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*Full Length Research paper*

# Nutritional status of non-conventional leafy vegetables, *Ficus asperifolia* and *Ficus sycomorus*

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***Ficus asperifolia* and *Ficus sycomorus* leaves were assessed to determine proximate nutrient content, mineral and amino acid composition and antinutritional factors. Results obtained for proximate composition showed protein content of 20.27 ± 0.17 and 17.24 ± 0.71% for *F. asperifolia* and *F. sycomorus*, respectively. Compared to some of Nigeria vegetables, these values are higher. Both the leaves of the plants have high percentage of crude fibre (28.68 ± 0.57 and 31.54 ± 0.11%). Moisture, ash, lipid and carbohydrate contents were within the range expected for dry leaf vegetable. The mineral content of the leaves showed that *F. asperifolia* had higher mineral content except for copper which is lower (1.45 ± 0.61 for *F. asperifolia* and 1.50 ± 0.51 for *F. sycomorus*). All the essential amino acids were found present in the leaves in varying proportions in the protein of both vegetables. The antinutrients analyzed include oxalate, tannin, saponin, phytate, alkaloids and hydrogen cyanide (HCN). Results of the antinutrients (oxalate, tannin, saponin phytate, alkaloids and HCN) showed that they are below the extablished toxic levels. This study therefore, revealed that *F. asperifolia* and *F. sycomorus* can serve as good sources of nutrients and minerals where cultivated leaves are scarce or out of season.**

**Key words:** *Ficus asperifolia, Ficus sycomorus,* amino acid, nutrient, mineral, antinutrient, vegetables.

## INTRODUCTION

In recent years researchers intensified the search for lesser known crops in the wild, many of which are potential valuable as human and animal's foods to maintain a balance between population growth and agricultural productivity, particularly in the tropical and subtropical areas of the world (Barminas et al., 1998). The seeds and leaves of these crops have been ascribed several medicinal and other desirable properties and young shoots are used as vegetables in soups (Kubmarawa et al., 2008; Watcho et al., 2009). The search for these wild leaves becomes necessary as cultivated plants such as green vegetables are now becoming too costly for low income groups in Michika Local Government Area of Adamawa State Nigeria. Therefore, wild and semiwild food resources are frequently consumed as dominant source of leafy vegetables in the area. The presence of such vegetables has helped to provide a steady supply during the dry season when the cultivated vegetables are scare.

*F. asperifolia* (Sand paper tree) is an ever green tree reaching a height of 5-12 m. The tree is widely distributed from Senegal to Cameron as far as Sudan, Central and East Africa and also found in Nigeria especially in the Northern Eastern part (Michika, Hong and Song Local Government Area of Adamawa State). The roots are used in the treatment of coughs, gastritis, urinary disorders and haemorhoids. Also the back of the tree is used to treat pains and circumcision wound. The leaves are considered to be abortificient (Michel, 2004). Fresh new shoots, which are always growing during the dry season, are commonly used in preparing soup especially for women after delivery as it facilitate breast feeding. This is one of the reasons why Higgi community in Michika Local Government Area of Adamawa State is regarding the leaves of *F. asperifolia* than any other leaves found within the area.

*F. sycomorus* is commonly known as Ibbe in Fulfulde, Baure in Hausa and Kwadachikwa in Higgi Michika Local Government Area of Adamawa State. *F. sycomorus* is a genus of about 800 species of woody trees, shrubs,

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vines, epiphytes and hemi-epiphytes in the family M*oracea*. It can be monocious or diecious (Berg and Corner, 2005). The plant grows to 20 m tall and 6m wide with a dense round crown of spreading branches. The leaves are heart-shaped with a round apex, 14 cm long by 10 cm wide. The flowering and fruiting occurs from July - December.

Green leafy vegetables constitute an indispensable constituent of human diet in Africa and West Africa in particular. It has been estimated that over 60 species of green leafy vegetables are consumed in Nigeria along (Kubmarawa et al., 2008). These non-conventional leaf vegetables play an important role in every day cooking especially in the rural areas. In addition, the vegetables supply calories and nutrient to community where these leaves abound.

The fight against poverty, hunger, malnutrition and under nourishment continues to be a basic goal of development and a variety of strategies are being applied. Strategies based micronutritent rich food like vegetables are considered essential because dark green vegetables have been recognized as one of the richest natural sources of provitamin A carotenoids, ascorbic acid, thiamin, riboflavin and minerals (Barminas et al., 1998). Many of such plants have been identified but lack of scientific data on their chemical composition has limited the prospect of their utilization (Kubmarawa et al., 2008). *F. asperifolia* and *F. sycomorus* fall within the category of such plants. The two plants are popular among certain communities (Michika, Hong and Song) in Adamawa State of Nigeria. In the well being of the communities that consumed them, one can better assess their importance by learning more about their nutritional and anti-nutritional status.

This study was therefore under taken to examine the leaves of *F. asperifolia* and *F. sycomorus* for proximate nutrient content, mineral and amino acid composition, and anti-nutritional factors. This work would provide necessary information on both vegetables and also provide basis for their wider utilization.

## MATERIALS AND METHODS

### Collection and treatment of samples

*F. asperifolia* and *F sycomorus* leaves were sampled from wild in Michika Local Government Area of Adamawa State of Nigeria in October 2008. The leaves were plucked and air dried in a closed room (25°C), that is, away from sunlight. They were then grounded into fine powder using pestle and motor (stainless steel) and store in screw capped containers.

### 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 (1996). A method adopted by Nelson (1994) and Kubmarawa et al., (2008) was used for ash and crude fibre determination. Crude protein was determined by micro-Kjedahi procedure (Kubmarawa et al., 2008). The carbohydrate content was obtained by difference.

### Analysis of minerals and amino acid

For mineral analysis, the method adopted by Nkafamiya et al. (2007a) was used. Amino acid profile of the two non-conventional leafy vegetables was determined by standard method described by Sparkman et al. (1958) and Kubmarawa et al. (2008).

### Determination of anti-nutrients

Oxalate was determined by standard method described by Day and Underwood (1986) and Nkafamiya et al. (2007b). Saponin was determined using the method of Birk et al. (1963) as modified by Hudson and El-Difawi (1979) while phytate was determined using the method of Reddy and Love (1999). Tannin was however determined using the method of Trease and Evans (1978). The qualitative, extraction and quantitative analysis of HCN was done by method described by Nkafamiya and Manji (2006). Melting point of hydrazones was also determined by the method adopted by Vogel (1996). In all analysis, reagents were of analytical grades and were not subjected to further purification.

## RESULTS AND DISCUSSION

The result for proximate composition of *F. asperifolia* and *F. sycomorus* leaves are presented in Table 1. The leaves contained 20.27 ± 0.17 g/100 g for *F. asperifolia* and 17.24 ± 0.71 g/100 g for *F. sycomorus.* These values are higher compared to those of *Sesamum indicum* (18.59 ± 0.82) and *Balanites aegyptiaca* (15.86 ± 0.56 g/100 g) as reported by Kubmarawa et al. (2008). The lipids (fats) content 2.78 ± 0.34 g/100 g for *F. asperifolia* and 3.01 ± 0.52 for *F. sycomorus* are higher compared to lipids (fats) for *S. indicum* (1.66 ± 0.24 g/100 g) and 2.90 ± 0.07 for *B. aegyptiaca*. The crude fibres in the two vegetables were also relatively high. This implies that in the diet, the two vegetables will perform the important role of promoting softer stools with increase frequency and regularity of elimination as is characteristic of fibre-rich diet (Okaka et al., 2000; Kubmarawa et al., 2008). Ash, lipid and carbohydrate contents of the two non-conventional leaves were within the range expected for dry leaf vegetables (Osagie and Offiong, 1998).

The mineral composition of *F. asperifolia* and *F. sycomorus* are listed in Table 2. Iron and zinc are among the essential elements for humans and their daily requirements for adult are 15 and 18 mg respectively. Though the level of iron (14.56 ± 0.22 and 10.07 ± 0.23 mg/100 g for *F. asperifolia* and 11.65 ± 0.15 and 9.58 ± 0.67 mg/100 g for *F. sycomorus*) are low in the two leaves, the mineral present were also lower than those found *Moringa oleifera, Adansonia digitata, Colocasia esculenta* and *Cassia tora* as reported by Barminas et al. (1998). Though the level of some of these elements are low, consumption of these leaves will help to alleviate symptoms of Magnesium and zinc deficiency such as

**Table 1.** Proximate composition of the leaves of *F. asperifolia* and *F. sycomorus Leaves* (g/100 g dry weight).

| Parameters | *F. asperifolia* | *F. sycomorus* |
|---|---|---|
| Moisture | 9.01 ± 0.58 | 14.12 ± 0.22 |
| Ash content | 11.25 ± 0.11 | 10.24 ± 0.68 |
| Lipids (fats) | 2.78 ± 0.34 | 3.00 ± 0.52 |
| Crude fibre | 28.68 ± 0.57 | 31.54 ± 0.11 |
| Crude protein | 20.27 ± 0.17 | 17.24 ± 0.71 |
| Carbohydrate | 37.02 ± 0.34 | 39.32 ± 0.38 |

Values are means ± SD for three determinations.

**Table 2.** Mineral composition of *F. asperifolia* and *F.sycomorus* leaves (mg/100 g dry weight).

| Minerals | *F. asperifolia* | *F. sycomorus* |
|---|---|---|
| Phosphorus | 385.52 ± 0.11 | 380.25 ± 0.55 |
| Magnesium | 355.26 ± 0.78 | 300.65 ± 0.67 |
| Calcium | 428.65 ± 0.17 | 390.78 ± 0.65 |
| Iron | 14.56 ± 0.22 | 11.65 ± 0.15 |
| Zinc | 10.07 ± 0.23 | 9.58 ± 0.67 |
| Manganese | 4.58 ± 0.77 | 4.01 ± 0.85 |
| Copper | 1.45 ± 0.61 | 1.50 ± 0.51 |

Values are means ± SD for three determinations.

**Table 3.** Amino acid composition of the leaves of *F. asperifolia* and *F. sycomorus* (g/100 g protein).

| Amino acid | *F. asperifolia* | *F. sycomorus* |
|---|---|---|
| Alanine | 3.15 | 2.90 |
| Valine | 5.49 | 5.40 |
| Leucine | 9.67 | 7.63 |
| Lysine | 11.69 | 12.75 |
| Arginine | 6.64 | 6.25 |
| Phenylalanine | 7.05 | 6.85 |
| Glycine | 0.75 | 0.98 |
| Glutamic acid | 10.78 | 10.95 |
| Serine | 3.45 | 3.21 |
| Proline | 3.27 | 2.75 |
| Threonine | 4.62 | 3.87 |
| Cysteine | 1.78 | 1.02 |
| Methionine | 1.11 | 1.01 |
| Isoleucine | 4.37 | 4.35 |
| Tyrosine | 4.32 | 4.31 |
| Aspartic acid | 9.21 | 8.71 |
| Histidine | 3.26 | 3.28 |

weakness, cardial arrhythmia, poor growth, impairment of sexual development and poor wound healing often observed in the study area where majority are alcoholics (Nkafamiya et al., 2006). This suggests that the two leaves could contribute partially to the overall daily intake of these elements.

Amino acid composition of *F. asperifolia* and *F. sycomorus* are presented in Table 3. All the essential

**Table 4.** Antinutritional content (%) of *F. asperifolia* and *F. sycomorus* leaves.

| Antinutrient | *F. asperifolia* | *F. sycomorus* |
|---|---|---|
| Oxalate | 3.78 ± 0.28 | 2.88 ± 0.37 |
| Tannin | 5.60 ± 0.10 | 4.01 ± 0.22 |
| Saponin | 2.67 ± 0.28 | 1.78 ± 0.11 |
| Phytate | 2.01 ± 0.12 | 1.98 ± 0.78 |
| Alkoloids | 6.40 ± 0.11 | 5.64 ± 0.41 |
| HCN | 0.45 ± 0.12 | 3.05 ± 0.51 |

Values are means ± SD for three determinations.

**Table 5.** Qualitative determination of cyanogenetic glucoside of *F. asperifola* and *F. sycomorus.*

| Samples | Observation | Melting point of hydrazones (°C) |
|---|---|---|
| *F. asperifolia* | + | 236.50 |
| *F. sycomorus* | + | 236.00 |

amino acids were present in both leaves. Lysine had the highest value for both vegetables, while the limited amino acid in both leaves was glysine. All the amino acid present in both vegetables are comparable with those found in *S. indicum* and *B. aegyptiaca* as reported by Kubmarawa et al. (2008).

The antinutrient content of the leaves are listed in Table 4. These are compounds that limit the wide use of many plants due to their ubiquitous occurrence of them as natural compounds capable of eliciting deleterious effect in man and animals (Kubmarawa et al., (2008). The anti-nutrient factors; oxalate, tannin, saponin, phytate, alkaloids and HCN were present in varying amounts in both vegetables. The results for the melting of the hydrazones (For HCN) of the two vegetables indicate that benzaldehyde was present, which is one of the hydrolyzed products of amygdalin (Table 5) with melting point of 237°C (Nkafamiya et al., 2006). These anti-nutritional factors tend to bind to mineral elements there by forming indigestible complex (Nkafamiya et al., 2006). Oxalate for instance tends to render calcium unavailable by binding to the calcium ion to form complexes (calcium oxalate crystals). These oxalate crystal formed prevent the absorption and utilization of calcium. The calcium crystals may also precipitate around the renal tubules there by causing renal stones (Ladeji et al., 2004; Nkafamiya et al., 2006). In general the levels of anti-nutrients in *F. asperifolia* and *F. sycomorus* are low to significantly interfere with nutrients utilization. They are below the established toxic level (Nkafamiya et al., 2006).

In conclusion, the leaves of *F. asperifolia* and *F. sycomorus* consumed in Michika, Hong and Song Local Government Areas of Adamawa State, Nigeria contain substantial level of nutrients and could contribute useful amount to human diet. The mineral composition of these non-conventional leaf vegetables also showed that they could be rich sources of minerals. The anti-nutritional content of both the leaves are below the established toxic level and implies that, the overall nutritional value of the vegetables will not be affected. This study therefore revealed that these vegetables consumed largely by the rural populace in Michika, Hong and Song Local Government Areas of Adamawa State are not inferior to the conventional popular Nigerian vegetables. For the two plants studied, *F. sycomorus* has higher proximate composition. *F. asperifolia* has more of mineral and amino acid compositions. This shows that preparing diet with *F. asperifola* would be of more advantage than *F. sycomorus.* To provide basis for maximum utilization of the plants, there is a need to determine the vitamins and nutrient loss during blanching and cooking of these vegetables.

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