



Research Article

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Proximate study, amino acids and Phyto-constituents of raw and boiled *Ficus polita* Vahl fruits

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Abstract The nutritional composition, amino acid profile and anti nutritional factors of raw and boiled *Ficus polita* fruits were evaluated using standard analytical methods. The proximate composition (%) of the raw fruit meal showed moisture content (5.23%), ash (11.88%), fat (2.09%), fibre (10.42%), protein (9.44) and carbohydrate (66.17%) and energy value of 1362.70 Kcal/kg. Boiling treatment reduced the moisture content (4.80%), crude protein (8.59%), ash (9.12%), crude fibre (9.55%), and fat (0.96%) while the carbohydrate and energy contents increased (70.85% and 1385.66Kcal/kg). Results of the anti-nutritional factors showed that raw *Ficus polita* fruits had phytate values of (1.25%), oxalate (0.38%), tannin (0.18%), saponin (6.50%) and cyanogenic glycosides (10.08 mg/100g) compared with boiled fruits which shows reduction in concentrations of tannin (50%), oxalate (28.95%), saponin (13.85%), phytate (8.80%) and glycoside (41.37%) with values of 0.09, 0.27, 5.60, 1.14 % and glycoside (5.95mg/100g), respectively. The analyzed *Ficus polita* fruits show appreciable amino acid concentration in both raw and boiled samples. The boiled samples increase the concentrations of arginine, cystine, isoleucine, threonine, methionine, tryptophan and phenylalanine (histidine, leucine, lysine, Glutamine, aspartate acid and reduced in alanine, valine, serine and proline. Glutamic acid and aspartic acid dominates (11.89-12.04 and 10.11-10.61%) the amino acid profile of the sample. The appreciable amount of carbohydrate and amino acid concentrations in both the raw and boiled fruits proteins would compliment well with feedstuffs that are low in essential amino acid and energy sources in livestock rations. *Ficus polita* fruits can be used as an energy source to curtail with the problem of deficiency in energy feedstuffs in the developing countries.

Keywords *Ficus polita* fruits, Proximate composition, Amino acid profile, Anti-nutritional factors

Introduction

The increasing cost of proteins (groundnut meal and soybean meal) and energy (maize) sources of plants origin has led to extensive research in the use of lesser known plant supplements in order to augment livestock feeds production [1, 2, 3]. *Ficus* species are evergreen browse plants that grow in the various ecological zones of Nigeria and are available all the year round. The fig tree which is also referred to as *Ficus polita* commonly known as wild rubber tree [4] and called Durumi in Hausa, Jammeiz alazrak in Shuwa Arabic all in northern Nigeria, belongs to the family *Moraceae* [3]. It grows to about 18m high and is much branched with dense rounded crown upon which abscission can occur during wind or storm [5]. This perennial plant is found grown in villages primarily to provide shade around the houses [6] The leaves of *Ficus polita* tree are harvested to feed ruminant animals by peasant farmers in most rural settings in Nigeria and they have been reported to contain anti nutritional factors such as tannin, phytate, saponin, oxalate and hydrogen cyanide [7, 8] but no literature information on the fruits quality of



this plant. The knowledge that these compounds elicit both toxic and advantageous biological responses has given rise to several investigations in recent times as to their possible physiological implications in various biological systems [9]. The anti-nutrient effects of these compounds in plants could be removed by several processing methods such as soaking, germination, boiling, autoclaving, fermentation, genetic manipulation and other processing methods [10]. The current study was to identify the proximate, amino acids and anti-nutrient contents and to ameliorate the level of anti nutritional factors present in *Ficus polita* fruits meal by conventional heat treatment of boiling so as to consider the use of the fruit meal as energy-rich dietary sources in poultry ration.

Materials and Methods

Site of the Experiment

The study was conducted at the Poultry Unit of Teaching and Research Farm, Federal University Wukari, Taraba State, Nigeria. Wukari is located between Latitude 7°51*N, 9 047*E and Longitude 7°85*N, 90°78*E [11].

Collection and Processing of Seed Meal

Matured fruits of *Ficus polita* were collected in Wukari Metropolis area in Taraba State. The fruits were sun dried, weighed and divided into two portions and the first portion of the fruits were stored without any treatment and considered as raw fruits. The second portion of the sample was boiled for 15 minutes in open fire using traditional methods. After cooling, the water was drained from the pot. The boiled fruits were washed with tap water so as to remove it bitter taste. The sample was then dried in open sunlight for 10days. The boiled and raw fruits were crushed using hammar mill and ground to form raw *Ficus polita* fruit meal (RFFM) and boiled *Ficus polita* fruit meal (BFFM), respectively.

Proximate Analysis

Proximate composition analysis of moisture, ash, fat and crude fibre content of the raw and boiled *Ficus polita* fruits were determined by the standard methods of AOAC (2006) [12]. Protein content of the samples were determined by the automatic Kjeldahl method, using the Kjeldahl digester and distillation unit (Gerhardt, Vapodest 30S, Germany). The carbohydrate content is expressed as the weight difference, using moisture, ash, crude fibre, fat and crude protein content data. All the analyses were done in triplicate and the final values are expressed as their means.

Amino Acid Profile Determination

Quantitative analyses of individual amino acids were carried out using HPLC after hydrolysis with 6 M HCl for 18 hr at 110°C as described by Benitez, 1989 [13] and AOAC, 2006 [12] methods. Because Cystine and methionine are destroyed by acid hydrolysis, they were oxidized to cystic acid and methionine sulphone prior to hydrolysis. Tryptophan is destroyed by the presence of hydrochloric acid. Therefore NaOH was used to hydrolyze the protein for tryptophan analysis. Sixty microlitres of the hydrolysate was loaded on the Applied Biosystems PTH amino acid Analyzer (Model: 120A) designed to separate and analyze free acidic, neutral and basic amino acids.

Determination of anti-nutritional factors in *Ficus polita* fruits

The anti-nutritional factors (phytic acid, oxalate, hydrogen cyanide, tannins, saponins, flavonoids and alkaloids) of raw and boiled *Ficus polita* fruit were screened for qualitative and quantitative toxicity levels according to Anhwange *et al.*, 2004 [14] and Umar *et al.*, 2007[15] methods.

Metabolisable Energy

The metabolizable energy was calculated in Kilojoules per 100g (kJ/100g) by multiplying the crude fat, protein and carbohydrate values by Atwater factors of 37, 17 and 17 respectively.

Results and Discussion

The results of the raw and boiled *Ficus* fruit meals are presented in Table 1. Boiling as a traditional processing technique reduced crude protein (9.22%), fat (54.07%), Crude fibre (8.35%) and Ash (23.23%) contents. The nitrogen free extract increased with boiling process by 6.61%. The crude protein level obtained in the present study is comparable to those of maize, sorghum, millet and mango seed (9-13%) [16, 17, 18, 19]. According to Pamela *et al.*, 2005 [20], proteins from plant sources have lower quality but their combination with many other sources of



protein such as animal protein may result in adequate nutritional value. Nitrogen free extract and gross energy were high with values of 70.85 % DM and 1385.66 Kcal/kg in boiled fruit meal compared with values of 8.57 % DM and 1362.70 Kcal/kg) for crude protein and gross energy for raw fruits. The NFE contents obtained in this study are comparable to that reported for maize and mango seed [16, 17] but lower than sorghum and millet [19]. The increase in NFE and energy values in this study is in agreement with reports by Olajide *et al.*, 2011[21] and Gandi *et al.*, 2016[22] who reported an increase in NFE and energy content when *Citrullus lanatus* seed and Taro cocoyam meal were subjected to boiling. This NFE will be able to supplement the energy that was reduced as a result of high fiber content, thereby balancing up the energy level.

The crude fiber mean values of 10.42 % (raw fruit meal) and 9.55% (boiled *Ficus* meal) are high when compared to those of maize, millet, sorghum and mango seed having 1.6-3.0 % [16, 17, 18] indicating that the fruit meal will give low energy in terms of fiber. This is because energy decrease with increase in fiber content i.e. the higher the fiber content, the lower the energy and vice versa. The ether extract values for raw fruit (2.09 %) and boiled *Ficus polita* fruit meal (0.96 %) can be compared with percentage values of maize and sorghum having between 1.44 and 3.0 % [17,18], though lower than that of millet grain having 4.5% [19]. Fibre content of foods helps in digestion process and prevention of cancer [23]. Crude fiber enhances digestibility, decreases the absorption of cholesterol from the gut in addition to delaying the digestion and conversion of starch to simple sugars, an important factor in the management of diabetes [24]. Although crude fibre, its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage [23].

The result of the ash content in the raw (11.8%) and boiled 9.12%) *Ficus* fruit was high which suggest that there is a high deposit of mineral elements in *Ficus* fruits. Ash content is generally taken to be a measure of the mineral content of the original food [25]. This result may indicate that *Ficus* fruit would likely contain very high qualities essential minerals; ash content is an index to evaluate and grade the nutritive quality of foods [26].

The results of determined anti-nutritional factors of raw and boiled *Ficus* fruit meal are presented in Table 2. Boiling showed reduction in all ANFs studied compared to their raw states. Tannin had highest reduction value of 50% followed by cyanogenic glucoside(41.37%), oxalate (28.95%, saponin (13.85%) and phytate (8.80%).The reduction of ANF in boiled fruits meal confirmed earlier report of Ravindran and Sivakanesan,1996 [27] who asserted that soaking and boiling drastically reduced the anti-nutritional factors in mango seed kernels thereby improving its nutritional quality. The result is in agreement with the reports of Akinmutimi and Onwukwe, 2002 [28] who reported that thermal processing methods reduce or destroy nutrients and anti-nutritional factors in lima beans.

Table 3 shows the results of the analyzed amino acids in raw and boiled *Ficus polita* fruit meal. *Ficus polita* fruits are rich in both essential and non-essential amino acids. Processing by boiling increased virtually all the amino acid content after boiling with exception of valine, proline and Alanine. The result showed that the essential amino acids content had higher leucine (5.11-5.31) which is very useful in the body to counterbalance the isoleucine which help in the regulation of the thymus, spleen, pituitary, the metabolism and forming haemoglobin.

The raw and boiled fruits showed lysine values of 3.74-3.87mg/100g which helps in the functions of the liver, gallbladder and pineal and mammary glands. The sample contains arginine (4.46-5.00), Cystine (1.94-2.1), isoleucine (4-4.03), threonine (3.97-4.11), valine (4.27-4.21), alanine (3.19-3.04), methionine (0.83-0.86), tryptophan (0.95-1.00) and phenylalanine (3.75-3.82), respectively. The presence of tryptophan, threonine, and valine is an indication that the plant can help in the generation of cells, red and white blood corpuscles, involved in the functioning of the mammary glands and ovaries. The major non-essential amino acid were (g/100g protein): glutamic acid (11.89-12.04), aspartic acid (10.11-10.61), proline (3.35-3.05) and serine (4.11-3.90), glycine (3.14-3.25) and tyrosine (2.93-3.10) respectively. Glutamic acid and aspartic acid dominates (11.89 and 10.11) the amino acid profile of the sample. This could be because these two amino acids are the precursors from which most amino acids are formed. It was observed that the concentration of both glutamic and aspartic acids (together make up 22.00 g/100g protein) are the most abundant amino acids in the plant food sample, this was close to (23.8 g /100g protein reported for cashew nut [29].



The levels of some of the essential amino acid are comparable to that of FAO/WHO, 2007 [30]. The results therefore show that these fruit proteins would compliment well with those protein sources that are low in lysine, methionine, threonine, leucine and isoleucine. Comparatively, among the non essential acids glutamic is high in the entire samples when compared to *Blighia sapida* (2.76 mg/100 g) [31]. The values are similar to the amino acids content of wild seed reported by Olafe *et al.*, 1994 [32]. All the amino acids values reported by this study is favourably well compared with those reported for *Moringa oleifera* seed by Fugile, 2004 [33].

Table 1: Proximate Composition (% DM) of raw and boiled *Ficus polita* fruits

Parameter	Moisture	Crude Protein	Fat	Crude fibre	Ash	NFE	ME(Kcal/kg)
Raw fruits	5.23	9.44	2.09	10.42	11.88	66.17	1362.70
Boiled fruits	4.80	8.57	0.96	9.55	9.12	70.85	1385.66

Table 2: Anti-nutrient composition of raw and cooked *Ficus polita* fruit

Parameter	Tannin (%)	Oxalate (%)	Saponin (%)	Phytate (%)	Cyanogenic glycoside (mg/100g)
Raw fruits	0.18	0.38	6.50	1.25	10.08
Boiled fruits	0.09	0.27	5.60	1.14	5.91
% Reduction	50.00	28.95	13.85	8.80	41.37

Table 3: Amino acid concentrations (g/100g protein) of raw and boiled *Ficus polita* fruit meal

Amino acid	Raw fruits	Boiled fruits
Leucine	5.11	5.31
Lysine	3.74	3.87
Isoleucine	4.00	4.03
Phenylalanine	3.73	3.82
Tryptophan	0.95	1.00
Valine	4.27	4.21
Methionine	0.83	0.86
Proline	3.25	3.05
Arginine	4.56	5.00
Tyrosine	2.93	3.10
Histidine	2.01	2.30
Cystine	1.94	2.18
Alanine	3.19	3.04
Glutamic acid	11.89	12.04
Glycine	3.25	3.14
Threonine	3.83	3.97
Serine	4.11	3.95
Aspartic acid	10.11	10.61

Conclusion

From the chemical and nutritional potentials investigations in this study, it is concluded that *Ficus polita* fruits can be used as an energy source to curtail with the problem of deficiency in energy feedstuffs in the developing countries. Processing by boiling for 10 minutes did not eliminate the anti nutrients in raw *F. polita* fruit meal. The presence of the ANFs identified in the raw and processing by boiled methods in the current study should not pose a problem for animal ration. The *F. polita* fruits should be subjected to further processing.

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