TENDER COCONUT WATER

Introduction

Coconut water refers to the liquid endosperm of a tender coconut at an age of approximately 9 months from time of pollination, the period before the solid endosperm or white meat forms. It is a pure and nutritious beverage in the natural state. The coconut husk is an excellent package for the water which contains sugars, minerals, amino acids and vitamins.

Tender coconut water is a natural source of electrolytes, minerals, vitamins, complex carbohydrates, amino acids and other nutrients. The natural carbohydrate content is between 4-5% of the liquid solution. This make coconut water particularly suitable for the burgeoning sports drink market. According to Sports Science Institute (USA), sports drinks containing under 5% carbohydrates are likely to provide benefits, while those exceeding 10% carbohydrate content, like most soft drinks are associated with abdominal cramps, nausea and diarrhea.

Isotonic and bacetriologically sterile properties of fresh coconut water, straight out of the nut, promoted its use as a direct plasma replacement by military forces in the Asian theatre of combat during World War II.

It has caloric value of 17.4 per 100gm. "It is unctuous, sweet, increasing semen, promoting digestion and clearing the urinary path," says Ayurveda on tender coconut water (TWC).

Numerous medicinal properties of tender coconut water reported are:-

1. Good for feeding infants suffering from intestinal disturbances.
2. Oral rehydration medium
3. Contains organic compounds possessing growth promoting properties
4. Keeps the body cool
5. Application on the body prevents prickly heat and summer boils and subsides the rashes caused by small pox, chicken pox, measles, etc.
6. Kills intestinal worms
7. Presence of saline and albumen makes it a good drink in cholera cases
8. Checks urinary infections.
9. Excellent tonic for the old and sick
10. Cures malnourishment.
11. Diuretic
12. Effective in the treatment of kidney and urethral stones
13. Can be injected intravenously in emergency case.
14. Found as blood plasma substitute because it is sterile, does not produce heat, does not destroy red blood cells and is readily accepted by the body.
15. Aids the quick absorption of the drugs and makes their peak concentration in the blood easier by its electrolytic effect.

16. Urinary antiseptic and eliminates poisons in case of mineral poisoning.

Average composition of young coconut (6-8 months old)

Table 1 - Average Composition of Tender Coconuts (per Nut)								
Variety	Age (months)	Total Weight g	Water g	Jelly g	Husk g	pH	Total Acidity	Total Solids %
Tall	6/8	2,933	349.3	92	2,501	5.2	0.06	4.6
Y. Dwarf	7/8	2,443	327.5	62.1	2,056	4.8	0.10	5.0
R. Dwarf	7/8	2,753	319.2	92.3	2,350	4.8	0.06	6.4
G. Dwarf	6/8	2,360	435.3	33.2	2,176	4.8	0.09	5.6

Analysis of Mature and Tender Coconut Water

	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
Source: Satyavati Krishnankutty (1987)		

Sugars

Sugars in the forms of glucose and fructose form an important constituent of the tender nut water. The concentration of sugars in the nut water steadily increases from about 1.5 per cent to about 5 - 5.5 per cent in the early months of maturation and then slowly falls reaching about 2 per cent at the stage of the full maturity of the nut. In the early stages of maturity sugars are in the form of glucose and fructose (reducing sugars) and sucrose (non-reducing sugar) appears only in later stages which increases with the maturity while the reducing sugars fall. In the fully mature nut approximately 90 per cent of the total sugars is sucrose.

Minerals

Tender coconut water contains most of the minerals such as potassium, sodium, calcium, phosphorous, iron, copper, sulphur and chlorides. Among the minerals more than half is potassium the concentration of which is markedly influenced by potash manuring. Tender coconut water being rich in potassium and other minerals plays a major role to increase the urinary output.

Protein

Coconut water contains small amounts of protein. The percentage of arginine, alanine, cystine and serene in the protein of tender coconut water are higher than those in cow’s milk. Since it does not contain any complex protein the danger of producing shock to the patients is minimised.

Amino Acid Composition of Coconut Water (% of total protein)	
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
Source: Pradera et al, 1942	

Vitamins

Tender coconut water contains both ascorbic acid and vitamins of B group. The concentration of ascorbic acid ranges from 2.2 to 3.7mg per ml, which gradually diminishes as the kernel surrounding the water begins to harden.

Vitamins of B Group in Coconut Water	
Nicotinic acid	0.64 microgram / ml
Pantothenic acid	0.52 ,,
Biotin	0.02 ,,
Riboflavin	< 0.01 ,,
Folic acid	0.003 ,,
Thiamine	Trace ,,
Pyridoxine	Trace ,,
Source: The Wealth of India (1950)	

Technology

In order to bring the product commercially in the market, CDB in association with Defense Food Research Laboratory, Mysore has developed a technology for packing tender coconut water in pouches/ aluminium cans with shelf life of more than six months under normal ambience condition and 12 months under refrigerated condition.

The process involves collection of tender coconut water under hygienic conditions, up gradation and pasteurization, filtration and packaging either in Bottles or cans as the case may be. Additives such as nissin and sweeteners will be added to the product.

Plant and Machinery

Sl.No	Item
1	Mechanical washing system with conveyor
2	Automatic boring and sucking system
3	SS filter/ clarifier
3	Collection tank
4	Treatment tank
5	Pasteurization unit
6	Boiler and other accessories
7	Filling and sealing machine
8	Shrink wrapping machine
9	Air compressor
10	Coding machine

Project Cost

Particulars	**5000 nuts/day (Rs. in lakhs)**	**10,000nuts/day (Rs. in lakhs)**	**15,000 nuts/day (Rs. in lakhs)**
Building	50	50	60
Plant & Machinery	65	75	85
ETP	3	3	3
Electrification	3.25	3.75	4.25
Technical know-how	3.90	3.90	3.90
Preliminary & preoperative expense	1.25	1.50	1.75
Working capital margin	5.00	9.50	14.00
Total	**131.40**	**146.65**	**171.90**

Financial parameters

Particulars	**5000 nuts/day**	**10,000nuts/day**	**15,000 nuts/day**
IRR	18%	19%	17%
DSCR	2.38	3.56	1.44
BEP	51%	55%	59%