# Packaging Technologies for Coconut water

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## INTRODUCTION

Coconut water, as a tropical fruit juice, is highly valued and consumed in tropical areas since it is tasty and has all the desirable nutritional and therapeutic properties. Coconut (*Cocos nucifera* Linn.) fruit is filled with the sweet clear liquid "coconut water" when the coconut is about 5 to 6 months old. Coconut water has been called the"fluid of life" due to its medicinal benefits such as oral rehydration, treatment of childhood diarrhea, gastroenteritis and cholera (Kuberski 1980, Carpenter and others1964). It is high in electrolyte content and has been reported as an isotonic beverage due to its balanced electrolytes like sodium and potassium that help restore losses of electrolytes through skin and urinary pathways. Coconut water was claimed as a natural contender in the sports drink market with its delicate aroma, taste and nutritional characteristics together with the functional characteristics required in a sports drink (Food and Agricultural Organization [FAO] 2005). The constituents of coconut water are water 94% (w/v), sugars such as glucose, fructose and sucrose around 5% (w/v), proteins around 0.02% (w/v) and lipids only about 0.01% (w/v). It is rich in minerals such as potassium, calcium, magnesium and manganese, and low in sodium. An immature coconut between 5- 6 months contains about 200-250 ml of water. Coconut water has been called the "fluid of life" in many parts of the world due to its medicinal benefits. It has been reported as a natural isotonic beverage due to electrolytes like sodium and potassium Coconut water is rich in mineral composition (Table 1). It is high in potassium, calcium, magnesium, and manganese, and low in sodium. Coconut water is low in fat and proteins. It is rich in many essential amino acids such as lysine, leucine, cystine, phenylalanine, histidine and tryptophan (Pradera and others 1942). Its arginine, alanine, cysteine and serine percentage is higher than those of cow's milk (Maciel and others 1992). It contains ascorbic acid and B complex vitamins. Ascorbic acid content of coconut water from a 5-6 month coconut has been reported to be 2.2 to 3.7 mg/100 mL (Mantena and others 2003).


Table 1. Mineral composition of tender coconut water

| Minerals | mg/100 ml |
|---|---|
| Copper | 26 |
| Potassium | 290 |
| Sodium | 42 |
| Calcium | 44 |
| Magnesium | 10 |
| Phosphorous | 9.2 |
| Iron | 106 |

### Available Technologies for Tender coconut in fresh and packed form

Tender coconut is valued both for its sweet odour and the delicious gelatinous kernel. Today there are packaging technologies available for packing tender coconut water in its fresh form as well as in its packed form in various consumer packs.

## Tender Coconut in its fresh form

Tender coconut could be packed in its fresh form using the minimal process technique. Tender coconut of 5-6 months old green tender nuts are trimmed using a trimming machine into an attractive and uniform hexagonal shape. After the removal of husk, the tender coconuts are dipped in an enzyme solution for about 5 minutes and then dried. These machine-shaved nuts are then shrink wrapped in a polythene cover and distributed. The recommended packaging for packing tender




*Packaged Tender Coconut Water*

coconut in its fresh form was to stretch-wrap the minimally processed tender coconuts in 15 $\mu$ LDPE (stretch film). The second option is to pack them in a pillow pouch of 25 $\mu$ PP with 3/4 side seals. After filling the product, the pouch is closed by heat sealing.

## Other Packaging Technologies

The bulky nature of the tender coconut and its tendency to undergo biochemical changes and spoilage after harvesting are constraints in the popularisation and marketing of tender coconut in natural form in areas where coconut is not grown. Now technologies are available for the processing of tender coconut and matured water into packed soft drinks. The various technologies available in India are given below.

## DFRL Technology

Defence Food Research Laboratory (DFRL), Mysore under a sponsored project of the Coconut Development Board has developed a technology for packaging of tender coconut water. Under this technology tender coconut water can be packed in PP bottles aluminum cans and retortable pouches using pasteurization technique. Since tender coconut water is highly susceptible to heating, it is subjected to minimum heating by the use of additives like nisin to achieve commercial sterility.The shelf life of the product is three months under ambient condition and six months under refrigerated condition.

## Ultrapasteurization

The objective of ultrapasteurization is similar to pasteurization but it is done at higher temperatures with shorter exposure times and extends the shelf-life to about six to eight weeks under refrigeration.

## Ultra High Temperature (UHT)

Commercially sterile products are obtained by a UHT process at temperatures in the range of 265 to 295°F (130 to 145 deg C) and holding times between 2 and 45 secs. The product is aseptically packaged after UHT processing in order to obtain a shelf stable product with a shelf life of 1 to 2 years at ambient temperatures.

## FAO Technology

FAO has patented a technology for bottling tender coconut water and marketing it as a sports drink. The new process developed by Mr.Morton Satin, Chief of FAO's Agriculture Industries and Post Harvest Management Service uses microfiltration technology in which the water is modified to approximate the vitamins and energy content of major sports drinks. The UK has granted a patent to the FAO on this technology.

## German Technology

Spray Evaporation Technique (SET) is adopted in this technology. It is a technology used for separating clear from any liquid. The special advantage of this technique is that the product retains all its original characteristics such as retention of vitamins and minerals, aroma, colour, taste, etc. which is not possible in the conventional methods. The technique was developed and patented by Winter Umwelttechnik of Germany. The concentrated tender coconut water has a shelf life varying from six months to 24 months depending upon the degree of concentration.