



## Special Topic

# King coconut - The golden nut of Sri Lanka

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**Abstract:** King coconut (*Cocos nucifera*), a variety of coconut that is native to Sri Lanka. King coconut water is one of the fastest growing export commodities in Sri Lanka during the last decade. Rich nutritional profiles of sugars, vitamins, minerals and amino acids with profound therapeutic values have made king coconut water a popular functional beverage worldwide. This paper highlights the importance of optimum pre-harvest factors (variety, maturity) along with systematic

processing, packing, transporting and storage; to maintain a consistent quality of the king coconut water.

**Keywords:** King coconut, nutrition and therapeutics, Sri Lanka



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## Introduction

King coconut (*Cocos nucifera* var. *aurantiaca*), a tropical nut belongs to Family *Arecaceae* and mainly categorized into "Typica" (*Ran Thembili*, *Gon Thembili*) and "Aurantiaca" (*Rath Thembili*, *Nawasi Thembili*) varieties (Ekanayake *et al.*, 2010). It is endemic to Sri Lanka with unique flavour characteristics compared to green coconuts, which are available in other coconut-growing countries. King coconut cultivation in Sri Lanka has been estimated as 2.20 million palms (DCS, 2005) and mainly concentrated in Kurunegala, Gampaha and Galle districts.

King coconut is a drupe, which is enclosed with an edible liquid endosperm (water) and a solid endosperm (kernel). King coconut water is a popular functional beverage with splendid nutritional properties and rich in sugars, vitamins, minerals and amino acids with immense therapeutic values (Shubhashree *et al.*, 2014). The kernel of king coconut is a delicate spongy material, which offers soothing mouth feel and rich in

antioxidants, flavonoids and phytochemicals (Kalina and Nawaratne, 2018). Physico-chemical characteristics of king coconuts are presented in Table 1.

## Uses of King Coconut Water

King coconut water, which is known as a perfect thirst quenching sports drink that helps keeping human body rehydrated and delay exhaustion, can be used as a refreshing drink due to its isotonic composition in balancing body's electrolytes (Marapana *et al.*, 2017). The higher osmolality of king coconut water directly influences on rapid intestinal absorption, which is mainly governed by carbohydrates and minerals. Therefore, king coconut water is a good source for blood sugar restoration and to stave-off hunger without using artificial beverages with added-sugars and harmful additives. As king coconut water is rich in vitamin C, it could be effectively used as an important dietary antioxidants. Presence of ascorbic acid in

king coconut water found to have anti-ageing effects on skin care (DebMandal and Mandal, 2011). Magnesium found in king coconut water helps maintaining lower blood sugar levels against Type II diabetes due to increased insulin sensitivity. King coconut water was used treating dysentery and for infant feeding during the World War II as intravenous hydration and resuscitation fluid. It was used to facilitate blood circulation in the

kidneys and causes profuse diuresis (Ediriweera, 1996). The presence of L-arginine in king coconut water found to have cardio protective effect, which favours relaxation. The king coconut water is used for other therapeutic activities, such as hepato-protective, anti-inflammatory, anti-pyretic, anti-hypertensive, hypo-glycemic and renal regenerative actions (Prades *et al.*, 2012).

**Table 1:** Physico-chemical parameters of king coconuts harvested at three different maturity stages, 6, 7 and 8 months after fruit/nut set

Product	Parameters	Maturity Stage (months after pollination)		
		6 months	7 months	8 months
Fresh Nut	Total Nut weight (g)	650 - 780	1100 - 1400	1500 - 1900
	Nut Circumference (cm)	33 - 35	37 - 40	40 - 45
	Nut Water Volume (mL)	275 - 300	330 - 430	440 - 500
King coconut water	pH	4.3 - 4.5	4.7 - 4.9	5.0 - 5.3
	Total Soluble Solids (Brix)	4.0 - 4.3	4.5 - 5.0	5.0 - 5.2
	Total Sugars (%)	4.0 - 4.2	6.1 - 6.3	6.2 - 6.5

Source: Industrial Technology Institute (ITI), Sri Lanka

### Compositional Changes in King Coconut Water during Nut Maturation

Nut development process is compromised with consecutive physical and chemical processes during maturation and the ripening process. Since king coconut is fully enclosed biological compartment, the liquid endosperm is exerting pressure due to increased water holding capacity with the initiation of kernel development (Prades *et al.*, 2012). As a result, water is partially replaced by the kernel in order to release the over pressure inside the nut during maturation. Whole nut weight and the nut circumference are known to be significantly increased during maturation (Yong *et al.*, 2009). Higher nut water volume found to be yielded at 7-8 months of maturity followed by the reduction of nut water volume with initiation of kernel development (Kannangara *et al.*, 2018).

Kernel development is poor at the stage of 6-7 months of maturity and a gradual development can be demonstrated at 8-9 months of maturity (Pue *et al.*, 1992). Higher concentration of reducing sugars (glucose, fructose) and minerals ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{+2}$ ,  $\text{Ca}^{+2}$ ) are reported in nut water during 7-8 months of maturity and gradually decreased with initiation of sucrose at later maturity stages (8-9 months). However, sugars and minerals present in nut water found to be deposited in kernel during maturation

as evidenced by its decreasing trends (Ranasinghe and Wimalasekara, 2002). Initial presence of invert sugars (glucose and fructose) in nut water and later initiation of non-reducing sugars (sucrose) may attribute to the distinct changes in sweet taste of nut water with maturation (Jayasekara and Fernando, 1990). Presence of minerals could be widely varied based on the climate, soil type, agronomy, fertilizer application and irrigation. Hence, several physico-chemical changes take place during maturation, and it is vital to select the best harvest maturity with optimum desired quality characteristics to be matched with the intended application (Prades *et al.*, 2012).

### Time of Nut Harvest

The nuts with 5-6 months of maturity is the best for use of king coconut water as a suitable alternative for saline water with higher mineral concentration ( $\text{Na}^+$ ,  $\text{K}^+$ ) along with lower sugar levels (Gunathilake *et al.*, 2012). Further, 7-8 months of nut maturity with the maximum concentration of reducing sugars (glucose and fructose) along with optimum levels of minerals and vitamins in king coconut water is highly recommended to be used as a natural beverage or processed food for exportation (Jackson *et al.*, 2004). Kernel development is mainly initiated at 6 months of maturity and the optimum

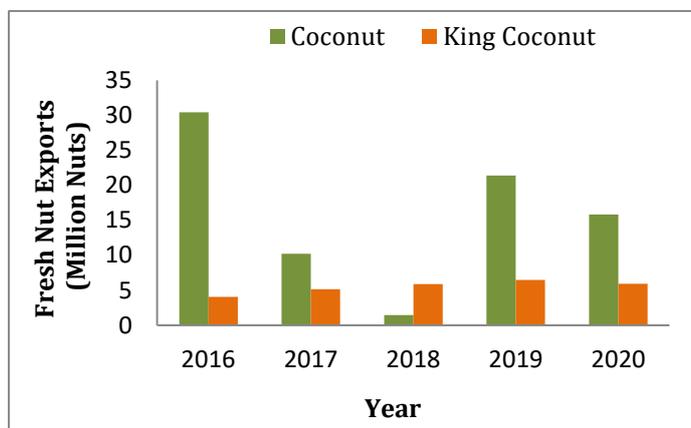
development can be achieved at 8-9 months of maturity of the king coconut.

In selection of bunches at harvest, king coconuts at 7 months of maturity could be easily picked at the 14<sup>th</sup> leaf counted from the uppermost tender leaf of the tree based on the guidelines given by the Coconut Research Institute (CRI), Sri Lanka. As per the recommendations of CRI, “Aurantiaca” varieties are highly recommended to be used as beverages and “Typica” varieties are the best for kernel production. Therefore, optimum combination of variety/maturity could yield a better quality product as per the requirement.

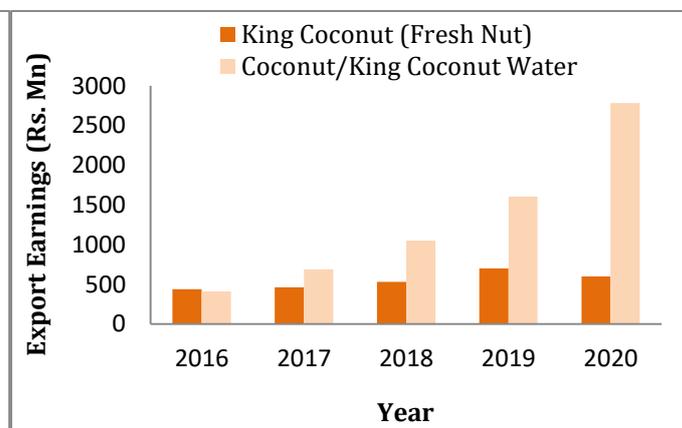
### Commercial Feasibility

King coconut water has been identified as one of the fastest growing export commodities in Sri Lanka

during the last decade (EDB, 2019). According to the National Export Strategy 2018-2022 (NES, 2018), coconut/king coconut water has been categorized under HS21 (Harmonized System) and has represented about 89% of the exports under HS21, with a 73% of growth during 2015-2016. Furthermore, coconut/king coconut water has represented about 40% of total Sri Lankan processed food and beverage exports with a value of 154 million US Dollars (CDA, 2020). Therefore, king coconut industry plays a pivotal role in foreign exchange earnings by offering wide array of market opportunities. Recently, an emerging international market with a boosting consumer demand for processed king coconut water has been initiated and this is the best time to address the market need while ensuring quality and authenticity of Sri Lankan king coconuts.



**Figure 1:** Fresh nut exports of coconuts and king coconuts  
Source: CDA (2020)



**Figure 2:** Export earnings from fresh king coconuts and coconut/king coconut water

### Future Challenges

King coconut water has delivered a proud performance globally, attracted by a new health-conscious audience as a natural functional drink. As per the technical guidelines of CRI (2002), Sri Lanka fresh king coconuts can be stored only for 6 days and the fresh king coconut water can be kept only for less than 10 hours under ambient temperature conditions (Ranasinghe *et al.*, 2006). The storage studies conducted at the Industrial Technology Institute (ITI) revealed that the postharvest application of wax coating and low temperature storage (13.5 °C + 85% RH) could extend the

storage life of fresh king coconuts up to 28 days (Wilson *et al.*, 2006). Although, king coconuts were initially exported as wrapped whole nut, processed bottled/packed king coconut water has been introduced as an effective approach to make it more viable in market shelf. However, rapid discolouration/turbidity are major challenges in bottled king coconut water industry and need to find better solutions to get rid of these concerns. In conclusion, optimum harvest-maturities/systematic process operations are vital in retaining the consistent quality of the product.

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