

Coconut Water: A Good Medium of Nutrition for Sports Person

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Abstract— Coconut water (*Cocos nucifera* L.) is usually found in tropical regions. Its functional properties make it most versatile natural product on earth. It is consumed in whole world because of its nutritional and health benefits. Many scientific evidences are there which shows and support its health benefits. Unique chemical composition of coconut water like sugars, vitamins, amino acids, minerals and phytohormones makes it a good source of nutrition for sports person. Coconut water is gaining its demand among sports person because of low sugar and presence of good amounts of minerals. Its hydrating properties make it suitable for sports person. As after physical exercise body starts losing electrolytes and the presence of those in it make it a good medium of nutrition for them. This review attempts to show the chemical composition and their benefits for sports person.

1. INTRODUCTION

Coconut water is gaining its demand among sports person due to its chemical composition. Also it provides a good competition to other sports beverage. The nutritional value and the hydrating properties of coconut water bring this trend. The rising health awareness and consciousness about fitness among the consumers make it as a sport drink. It is also consumed by other health conscious persons. It was found that one 8-ounce cup of coconut water contains more amount of potassium than a banana. Due to the presence of same electrolyte balance as that of our blood it is considered as an isotonic beverage. There are many proved medicinal benefits of coconut water. Because of its rehydrating and health benefitting properties it is called as “**dew from heavens**”.

Potassium is very important electrolyte to our body, as it is included in the regulation of fluids and mineral balance in cells, maintenance of blood pressure and transmission of nerve impulses. It also regulates the muscle function. It rehydrates our body quickly due to its ability to draw water in to cells, blood. It is also called as “**nature’s sports drink**”. Due to heavy exercises performed by gym persons or other intense physical activities, our body starts losing electrolytes. So to them it is a good source of electrolytes and also it is rich in vitamins, amino acids, sugars & proteins.

2. PRODUCT DESCRIPTION

In *Cocos nucifera*, *cocos* is a Portuguese word means “fruit” and *nucifera* is a Latin word means “nut bearing”. The coconuts (*Cocos nucifera* L.) are usually found in the tropical regions and the fruit of coconut is of great importance. Coconut water is a clear liquid, nutty and little sweet liquid which is obtained from the tender or green coconuts. Coconut meat and coconut water are the edible part of the coconut fruit. And this edible part is called as endosperm tissue. Coconut water is the clear liquid present inside the young green coconuts (fruits of the coconut palm). In the early stage of development or the nuclear phase of development it is a clear liquid endosperm that fills the central cavity which is enclosed by a solid endosperm. As the maturity of coconut occurs, this liquid endosperm matures and starts to get deposited in to the rind of coconut meat. This is the cellular phase of development. Coconut meat and coconut water are the edible part of the coconut fruit. And this edible part is called as endosperm tissue. Three stages of growth are there in endosperm tissues:-

- nuclear
- cellular
- helobial

Nuclear stage: It is also called as liquid endosperm. It is the stage in which formation of repeated free-nuclear division is there. It is a primary step in the formation of cell wall. Coconut juice is a good example of this.

Cellular stage: It is a stage where a cell-wall formation is coincident with nuclear divisions. And coconut meat is a cellular endosperm.

Helobial stage: Stage where a cell wall is laid down between the first two nuclei. And then the formation of one half which develops endosperm along the cellular pattern and the other half along the nuclear pattern is there.

The development of coconut endosperm follows the nuclear mode of growth. In the initial period, the endosperm is just like a liquid which contains free nuclei developed through a

process, in which the initial endosperm nucleus follows several cycles of division without undergoing cytokinesis. Cytokinesis is a process in which two daughter cells are formed when the division of single eukaryotic cell takes place. After that cytokinesis occurred, moving to centre part from the periphery. This leads to the formation of the layer of cellular endosperm.

Initially the cellular endosperm is of translucent jelly-like in nature, but later on it hardens and become a white flesh which is called coconut meat. The cellularization process of coconut fruit is different from the other plants like in wheat, corn. Like it does not fill up the entire embryo sac cavity as in the endosperm of other plants, but instead leaves the cavity solution-filled. This solution is of cytoplasmic origin and commonly called as coconut water. It is found that the nutrients present in coconut water comes from the seed cell wall which is called as seed apoplasm and are transferred symplasmically (through plasmodesmata, which is like a connecting bridge between cytoplasm of adjacent cells) into the endosperm".

On an average the volume of coconut water in fruit varies from 200ml - 900ml depending upon the variety of the coconut and the harvesting stage. Tender coconut water is a gift which is provided by nature. It is believed that it is a first soft drink on the earth. It is a rich source of vitamins, amino acids, sugars, minerals, & proteins. The special flavor of coconut water is basically due to the **delta lactones**.

3. REASONS FOR ITS RECOMMENDATION TO SPORTS PERSON

Coconut water is from young, green coconuts and is low in calories and a natural source of electrolytes including sodium and potassium. Eight ounces of coconut water has 46 calories, 9 grams of carbohydrates, 250 mg of sodium, 600 mg of potassium, 60 mg of magnesium, 45 mg of phosphorus, and 2 grams of protein [7].

Rich in essential electrolytes: The main minerals present in coconut water are:

- Iron
- Calcium
- Chloride
- Magnesium
- Phosphorous
- Potassium
- Sodium

And among these minerals more than half is potassium. The presence of these minerals in the form of electrolytes makes it readily absorbed by the human body. They control the amount of water in body, body pH, and muscle functions.

Due to the presence of same electrolyte balance as that of our blood it is considered as an isotonic beverage. This is the reason due to which most of the countries like Indonesia, Srilanka during world war second used sterile coconut water for the intravenously injection of the dehydration, cholera patients. Because of its medical benefits it is called as **"fluid of life"**.

One of the very important electrolytes to our body is potassium, as it is included in the regulation of fluids and mineral balance in cells, maintenance of blood pressure and transmission of nerve impulses. It also regulates the muscle function. It rehydrates our body quickly due to its ability to draw water in to cells, blood.

It is a **"nature's sports drink"** as it contains more potassium than the banana. As the exercises performed in gym or other heavy physical activities, our body starts losing electrolytes in the form of sweat. So for them it is a good source of electrolytes mainly sodium and potassium.

Low calories and cholesterol free: Coconut water contains very low or no fat or Trans fat and also cholesterol free.

Low in sugar: Compared to other juices like grape juice, apple juice, it contains very low amount of sugar and thus make it a good thirst quencher. The amount of sugar in it varies or depends on the stage of maturity. In early stages it is less, then increases and in full maturity again it falls.

Good source of vitamins: Coconut water is a fair source of vitamin C and B-complex vitamins like riboflavin, niacin, thiamin, pyridoxine and folates.

Essential amino acids: Coconut water contains essential amino acids which regulates the various functions in our body like in the growth of muscles, bones, hair, skin and eyes, as well as digestion and the creation of antibodies.

In tender coconut water fructose and glucose are the main components. And in the seventh month of the maturity stage glucose is present in great amount. When comparison is made to cow's milk, it contains high amount of arginine, alanine, serine, cystine [13]. Coconut water contains less fat, carbohydrates and calories and high quantity of minerals due to which it become so popular nowadays that it becomes the fastest growing product in beverages. In the market the top brands are zico, vitacoco, O.N.E. etc.

4. CHEMICAL COMPOSITION OF TENDER COCONUT WATER

It contains water 95.5% (w/v), sugars (glucose, fructose and sucrose) around 4% (w/v), proteins around 0.1% (w/v) and lipids only about 0.01% (w/v). Rich in minerals like potassium, calcium, magnesium and manganese, and low in sodium.

Coconut water is considered a low acid (>4.6) and high water activity (~0.995) beverage. Coconut water contains minerals,

carbohydrates, proteins and fats [6] Minerals include calcium, iron, magnesium, phosphorus, potassium, and sodium [6]. Others present in coconut water include zinc, copper, manganese, selenium, sulphur, and boron. Vitamin content includes C, B1, B2, B3, B5, B6, B7, and B9 [11]. The mineral and vitamin amounts of the coconut water can vary due to variety and geography. The main carbohydrates present in coconut water are glucose, fructose, and sucrose [11]. Many research studies have been conducted to know about the changes in nutritional during the different stages of maturity of coconut. There is continuous increase in fat and protein content till around nine months, the reason may be the development of the endosperm. The sugar levels are low around 1.5% during the immature stage and found to be increase to 5% as the coconut and in full maturity stage it is 2% [13]. Also during the immature stage, the coconut water contains reducing sugars i.e. glucose and fructose. But as the nut start to mature the non reducing sugars such as sucrose starts to appear and content found to be increased until maturity.

The coconut water pH level also appears to turn in to more basic as the coconut is in the maturity stage. The pH changes from ~4.5 up to almost 6 [10] Increase in the soluble solids and total solids content is there as the coconut matures.

Table 1: Chemical composition of coconut water

| Constituents | Percentage value (%) |
|----------------|----------------------|
| Water | 95.5 |
| Protein | 0.1 |
| Fat | <0.1 |
| Mineral matter | 0.4 |
| Carbohydrates | 4.0 |
| Calcium | 0.02 |
| Phosphorous | <0.01 |
| Iron | 0.5mg per 100g |

Source: The Complete Book on Coconut & Coconut Products (Cultivation and Processing) By NIIR Board of Consultants and Engineers

Table 2: Comparison of commercial coconut brands versus traditional sports drink [12]

| Product (8 ounces) | Calories | Carbohydrates (g) | Sodium (mg) | Potassium (mg) |
|------------------------------------|----------|-------------------|-------------|----------------|
| Popular coconut waters: | | | | |
| Harvest Bay Original Coconut Water | 47 | 12 | 25 | 480 |
| Naked Juice Coconut Water | 44 | 10 | 14 | 473 |
| O.N.E. 100% Coconut Water | 44 | 10 | 44 | 487 |

| | | | | |
|-----------------------------------|----|----|-----|-----|
| Vita Coco 100% Pure Coconut Water | 44 | 10 | 29 | 494 |
| Traditional sports drink: | | | | |
| Traditional sports drink | 50 | 14 | 110 | 30 |

I also researched the use of coconut water as a hydrating drink for physical activity and found two published studies. The first study compared rehydration after exercise with young coconut water, a carbohydrate electrolyte beverage, and plain water [8]. The results indicated that recovery was similar when either coconut water or the carbohydrate electrolyte beverage was ingested. However, as stated previously, water straight from the nut has higher sodium content than the commercial varieties sold in stores. The second study used sodium enriched coconut water for testing rehydration [9] and compared it to a sports drink and fresh coconut water from the nut. The results indicated that the sodium enriched coconut water was as effective as the sports drink in whole body rehydration [12].

5. CONCLUSION

Demand of coconut water among sports persons is increasing. So it becomes necessary to preserve the coconut water for future use. So, that people not belongs to tropical area can also consume this product. It is becoming popular due to its medicinal and nutritional benefits. Low calories and good source of minerals make it a good source of nutrition for sports person. People are becoming more conscious about their health these days. Drinking coconut water is good for health as compared to carbonated drinks or drinks which contain high sugars. Furthermore development of new technologies also facilitates the preservation of coconut water. In 2012, the estimated demand for coconut water was around 100 million litres and which is expected to 350 million litres in 2020. So, there is a wide scope for this product. Its global increase in demand made it a good export product. Also the increasing market demand not only profits the companies but also serve as a source of income to the farmers in one end of supply chain. Popular beverage giants like Coca-Cola Co. and PepsiCo plays a significant role in the coconut water market. So there is a good future scope of this product. It is becoming a popular drink today among the beverages and increasing rapidly.

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