Proximate and Anti-Nutritional Analyses of the Leaves of Synedrella nodiflora Linn and Ficus exasperata Vahl.

***Achika I. Jonathani, Ayo G. Rachael[ii], [2]Bolarin-Akinwande Olubunmi[ii] & Onoja Nathaniel[iii]**

[i]*Department of Chemistry, Federal University Lokoja, Kogi State, Nigeria*
[ii]*Department of Chemistry, Ahmadu Bello University, Zaria, Kaduna State, Nigeria*
[iii]*Department of Chemistry, Kogi State University Anyigba, Kogi State, Nigeria*

***Corresponding author:** adajiileileile@gmail.com

ABSTRACT

Background: *Synedrella nodiflora Linn and Ficus exasperata Vahl are very common edible plants in Nigeria which possess lots of medicinal uses. However the nutritional and antinutritional importance of these plants is unknown. The aim of the study was to determine proximate and anti-nutritional components of Synedrella nodiflora Linn and Ficus exasperata leaves.*

Methods: *The Association of Official Analytical Chemists (AOAC) and other standard techniques were used to analyse the nutritional and anti-nutritional properties of Synedrella nodiflora and Ficus exasperata leaves.*

Results: *The moisture content of the leaves of S. nodiflora and F. exasperata was found to be 17.25 and 19.3 g/100 g, crude protein 21.44 and 23.63 g/100 g, crude fiber 9.15 and 18.8 g/100 g, ash 13.2 and 12.00 g/100 g, fat 8.45 and 2.4 g/100 g, and carbohydrate 30.1 and 28.87 g/100 g, respectively. Anti-nutritional study of S. nodiflora and F. exasperata leaves revealed tannin levels of 7.29 and 8.33 g/100 g, oxalate levels of 0.75 and 0.8 g/100 g, phytate levels of 1.32 and 1.32 g/100g, and hydrocyanic acid levels of 0.67 and 0.68 g/100 g.*

Conclusion: *The two plants were found to contain significant amounts of nutrients that could be used to supplement daily nutrient requirements for humans and animals.*

Keywords: Proximate analysis, Anti-nutrients, Synedrella nodiflora, Ficus exasperata, Leaves

Received: 26-06-2022
Accepted: 23-08-2022
doi: https://dx.doi.org/10.4314/njns.v44i1.8

INTRODUCTION

Plants are widely recognized as the primary sources of food and medicine. Plants have long been utilized by humans to treat a variety of illnesses [1,2]. Approximately 80 % of the world's population now uses herbal remedies to treat a variety of ailments [3]. Primary metabolites (lipids, nucleic acids, proteins, and carbohydrates) are chemical compound manufactured by the plants and used for growth, development and repair of the plant tissues. Secondary metabolites are chemical found in the plant but not used growth, development and repair of the plant tissues, rather they are employed in disease treatment [4]. Some toxic (anti-nutritional) compounds have been identified in foods and found to be heat-stable or heat-labile. Saponins, tannins, gossypol, lectins, amylase inhibitors, protease inhibitors, antivitamin, phytic acid, and goitrogens are examples of these toxic compounds [5]. Anti-nutrients are one of the main factors that lower the bioavailability of certain nutritional

compounds in cereal and legume. These anti-nutrients are found in the leaves, fruits, and seeds of grains and legumes, cause nutritional difficulties and have detrimental impacts on human health [5]. *Synedrella nodiflora* Linn (Asteraceae) is an annual herb endemic to tropical America and Africa that grows upto two (2) meters tall. The leaf sap with other components is used to treat stomach-ache [6]. Epilepsy is treated using a hot aqueous preparation of the leaves of *S. nodiflora*. The young foliage is used as a vegetable, and the leaf sap, together with other ingredients, is used to treat stomach-ache [6]. The leaves are used in the treatment of threatened abortion, hiccups, and used as a laxatives and cattle feed [7]. The bioactive components found in the leaves of *S. nodiflora* are flavonoids, alkaloids, and tannins. They are used to cure a variety of ailments and are consumed by humans and livestock as a vegetable [8]. The leaves of *Ficus exasperata* have a rough surface similar to sandpaper, earning it the nickname "sandpaper tree." The bark is smooth and sticky, with brown streaks. A decoction of the leaves is taken orally to treat malaria, haemorrhoids and diarrhoea, [9]. The young leaves are chewed and swallowed three times a day for four to eight weeks in Nigeria to treat ulcers and stomach-aches [10]. The leaves are consumed daily in Ivory Coast, combined with palm oil, to avoid skin ailments, heart failure, and respiratory tract infections [11, 12]. Flavonoids, alkaloids, glycosides, steroids, tannins, phytosterols, gums, reducing sugars, saponins, triterpenoids, and triterpenoids have been found in *Synedrella nodiflora* extracts [13]. There is no report on the anti-nutritional and proximate content of *Synedrella nodiflora* and *Ficus exasperata*, which are two common and edible vegetables in Nigeria. The aim of this study was to assess the proximate and anti-nutritional contents of *Synedrella nodiflora* Linn and *Ficus exasperata* leaves.

METHODS

Collection and preparation of plant materials

The leaves of *S. nodiflora* and *F. exasperata* were collected at Kogi State University campus Anyigba Nigeria, in May 2021. A taxonomist in the Department of Botany at Kogi State University, Anyigba identified and authenticated the plants.

Proximate analyses

Fresh leaves of *S. nodiflora* and *F. exasperata* were washed, air-dried and pulverised. It was then evaluated for protein content, fat content, fiber content, ash content, moisture content, and carbohydrate content using standard laboratory procedures [14]. For moisture content analysis, the samples were dried at 100–105 °C for 16 hours in a draft air oven (Gallenkamp oven, Germany). The loss in weight was reported as moisture. The ash content was evaluated by placing crucibles containing preweighed samples in a heated furnace (Fisher Isotemp Muffle Furnace, model 186A, USA), maintaining the temperature at 600 °C for 6 hours, then cooling to room temperature in desiccators and weighing them. The protein content (percent nitrogen x 6.25) and fat content (1g was extracted for ether extract determination using diethyl ether) were determined using standard method [15]. The carbohydrate content was obtained by difference; Carbohydrate = 100 - (crude protein + crude fat + crude fiber + moisture content + ash content) [2]

Anti-nutritional analysis.

The leaves of the two plants were cleaned and sorted out to remove contaminants before being oven-dried for 24 hours at 60 °C. The dried leaves were then washed and milled until they were fine flour. For analysis, the samples were properly labelled and stored in airtight containers at 4–6 °C. The sample was analysed for tannins, oxalates, phytates, and hydrocyanic acid using standard procedures [1,14]. Tannin determination and Phytic acid analysis was carried out using standard methods [16-19]. All the analyses were carried out at the Food and Nutrition Sciences Laboratory, IITA, Ibadan, Nigeria. Proximate and antinutrient analyses were performed in triplicates.

Statistical analysis

F-values (SPSS) were used to show the level of significance, and all data were provided as the mean standard deviation of three different determinations.

Results

Table 1: Proximate composition of the leaves of *S. nodiflora* and *F. exasperata* (g/100 g)

Sample	Moisture	Crude fiber	Fat	Ash	Crude Protein	Carbohydrate
S. nodiflora	17.25 ±.015	9.15 ±.011	8.45 ±.012	13.2 ±.013	21.44 ±.014	30.1 ±.012
F. exasperata	19.3 ±.021	13.8 ±.013	2.4 ±.012	12 ±.014	23.63±.013	28.87±.012
F values	1.563***	1.397***	1.000***	1.160***	1.160***	1.000***

F values represent one-way ANOVA, degrees of freedom (df)= 2. *** P ≥ 0.05

Table 2: Anti-nutritional analysis of *S. nodiflora* and *F. exasperata* leaves (g/100 g)

Sample	Tannins	Oxalate	Phytate	Hydro cyanide
S. nodiflora	7.92 ±.013	0.75 ±.021	1.23 ±.022	0.665 ±.023
F. exasperate	8.33 ±.011	0.8 ±.021	1.32 ±.012	0.68 ±.034
F values	1.397***	1.000***	3.361***	2.185***

F values represent one-way ANOVA, degrees of freedom (df) = 2. *** P ≥ 0.05

Proximate analysis of fresh leaves of *S. nodiflora* and *F. exasperata* are presented in Table 1. The total carbohydrate content of *S. nodiflora* (30.1 g/100g) was higher than that of *F. exasperata* (28.87 g/100g) (Table 1). The protein content of *S. nodiflora* leaves was 21.44 g/100 g which was also relatively lower than that of *F. exasperata* leaves (23.63 g/100 g). The *S. nodiflora* and *F. exasperata* leaves contained very similar amount of ash content of 13.2 g/100 g and 12.0 g/100 g respectively. Leaves of *F. exasperata* leaves had lower oil content (2.4 g/100 g) compared to *S. nodiflora* leaves (8.45 g/100 g). The crude fibre for *S. nodiflora* leaves (9.15 g/100 g) was observed to be lower than that of *F. exasperata* (13.8 g/100 g), while the moisture content of *F. exasperata* (19.3 g/100g) was relatively higher than that of *S. nodiflora* leaves (17.25 g/100 g). The antinutritional factors of the leaves of *S. nodiflora* and *F. exasperata* are shown in Table 2. The oxalate content for *F. exasperata* (0.8 g/100 g) was fairly higher than that of *S. nodiflora* (0.7 g/100 g) but almost similar values were recorded for their hydrocyanic acid content; 0.67 g/100 g for *S. nodiflora* and 0.68 g/100 g for *F. exasperata* (Table 2.). Their phytate contents was similar (1.23 g/100 g for *S. nodiflora* and 1.32 g/100 g for *F. exasperata*) while, the tannin content of *F. exasperata* (8.33 g/100 g) was slightly higher than that of *S. nodiflora* (7.92 g/100 g).

4.0 Discussion

The proximate analysis of the leaves of *S. nodiflora* and *F. exasperata* show that their leaves have high carbohydrate content when compared with edible plants. Therefore they can be classified as carbohydrate-rich vegetables [20]. The crude protein content of *S. nodiflora* (21.44 g/100 g) and *F. exasperata* (23.63 g/100 g) leaves was similar, and both higher than *Amaranthus cauclatus* (20.59 g/100 g), a common vegetable [21, 22]. The purpose of dietary fat is to improve food palatability by absorbing and retaining flavours [23]. Excess fat consumption may cause cardiovascular disorders such as atherosclerosis, cancer, and premature ageing, hence a diet supplying 1.2 g/100 g of its calorie of energy as fat is sufficient for humans [23]. Because of its unsaturated composition, fat and oil in vegetables are usually good for human intake, making them a viable food crop for weight management [24]. Low-fiber diets are unpleasant because they can cause constipation and have been linked to colon problems like piles, appendicitis, and cancer [25]. *S. nodiflora* (9.15

g/100 g) and *F. exasperata* (13.8 g/100 g) had higher crude fiber content than *Talinun triangulare* (6.20 g/100 g) and *Vernonia amygdalina* (6.5 g/100 g), respectively [22]. Non-starchy vegetables are the richest sources of dietary fiber [26] and can help in the treatment of diseases such as obesity, diabetes, cancer, and gastro-intestinal ailments [27]. Both plants' moisture content is outside the permissible range of 0–13 g/100g [28]. According to reports, the ideal moisture content is 9–12 g/100g to avoid the generation of mycotoxins and provide safe storage. Most food plants' respiration virtually stops at a moisture content of less than 10 g/100g, extending grain storage life [29]. *S. nodiflora* (17.25 g/100 g) and *F. exasperata* (19.30 g/100 g) both had higher moisture contents than *Moringa oleifera* (3.21 g/100 g) [30]. In the manufacturing and testing of food, moisture content is an extensively utilized metric [31]. It's a measure of how much water a food has, and it's important for keeping the protoplasmic content of the cell and the texture of the leaves [32]. Idris *et al.*, 2018, found that the oxalate content of *S. nodiflora* (0.75 g/100 g) and *Ficus exasperata* (0.8 g/100 g) was greater than the anticipated value for *Rumex crispus* (0.15 g/100 g) [32]. The value was lower than the harmful limit of 2.5 g/100 g. [33]. Oxalates usually produce insoluble complexes with Ca, Mg, and Fe, preventing the mineral elements from being used [33]. Calcium regulation, heavy metal tolerance, and protection from herbivore consumption are all biological functions of oxalate in plants. It also help plants grow, but can cause huge kidney stones in people, which can obstruct the tubules in the kidney [34]. Bitter and fluted pumpkin leaves (20.8 and 19.0 g/100 g, respectively) had higher phytate concentrations than *S. nodiflora* (1.23 g/100 g) and *F. exasperata* (1.32 g/100 g) [35]. *S. nodiflora* and *F. exasperata* had tannin concentrations of 7.92 and 8.33 g/100 g, respectively, which were greater than *Vernonia amygdalina's* value of 3.43 g/100 g [36].Tannins are phenolic compounds with a molecular weight of more than 500 g/mol that can precipitate proteins from aqueous solutions. They can be found in all types of vascular plants. Tannins attach to proteins and render them bio-inaccessible [37]. Hydrocyanic acid levels were higher in *S. nodiflora* (0.66 g/100 g) and *F. exasperata* (0.68 g/100 g) than in *Vernonia amygdalina* (0.11 g/100 g) [38].

CONCLUSION

According to the findings of this study, *S. nodiflora* and *F. exasperata* have nutritional contents that are equivalent to those of other common vegetables, with high quantities of protein, carbohydrate, and other nutrients. The leaves of *S. nodiflora* and *F. exasperata* exhibit minimal antinutrient content, suggesting that they could be beneficial sources of food nutrients and therapeutic ingredients for humans.

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