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Full Length Research Paper

Proximate composition and amino acid profile of two non-conventional leafy vegetables (*Hibiscus cannabinus and Haematostaphis barteri*)

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Two non-conventional leafy vegetables namely *Hibiscus cannabinus and Haematostaphis barteri* consumed largely by the rural dwellers in Adamawa State of Nigeria were subjected to standard chemical analysis to determine proximate nutrient content, amino acid composition and anti-nutritional factors. The results of the proximate analysis showed high crude fibre in *H. barteri* (33.04%), *H. cannabinus* had percentage crude fibre (29.61%). The protein contents were relatively high in both vegetables (13.78 and 12.40%), respectively. Carbohydrate, lipid, ash and moisture contents were within the range of values expected for dry leafy vegetables. All the essential amino acids were present in good quantities in both vegetables. Only cysteine and methionine ranked below 50% in comparison to the WHO/ FAO reference protein. The anti-nutritional factors analysed in the vegetables namely, tannins, oxalates, and phytates were lower than the range of values reported for most vegetables.

Key words: *Hibiscus cannabinus, Haematostaphis barteri*, vegetables, nutrients, anti-nutrients.

INTRODUCTION

Green leafy vegetables constitute an indispensable constituent of human diet in Africa generally and West Africa in particular (Oguntona, 1986). The varieties of leafy vegetables utilized are diverse, ranging from leaves of annuals and shrubs to leaves of trees. Leafy vegetables are generally good sources of nutrients. They are important protective foods and highly beneficial for the maintenance of health and prevention of diseases as they contain valuable food ingredients which can be utilized to build up and repair the body.

The fight against malnutrition and under-nourishment continues to be a basic goal of development and a variety of strategies are being applied. Strategies based on nutrient-rich foods like vegetables are considered essential (Susane, 1996). In Nigeria, most rural dwellers rely on leaves gathered form the wild as their main source of leafy vegetables. Throughout the year, these non-conventional vegetables play an important role in everyday cooking. Although, commonly eaten in rural areas, they are also consumed by urban people who buy from traders who also collect them from the wild. In addition, these vegetables supply calories and nutrient during the dry season when there is shortage of cultivated green vegetables and other food resources. The inclusion of these non–conventional vegetables in the diet of most rural communities therefore is critical to their survival. Until recently, little attention has been given to the role of these wild and semi-wild vegetables in Nigeria.

By learning more about the nutritional and anti-nutritional contents of such plants, one can better assess their importance in the well-being of the communities that consume them. Two such plants are *Hibiscus cannabinus and Haematostaphis barteri*.

H. cannabinus, commonly known as Kenaf, is an annual tough herbaceous plant belonging to the *malvaceae* family. Its leaves have an acid flower and are used for soups. Edible oil is obtained from the seed. Concentrated food for cattle in the form of seed cake comes from the residue after oil extraction. Kenaf has been reported to be anodyne, aperitif, aphrodisiac, fattening and purgative (Duke and Wian, 1989).

H. barteri is a tree belonging to the *anacardiaceae* family. Its fruit is a red purple drupe. It has a thin acidic pulp with a resinous flavour. The tree is found wild in Borno and Adamawa States of Nigeria (Bokhari and

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Table 1. Proximate composition of *H. cannabinus and H. barteri leaves.*

	Hibiscus cannabinus	*Haematostaphis barteri*
Moisture (%)	11.82 ± 0.45	10.25 ± 0.70
Ash content (%)	5.11 ± 0.15	9.83 ± 0.18
Crude fibre (%)	29.61 ± 0.22	33.04 ± 0.02
Lipids (%)	2.33 ± 0.34	1.66 ± 0.86
Crude protein (%)	13.78 ± 1.17	12.40 ± 0.82
Carbohydrate%	37.67 ±1.03	34.94 ± 0.43

Values are means ± S.D. for three (3) determinations.

Table 2. Anti-nutritional components of H. *cannabinus* and H. barteri leaves.

Anti- nutrients	*Hibiscus cannabinus*	*Haematostaphis barteri*
Phytic acid (mg/100g)	19.78 ±1.80	17.80 ± 0.20
Tannins (mg/100g)	2.74 ± 0.47	4.92 ± 0.34
Oxalates (mg/100g)	158.5 ± 0.07	122.0 ± 2.14

Values are means ± S.D. for three (3) determinations.

Ahmed, 1979). Tender leaves are used to prepare soups; oily seed kernels are also edible.

This paper reports the proximate nutrient contents, amino acid composition and anti- nutritional factors of the leaves of *H. cannabinus* and *H. barteri* consumed in Adamawa State of Nigeria mostly by the rural dwellers.

MATERIALS AND METHODS

Collection and treatment of samples

H. cannabinus and *H. barteri* leaves were sampled randomly from farmlands in Yola, Adamawa State, Nigeria in the month of September 2005. They were destalked, air dried, ground into fine powder and stored in airtight containers for the various analysis.

Proximate analysis

The samples were analyzed for proximate composition (moisture, crude fat, fibre, carbohydrate and protein). Moisture and lipid were determined by Cocks and Pede. method (1996). The method of Nelson (1994) was adopted for the determination of ash and crude fibre. Determination of crude protein was by the micro-Kjedahl procedure. The carbohydrate content was obtained by difference that is 100-(sum of percentages of moisture, ash, protein, lipid, fibre).

Amino acid analysis

The amino acid profile was determined using the method described by Sparkman et al. (1958). Each sample was dried to constant weight, defatted, hydrolyzed, evaporated and loaded into the techno sequential multi-sample amino acid analyzer (TSM) which is designed to separate and analyze free acidic, neutral and basic amino acids of the hydrolysate.

Determination of anti-nutrients

Tannin content was estimated using the vanillin-HCl method modified by Price and Butler (1977). Oxalates were analyzed using the method of Ukpabi and Ejidon (1989). The Reddy and Love method (1999) was adopted for the estimation of phytates.

RESULTS AND DISCUSSIONS

The proximate composition of *H. cannabinus* and *H. barteri* are given in Table 1. Crude protein contents were 13.78 and 12.40% for *H. cannabinus and H. barteri,* respectively. These values though higher than in most conventional leafy vegetables are close to the lower end of the range expected for dry leafy vegetables (15-30%) (Aletor and Adeogun, 1995). Fibre, which is known to promote softer stools with increased frequency and regularity of elimination, was most abundant in *H. barteri* (33.04%). *H. cannabinus* had crude fibre content of 29.61%. In the diet therefore, both vegetables will be highly beneficial in easing bowel movement.

Lipids, carbohydrate and ash contents of both vegetables were within values expected for dry leafy vegetables. The major anti-nutritional factors commonly found in green leafy vegetables are phytic acid and oxalic acid (Osagie and Offiong, 1995) (Table 2). Tannins may also be present in significant amounts in certain vegetables especially those of leguminous origin. High levels of phytates and oxalates have long been known to inhibit the absorption and utilization of minerals by animals including man (Taylor, 1975). Tannins decrease protein quality by reducing digestibility and palatability. Other anti-nutritional effects attributed to tannins include damage

Table 3. Amino acid composition of the leaves of *H. cannabinus and H. barteri* (g/100g protein).

Amino acids	*H. cannabinus*	*H. barteri*	FAO Ref. protein
Lysine	3.96	3.02	4.20
Threonine	3.25	2.26	2.80
Cysteine	0.90	0.83	2.00
Valine	3.85	3.25	4.20
Methionine	0.91	0.86	2.20
Isoleucine	2.81	3.03	4.20
Leucine	7.05	5.66	4.20
Tyrosine	3.06	2.86	2.80
Phenylalanine	4.55	3.86	2.80
Histidine	2.41	2.01	
Arginine	5.02	5.11	
Aspartic acid	7.02	6.69	
Serine	1.45	1.72	
Glutamic acid	11.11	9.52	
Proline	2.50	2.06	
Glycine	0.72	1.02	
Alanine	1.65	2.25	

Table 4. Percentage comparison of the essential amino acid composition of the vegetables with the WHO standard (Sample/Standard multiply by 100)%.

Amino acids	*H. cannabinus*	*H. barteri*
Lysine	94	72
Threonine	116	81
Cysteine	45	42
Valine	91	77
Methionine	41	39
Isoleucine	67	72
Leucine	167	134
Tyrosine	109	102
Phenylalanine	162	137

to the intestinal tract, interference with the absorption of Iron and a possible carcinogenic effect (Butler, 1989).

The amounts of phytates, oxalates and tannins in the vegetables (Table 2) were well below the range of values that would adversely affect their nutritional values or cause any of the toxic effects associated with the anti-nutrients.

Table 3 shows the amino acid composition of the *H. cannabinus and H. barteri*. Seventeen amino acids were found in varying proportions in the vegetables. All the essential amino acids were present. The proportions of the essential amino acids in the vegetables were compared with the WHO/FAO protein standard (Table 4). With few exceptions, the essential amino acids in both vegetables compared favourably with the WHO protein standard. *H. cannabinus* had a ranking of above 100% for threonine, leucine, tyrosine and phenylalanine in comparison to the WHO standard. Lysine, valine and isoleucine also had high scores: 97, 91 and 67%, respectively. Only methionine and cysteine in *H. cannabinus* ranked below 50%.

In *H. barteri* the essential amino acids were also present in good quantities. Leucine, tyrosine and phenylalanine scored above 100%. With the exception of cysteine and methionine, the remaining essential amino acids had a ranking of above 50% in comparison to the standard.

These results support the claim that the protein in leafy vegetables although low, is of a very high grade (Okaka et al., 2002).

Conclusion

This study reveals that the leaves of *H. cannabinus* and

H. barteri can serve as good sources of food nutrients for man. Fibre diets promote the wave-like contractions that move food through the intestine, thus easing the passage of waste. It also lowers cholesterol level in the blood, reduces the risk of various cancers, bowel disease and improves general health and well being (Eromosele and Eromosele, 1993). The high fibre contents of *H. barteri* (33.04%) therefore, will make it highly beneficial in the diet. Both vegetables contained high percentages of the essential amino acids except methionine and cysteine, which are commonly deficient in green leafy vegetables. The anti-nutritional levels of the leaves were generally low- therefore the nutritional value of the vegetables will not be affected.

These results re-enforce the growing awareness that wild and semi-wild vegetables can contribute useful amounts of essential nutrients including amino acids to human diets.

Although this study has revealed much about the nutritional value of the leaves of *H. cannabinus* and *H. barteri*, additional knowledge remains to be secured. There is need to determine vitamins and minerals present in the vegetables.

The effect of cooking procedures on nutrient availability of the vegetables also needs to be studied. These investigations would provide a more complete picture of the nutritional significance of the vegetables.

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