of *Narikelodaka*, taruna (immature ones) are trushnagna (relieves thirst) and pittanashaka. Young tender coconut water probably induces virechana (laxative). It is given in Chardi (emesis), Bhrama (giddiness), pittajwara. Whereas the mature coconut water is guru (heavy for digestion)

vistambhi (Food that causes distension). Shaligrama Nighantu adds on qualities like ashu (quickly imbibed) madakruth (intoxicating), aparhne amlabhavmupayathi (attains sourness in the afternoons), krimighna (wormicidal), increases shleshma and pitta. Chakrapanidutta, states that the tree is grown mainly in anoopa desha(moist area)<sup>14</sup>.

**Table-1 Tender coconut water (Narikelodaka) in Ayurvedic formulations**

Compound formulations containing Narikelodaka	Indications
Elanir Kuzamphu <sup>15</sup>	Netrarogas like Arma (Pterygium) , Cataract , Blurred vision , Relieves vata pittaja ailments of the eye
Narikela Khanda <sup>16</sup>	Aruci (Tastelessness), Vami (Vomiting), Shula (Colicky Pain), Amlapitta (Dyspepsia), Raktapitta (Bleeding disorder), Kshata (Wound), Kshaya (Pthisis), Daurbalya (Weakness)
Narikela lavana <sup>16</sup>	Amlapitta (Hyperacidity) , Parinama shula,
Vastyamayantaka ghrta <sup>15</sup>	MutraKrcchra(Dysuria), Prameha, Asmari (Urinary calculi)
Lakshminarayana rasa <sup>17</sup>	Vata roga, Jwara (Fever), sutika roga (Post partum disorders)
Chandanadi thaila <sup>18</sup>	Daha, Jwara (Fever)
Bhallataka Upavisha <sup>19</sup>	For Purification Purpose

**Table -2 Applications of Narikelodaka in diverse disease conditions**

Sl.No	Disease condition	Indications
1.	Suryavarta (Headache)	Narikela jala with sharkara
2.	Udara Krimi (Intestinal Worms)	Narikela jala with Hingu act as krimihara
3.	Ardhavabhedaka (Migraine)	Narikela jala (Chakradatta)
4.	Shirashula in Kshaya (Headache due to nutritional deficiency)	Narikela jala with sugar (Shodala Nighantu .Ni)
5.	Chardi (Vomiting)	Narikela Jala with Pippali, Madhu and Sita (Ch.Chi 20/26 )
6.	Mukhadushika (Acne)	Narikela jala with Vatapallava pasted with shukta
7.	Daha Jwara (Pyrexia)	Application of Chandanadi thaila containing Narikela Jala
8.	Parinama shula (Duodenal ulcer)	Narikela Lavana
9.	Amlapitta (Hyperacidity)	Narikela Khanda

**Nutritional facts of tender coconut water:**

Green Coconut has much water and is rich in proteins, minerals, vitamins, calcium, Phosphorus, iron, iodine, chlorine, sulphur, potassium, carbohydrates and vitamins, B1, B2, B5 and magnesium. The water also helps the hydration of the body. Sugars are the main fraction of soluble solids in coconut water Sucrose, sorbitol, glucose and fructose are the main sugars in mature coconut water are followed by minor sugars including galactose, xylose and mannose. Minerals are said to be the second constituents in terms of quantity<sup>6</sup>. It also contains several amino acids. Besides sugars, minerals and proteins, a minor fraction is composed of aromatic compounds. Coconut water has a specific taste and

flavour. The glucose content of the tender coconut water is slightly lower than that of fasting blood sugar level for humans. With this coconut water could be the best drinks for diabetic's patient<sup>20</sup>. Trace amount of mannitol and sorbitol are reported from tender coconut water. Sugar alcohols reduce blood sugar levels so that liver is healthier and gets more energetic life. Metabolism of oral bacterial can be prevented by mannitol, it also prevents the increase in the acidity of mouth after ingestion, and acts as anti cavity agent of tooth. Organic acid such as malic and citric acids are present in tender coconut water, which inhibit the growth of micro organisms such as yeast moulds and bacteria. It also helps to improve the taste by balancing sweetness<sup>21</sup>

Calcium on the other hand, is an indispensable component of the structure of the body<sup>22</sup>. The calcium content is slightly higher than the Extracellular Fluid. This makes coconut water a major source of calcium to the body; in addition intake of coconut water by infants can help prevent nutritional rickets. It is important to note that in exclusive breast feeding after the forth calcium is gradually reduced from the colostrum, regular intake of coconut is advised for the nursing mother to meet up the calcium nutritional requirement of the baby<sup>20</sup>. Some of the important significant and useful components in coconut water are cytokinins.

Coconut is known as a 'functional food,' which provides health benefits over and beyond the basic nutrients. Lauric acid is a key ingredient in coconut products: 'Approximately 50% of the fatty acids in coconut fat are lauric acid. (The percentage of arginine, alanine, cystine and serine in the protein of tender coconut water are higher<sup>23</sup>. The green dwarf variety contains the highest levels of total phenols and Vitamin C<sup>24</sup>. Amino acid is important not only as building material for the body, it has major other property such as energy source (body converts amino acid into glucose), helps produce lymphocytes, which are cells in human lymph fluid and bloodstream that are vital to immune system. It may help regulate blood sugar; helps reduce symptoms of prostate enlargement in men, helps adrenal gland function

**Table- 3 Chemical composition of coconut water<sup>25</sup>**

Nutritional values	Mature Coconut Water	Tender Coconut Water
Total solids%	5.4	6.5
Reducing sugars %	0.2	4.4
Minerals %	0.5	0.6
Protein %	0.1	0.01
Fat %	0.1	0.01
Acidity mg %	60.0	120.0
pH	5.2	4.5
Potassium mg%	247.0	290.0
Sodium mg%	48.0	42.0
Calcium mg%	40.0	44.0
Magnesium mg %	15.0	10.0
Phosphorous mg%	6.3	9.2
Iron mg%	79.0	106.0
Copper mg%	26.0	26.0

(Satyavati, K.G , Biochemical Analysis of Coconut Water. Coconut Development Board India.)

Coconut water is the richest natural source of cytokinins. Cytokinins can retard the effect of aging in plant cell as well as human cell. They inhibit platelet clots that may lead to heart attacks and strokes. Cytokinins has potential for

treatment of degenerative brain diseases like demential and Alzheimer's disease<sup>21</sup>.

**Table -4 Nutritional values of Tender coconut water**<sup>26</sup>

Nutritional values	Coconut water	Tender Coconut Water
Moisture	93.8	90.8
Protein	1.4	0.9
Fat	0.1	1.4
Minerals	0.3	0.6
Crude fibre	0	0
Carbohydrates	4.4	6.3
Energy (in Kcal)	24	41
Ca	24	10
P	10	30
Fe	0.1	0.9
Thiamine	-	0.01
Niacin	-	0.1
Vit.C	-	2

(Nutritive value of Indian foods, National Institute of Nutrition, Hyderabad)

**Table- 5 Vitamins of B Group in Tender Coconut Water**<sup>23</sup>

Nicotinic acid	0.64 microgram / ml
Pantothenic acid	0.52 "
Biotin	0.02 "
Riboflavin	< 0.01 "
Folic acid	0.003 "
Thiamine	Trace "
Pyridoxine	Trace "

(Wealth of India)

**Table- 6 Amino Acid Composition of Coconut Water (% of total protein)**<sup>27</sup>

Alanine	2.41
Arginine	10.75
Aspartic acid	3.60
Cystine	0.97 - 1.17
Glutamic acid	9.76 - 14.5
Histidine	1.95 - 2.05
Leucine	1.95 - 4.18
Lysine	1.95 - 4.57
Proline	1.21 - 4.12
Phenylalanine	1.23
Serine	0.59 - 0.91
Tyrosine	2.83 - 3.00

(Pradera et al)

#### Coconut water nutrition facts:

The amount of coconut water that can be harvested from each nut is about 300 ml, but depends to a great extent on the stage of maturity and on the variety of coconut. There are only three types of coconut varieties: tall (allogamous), dwarf (autogamous) and hybrid; the last often being a cross between dwarf (mostly mother) and tall (father). A study conducted by Chikkasubbana et al on the effects of maturity on the physical and chemical parameters of tender coconut water suggests that the nuts should be harvested between the 7<sup>th</sup> and 8<sup>th</sup> month of maturity for obtaining adequate amounts of nutrients and sugars in the coconut liquid endosperm<sup>28</sup>. In the early stages of ripening, during the formation of endosperm, invert sugar and amino acids accumulate in the coconut water. They reach a peak at about seventh month and then decline. The concentration of ascorbic acid is high in water of green nut with soft pulp and gradually diminishes as the nut ripens<sup>23</sup>. Compared with

other fruit juices, the dry weight of mature coconut water is very low: 5% to 6% versus 12% to 15% for apple juice. A coconut tree under its lifetime can produce 10,000 nuts<sup>29</sup>. For best results, the water from a fresh coconut should be consumed shortly after being exposed to air due to the possible loss of important nutrients. While still in an undamaged fruit, coconut water remains sterile and stable, but it may become unstable when extracted from the fruit and stored for a few days at 4°C<sup>30</sup>. Each nut may contain about 200 to 1000 ml of water depending on cultivar type and size. Any nuts younger than five months of age tend to be bitter in taste and devoid of nutrients. In contrast, mature nuts contain less water, and their endosperm thickens quickly to white edible meat (kernel). Coconut milk obtained from the meat is different from the coconut water.

Coconut water's rich enzyme systems include very effective and selective reductase, polyphenol oxidase (PPO) and peroxidase (POD). These are involved in its development of a brownish colour when it is exposed to air for a long time<sup>21</sup>. The chemical composition of coconut water is affected by several factors. Jackson et al. showed that coconut water of different coconut varieties contains different concentration of chemical compounds, and that the chemical contents also varied during the different stages of maturity<sup>31</sup>. Soil and environmental conditions also affect the chemical profile of coconut water. A study which was done in Brazil demonstrated that the physical properties of coconut water were affected by varying nitrogen and potassium application<sup>32</sup>. It can be concluded that the chemical composition of coconut is dependent on environmental factors, soil and the state of maturity<sup>33</sup>.

Coconut water when given intravenously is harmless to a patient in circumstances where it may be dangerous to give the same amount of potassium alone. The phosphates ion is nearly same as that of body fluid. However sodium and chloride ion were lower when compared with extracellular fluid<sup>32</sup>.

Coconut water's fresh aroma is attributed to the volatile compounds. Organic acids composed of malic, succinic, citric, acetic and tartaric acids contribute to the taste of coconut water. It is believed that coconut water could be used as important alternative for oral rehydration and even so for intravenous hydration of patients in remote region due to its electrolyte content<sup>34</sup>. The potassium and magnesium ions are higher than that of the extracellular fluids (ECF) making it a good source of electrolytes for the body.

The particular mineral composition and reasonable total sugar content make coconut water a natural isotonic liquid. The characteristics of coconut water make it an ideal rehydrating and refreshing drink after physical exercise. In the Indian subcontinent coconut water is used as a rehydrating agent in cholera, diarrhea and dysentery; treatment of cancer; as a hair nutrient in alopecia<sup>1</sup>

#### **Pharmacological activities of tender coconut water:**

The first major scientific studies of the water of the coconut were reported by Pradera and coworker in 1942. His determination of protein, amino acid and chemical constituents compared favorably with those of cow's milk. Pradera identified 12 essential amino acids (including cystine, methionine, valine, leucine, histidine). Coconut water also contains folate also known vitamin B9. It was identified in the late 1930s as the nutrient required in reducing anemia in pregnancy which also help to prevent mitochondrial toxicity induced by methanol metabolites<sup>31</sup>.

In yet another study, Saat et al have compared the efficiency of fresh young coconut water, a carbohydrate – electrolyte beverage and plain water, for rehydration as an oral hydration fluid after the exercise. Coconut water was significantly sweeter, caused less nausea, fullness and no stomach upset<sup>6</sup>. It can be used in protection against dehydration and maintenance of osmotic pressure in the body. The use of coconut water in dehydration, as a sport drink and in treatment of a number of diseases such as congestive cardiac diseases, diabetes and infectious diseases have been reported<sup>35</sup>. Its specific gravity and pH closely approximate that of blood plasma. Tender coconut water is the natural isotonic beverage with almost the same level of electrolyte balance as we have in our blood. Hence, it deserves to be known as the "fluid of life". Prof. K. Rajasuriya and colleagues were the first to use intravenous tender coconut water to treat diarrhoea in Sri Lanka. Prof. C.C. De Silva has used intravenous tender coconut water in the treatment of infantile diarrhoea. Dr. (Mrs) N. P. Fernando has used tender coconut water intravenous as rehydrating fluid in malnourished children with diarrhoea. It has been used in other areas of the world where intravenous solutions cannot be obtained. Japanese have used it intravenously in Sumatra in World War I. Pradera et al have used intravenous the same for paediatric patients in Havana, Cuba without any serious reactions. Dr. Ben Eisman at Barnes Hospital, St. Louis has used fresh intravenous tender coconut water in 21 patients without evidence of any serious reactions<sup>36</sup>.

#### **Reports of experimental studies on tender coconut water:**

Tender coconut water has been shown to exhibit hepatoprotective and antioxidant effect<sup>37</sup>. It is also revealed to have anti-inflammatory, antipyretic and wound healing activity<sup>38</sup>. Interestingly Anurag, Rajamohan et al have demonstrated that coconut water has cardio protective effect in experimental myocardial infarction induced in rats and this was probably attributed to the rich mineral in coconut water especially potassium<sup>39</sup>. The presence of L-arginine (300mg. L) in coconut water could have a cardioprotective effect through its production of Nitric oxide which favours vasorelaxation<sup>6</sup>. Nneli RO and Woyike OA have illustrated that coconut water had protective effects on the ulcerated gastric mucosa i.e. antiulcerogenic activity<sup>40</sup>. Incidentally, tender coconut water is one among the food based solutions, a viable alternative to glucose electrolyte solutions for oral hydration in acute diarrhoea<sup>41</sup>.

Though coconut contains sugar, contrary to the popular belief, the experimental studies by Preeta et al have shown that the mature coconut water significantly attenuated hyperglycemia and oxidative stress, indicating the therapeutic potential of coconut water in diabetes<sup>42</sup>. In support to the above finding Eze K. Nwangwa et al has shown that coconut water has a hypoglycaemic effects and coconut milk has a regenerative effect on the pancreatic cells of alloxan induced diabetic rats<sup>43</sup>. The finding also suggests that coconut water play a role in the decrease in the treated rats' weight as previously reported that coconut water promotes weight loss.<sup>44</sup>

Functional foods with preventive and therapeutic effects on metabolic disorders are very helpful for the improvement of lifestyle-related diseases. The bioactive phytochemicals have become a very significant source for nutraceutical ingredients<sup>45</sup>. Coconut water is a natural nutritious beverage can be considered as a functional food/ nutraceutical as it contains several biologically active components. Studies conducted by Preetha et al have clearly revealed that the mature coconut water has beneficial effect against diabetes induced complications and its effects were comparable to that of standard drug, glibenclamide<sup>46</sup>.

Interestingly, a study has shown that the regular consumption of either coconut water or *mauby* (a liquid extracted from the bark of the *mauby* tree, *Colubrina arborescens*), or particularly, a mixture of them, is effective in bringing about the control of hypertension<sup>32</sup>. Prathapan et al have evaluated that, Tender coconut water treatment had a better antioxidant effect than streptokinase, while its antithrombotic effects were comparable to that of streptokinase. It was found that tender coconut water can reduce oxidative stress and thrombosis, which are the two main factors involved in the pathogenesis of myocardial infarction. TCW treatment had a better antioxidant effect than streptokinase, while its antithrombotic effects were comparable to that of streptokinase<sup>47</sup>. Sandhya et al have demonstrated the beneficial effects of tender coconut water on lipid metabolism. Research has shown that Coconut water supplementation increased hepatic bile acid and fecal bile acids and neutral sterols (P<0.05). Coconut water has lipid lowering effect<sup>48</sup>.

The overall results suggest that, Tender coconut water treatment could prevent and reverse high blood pressure induced by high fructose diet probably by inhibition of lipid peroxidation, upregulation of antioxidant status and improved insulin sensitivity<sup>49</sup>.

Interestingly A. A. Bakare et al has demonstrated the fertility enhancing properties of coconut water by regulating estrous cycle pattern. The study clearly depicts that green coconut water is a promising substance in reversing infertility induced as a result of high prolactin. It has been reported to be a source of estrogen and may be responsible for reversing infertility<sup>50</sup>. Studies by Nisaudah R have demonstrated that the oral intake of Young coconut juice significantly reduced the number of degenerating cortical

neuronal cells, which was induced by overiectomy. It has further provided evidence that the young coconut juice has neuroprotective effects in conditions that mimic menopause in humans<sup>7</sup>. Coconut water also contains folate also known vitamin B9. It was identified in the late 1930s as the nutrient required in reducing anemia in pregnancy which also help to prevent mitochondrial toxicity induced by methanol metabolites<sup>31</sup>. Coconut water has been proved beneficial in preventing kidney damage in diabetic patients. The renal cyto-architecture has shown a protective/regenerative effect following treatment with coconut water<sup>51</sup>. Other health benefits of coconut water include its use in the treatment of kidney stones, improving complexion, acne, heart burn in pregnancy etc.

#### **Other nonmedical uses:**

Coconut water is an important additive in the tissue culture media of several plants, including orchids and traditional Chinese medicinal herbs. The cytokinins found in coconut water support cell division, and thus promote rapid growth. They are mostly used to propagate protocorm-like bodies of orchids in plant industries. However, cytokinins cannot completely substitute coconut water's effects. This is due to the presence of other phytohormones (such as auxin and gibberellins or even undefined chemical components which may exert synergistic effects with cytokinins. One advantage of coconut water is that it results in considerable plant cell proliferation without increasing the number of undesirable mutations<sup>52</sup>. Non medical uses include the usage of tender coconut water in lotions, for adulterating milk and for manuring or composting. Fermented coconut water is used as a rubber coagulant<sup>23</sup>

**Panchagavya** is a concoction prepared by mixing five products of cow. The three direct constituents are cow dung, urine, and milk; the two derived products are curd and ghee. These are mixed in proper ratio and then allowed to ferment. The mixture which is made using yeast as a fermenter, bananas, groundnut cake, and the water of tender coconut, is a potent organic pesticide and growth promoter.

#### **Contraindications:**

However, in patients with hyperkalemia such as renal failure, acute adrenal insufficiency and in patients with low urine output, the tender coconut water should be avoided. When the coconut water is injected intravenously, in view of its high potassium level (290 mp %) it may cause hyperkalaemia (high level of serum potassium) in patients with poor kidney function. Hence, it is best avoided in patients with hyperkalaemia such as renal failure, acute adrenal insufficiency and in patients with low urine output due to haemolysis following blood transfusions and in case of viper bite in whom serum potassium is usually very high<sup>53</sup>.

#### **DISCUSSION:**

Modern research has in many ways rediscovered with greater clarity, what ancient Ayurvedic classics have mentioned. Tender coconut water is a gift of nature and best remedy for thirst and providing better health. Analysis of coconut water reveals that it contains 95.5% water, 4% carbohydrates, 0.1% fats, protein and mineral salts.<sup>25</sup> Sodium also play a role in the normal irritability of muscles and cell permeability, while potassium is a major cation of intracellular fluid involved in protein synthesis. Studies have shown that most high protein foods are rich in both sodium and potassium. Thus, the Ayurvedic vision of indicating *narikelodaka* in shrama (Fatigue) and shosha (emaciation) are justified. Rajamohan et al have demonstrated that coconut water has cardio protective effect which exemplifies the Ayurvedic concept of hrudya. Study by Eze K. Nwangwa regarding the beneficial effect of Coconut water in preventing kidney damage in diabetic patients and the protective/regenerative effect of the renal cyto-architecture following treatment with coconut water has reiterated the Ayurvedic view as bastishuddhikara (diuretic) Being rich in sodium, potassium and other electrolytes, tender coconut water is an important alternative for oral rehydration, thus its indication in Pipasa(thirst) is justified The findings by Zakaria et al stating that coconut water has anti-inflammatory, antipyretic and wound healing activity has scientifically supported the folklore use of *narikelodaka* in the treatment of inflammation, pyrexia and wound. The coconut palm is, therefore, eulogised as 'Kalpavriksha' (the all giving tree) in Indian classics, and thus the current review describes the facts and phenomena related to its use in health and disease prevention.

#### **CONCLUSION:**

Treatment with coconut water appears to be more natural, less expensive and without any side effects. Thus, it provides an accessible medicine source for various disorders like diabetes, coronary vascular diseases, in the developing countries. With health awareness growing among consumers, healthy and natural refreshing drink like tender coconut has great potential and scope in the country as well as overseas. The market is attracting health conscious groups with functional food buzz words like longevity foods, nutritional foods, super foods, pharma foods, phyto foods, therapeutic foods and others. These foods contain biologically active components, intended to enhance health and wellbeing. In the context of global warming and extended spells of summer, tender coconut water would be a much sought drink. Consequently, it provides great profit to the farmers, imparts economical benefits and also eco friendly too. It may further pave way for the development of some nutritious soft drink like products based on tender coconut. Better insights and understanding of the properties of coconut water will, therefore, help us to better utilize this marvellous and multidimensional liquid with special biological properties from nature.

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