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Research Article

# Bio-Nutritional Potential of Mangrove *Ceriops tagal* (Perr.) C. B. Rob.

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## Abstract

Some mangrove fruits are popularized for their medicinal properties. From nutritional point of view, there is no concrete report on mangroves. Therefore, the present study was attempted to assess nutritional parameters viz. moisture, protein, fibre, ash and calorific value in mangrove *Ceriops tagal*. The leaves and hypocotyls of *C. tagal* were analyzed for their chemical constituents. They showed almost similar characteristics in major metabolites. Both the leaves and hypocotyl had high concentration of carbohydrates and crude fibre and very low fat and protein. The ash was rich in Na, K and Ca. Calorific values were found fairly high. According to previous studies and assumption, mangrove swamps are rich in food which is readily consumed by estuarine animals. Thus, there is strong possibility of using leaves, fruits as well as hypocotyls of C. tagal may supplemented for animal feed.

**Keywords:** Mangrove; *C. tagal*; Hypocotyl; Carbohydrate; Protein

## Introduction

Mangrove forests dominate the world's tropical coastlines. Mangroves are highly productive, fixing and storing significant amounts of carbon [1]. The most of the mangrove fruit species provide nutrient security of rural or coastal community. There is a lot of information available on the therapeutic as well as medicinal properties isolated from mangroves. To the contrary, insufficient data on their nutrition aspect, also the mangroves fruits, which the tribes use, are not familiar to urban communities. There are several studies have been carried out on nutritive values in different plant species but less studies have been documented in mangroves.

*Ceriops tagal* is mangrove medium sized tree species in family Rhizophoraceae. The growth habit is columnar or multi-stemmed and the tree develops large buttress roots. The leaves are opposite, glossy yellowish green and obovate with entire margins. The flowers are borne singly in the leaf axils. The ovoid fruits are up to 3 cm long, brown at first, change colour on maturity and the hypocotyls emerges. The hypocotyl is long and slender, growing to about 35 cm long and ribbed.

Due to ever increasing human population and depleting natural resources, there is needed to search new alternative sources. Information available on the edible as well as therapeutic properties of the mangrove fruits is isolated and data on their nutrition aspect are scarcity. The present piece of work provides bio-nutritional status of leaves and hypocotyls of *C. tagal* and aims to investigate its possibilities to be used as a feed component for fish and ruminants. Nutritional analysis of this promising mangrove species play essential role in bio-prospecting of mangroves.

## Material and Methods

- **Collection of Material:** Leaves as well as hypocotyls were collected from coastal area of Ratnagiri district.
- **Sample Preparation**: The leaves and hypocotyls were air-dried and ground to a fine powder. Powder is stored in air-tight containers prior to further analysis.
- **Proximate analysis:** The moisture and ash content were determined by gravimetric method. The crude fiber was calculated by acid-base digestion. Crude protein was determined by Macro-Kjeldahl method. Crude fat content was determined gravimetrically following Soxhlet extraction with ether according to Official "Association of Official Analytical Chemists" (AOAC) [2]. method. Available carbohydrate was estimated "by difference" using the formula, TCH (%) =100-% (CP+A+CF+M). The energy value were estimated by calculation method.

- using following formula, Energy value (g/100g) = [4x crude protein] + [4 x carbohydrate] + [9 x crude fat].
- **Mineral Analysis:** Acid digestion was carried out by the method followed by Toth., *et al,* 1948 [3]. The mineral elements like Cu, Zn, Fe, Ca, Mg, Mn etc. were analyzed by Atomic Absorption Spectrophotometer (AAS).

## Results and Discussion

The present study exhibited appreciable nutritional status in terms of moisture, ash, fibre, protein, carbohydrate and energy. The chemical and mineral composition of the leaves and hypocotyls are represented in table 1 and 2. It is interesting to note that, the leaves and hypocotyl samples have almost similar chemical constituents in major metabolites. Moisture content present in highest in hypocotyl while crude protein content is found to be highest in the leaves of *C. tagal*. The high moisture content of hypocotyl is easily susceptible to spoilage if not well preserved [4]. In this study, there was an appreciable amount of protein is present in leaves of *C. tagal*. Protein is an essential component of human diet needed for the replacement of the dead tissues and for the supply of energy and adequate amount of required amino acids [5]. Hypocotyl of *C. tagal* is rich in crude fibre (26.92%). Lipid and carbohydrate contents found to be same in both leaves as well as hypocotyls of *C. tagal*. The crude lipid contents of leaf and propagules of *C. tagal* were less than the range.

Sodium is one of the essential elements that regulate the blood pressure and nerve processes for transmitting impulses through the body cells [6]. All studied samples had high amount of Ca, Na and K content. Potassium is one of the essential elements in human diet and plays important role in vital cellular mechanism. Calcium helps in the development and growth of skeletal system e.g., bones and teeth.

| Proximate composition | Moisture (%) | Ash (%) | Crude protein (%) | Crude lipid (%) | Crude fibre (%) | Carbohydrate (%) | Total energy (Kcal/100g) |
|---|---|---|---|---|---|---|---|
| Leaf | 5.57 ± 0.03 | 6.85 ± 0.05 | 9.69 ± 0.01 | 1.40 ± 0.015 | 18.01 ± 0.05 | 56.79 ± 0.02 | 296.52 ± 0.02 |
| Hypocotyl | 6.15 ± 0.01 | 3.30 ± 0.02 | 4.63 ± 0.2 | 1.30 ± 0.01 | 26.92 ± 0.03 | 57.70 ± 0.05 | 261.02 ± 0.01 |

**Table 1:** Proximate chemical composition of *Ceriops tagal.*

| Sr. No. | Mineral Composition | Leaf (mg/100g) | Fruit (mg/100g) |
|---|---|---|---|
| 1. | Copper (Cu) | Nil | 0.242 |
| 2. | Iron (Fe) | 2.296 | 3.308 |
| 3. | Magnessium (Mg) | 0.578 | 1.256 |
| 4. | Mangnese (Mn) | 0.19 | 0.06 |
| 5. | Calcium (Ca) | 1.102 | 3.482 |
| 6. | Zinc (Zn) | 0.232 | 0.962 |
| 7. | Sodium (Na) | 240 | 520 |
| 8. | Potassium (K) | 180 | 220 |

**Table 2:** Mineral composition of *Ceriops tagal.*

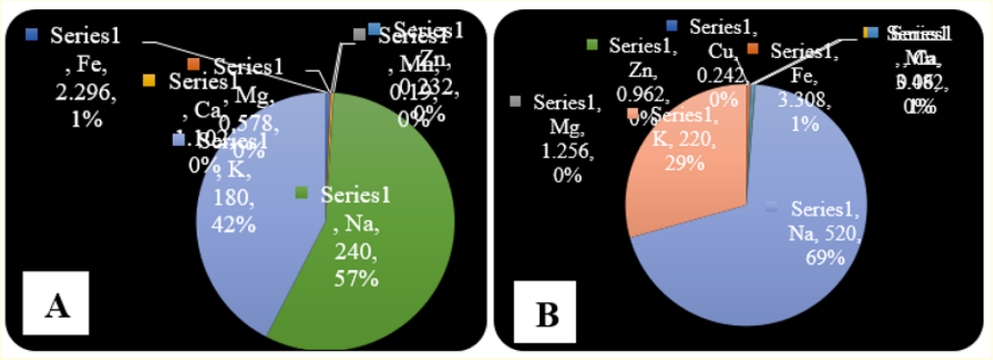


**Figure 1:** Elemental Analysis in *Ceriops tagal* (mg/100g) A: Leaf B: Propagule.

The highest sodium and potassium content was noted in propagules than the leaf whereas, calcium content was found in significant amount in both leaf as well as propagules. Normal extracellular calcium concentrations are necessary for blood coagulation, maintenance of cell integrity and intracellular cement substances [7]. Iron is essential trace element for haemoglobin formation, normal functioning of central nervous system and in the oxidation of carbohydrates, proteins and fats [8]. Iron content is more in leaves while, other microelements like magnesium, manganese, zinc and copper are found more in propagules of *C. tagal*. Consumption of manganese-containing foods is believed to support the immune system, regulate blood sugar levels, production of energy and cell reproduction [5]. Also, zinc is regarded as an essential trace element for protein and nucleic acid synthesis and normal body development [9]. It stimulates the activity of vitamins and formation of red and white blood cells [10]. Nutritional significance of elements in both leaf as well as propagules has adequate level of all the essential minerals.

## Conclusion

The present results demonstrated that the leaves and hypocotyl of *C. tagal* contain considerable amount of nutrients which if well exploited and promoted can address many nutritional related disorders. Also, the present results support the earlier assumption that mangrove swamps are rich in food materials which are readily consumed by estuarine animals. Thus, there is strong possibility of using leaves and hypocotyl of *C. tagal* as food source of nutrients and hence may be supplemented for animal feed. The present piece of work explored superior nutritional status in terms of protein, moisture, carbohydrates and fiber content. Thus, this promising species of mangrove deserved to be non-conventional bio-nutritional source based on their primarily nutritional analysis. Nevertheless, extensive toxicity study needs to be done to ascertain their safety levels.

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