



Study of Coconut water different stages of Development

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Cocos nucifera L. or coconut is from **Arecaceae/Palmaceae** family.

The fruit of coconut contains a whitish liquid of sweet flavour. This liquid is a pleasant and refreshing drink which is called "coconut water". Technically, it is liquid endosperm, which begins to form around two months after the natural opening of the inflorescence. At seven months the endosperm develops in the entire side of the fruit and it is more consistent. At ten months the endosperm is completely ripe and the endosperm or peel is dark and hard. Coconut water comprises about 80% of the fruit. When matured, the coconut water becomes the meat or coconut milk. The component of the liquid are altered through the aging process, coconut water has different taste, depending upon where it grows; like Indian coconut water tastes saltier. The variety of coconut varies according to the providence of soil, water and sunlight. Coconut water can be regarded as the nature's best refreshing energy giving drink. Tender coconut water has numerous medicinal properties : to cure infants suffering from intestinal disturbances; to use as oral re-dehydration medium, possessing growth promoting properties, keeping the body cool; preventing prickly heat and summer boils; checking urinary infections; tonic for old and sick, etc. Coconut water can replace the electrolytes, perhaps with greater efficiency than others which generally have preservatives, dyes and processed sweeteners. This study showed that tender coconut water is more beneficial to us from health point of view than mature coconut water.

Key words: Endosperm, Coconut water, Tender coconut, mature coconut.

Introduction : The coconut is a tree from tropical countries, originated and cultivated in the tropical zone and preferentially on the coast and in island. In India tall palm is cultivated chiefly in Kerala, Tamil Nadu and Karnataka. *Cocuc nucifera L.* or coconut is from Arecaceae/Palmaceae family. It is considered as the tree of life, since every part of this plant roots, husks, leaves, inflorescence and fruit can be utilized. History and folklore credit coconut water with remarkable healing power, which medical science is now confirming. According to 'Ayurveda' tender coconut water is unctuous, sweet, increasing semen, promoting digestion and clearing the urinary pathway. Tender coconut water has numerous medicinal properties, such as, curing infants suffering from intestinal disturbances, as oral re-hydration medium, possessing growth promoting properties, keeping the body cool, preventing prickly heat and summer boils, checking urinary infections, tonic for old and sick, etc. Coconut water can replace the electrolytes, perhaps with greater efficiency than others which generally have preservatives, dyes, and processed sweeteners. Its usefulness and numerous medicinal properties motivated us to conduct this study.

Materials and Methods:

Apparatus: Test tubes, Test tube holder, Pipettes, Measuring cylinder, conical flask, Funnel, spirit lamp, Glass rod, Beaker, pH meter, weighing machine.

Chemicals: HCL, BaCl₂, HNO₃, KOH, NaOH, C₂H₅OH, CuSO₄, H₂SO₄, KMnO₄, NH₄Cl, NH₄OH, K₂CrO₄, (NH₄)₂SO₄, (NH₄)₂C₂O₄, H₂S, (NH₄)₃PO₄, Ammonium molybdate, Fehling's solution A & B, Benedict's reagent, Molisch's reagent, Iodine, Phenolphthalein, Cobalt Nitrate, Sodium Potassium tartarate.

Samples of tender coconut which was collected from different locations in and around Patna. Similarly, mature coconuts which were dark brown in colour, and the inside meat which has already been settled was also collected. The collecting of coconut water was done in sterile condition. pH of the sampled coconut water was measured by pH meter to know its acidic or basic nature. The pH of mature coconut water was measured **5.8** and that of tender coconut water as **5.1**.

Then, different qualitative tests were performed on each and every sample to detect the presence or absence of carbohydrate, lipids, minerals, and proteins.

Tests for checking the presence of Carbohydrate:

- **Fehling's test:** – 2 ml of coconut water was taken in test tube; 1-2 ml. of Fehling's A and B solution was added. Test tube was kept in boiling water.
- **Benedict's test:**- 2 ml of coconut water was taken in a test tube and 1-2 ml. of Benedict's reagent was added. Test tube was kept in boiling water.
- **Molisch's test:**- To 2 ml. of coconut water 2 droops of 10% solution of α - naphthol in alcohol and 1 ml. of concentrate sulphuric acid was added.

Test for checking the presence of Starch:

- **Iodine test:**- To 2 ml of coconut water, 1-2 drops of Iodine solution were added.

Test for checking the presence of Lipids:

Solution A – 5 ml. of coconut water was taken in test tube. $\frac{1}{4}$ th tablet of potassium hydroxide was added to it. The test tube was heated for few minutes. The solution was cooled, filtered, and then concentrated hydrochloric acid was added to neutralize it.

Solution B – To 5 ml. coconut water, phenolphthalein and dilute Potassium hydroxide was added till colour appeared. Solution A was mixed with solution B.

Tests for checking the presence of Protein:

- **Xanthoproteic Test:**- Coconut water was taken in test tube. 2 ml of concentrated nitric acid was added, and it was shaken.
- **Biuret Test:**- To 2 ml. of coconut water, few drops of sodium hydroxide solution were added, and then dilute solution of copper sulphate was added.

Minerals analysis:

- **Dilute Sulphuric acid test:**- To 1 ml. of coconut water, 1 ml. of dilute sulphuric acid was added.
- **Concentrated sulphuric acid test:**- To 1 ml. of coconut water, 1 ml. of concentrated sulphuric acid was added.

- **Test for checking oxalate ion:**- A granule of potassium permanganate was dissolve in 3 ml. of distilled water. To this were added a few drops of dilute sulphuric acid followed by 1 ml. of coconut water and then the solution was heated.

- **Test for group I (silver group):**- To 5 ml. of coconut water, a few drops of dilute hydrochloric acid was added.

- **Test for group II A (Copper group):**- To 5 ml. of coconut water, dilute hydrochloric acid was added, it was warmed, and hydrogen sulphate was passed to it.

- **Test for group III A (Iron group):**- 5 ml. of coconut water was boiled with little concentrated nitric acid, then ammonium chloride acid, ammonium hydroxide was added to it. The solution was the warmed.

- **Test for group III B (Zinc group):**- 5 ml. of coconut water taken in test tube; about 2 gm of solid ammonium chloride was added to it and boiled. After cooling excess amount of ammonium hydroxide was added and H_2S gas was passed.

- **Test for group IV (Calcium group):**- To 5 ml. of coconut water, 2-3 gm. Solid ammonium chloride was added, solution was boiled, cooled and ammonium hydroxide was added in it. If ppt. is obtained, then filter and wash the ppt. Dissolve it in hot dilute acetic acid. Otherwise, given over group V for analysis.

Test of group iv using Ppt.:

Ppt. shows presence of calcium group so further confirmatory test for presence of Barium, calcium and strontium is done.

Potassium Chromate Test (for Barium):- To one part of the ppt. few drops of potassium chromate was added.

Ammonium Sulphate Test (for Strontium):- To the other part of ppt. 1 ml. of ammonium sulphate is added and warmed.

Ammonium Oxalate Test for (calcium):- To the next part was added 1 ml. of ammonium oxalate, and ammonium hydroxide.

Test for Group V:-

Ammonium Phosphate test for magnesium:- To the original solution was added some solid ammonium chloride and ammonium hydroxide slight excess. Then ammonium phosphate was added and rubbed the sides of test tube with a glass rod.

Sodium cobaltinitrite test for potassium:- To the original solution, sodium hydroxide was added to make it alkaline and then freshly prepared sodium cobalt nitrite solution was added.

Observations:

Test Performed	Tender Water	Mature Water
FEHLING TEST	POSITIVE	NEGATIVE
BENEDICT'S TEST	POSITIVE	NEGATIVE
MOLISH'S TEST	POSITIVE	NEGATIVE
IODINE TEST	NEGATIVE	NEGATIVE
XANTHOPROTEIC TEST	NEGATIVE	POSITIVE
BIURET TEST	POSITIVE	POSITIVE
LIPID TST	NEGATIVE	POSITIVE
OXALATE ION TEST	NEGATIVE	POSITIVE
TEST FOR GROUP I	NEGATIVE	POSITIVE
TEST FOR GROUP II	NEGATIVE	POSITIVE
TEST FOR GROUP III A	NEGATIVE	POSITIVE
TEST FOR GROUP III B	NEGATIVE	NEGATIVE
TEST FOR GROUP IV	POSITIVE	POSITIVE
TEST FOR GROUP V	POSITIVE	NEGATIVE

The mature coconut water gave positive results for protein, lipid oxalate and calcium while the samples of tender coconut water gave positive results for the tests of carbohydrate, protein, calcium, magnesium, and potassium.

Results and Discussion :

In mature coconut water no carbohydrate was found. But lipids and protein were present in it. The precipitate obtained was used to carry out the confirmatory test for calcium and found it in small amount. This shows that only a trace of calcium was present. No magnesium and potassium were found in the mature samples. Test for oxalate ion was positive in mature coconut water.

In tender coconut water many of the tests gave positive result. Absence of lipids was found in the samples. For the detection of proteins, Biuret test gave positive result while Xanthoprotic test was negative. This result showed that there was absence of complex proteins i.e. *tyrosine, tryptophan and phenylalanine*. Large amount of calcium, magnesium and potassium were found. So, it was rich minerals. No oxalate ions were found.

The above result clearly shows tender coconut water is more beneficial from health point of view. Due to the presence of carbohydrate, it is refreshing and energy giving drink. The presence of minerals makes it a nutritional drink. As no oxalate, complex proteins and lipids are present in the tender coconut water it is safe for feeding infant and can be used an oral re-hydration medium.

Conclusion :

It is more beneficial to drink tender coconut water as it contains a lot of carbohydrate, minerals and simple proteins. It is a nutritional drink with lots of medicinal properties.

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