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NUTRIENT AND ANTINUTRIENT CONTENT OF *Gynandropsisgynandra* FLOWERS

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ABSTRACT
Nutrient and antinutritional factors present in *Gynandropsisgynandra* flower were determined using standard analytical methods. The proximate composition analysis showed the result to be, moisture 41.5 ± 0.50, ash 13.3 ± 0.29, Crude lipid 8.33 ± 0.76, Crude protein 23.3 ± 0.50, fibre 5.67 ± 0.29, available carbohydrate 49.0 ± 1.07 and calorific value 262Kcal/100g. The mineral analysis showed that the flower contain some essential minerals such as Ca, Fe, Na, K and Mg, but was low in Mn and Cu. The flower has low concentration of antinutritive factors below the reference toxic standard levels. Therefore, the flower consumed plays an important role in the diet (such as microelements requirement, energy and protein) of the general populace which could be used to supplement other major sources.

Keywords: Edible Wild Plant, *Gynandropsisgynandra,* Flowers, Nutrient, Antinutrient

INTRODUCTION

The greatest threat to the survival of humanity is the ever – increasing gap between population growth and food supply [19]. However, edible wild plants and their products have played a substantial role in human welfare by satisfying various essential needs ranging from food to medicines that are not sufficiently exploited [23]. Currently, among alternatives available to meet the food demands is the used of wild vegetables such as edible flowers as cheep source of food for the marginal communities [13]. Many seeds, leaves and flowers of wild plants are highly consumed in Africa, but Mexico and Central America are areas where flowers are also used as food [16] [26]. Flowers of *Cucurbitapepo, Agave salmiana, Aloe vera, Arbutus xalapensis, Erythrinaamericana, Yucca filifera,* are in high demand all year round in Mexico and are prepared in different forms, being highly consumed in 'tacos' or 'quesadillas' or in sophisticated recipes offered in fancy restaurants in urban centres [27]. In the Western region of Cameroon, flowers of *Colocasiaesculanta* are used as a major ingredient in the preparation of 'Achu soup' [24]. In the Yuman province of China, many minority races such as

Bai, Yi, Miaoetc have the tradition of eating flowers. The flower of Sophoraviciifocia is used as a health giving food, and is cooked with egg, meat and chicken for the remedy of night sweat, heart stroke and oedema [10]. Flowers of *Prunusmume* are used to make various delicious foods since ancient times, such as porridge soup and drinks [14]. Hassan *et al.* [11] and Abubakar *et al.* [1] reported that, flowers of *Parkiabiglobosa* and *Calotropisprocera* respectively are used as food in North – Western Nigeria especially by rural dwellers when mixed with groundnut cake and other ingredients to make a delicious dish. It is therefore, the aim of this study is to determine the nutritional potential of *Gynandropsisgynandra* flower.

MATERIALS AND METHODS

Sample Collection and Identification

Samples of the flower of *Gynandropsisgynandra* were obtained from Shagari Local Goverrnent Area of Sokoto State, Nigeria. The taxonomic identification of the samples was carried out at Botany Unit, Usmanu Danfodiyo University, Sokoto State, Nigeria. The samples were washed, but not excessive, oven dried (55^0C), and finely pulverised or used fresh for moisture content analysis.

Proximate Analysis

The proximate composition analyses of the samples (moisture, ash, fibre, crude lipid, crude protein and available carbohydrate) were carried outin triplicate according to the standard methods of analysis, as described by Nancy and Wendt [21] methods. The energy value was calculated using Atwater factors of 4, 9 and 4 for protein, lipid and available carbohydrate respectively [9][4].

Mineral Analysis

The macro and micronutrients contents were determined after sample wet digestion; Ca, Na, K, Mg, Fe, Cu, Zn, Ni, Cr, Mn, Co, and Pb were quantified using atomic absorption spectrophotometer.

Antinutritional Analysis

The method of Ola and Oboh [22] was adapted for the determination of phytate. Hydrocyanic acid was determined by Nancy and Wendt [21] method. Oxalate and nitrate were determined by the methods of Krishna and Ranjhan [17].

Data Analysis

The Data obtained were expressed as mean ± standard deviation.

RESULTS and DISCUSSION

Table 1: Proximate Composition of *Gynandropsisgynandra* flowers (%)

Component	Composition
Moisture (wet weight) (%)	41.5 ± 0.50
Ash content (%)	13.3 ± 0.29
Crude protein (%)	23.5 ± 0.50
Crude lipid (%)	8.33 ± 0.76
Carbohydrate (%)	49.0 ± 1.07
Crude fibre (%)	5.67 ± 0.29
Energy value	262Kcal/100g

All values except for moisture are the mean ± standard deviation of triplicate determinations expressed in dry weight basis.

Table 2: Mineral Composition of *Gynandropsisgynandra* Flowers.

Element	Concentration (mg/100g) DW
K	30.5 ± 0.05
Na	21.8 ± 0.02
Ca	40.9± 1.56
Mg	10.2± 0.06
Fe	13.6 ± 0.12
Cu	0.02 ± 0.01
Zn	1.36 ± 0.04
Cr	0.03 ± 0.01
Mn	0.12 ± 0.03
Pb	0.15 ± 0.05
Co	0.04 ± 0.01
Ni	0.01 ± 0.01

All values are the mean ± standard deviation of triplicate determinations expressed in dry weight basis.
DW = Dry Weight

Table 3: Antinutritional Composition of *Gynandropsisgynandra* Flowers

Parameters	*G. gynandra* flowers (mg/100gDW)
Oxalate	0.12 ± 0.01
Phytate	1.34 ± 0.21
HCN	0.03 ± 0.02
Nitrate	0.04 ± 0.01

Data are mean ± standard deviation of triplicate result

DISCUSSION

Proximate composition

The result of proximate analysis showed that the *G. gynandra* flowers had moisture content of 41.5 ± 0.50% which is low when compared to (61.0 - 93.2 ± 2.6%) reported for some edible flowers [24] [27] [19] [11] [1]. Hassan *et al.,* [12] and Ruzainah *et al.* [25] reported that high moisture content is associated with the rise of microbial activities during storage. The ash content of the flowers (13.3 ± 0.29%) is high when compares to 6.50 ± 1.00% in *Parkiabiglobosa* flower [11], 7.50% in *Calotropisprocera* flower [1], 6.67% in *Balanitesaegyptiaca* flower [28], but also high when compared to 5.8 – 8.6% reported for some edible flowers

[27].The crude protein content of the flower obtained from the analysis was 23.5 ± 0.50% which is higher when compared to(6.7 – 14.9%) reported for edible flowers [24] [27] [11] [28] [1]. This result shows that *G. gynandra* flowers contains appreciable amount of protein content. As expected, the crude lipid was low. The value obtained is within the range reported by Sotelo *et al.* [27] and Hassan *et al,* [11]. Kirsh *et al.* [15] reported that edible flowers are low in fat and high intake has been found to reduce the risk of prostate cancer. The crude fibre content obtained is comparable as that reported for *P. biglobosa* flower [11] and *Balanitesaegyptiaca* flower [28]. This value is lower than (17.3%) *Erythrina Americana,* (13.8%) *Aloe vera*, (12.7%) *Agave salmiana* [27] and *C. esculenta* (20.4%) [24]. Fibre plays a role to a reduction in the incidence of certain diseases like colon cancer, coronary heart diseases, diabetes, high blood pressure, obesity and other digestive disorders [5]. The flowers of *G. gynandra* have carbohydrate content (49.0%). This is low when compared with 78.9% reported for *P. biglobosa* flower [11], 70.4% reported for *C. esculenta* flowers [24], 88.0% reported for *Calotropisprocera* flower [1] and 74.2% reported for *Balanitesaegyptiaca* flower [28]. The calorific value (262kcal/100g) which lower than 388.9kcal/100g reported in *Colocasiaesculenta* flowers [24], 384.7kcal/100g reported in *P. biglobosa* flower [11], 416.4kcal/100g reported in *Calotropisprocera* flower [1], but higher than 34kcal/100g in broccoli flower [3] and 111kcal/100g in *Madhucaindica* flowers [19]. This result shows that *G. gynandra* flower is a good source of energy to human populace.

Mineral Composition

The concentrations of different mineral elements in the flowers of *G. gynandra* analyzed were reported in Table 2. The potassium content (30.5mg/100g) is low when compared to 325mg/100g in *broccoli* flower [3], 106.3mg/100g in *Calotropisprocera* flower [1], and 81.8mg/100g in *Balanitesaegyptiaca* flower [28]. The contents of calcium and magnesium were 40.9 and 10.2mg/100g respectively and were higher than values reported in *Colocasiaesculenta* flowers 8.9 and 3.6mg/100g respectively [24]. However, the values are in close range with 38.2 – 49.8mg/100g and 15.6 – 19.36mg/100g reported by Abubakar *et al.* [1] and Umar *et al.* [28] respectively. Sodium content obtained is low when compared to 139.2mg/100g for *P. biglobosa* flower [11], 104mg/100g for *Colocasiaesculenta* flowers [24], 54.2mg/100g for *Calotropisprocera* flower [1] and 42.1mg/100g for *Balanitesaegyptiaca* flower [28]. Iron content obtained is within the range with 9.1 – 16.7mg/100g in some edible flowers [11] [1]. However, the value is low in compared with 31.46mg/100g reported for *Balanitesaegyptiaca* flower [28]. Manganese, zinc, copper, cobalt, nickel and chromium contents were 0.12, 1.35, 0.02, 0.04, 0.01 and 0.01mg/100g respectively which were lower than respective

values reported in *P. biglobosa* flowers, *Balanitesaegyptiaca* flower and *Calotropisprocera* flower respectively [11][28][1]. Earlier research on humans and livestock has shown that optimal intakes of elements such as Na, K, Mg, Ca, Mn, Cu, and Zn can reduce individual's risk factors for health problems such as cardiovascular diseases [20]. The concentration of lead in the flower was 0.15mg/100g which is below the concentration reported in *Calotropisprocera* flower [1]. The lead provisional tolerable weekly intake was 0.025mg/kg, equivalent to 0.214mg/day for 60kg person [18]. Lead has the tendency to bioaccumulate the tissues and organs, where it causes havoc to the body, depress the enzymes cholinesterase, suppress cellular redox reactions and inhibit protein synthesis [11].

Antinutritional Composition

The levels of the antinutritional factors are reported in Table 3. The results show that phytate (1.34mg), oxalate (0.12mg), hydrocyanic acid (0.03mg), nitrate (0.04mg), determined are all below the recommended toxic levels caused by the presence of antinutritional factors [2]. The phytate value is similar to that of *Parkiabiglobosa* flower (1.41mg/100g) reported by [11] and 1.63mg/100g reported in *Balanitesaegyptiaca* flower [28], but low compared to 3.79mg/100g reported in *Calotropisprocera* flower [1]. High concentration of phytate causes adverse effect on digestibility [8].The oxalate content compares favorably to values obtained for *Calotropisprocera* flower [1] and *Balanitesaegyptiaca* flower [28]. The HCN value obtained was quite low compared to (0.17mg/100g) reported for *Parkiabiglobosa* flower [11], (0.14mg/100g) reported for *Calotropisprocera* flower [1], but compares favorably to 0.04mg/100g for *Balanitesaegyptiaca* flower [28]. The nitrate content of this flower is also lower than (1.32mg/100g) reported for *Parkiabiglobosa* flower [11], but a little higher than value reported for *Calotropisprocera* flower [1]. Esenwah and Ikenebomeh, [7], and El – adway [6] reported that, high contents of some of the antinutrients can be reduced through soaking, boiling and fermentation process.

CONCLUSION

Even though the flowers are consumed every year only during the short blooming time, the *G. gynandra* flowers still play an important role in the diet (such as microelements requirement, energy and protein) of most poor people as the level of substance which interfere with digestion and absorption are all below the toxic level. It can therefore, be concluded that the flower could be used to supplement other source of nutrients.

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