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CHEMICAL CONSTITUENTS OF THE FRUIT AND HYPOCOTYL OF MANGROVE, *CERIOPS TAGAL*

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ABSTRACT: The fruit and hypocotyl of *Ceriops tagal* were analysed for their organic and inorganic constituents. They showed almost similar characteristics in major metabolites and high molecular weight elements. Both the samples had high concentration of the carbohydrates and crude fibre and very low in fat and protein. The ash was rich in Na, K and Ca. Some essential free amino acids and sugars were also present. Calorific values were found fairly high. There is a strong possibility of using fruit and hypocotyl of *C. tagal* as a source for supplementing animal feed.

KEY WORDS: Mangrove - *Ceriops tagal* - fruit - hypocotyl - chemical constituents.

INTRODUCTION

Mangroves are marine macrophytes. They grow in dense forests along tidal estuaries, in salt marshes and in arid and semiarid coastal environment. Mangrove areas are no longer considered as stinking, mosquito ridden waste lands. In fact they are highly productive and their uses are many. Their biomass, wood, leaves and fruit are directly of some benefit to mankind and indirectly contribute to the preservation of the ecosystem (Saifullah, 1982). The mangrove leaves contain large amount of minerals, vitamins and amino acids which are essential for the growth and nourishment of marine organisms and livestock (Odum and Herald, 1975). The superiority of mangrove fodder over others is due to the presence of common salt and iodine in the former. It is experimentally demonstrated that the livestock fed on mangrove leaves yield better quality of milk and more in quantity (Saifullah, 1982).

Biochemical investigations on mangrove foliage has been recognised by many workers (Saifullah, 1984; Qasim *et. al.,* 1986). Recently Qadri and Jamil (1990) reported chemical constituents of the fruit of *Avicennia marina* of Karachi coast for its utilization as a feed ingredient.

The present study provides some informations on the chemical characteristics of the fruit and hypocotyl of *C. tagal* and aims to investigate its possibilities to be used as a feed component for fish and ruminants.

MATERIALS AND METHODS

The fruit and hypocotyl were collected from Sonmiani coast (Balochistan) and randomly selected for analysis. Three replicates were used for each analysis. The methods described in AOAC (1984) were used for the determination of moisture, protein, fat, crude fibre and ash contents. Moisture contents were determined by drying at 105°C to a constant weight. Crude protein was estimated by the microkjel-dahl method. Fat was measured by a soxhlet extraction method using the moisture free sample. Crude fibre was determined by first digesting the sample in sulphuric acid followed by sodium hydroxide. The difference between the residue and ash gave the crude fibre contents. The determination of ash was made by igniting the sample (5g) in a muffle furnace at 550°C. Total carbohydrates were calculated by difference.

For the determination of mineral contents, ash was dissolved in nitric acid (50%, v/v) diluted with double distilled water 1:10. The results were determined on Perkin Elmer Atomic Absorption Spectrophotometer. The soluble carbohydrates (sugars) and amino acids present in the fat free samples were determined according to the methods described by Harborne (1984).

Using the appropriate calorific equivalents of 4.1 for protein, 4.01 for carbohydrates and 9.3 for lipids on dry weight basis, the calorific values of mangrove fruit and hypocotyl in terms of each fraction and total energy were calculated.

RESULTS AND DISCUSSION

The gross chemical and mineral composition of the fruit and hypocotyl are represented in Table I and II. It is interesting to note that the fruit and hypocotyl samples have almost similar chemical characteristics in major metabolites such as

Table I: Proximate chemical composition of *Ceriops tagal* (% of dry weight) (mean of 3 samples)

	Moisture	Dry Matter	Ash	O.matter	Protein (Nx6.25)	Total lipids	Crude Fibre	Total Carbohydrate	Energy KCal./100g
Fruit	55.57	45.57	4.30	95.7	3.25	0.33	15.64	36.55	162.66
Hypocotyl	63.17	36.87	2.01	97.9	93.85	0.35	15.02	30.66	141.98

protein, fat and carbohydrate and also in high atomic weight elements like Na, K, Mg and Ca. While studying the energy values of these samples it was observed that they had low protein values i.e. 3.25x4.1 and 3.85x4.1 calories per 100 g dry weight for fruit and hypocotyl. Both the samples showed relatively high concentrations of total carbohydrates and crude fibre and very low in fat and ash. A total of 6 and 4 free amino

Table II: Inorganic constituents of *Ceriops tagal* (% of Ash)

Elements	Fruit	Hypocotyl
Sodium	9.21	9.05
Potassium	6.71	5.64
Na/K ratio	1.37	1.60
Magnesium	2.31	2.04
Calcium	3.75	2.86
Sulphur	3.10	2.20
Aluminium	10.70	11.90

acids were detected in fruit and hypocotyl respectively (Table III). Free sugars identified in fruit and hypocotyl are shown in Table IV.

Table III: Water soluble amino acids composition of *Ceriops tagal*

Amino acids	Rf. of Std.	Rf. of Sample
Fruit		
Lysine	0.066	0.060
Threonine	0.213	0.230
Valine	0.400	0.350
Phenylalanine	0.540	0.560
Tryptophan	0.580	0.620
Proline	0.730	0.740
Hypocotyl		
Arginine	0.121	0.135
Glutamic acid	0.348	0.354
Tryptophan	0.690	0.670
Alanine	0.316	0.320

Table IV: Free sugars composition of *Ceriops tagal*

Free sugars	Rf. of Std.	Rf. of Sample
Fruit		
Xylose	0.530	0.470
Maltose	0.160	0.150
Glucose	0.250	0.260
Fructose	0.200	0.200
Sucrose	0.100	0.100
Hypocotyl		
Glucose	0.075	0.087
Sucrose	0.162	0.162
Galactose	0.317	0.317
Maltose	0.250	0.210

Sodium content is comparatively higher than of the other mangroves. (Kotmire and Bhosale 1980) (Table II). Even though the potassium values in the present study appears to be slightly higher, but it is possible that increase in potassium may help the plant to tolerate high level of sodium. Calcium values are considerably low as compared to Na and K. This may be due to more absorption of monovalent cations as against the less mobile Ca. It has been reported that under saline conditions more amino acids are formed (Joshi *et al.*, 1962), which enhances nitrogen metabolism. This may be the reason for the contents of essential free amino acids like lysine, threonine, tryptophan and phenylalanine in fruit and arginine and tryptophan in hypocotyl. Increase in carbohydrate contents of *C. tagal* fruit and hypocotyl is due to more salts in the mangroves (Joshi and Karekar, 1974).

Energy values of the *C. tagal* fruit and hypocotyl were found to be fairly high. *Ceriops tagal* seems to have a low calorific value for protein and fat but considerably high for carbohydrate (Table I).

The present analysis supports the earlier assumption (Saifullah, 1984) that mangrove swamps are rich in food materials which are readily consumed by estuarine animals. Thus there is a strong possiblity of using fruit and hypocotyl of *C. tagal* as food source of nutrients and hence may be supplemented for animal feed.

REFERENCES

AOAC, 1984. *Official Methods of Analysis of the Association of the Official Analytical Chemists* (Ed.S. Williams). *Assoc. Biol. Anal. Chem. Inc. Ltd.*: 1141

Harborne, J.B. 1984. *Phytochemical Methods.* Chapman & Hall, N. York. Pp.1-228.

Joshi, G., T. Dolan, R. Gee and P. Saltman, 1962. Sodium chloride effect on dark fixation of CO_2 by marine and terrestrial plants. *Plant Physiology* 37: 446-449.

Joshi, G.V., M.D. Karekar, 1974. Photosynthetic carbon metabolism and carboxylating enzymes in algae and mangroves under saline conditions. *Photosynthetica* 8: 51-52.

Kotmire, S.Y. and L.J. Bhosale, 1980. Chemical composition of the leaves of *A. marina* and *A. officinalis*. *Indian Journal of Marine Sciences* 9: 299-301.

Odum, W.E. and E.J. Herald, 1975. Mangrove forests and aquatic productivity. In: *Ecological Studies* 10. (Ed. A.O. Hastner). Springer Verlag, New York. Pp.129-136.

Qadri, N.N. and K. Jamil, 1990. Characteristics and composition of the fruit of *Avicennia marina*. *Pakistan Journal of Scientific and Industrial Research* 33: 484-485.

Qasim, R.S, M. Ilyas and S. Barkati, 1986. Biochemical composition of the mangrove *Avicennia marina* foliage. *Pakistan Journal of Scientific and Industrial Research* 29 :37-39.

Saifullah, S.M. 1982. Mangrove Ecosystem of Pakistan. In: *The Third Research Symposium on Mangroves in Middle East.* Japan Cooperation Centre for the Middle East, Publication No.137. Tokyo. Pp.69-80.

Saifullah, S.M. 1984. Utilization of mangrove foliage for grazing stall feeding, and as a feed supplement. In: *Handbook of Mangrove area management* (Eds. L.S. Hamilton and S.C. Sneadaker). UNESCO, Paris. Pp.38-41.