



Antioxidant Activity, Nutrient Analysis and Sensory Evaluation of Coconut Apple

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ABSTRACT: The Coconut Palm is species of a palm tree, *Cocos nucifera*, that grows to about 30 meters tall and is significantly cultivated in tropical climates. Six hundred species in the palm circle of relatives Arecaceae, and its miles the simplest extant species in the genus Cocos. This study to be determine the antioxidants, Nutritional (vitamin c, Crude fiber, Moisture and Ash content) and Sensory parameters of Coconut apple. The result showed as antioxidant activity by DPPH Method showed as 19.80% %, Total antioxidants activity by FRAP method is 315.27 of inhibition against free radicals. whereas Vitamin C content is 10.95 mg/100gms; Crude Fiber (1.98%) and Ash content (30.2%), Moisture content (28.8%); Sensory evaluation showed that Dried coconut apple scored the highest on the 5 point hedonic scale with aroma (2.75), taste (4.0), texture (3.90), overall acceptability (3.55) compared with the Fresh coconut apple. Coconut apple helps in easy digestibility, boosts immunity, dissolves kidney stones, proper insulin secretion to diabetic patients, protects from cancer, reduces the risk of blood clots and heart attacks. Due to presence of high antioxidant activity in coconut apple helps in preventing cellular damage in the body.

KEYWORDS: Antioxidant activity, Nutritional analysis, sensory analysis, Coconut apple.

INTRODUCTION

The coconut win is species of a win tree, *Cocos nucifera*, that grows to about 30 measures altitudinous and is significantly cultivated in tropical climates. Picked coconut, also appertained to as coconut sprouts, are the comestible globular sponger- suchlike cotyledons of growing coconuts. They've a brickle watery texture with a slight agreeableness. They're eaten in coconut- growing countries either as it's or as part of colourful dishes. They aren't commercially produced. They're also known similarly as Coconut apple also named as coconut flower, coconut plum, coconut embryo. The term coconut refers to the fruit of the coconut win, which consists of a stringy cocoon (mesocarp) boxing a huge seed or inner gravestone. The term coconut is also used to consult the entire big seed with its overspreading of hard, green, stringy endocarp, or to the suitable for eating, commercially essential, white and fleshy part of the seed(the coconut" meat" or endosperm), which in flip surrounds the concave, fluid- filled, critical depression. The whole middle is freehandedly packed with a clouded but translucent, seasoned liquid (liquid endosperm) slightly thicker in thickness than water.(Newworldencyclopedia).

Picked coconuts can be set up inside sprouting mature coconut fruits. They can range from marble- sized to fully filling the depression inside the endosperm of the coconut seed. They grow to maximum size at around 20 to 24 weeks after germination. They're technically haustoria, as they're cotyledonary structures that absorb nutrients and water from the solid and liquid endosperm, in this case, as food for the growing embryo. MarketlessMondays. recaptured 25 April 2019.

Picked coconuts(Coconut apple) contain around 66 carbohydrates, around 64 of which are answerable sugars. They contain considerable quantities of salutary fiber and minerals (particularly potassium, manganese, calcium, phosphorus, and magnesium). Manivannan, et al 2018.



Fig 1: Coconut apple

The fruit takes between 330 to 420 days to expand after pollination, earlier than germination can arise. Throughout germination, embryo smash happens contemporaneously in two directions. Within the proximal check of the embryo, the cotyledonary petiole grows the origin severance, containing the plumule and radicle, which also develop outside of the endocarp. The cotyledonary blade, placed at the distal end of the embryo, expands to form a sponger- suchlike, performed technical haustorium which fills the outside of the endosperm concave space in a period of one hundred forty to 180 days after germination begins Shelf life of coconut apple is Without Refrigeration – 2 days With Refrigeration – up to 1 week firmed in watertight holders- 2- 3 months (Fernana caro beveridge, 2022).

Coconut Embryo, also known as “Coconut Malai” in Urdu, is healthier than coconut juice and coconut water. It's eaten raw and has great health benefits. Impunity Booster. Coconut embryo is rich in nutrients that help your body make strong impunity against several dangerous infections and conditions. It has anti-viral, anti-parasitic, anti-fungal, and anti-bacterial characteristics that cover you from the threat of several dangerous infections.

The fiber content in it's largely favourable for digestion, good health of the gut, and especially for a smooth bowel movement. Eating coconut embryo helps in the immersion of essential minerals, nutrients, and vitamins and promotes smooth metabolism. Weight management coconut embryo along with its juice. It's abundant in fiber and eating it makes feel full and one can beat hunger stings and manage weight effectively.

Coconut is low in calories, eating it prevents weight gain. The consumption of coconut embryo boosts your metabolic rate that helps promote weight loss significantly regulates diabetes. Coconut Apple is a blessing for diabetic people, coconut apple consumption promotes and improves insulin stashing in the body and controls diabetes to a large extent. Consumption of coconut apple showed the protection against the threat of developing cancer. High nutritive content which prevents the threat of cancer, specifically the bone which is caused due to insulin insufficiency (Rabya Jamshed, 2018).

Coconut embryos are an excellent source of several important nutrients that are essential for maintaining a healthy body. They contain plenitude of vitamins and minerals, including potassium and iron. They also contain a good quantum of protein. In addition, they're an excellent source of antioxidants, which may have numerous health benefits. Coconut embryos are rich in flavonoids. They give the body with plenitude of polyphenols, which have antioxidant parcels. Also, these polyphenols have anti-inflammatory goods. They're also suitable to help the conformation of blood clots. New study has set up that coconut embryos may be the key to good health. The study, which was conducted by experimenters at the University of Queensland, set up that the embryos contain high situations of antioxidants, which can help to cover the body from complaint (<https://nutritionbridge.com/coconut-embryo-health-benefits/>).

The germination process of coconut seeds, as in maximum win species, happens in an uncommon manner and does now not follow the usual description of germination involving early radicle projection. The fruit takes between 330 to 420 days to expand after



pollination, earlier than germination can arise. Throughout germination, embryo smash happens contemporaneously in two directions. Within the proximal check of the embryo, the cotyledonary petiole grows thru the origin severance, containing the plumule and radicle, which also develop outside of the endocarp. The cotyledonary blade, placed at the distal end of the embryo, expands to form a sponger- suchlike, performed technical haustorium which fills the outside of the endosperm concave space in a period of one hundred forty to 180 days after germination begins.(Fernana caro beveridge, 2022).

2. MATERIALS AND METHODS

2.1 Collection of Coconut Apple (Flower)

The flower of the coconut apple was collected in the month of May 2023 from the market in Hyderabad, Telangana. The coconut was covered with a hard outer layer that has to be removed before consumption coconut apples were further used for extraction.

2.2. Solvent Extraction (Methanol Extraction)

10grams of coconut apple were weighed and added to 100ml of organic solvent (methanol) in a conical flask. After 24 hours, it was filtered using muslin cloth and centrifuged at 5000 rpm for 15 minutes. The supernatant was then gathered in a round base jar and the dissolvable was dissipated to make the last volume of one-fourth of the first volume, giving a convergence of 40 (µg /0.1ml. It was put away at 40 in water/air proof jugs for additional studies.

2.3 Determination of Vitamin C

About 100 g of the coconut apple sample was completely uprooted with ethanol. The excerpt was concentrated to a residue. The crude excerpt was stored in a castrated bottle and kept in a refrigerator for farther use. 10 ml of each filtrate was mixed with 20 glacial acetic acid in a 100 ml standard beaker which was made up to 100 ml of distilled water. Color medication The standard color result was prepared by dissolving 50 mg of blue color in 50 ml of distilled water. The admixture was adulterated to 200 ml, filtered, and kept. Preparation of standard ascorbic acid result This was prepared by dissolving 100 mg liquid ascorbic acid in 50 ml of 20 glacial acetic acid and lacing it to 100 ml with distilled water. Titration procedures 10 ml of the ascorbic acid result was titrated with the color result. Each drop of the color in contact with the result turns pink. The endpoint was reached when the pink colour lasts for 10 seconds. also, 10 ml of each sample prepared was in turn titrated with the due, and the titre values were noted (PankajK. Tyagi1, and Shruti Tyagi, 2018).

2.4. Determination of Fiber

Determine independently the sample humidity by hot in a roaster at 105 °C to constant weight. Cool in a desiccator. Weight directly 1 g about of grinded sample (1 mm about) roughly with 1 mg. == > W1. Add 1.25 sulfuric acid up to the 150 ml notch, after preheating by the hot plate in order to reduce the time needed for boiling. Add 3- 5 drops of n- octanol as antifoam agent. Boil 30 twinkles exactly from the onset of boiling. Connect to vacuum for draining sulfuric acid. Wash three times with 30 ml (gauntlet filled up to the top) of hot deionized water, connecting each time to compressed air for stirring the content of gauntlet. After draining the last marshland, add 150 ml of preheated potassium hydroxide (KOH)1.25 and 3- 5 drops of antifoam. Boil 30 twinkles. Sludge and marshland as point 7. Perform a last washing with cold deionized water aimed to cool the trials and also wash three times the gauntlet content with 25 ml of acetone, stirring each time by compressed air. Remove the trials and determine the dry weight after drying in an roaster at 105 °C for an hour or over to constant weight. Let cool in a desiccator. This weight(W2) represents the crude fiber plus ash content in comparison to original weight (Fiber plus system).

2.5. Determination of Antioxidants By DPPH Method

The HCl buffer(pH7.4) in a testing tube. And also 200µl of testing sample result was added and mixed snappily. The result was kept at room temperature for 30 min. The absorbance of the result at 517nm was recorded. A mixed result with 1,200 µl of ethanol and 800µl of Tris HCl buffer(pH7.4) was used as the blank. The inhibition rate() was attained from the following equation Inhibition rate()(A1 – A2) × 100/A1, where A list the absorbance of the addition of ethanol rather of testing sample and A2 is the absorbance of testing sample result.(Debasis nayak,2012.)

%DPPH radical scavenging effect = A0 – A1/A0 x 100



2.6 Determination of Total Antioxidant Activity by FRAP Method

FRAP (3.6 mL) add to distilled water (0.4 mL) and incubated at 37 °C for 5 min. also this result mixed with certain attention of the factory excerpt (80 mL) and incubated at 37 °C for 10 min. The absorbance of the response admixture was measured at 593 nm. For construction of the estimation wind, five attention of FeSO₄, 7H₂O (0.1,0.4,0.8, 1,1.12,1.5 mM) were used and the absorbance values were measured as for sample results (Monika skowrya, 2014).

2.7 Determination of Moisture Content

Weigh a small vessel. Weigh 10 g of the material into the vessel. Sot the sample for 24 hours in a 105- 110 °C roaster. R eweigh the sample, abate the weight of the vessel, and determine the humidity content using the following equation $M_n = ((W_w - W_d) / W_w) \times 100$. (Mayur- Chandrasekhar- Patil 2019).

2.8 Determination of Ash

Find out the weight of a clean dry gauntlet. Place about 2 g of sample and weigh this to find out accurate weight of the sample taken. Precisely place the counted gauntlet over electric burner. The gauntlet should be incompletely opened. The sample will get scorched with original expatriation of bank. Place the gauntlet in a muffle furnace and heat to 600oC. Keep it for 2 hours. At this temperature all organic matter will be burnt leaving behind minerals. Remove the gauntlet from the furnace precisely and cool it in a desiccator to room temperature and weight again.(AOAC Official Method942.05)

2.9 Sensory Evaluation

Sensory evaluation is done for the fresh coconut apple and dried coconut apple. where panellist are asked to rate the acceptability of the sample by 5 point hedonic scale for evaluation. The parameters are aroma, taste, texture, colour, mouth feel and over all acceptability.

2.10 Statistical Analysis:

Statistical analysis used is two sample t test to compare between both the samples with the formula, $t = (X_1 - X_2) / (S_1^2/n_1 + S_2^2/n_2)$.

3. RESULT AND DISCUSSION

Antioxidant activity, vitamin c, fiber, moisture and ash content of coconut apple showed in Table 1.

Table 1: Antioxidant activity (DPPH and FRAP methods) of Coconut apple

S.No	Parameters	Method of Analysis	Result
1	Antioxidant activity (% Inhibition)	DPPH Method	19.80
2	Total antioxidant activity(µg/g)	FRAP Method	315.27

As mentioned in the above table the antioxidant activity (% inhibition) by the method of DPPH shown the result as 19.80, Total antioxidant activity (µg/g) by the method of FRAP it shown the result as 315.27.

Table 2: Nutrient analysis of fresh Coconut Apple

S.No	Parameters	Result	Method of analysis
1	Moisture content (%)	28.8%	AOAC Method
2	Ash content (%)	30.2%	AOAC Method
3	Crude fiber (%)	1.98	Fiber plus method
4	Vitamin c (mg/100g)	10.95	Biochemical methods, 2 nd Edn. 1996

As mentioned in the above table the moisture content by the method of AOAC it shown the result as 28.8%, Ash content by the method of AOAC shown the result as 30.2% , Crude fiber by the method of fiber plus method it shown the result as 1.98% , Vitamin c content by the method of Biochemical methods, 2nd Edn ,1996 it shown the result as 10.95mg.

Sensory Evaluation

Mean and standard deviation of the two samples T1 and T2 are represented in Table 3. As per the sensory analysis results, sample B (Dried coconut apple) scored the highest on the hedonic scale with aroma (2.75), taste (4.0), texture (3.90), overall acceptability (3.55) compared with the sample A(Fresh coconut apple) with aroma (2.25), taste (3.40), texture (2.95), over all acceptability (2.85) .

Table 3: Sensory evaluation cotyledon of *cocos nucifera*, fresh coconut apple and dried coconut apple.

Parameter	Sample A (Fresh coconut apple)	Sample B (Dried coconut apple)
Aroma	2.25 ± 0.85	2.75 ± 0.79
Taste	3.40 ± 0.94	4.00 ± 0.97
Colour	4.05 ± 0.76	1.75 ± 0.79
Texture	2.95 ± 0.83	3.90 ± 0.91
Mouth feel	3.80 ± 0.70	3.00 ± 0.79
Over all acceptability	2.85 ± 0.81	3.55 ± 0.76

Sample A (Fresh) scored the highest on the hedonic scale with the colour (4.05), mouth feel (3.80) that compared to the sample B that colour (1.75), mouth feel (3.0). That above sensory comparison table shown that sample B has better aroma, taste, texture, overall acceptability whereas sample A has better colour and mouth feel.



Fig 2: Fresh coconut apple



Fig 3: Dried coconut apple

Statistical Analysis

The significance of the p value is (p = 0.05), and need to be compared with the other sensory parameter .



Table 4: Statistical analysis coconut flower of *cocos nucifera*.

Parameter	P (T <= t) two
Aroma	0.017904
Taste	0.038069
Colour	5.82
Texture	0.000345
Mouth feel	0.002166
Over all acceptability	0.004629

The Above Table 4 represents that Aroma, taste, texture, mouth feel, overall acceptability are significant, whereas colour is not significant.

CONCLUSION

This study has shown that coconut apple is a precious resource that can be used in a variety of operations. The fruit is rich in nutrients and antioxidants, and has implicit as a functional food component, a source of natural colors and flavours, and a feedstock for the product of biofuels and bioplastics. Farther exploration is demanded to completely understand the parcels and implicit operations of coconut apple, and to develop effective and sustainable processes. With continued disquisition and invention, coconut apple could come an important contributor to the food as nutritional, chemical and energy diligence, as well as to the livelihoods of smallholder growers in coconut- growing regions around the world due to its excellent Nutritional and phytochemical properties.

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