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Full length Research Paper

Nutrient content and amino acid composition of the leaves of *Cassia tora* and *Celtis integrifolia*

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The leaves of *cassia tora* and *celtis integrifolia* are popularly consumed by certain tribes in Adamawa state of Nigeria. They were analysed to determine proximate nutrient content, amino acid composition and some selected mineral elements. Data obtained for proximate analysis showed crude protein 11.63% for *Cassia tora* and 8.20% for *Celtis intergrifola* . Crude fibre contents were 27.07% and 25.00% for *C.tora* and *C.integrifolia* respectively. These values are relatively high compared to those of some common Nigerian leafy vegetables. Carbohydrates, lipids, moisture and ash contents were within the range expected for dry leafy vegetables. Seventeen Amino acids were found in varying proportions in the plants. Results of the elemental analysis showed both leaves contain the following minerals (in g/100g) Ca 3.52, 3.70, fe 0.22,0.22. Na 0.10, 0.07. Mg 0.86,0.78. Zn 0.04, 0.02. mn 0.10, 0.13. Co 0.02, 0.01. K 0.76, 1.44, for *C. tora* and *C. integrifolia* respectively.

Keywords: *Cassia tora, celtis integrifolia,* vegetables, amino acids.

INTRODUCTION

Wild plants play an important role in the diet of most rural dwellers in Nigeria. These plants tend to be drought resistant and are gathered both in times of plenty as well as times of need. Throughout the year, the plants play an important role in supplying nutrients and calories especially during the dry season when cultivated vegetables are scarce. (Freiberger et al, 1998). Although commonly eaten in the rural areas they are also consumed by urban people who buy from traders who also collect them from the wild. Two such plants are *Cassia tora and Celtis integrifolia.*

Cassia tora is a legume belonging to the *Caesalpiniaceae* family. It grows wild mostly in the tropics and is considered a weed in many places. *Celtis integrifolia* belongs to the *ulmaceae* family. It is a large spreading, shortly buttressed low branching tree found in tropical and temperate regions. The leaves of *C. Tora* and *C. Intergrifolia* are used for various soup preparations in some parts of northern Nigeria.

Until recently, little attention has been given to the role of such plant foods in Nigeria. By learning more about their nutrient content, one can better assess their importance in the nutritional wellbeing of the communities that consume them. In this study, the leaves of *C.tora* and *C integrifolia* collected from the wild in Adamawa state Nigeria were analysed for their proximate nutrient composition, amino acid profile and mineral content.

MATERIALS AND METHODS

Sampling and sample preparation.

The leaves of *C.tora* and *C. Integrifolia* were collected from the wild in the month of September 2008. Leaves of several plants of the same species were combined to form representative samples. (Petzke et al, 1997). Prior to analysis, the samples were air dried (away from sunlight) and ground into fine powder using a stainless steel mortar and pestle. All results are expressed on a dry weight basis.

Proximate analysis

The method of AOAC 1990 was used for the determination of moisture, ash, crude fibre, crude protein, lipid contents and total carbohydrate.

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Table1. Proximate composition

	Cassia tora	*Celtis Integrifolia*
Moisture (%)	12.82 ± 0.15	16.00 ± 0.02
Ash content (%)	9.86 ± 2.12	13.53 ± 0.12
Lipids (%)	2.02 ± 0.82	1.76 ± 0.50
Crude fibre (%)	27.07 ± 0.10	25.0 ± 0.10
Crude protein (%)	11.63 ± 0.20	8.20 ± 0.05
Carbohydrate (%)	36.60 ± 1.10	35.51 ± 0.14

Values are means ± S.D for 3 determinations.

Table 2. mineral content of *C.tora* and *C.integrifolia* (g/100g)

	C.tora	*C.integrifolia*
Ca	3.52 ± 0.40	3.70 ± 0.30
Fe	0.22 ± 0.07	0.22 ± 0.12
Na	0.10 ± 0.00	0.07 ± 0.01
Mg	0.86 ± 0.12	0.78 ± 0.25
Zn	0.04 ± 0.01	0.02 ± 0.01
Mn	0.10 ± 0.02	0.13 ± 0.10
Co	0.02 ± 0.00	0.01 ± 0.00
K	0.96 ± 0.06	1.44 ± 0.01

Values are means ± S.D for 3 determinations.

Mineral analysis

For the elemental analysis, the minerals were brought into solution by wet digestion using a mixture of nitric, sulphuric and perchloric acids (4:1:1). (Harris,1979). K and Na were determined using flame photometer(Corning 400 uk). The other minerals Ca, Fe, Zn, Mn and Co were determined using Atomic absorption spectrophotometer (Shimadzu AA 6800).

Amino acid analysis

For the determination of the amino acids, the method of Sparkman, et al 1958 was used. Each sample was defatted, hydrolyzed and evaporated. 10 microlitre of each hydrolysate was dispensed into the technicon sequential multisample amino acid analyser (TSM). The TSM is designed to separate and analyze free, acidic, neutral and basic amino acids of the hydrolysate. Chromatogram obtained showed amino acid peaks corresponding to the magnitude of their concentrations. The quantity of each amino acid in a peak was determined by spiking the sample with a known quantity of internal standard norleucine.

RESULTS AND DISCUSSIONS

The results of the proximate analysis (Table 1) shows protein content of 11.63% for *C.tora* and 8.20% for *C.integrifolia.* These values are higher than those of some common vegetables such as *Amaranthus hybridus(4.6%)* and *Telferia occidentalis (4.3%)* but lower than that for *chochorus olitoris (27.4%)* reported by Fafunso and Bassir, 1977. Crude fibre is relatively high in the samples, 27.0% for *C.tora* and 25.0% for *C.integrifolia.* This implies that in the diet, these vegetables will perform the role of promoting softer stools with increased frequency and regularity of excretion as is characteristic of fibre rich diets. Ash contents represent the index of mineral elements present in a sample (Hassan et al., 2007). *C integrifolia* had a high ash content of 13.53% while *C.tora* had an ash value of 9.86%. Percentage ash is useful in assessing a plant and gives an idea of the amount of minerals present in a sample (Michael and David 2002). Lipids and carbohydrate contents of the samples were within the range expected for dry leafy vegetables.

Mineral element content of the vegetables studied calculated in g/100g dry weight are presented in table 2. Ca is an important dietary mineral for strong bones and muscle/neurological function. *C.tora and C. Integrifolia* both had reasonably high calcium values (3.52 and 3.70g/100g) respectively. considering that the daily requirement of Ca is 1.2g until the age of 24, one modest serving of these vegetables (approximately 50g will be more than enough to satisfy a young adult's calcium needs (Sceriano et al.,1995).

Magnesium content of *C.tora* was 0.86g/100g and *C.integrifolia* 0.78g/100g. These values are higher than

Table 3. Amino acid composition of *C.tora and C.integrifolia*(g/100g protein)

	C.tora	*C.integrifolia*	WHO/FAO Ref
Lysine	5.02	3.14	4.20
Threonine	2.80	3.00	2.80
Cysteine	0.79	0.93	2.00
Valine	4.02	4.50	4.20
Methionine	0.91	0.83	2.20
Isoleucine	3.17	3.20	4.20
Leucine	6.59	7.44	4.20
Tyrosine	3.22	3.06	2.80
Phenyanaline	5.07	4.06	2.80
Histidine	2.13	1.72	
Arginine	4.25	2.45	
Aspartic acid	8.22	8.01	
Serine	3.12	2.30	
Glutamic acid	10.28	10.28	
Proline	2.78	2.34	
Glycine	3.26	3.55	
Alanine	4.25	4.30	

Table 4. Percentage scores of the essential amino acid compositions in comparison to the FAO ref protein (%).

	C.tora	*C.integrifolia*
Lysine	119	75
Threonine	100	107
Cysteine	39	47
Valine	95	107
Methionine	41	38
Isoleucine	75	76
Leucine	156	177
Tyrosine	115	109
Phenyanaline	208	145

those for some common vegetables; *Telferia occidentalis(0.65g/100g)* and *Chochorus olitoris(0.59g/100g)* but lower than the value for *Amaranthus hybridus(0.59g/100g)*.(Iffon and Bassir 1979). Na content of the samples (0.10g/100g for *C.tora* and 0.07g/100g for *C integrifolia)* were rather low in comparison to some common vegetables. The potassium content of the vegetables was 0.76g/100g for *C.tora* and 1.44g/100g for *C. Integrifolia*. These values are also lower than is obtained in some common Nigerian vegetables reported by Aletor and adeogun 1995; *Basella tubra* (5.80g/100g) and *Amaranthus hybridus* (4.2g/100g). Although low, these vegetables would still be useful in complementing other dietary sources of the minerals. Iron, Zinc, manganese and Cobalt are dietary trace elements needed for a healthy immune system among other functions. They were all present in appreciable amounts in the vegetables studied.

Table 3 shows The amino acid profile for the leaves of *C.tora* , *C.integrifolia* and the FAO Reference protein value for the essential amino acids. Seventeen amino acids were found in the vegetables studied. Among the essential amino acids, lysine had the highest value (5.02) in *C.tora.* The value for *C.integrifolia* was 3.14. The essential amino acid values were compared with the FAO reference protein (Table 4) (FAO 1993). In both vegetables, tyrosine, leucine and phenylalanine scored above 100% in comparison to the FAO standard. Lysine in *C. tora* also scored above 100%. Only Methionine and cysteine scored below 50% of the FAO standard. Overall, the vegetables *C.tora* and *C. Intergrifolia* are of high protein quality. These results support the claim that the protein in leafy vegetables, although low, is of very high quality (Okaka et al.,2002).

CONCLUSION

The goal of this study was to assess the nutritional content of two wild/non conventional leafy vegetables

(*C.tora and C. Integrifolia).* Both plants were found to contain significant quantities of a variety of essential nutrients. Proximate analysis showed very good nutrient content when compared to some common vegetables reported by previous workers (Nwaogu et al., 2006, Aletor and Adeogun.,1995, Iffon and Bassir.,1979). Minerals are important in the diet because they serve as co-factors for many metabolic functions. The vegetables analysed contained adequate levels of important minerals. The amino acid profiles of the samples revealed high protein quality for both vegetables. Earlier studies by Nkafamiya et al 2010 showed that the antinutritional factors of the vegetables are below harmful levels. This implies that their overall nutritional value will not be affected. These results re-enforce the growing awareness that wild and semi wild food resources can contribute usefull amounts of essential nutrients to human diets.

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