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MANGROVE AS A POTENTIAL FODDER CROP IN THE RED SEA COASTAL AREAS OF EGYPT

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Abstract

In an endeavor to exploit mangrove trees as a potential fodder plant in marginal salinity environments, mangrove leaves and fruits were collected from different locations adjacent to Red Sea shore at the southern part of Egypt.

Samples of both leaves and fruits were oven dried and analyzed for crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract (NFE), ash and organic matter (OM). Also, content of the elements Na, K, Ca, Mg , Fe, Mn, Zn, Cu, Cd, Co, and Pb were determined.

Fiber fractions were done to critically evaluate the mangrove leaves and fruits as a potential fodder crop. As well as, nutritive values and dry matter digestibility were calculated.

Results obtained indicate that mangrove plants (leaves and fruits) could reasonably be used as a good feed for animals in the environments that can't grow the traditional fodder crops.

INTRODUCTION

Halophytes have been used as forage plants in saline environments. The value of certain salt - tolerant shrub, tree and grass species has been recognized by their incorporation in pasture environment programs in many salt affected regions (Griffin Shay, 1990).

Considering the exploitation of mangrove trees as potential fodder, Clough (1993) reported that the direct grazing of mangrove areas is not recommended owing to the difficulty of controlling overgrazing and the considerable damage that can be done to the soil surface, even at low stocking densities.

Instead, it is preferable to hand cut the foliage for feeding outside the mangrove areas. In addition the mangroves foliage and fruit are suitable for stock-feed.

The present stndy aimed at evaluating mangrove leaves and fruits as potential fodder in an endeavor to possible best exploitation of adversely saline environments.

MATERIALS AND METHODS

In accordance with the objective of this research, mangrove leaves and fruits were collected through December 1996 from different locations along the Red Sea shore extending from Safaga city to Shalateen city of the upper Egypt. These locations are: Safaga, El-Qusair, Mersa alam, Abu-ghuson, Branees, Mersa hemera and Wady lahm.

Leaves and fruits samples were oven dried at 70°C, grounded then analyzed for crude protein (CP), crude fiber (CF), ether extract (EE), nitragen free extract (NFE), ash and organic matter (OM) using the general methods described by AOAC (1980). Representative samples from both leaves and fruits were prepared and analyzed for their content of some macro and micro elements; (Na, K, Ca, Mg, Zn, Cu, Cd, Co and Pb) according to the methods described by Chapman and Pratt (1991).

Fiber fractionation of mangrove leaves and fruits were also done to determine the acid detergent fiber (ADF), neutral detergent fiber (NDF), acid detergent lignin (ADL), hemicellulose, cellulose and silica as described by Van Soest (1971).

Nutritive value and dry matter digestibility were calculated to obtain dry matter digestibility (DMD), total digestible nutrients (TDN), and digestible crude protein (DCP).

RESULTS AND DISCUSSION

Mangrove trees are generally presented in Egypt along the Red Sea shore at the locations: Rass Mohammed, El-Gharakana (at the coastal area between Sharm-El-Sheikh and Newabba at the shore of Aqba Gulf), Safaga, El-Qusair, Mersa alam, Abu-ghuson, Brannees, Mersa Hemera, Wady lahm and different locations extended to Halaieb in upper Egypt.

Data presented in Table 1 (A and B) showed the chemical composition of mangrove leaves and fruits at different studied locations, and the data indicated that the mangrove leaves and fruits had relatively high crude protein (CP) content with an average of 10.83% and 9.62%, respectively, on the basis of dry weight. These values of CP are higher than those of wheat or rice straw but lower than those of Egyptian clover hay or alfalfa hay.

The relatively high content of crude protein in both leaves and fruits could be used to produce the salt-free protein according to Fellows (1987), which is sold at a price comparable with other protein rich feed.

Table 1.A. Chemical composition of Mangrove leaves in different locations along Red Sea shore (dry weight basis).

Location	Chemical analysis (%)					
	OM	CP	CF	EE	NFE	Ash
Safaga	82.65	11.64	20.72	3.96	46.33	17.35
El-Qusair	81.43	13.56	21.50	3.29	56.78	18.57
Baranees	84.67	9.34	21.29	3.99	50.05	15.33
Mersa alam	79.66	11.41	19.47	3.34	45.44	20.34
Mersa hemera	83.63	10.37	22.38	3.20	47.68	16.37
Wady lahm	81.29	10.39	18.19	3.31	59.89	18.71
Mersa alam, El-Qusair	81.59	9.13	22.33	3.98	46.15	18.41
Mean value	82.13	10.83	20.84	3.58	50.33	17.87

Values of crude fibre (CF) and ether extract (LE) were much higher in leaves than in fruits, it had average values of 20.84 and 3.58% in the leaves, respectively, in corresponding with 8.33% and 1.27% in the fruits (Table 1A and B). On the other hand, mangrove fruits had higher carbohydrate content (average value of 72.88%) than the leaves which had an average value of 50.33% on the basis of dry weight. In this respect, the reduction of carbohydrate content in mangrove leaves may be refered to the reduction of photosynthetic activity in plants stressed by high salinity which induced K deficiency rather than NaCl toxicity. Our results are in agreement with those found by Marilyn *et al.*, (1987).

Data also showed that the ash content in mangrove leaves were much higher than that in fruits, it had an approximate value as twice as that of fruit ash (Table 1). Thus, mangrove leaves are rich in minerals. This will be attributed to the ability of these plants to absorb as much as quantities of salts from the growing environment for the plant cell osmoregulation.

Table 1.B. Chemical composition of Mangrove fruits in different locations along Red Sea shore (dry weight basis).

Location	Chemical analysis (%)					
	OM	CP	CF	EE	NFE	Ash
Safaga	92.42	10.39	8.54	1.06	72.43	7.58
El-Qusair	92.12	10.13	7.78	0.87	73.34	7.88
Mersa alam	91.71	9.00	8.27	1.30	73.14	8.29
Abu-ghuson	92.16	10.31	7.96	1.72	72.19	7.82
Mersa hemera	92.05	8.26	9.11	1.39	73.29	7.95
Mean value	92.10	9.62	8.33	1.27	72.88	7.90

Generally, mangrove leaves had higher contents of CP, CF, EE, NFE and ash than fruits but the OM content was higher in fruits than in leaves. The relative high content of OM and NFE with moderate content CF and CP show that mangrove trees (leaves and fruits) could reasonably be used as a good feedstuff for animals.

Considering the contents of some elements in the mangrove leaves and fruits, the data in Table 2 revealed that, leaves had higher content of Na, K, Ca, and Mg and Cl than fruits but a contradictable trend was obtained for microe-lements contents. The fruits had remarkable higher content of Fe, Mn, Zn, Cu, Cd, Co and Pb than leaves (Table2).

Table 2. Some macro and micro elements content in mangrove leaves and fruits (dry weight basis).

Character	Plant organ	
	Leaves	Fruits
Macro and secondary elements %		
Na	4.35	2.77
K	2.04	1.75
CA	0.33	0.15
Mg	0.41	0.18
Micro and heavy elements (ppm):		
Fe	206	318
Mn	21	114
Zn	8	30
Cu	25	44
Cd	13	22
Co	38	78
Pb	34	116

Therefore, the permissible levels of these element should be considered to evaluate the possible best exploitation of the these plants as forage crop. In this concern, mangrove leaves and fruits had the permissible level for the elements Na, K, Ca, Mg , Fe, Mn, Zn and Cu, where the feeding of beef cattle was considered. Content of some heavy metals Cd, Co and Pb were in the range relatively above the maximum tolerable levels (Winchester and Howe, 1984). Thus, animals that can tolerate these levels should be taken into consideration. Also mixing of mangrove leaves and/or fruits with other materials must be considered to be used in the feeding system.

Mangrove leavel and fruits had relatively high content of Na, K, and Fe. The value of Na/K for leaves and fruits were 2.31 and 1.58, respectively, where the Na/K ratio 38 in the water, which the mangrove trees studied are grown in soils inundated with sea water. Consequently, mangrove has a mechanism for the selective uptake of K against the highest concentration of Na in the growing environment. The obtained results are in harmony with those of Dagar *et al.* (1993), Downton (1982) and Clough (1984).

Mangrove leaves and fruits showed the higher affinity to Fe accumulation in an extent, which may be beneficial for some animals, especially the mangrove fruits that contains 1.53 folds than leaves. Fortunately, the tolerance of animals for Fe level is relatively higher than other elements.

Trace elements and heavy metals Mn, Zn, Cu, Cd, Co, and Pd in the fruits were 5.43, 3.75, 1.76. 1.69, 2.05 and 3.41 fold as much as those in leaves, respectively.

The nutritive analysis of either mangrove leaves or fruits (Table 3) shows that mangrove could be successfully offered to or grazed by animals. It might need supplemental feed (concentrate, and vitamin mixture) especially with growing and lactating animals. Special precautions should be taken in the summer season when there is no rain and the pasture is poor.

Fractionation of CF (Table 4) showed that, mangrove leaves contained more NDF, ADF, ADL, hemicellulose, cellulose, and silica comparing with fruits. All the values indicate that, mangrove plants have an acceptable nutritive value. The only high undesirable nutrient observed in the leaves, is the ADL, which expresses the lignin content.

Table 3. Nutritive values and dry matter digestibility of mangrove leaves.

Character (%)	Leaves
DMD	51.60
TDN Cal	62.72
DCP	6.20

DMD: Dry matter digestibility.
TDN: Total digestible nutrients
DCP: Digestible crude protein.

Table 4. Fiber fraction of mangrove leaves and fruits.

Character (%)	plant organ	
	Leaves	Fruits
ADF	29.89	18.76
NDF	43.15	28.58
ADL	16.10	10.66
Hemicellulose	13.96	9.80
Cellulose	13.78	8.10
Silica	0.01	0.005

ADF : Acid Detergent Fiber.
NDF : Neutral Detergent Fiber
ADL : Acid Detergent Lignin.

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المانجروف كمحصول علف على ساحل البحر الأحمر فى مصر

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فى مسعى جاد لاستقلال أشجار المانجروف كمصدر محتمل للعلف فى البيئات المحلية الساحلية، جمعت أوراق وثمار الأشجار من المواقع المختلفة فى المساحات المتاخمة لساحل البحر الأحمر جنوب مصر.

تم تجفيف عينات الأوراق والثمار ثم حللت لتقدير المحتوى الخام لكل من البروتين والألياف والدهون والكربوهيدرات والرماد والمادة العضوية. كما تم تقدير عناصر الصوديوم والبوتاسيوم والكالسيوم والماغنسيوم والحديد والمنجنيز والزنك والنحاس والكادميوم والكوبلت والرصاص.

لتقييم أوراق وثمار المانجروف كمحصول علف فقد تم التحليل التجزيئى لمحتوى النبات من الألياف وكذا القيمة الغذائية وقابلية الهضم للمادة الجافة. وقد اظهرت النتائج المتحصل عليها أن أوراق وثمار المانجروف يمكن استخدامها كغذاء جيد للحيوانات فى بيئات نمو هذا النبات حيث يندر زراعة محاصيل الاعلاف التقليدية.