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Effect of Processing on Nutritional and Anti-Nutritional Composition of Urena Lobata Leaves

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Abstract

The proximate, phytochemical, mineral and vitamin composition of the processed urena lobata leaves were analyzed using Association of Official Analytical Chemist (AOAC) method, Arisa, Onwuka, Pearson, Harboure ,and Atomic Absorption spectrophotometry, Okwu and Josiah procedures respectively. This study is aimed at investigating the nutrition and anti -nutrition content of the leaves .The proximate analysis of the raw were 49.55% for moisture, 17.25% for crude protein, 7.44% for crude fibre, 7.95% for ether extract, 9.09% for Ash and 8.73% for carbohydrates. For oxalate, tannins, saponnins, alkaloids and flavonoids were 4.62mg/100g, 2.5mg/100g, 3.01mg/100g, 6.92mg/100g and 3.33mg/100g for respectively. While 48.13mg/100g for calcium, 34.77mg/100g for magnesium, 29.85mg/100g for sodium, 40.97mg/100g for zinc and 21.21mg/100g. And 1.95mg/100g for vitamin B1,1.06mg/100g for vitamin B2, 3.79mg/100g for vitamin B3 and 19.29mg/100g for vitamin C for raw respectively. The presence of some phytochemicals such as tannins, saponnins, alkaloids and flavonoids and some essential minerals proves that this leaves is a source for medicine.

Keywords: Fibre; Nutritional; Anti-Nutritional; Urena lobata

Introduction

Plants are known to be the main sources of medicine. Many years ago plants has been used by human in treatment of different kinds of diseases [1-5].

Base on world health organization analyses (WHO) roughly 80% of world's population currently uses herbal medicines in treating various illnesses [6-10]. Recently, there has been continuous reviewing of interest in the use of medicinal plants in developing countries as herbal medicine has recorded to be harmless and there is no side effect especially when compared with synthetics drugs. About 400,000 plants species, only about 6% have been evaluated for planed activity controlled phyto-pharmacological studies of herbal medicine. Chemical product of animals and plants are divided into primary and secondary metabolites. Primary metabolites are those chemicals founds in all the species and they are sub-divided into lipids, nucleic acid, protein and carbohydrate while secondary metabolite are those known as natural products that are plant chemical compounds that play major roles in treatment of diseases [11,12].

They are best used as medicine and main sources of both traditional and pharmaceutical drug [13,14]. Urena

lobata l. belongs to the family or member of the malvaceae.

It is also known as Caesar weed or congo jute. It is annual, erect ascendant under shrub measuring up to 0.5 meter to 2.5meter tall [15].

The stems are covered with minute star¬-like hairs and often tinged purple. It is widely distributed as a weed in tropics of both hemisphere including Brazil and Southeast Asia. Like the stem, leaves also have tiny hairs. Flower of the plant are pink-violet and grow one centimetre in width. The fruit is also hairy and may stick to clothing material or fur. The stem is used as teeth brush for healthy gum

Materials and Methods

Fresh samples were obtained from uncultivated farm land in umuezeokoha ezza north local government area of Ebonyi state, Nigeria.

Sample Preparation

The leaves were properly detached, washed with distilled water and allowed to drain. Chopped into homogenous pieces and divided into three portions. One part was oven dried for four hours at 55 degree while the second portion was analyse raw (control), but the third portion was boiled and oven dried.

Sample Treatment

Exactly 200g of the homogenous pieces of *U. Lobata* were immersed in a well-covered beaker, containing 500ml of boiling water, the leaves were removed after 10 minutes of boiling and oven dried for 4 hours at 55 degrees.

The oven dried and boiled + oven dried were then grinded into powder and kept in air tight container prior for analysis.

Proximate Analysis

The method of AOAC [16] was used for the determination of moisture, crude protein, crude fibre, ether extract and ash content on raw , oven dried and boiled + oven dried of the leaves. Total carbohydrate was determined by difference

Phytochemical Analysis

The method of AOAC [16] was used in the determination of saponin and tannin. The gravimetric method of Harbone [17] was used in the determination of alkaloid and flavonoids while the method of pearson [18] was used in the determination of oxalate content of the raw, oven dried and boiled + oven dried of the leaves.

Mineral Assay

The atomic absorption spectrophotometer was used in the analysis of Ca, Mg, Zn, and Na whiles the Arisa, et al. [19] method was used in the analysis of the phosphorus content of the raw, boiled + oven dried and oven dried of the leaves.

Vitamin Assay

The thiamine, riboflavin and niacin content of the leave were determined using the method of okwu & Josiah [20], while vitamin C content of the leaves were determined using the titrimetric method of Onwuka [21].

Statistical Analysis

Results were reported as the mean± standard deviations of duplicate experiments. One way analysis of variance (ANOVA) was used for the comparison of means. Results were considered to be significant at $P< 0.05$.

Proximate Composition

The results of the proximate composition of the raw and processed *U. Lobata* leaves are tabulated in table 1. The moisture content, crude protein, crude fibre, ether extract, ash and total carbohydrate and their values are 49.55, 17.25, 7.44, 7.95, 9.09 and 8.73 respectively.

Moisture is relatively higher ($P< 0.05$) in raw leaves compared to oven dried leaves and boiled + oven dried leaves.

The crude protein content of the raw (control) leaves significantly increase ($P<0.05$) when compared with the oven dried and boiled + oven dried leaves of the *U. Lobata* crude fibre content of the control. *U. Lobata* leaves significantly decreased ($P>0.05$) when compared with the boiled +oven dried. On the contrary, the crude fibre content of the boiled leaves significantly higher ($P<0.05$) when compared with the raw.

Ether extract content of the oven dried U. lobata leaves were significantly different ($P<0.05$) when compared to others.

Ash content of the control was significantly higher ($p<0.05$) when compared to boil +oven dried and oven dried leaves.

The total carbohydrate content of the boiled +oven dried were significantly higher ($P<0.05$) compared to

others, but, total carbohydrate content of the control significantly decrease (P<0.05) this decreased may attributed to the high moisture content of the control.

The phytochemical composition of the raw and processed urena lobata leaves are shown in table 2.

As presented in the table, the oxalate content of the raw leaves is considered to be highest but when the raw leaves were subjected for further treatment, the oxalates content drops drastically. Also the raw leaves contained considerable amounts of tannin, saponnin, alkaloid and flavonoid. And they were significantly decreased (P<0.05) when processed, compared to the raw leaves of *U. Lobata*. The decreased may be as a result of the oven drying and boiling as most of it might have lost during the processing.

The mineral composition of the raw and processed forms of the urena lobata leaves are represented in table 3. As presented in the table 3, the control leaves contained 48.31 ± 0.01 calcium, 34.77 ± 0.01 Mg, 29.85 ± 0.02 Na, 40.97 ± 0.02 Zn and 21.21 ± 0.01 P; oven dried leaves contained 45.26 ± 0.01 Ca, 33.81 ± 0.01 Mg, 29.33 ± 0.02 Na, 40.54 ± 0.01 Zn and 20.13 ±0.02 P; boiled + oven dried contained 36.53 ± 0.03 Ca, 25.16 ± 0.02 Mg, 21.16 ± 0.01 Na, 34.12 ± 0.02, Zn and 15.03 ± 0.02 P, respectively.

Vitamin composition of the raw and processed *U. Lobata* leaves is presented in table 4. As presented, boiled + oven dried attributed to the significant decreased (P<0.05) observed in vitamin B1, B2, B3 and C content when compared to the control.

Parameters	Raw	oven dried	Boiled + Oven dried
Moisture content	49.55±0.32	5.55±0.15	7.63±0.22
Crude protein	17.25±0.01	17.75±0.06	13.64±0.01
Crude fibre	7.44±0.01	7.93±0.02	7.97±0.01
Ether extract	7.95±0.03	8.41±0.03	7.75±0.02
Ash content	9.09±0.01	9.04±0.03	8.82±0.01
Carbohydrate	8.73±0.34	51.32±0.18	54.19±0.19

Table 1: proximate composition (%) of raw and processed *U. Lobata* leaves.

Parameter	Raw	Oven dried	Boiled + oven dried
Oxalate	4.62±0.01	4.10±0.01	2.85±0.02
Tannin	2.51±0.02	2.02±0.01	1.67±0.01
Saponnin	3.01±0.01	2.75±0.01	1.92±0.01
Alkaloid	6.92±0.02	6.51±0.01	4.49±0.02
Flavonoid	3.33±0.00	3.03±0.02	2.43±0.02

Table 2: phytochemical composition (mg/100g) of raw and processed urena lobata leaves.

Parameters	Raw	Oven dried	Boiled + oven dried
Calcium	48.31±0.01	45.26±0.01	36.53±0.03
Magnesium	34.77±0.01	33.81±0.01	25.16±0.02
Sodium	29.85±0.02	29.33±0.02	21.61±0.01
Zinc	40.97±0.02	40.54±0.01	34.12±0.02
Phosphorus	21.21±0.01	20.13±0.02	15.03±0.02

Table 3: mineral elements (mg/100g) of raw and processed urena lobata leaves.

Parameters	Raw	Oven dried	Boiled + oven dried
Vitamin B1	1.95±0.02	1.70±0.01	0.80±0.03
Vitamin B2	1.06±0.01	0.82±0.02	0.14±0.02
Vitamin B3	3.79±0.02	3.45±0.03	1.66±0.01
Vitamin C	19.29±0.01	16.70±0.01	11.12±0.01

Table 4: vitamin analysis (mg/100g) of the raw and processed *U. Lobata* leaves.

Discussion

The decreased observed in the moisture content of the processed leaved of the *U. Lobata* may be a results of the shrinking of the call wall of the leaves during processing. The moisture content of the processed leaves is in line with the previous reports of Elijah, et al. [22]. The protein content recorded in this study were little bit lower when compared with the earlier values reports by Elijah, et al, [22], but higher when compared with the report of Igwe & Eleazu, (2017) [23].

The decreased protein content of the processed leaves could be attributed to the denaturation of some of the cellular protein during processing. There was an increased protein content when subjected to only oven dried, that is, oven drying of the raw leaves intensified the release of its nitrogen during acid digestion [24]. High protein content recorded in this study made it very vital to the animal as it is good for animal growth and increased milk production. Plant proteins are good source of food nutrient especially for the poor people living in developing or under-developed countries [25]. Proteins are one of the macromolecule and it can be seen as a substitute of energy sources when other sources of energy are not available. Food proteins are essential in making important hormones, antibodies, vital brain chemicals, digestive enzymes and essential elements, for DNA production. Some protein takes actives parts in structural support, while others involves in fighting against germs [26]. Therefore, urena lobata leaves can be seen as good sources of protein as they provide more than 12% calories value from protein. Thus, urena lobata leaves can be recommended to those searching for protein supplement.

The crude fibre content obtained in the study was higher when compared with the earlier report of Fagbohun, et al. [27]. But it was lower when compared to annona muricata leaves (22.20 ± 0.05) reported by Usunobun, Fibre cleaves the digestive track by dislodging tumours that are liable to cause cancer from the body and decreases the assimilation (intake) of cholesterol thereby help in safeguarding against cardiovascular disease, obesity, and colorectal cancer. Fibre helps to speed up the excretion of waste and toxics from the body, by preventing them from staying in the intestine for long time, which would have resulted to blockage and leads to different types of disease [28]. Suitable absorption of dietary fibre can decreased the serum cholesterol level, hypertension, diabetes, constipation, colon and breast cancer [29,30].

Therefore, the increased fibre contents of urena lobata could be benefit to people suffering from cardiovascular disease, diabetes and obesity etc. *U. Lobata* had a range of lipids content of 8.41 ± 0.03 _ 7.75 ± 0.03 which contributed to the energy value of *U. Lobata*. Lipids enhance the palatability of food by assimilating and preserving the flavours [31].

Ash contents are a measure of the total mineral content of these plants. Values obtained in the currents study was lower when compared to the ash content of vitex doniana (11.50 ± 1.10) as reports by Vunchi, et al. [32]; but it was consistent with the value reported by Fagbohun. The decreased could be attributed to environmental factors and also leakage of some minerals into the boiling water [23].

The increased observed in total carbohydrates contents of oven dried and boiled + oven dried was a result of their loss of moisture during processing, while, the decreased of the total carbohydrate recorded on the raw leaves was due to the retention of the moisture as it was not subjected to any treatment before analyzing or it was analysed fresh.

Low oxalate content was observed in boiled + oven dried, while it was higher in raw and oven dried leaves. And this increased could be attributed to an adverse effect on calcium nutrient. It is known that oxalate chalets calcium to precipitate its deficiency due to its unavailability to the body.

Tannins are well known for its ability to prevent cancer as well as treatment of inflamed or ulcerated tissue [33-35].

Leaves that contain tannins as their component are astringent in nature and are used for the treatment of intestinal disorders such as diarrhoea and dysentery [36]. Saponnin in medicinal plants are responsible for most biological effects related to cell growth and division in human and prevent inflammation [33,37,38]. Saponnin have the properties of precipitating and coagulating red blood cell [23]. Other properties of saponnin may include formation of foams in aqueous solution, haemolytic activity, cholesterol binding features and bitterness [39,40]. Both the raw and the processed forms contain the considerable amount of saponnin suggesting that both might possess the aforementioned properties.

Alkaloids are very essential to plant as it serve as predators and parasites [25]. Plant that posse considerable amount of alkaloid have been considered as medicinal plant as it has been used by the early man to relieve pains, as recreational stimulant or in religious

ceremonies to enter a psychological state to achieve communication with ancestors or God [41,42].

Flavonoid is one of the free radicals scavenger that inhibits oxidative cell damage, and strong anticancer activities [43]. And they could induce mechanism that affect cancer cells and prevent tumour invasion [44].

These activities might be as results of their capability to neutralize and stops free radicals [44,45]. It could be also attributes to the presence of conjugated ring structures, redox properties and carboxylic group which have been reported to prevent lipid peroxidation [46].

Mineral, as inorganic elements are splinted into macro and micro elements. They function as co-factors in enzyme catalyzed reactions, regulation of acid-base balance, muscle irritability, nerve condition and structural elements of the body Eleazu & Eleazu [24].

Calcium, magnesium and phosphorus are macro-nutrients and they form essential constituent of the bone and teeth. Calcium functions as calmodulin bonding regulatory protein and mediates the excitation and contracting of the muscle fibre. Magnesium plays a crucial role in muscle relaxation [23]. Phosphorus plays a vital role in production of high energy compounds such as ATP, CTP, GTP, creatine phosphate and so on, as well as phosphate buffer system in the blood [24].

Zinc is an important constituent of many enzymes such as alkaline phosphates and helps in healing of wounds as well as essential in the regulation of insulin production by pancreatic tissue and glucose utilization by muscle and fat cells.

These vitamins are very important to the body as their deficiencies negatively affect the body metabolism. Vitamin B1 deficiency might cause cardiac failure, gastro-intestinal malfunction and weakness of muscle [47].

In vitamin B2, like thiamine and cobalamin (B12) acts as a coenzyme in breaking down of fats, protein, carbohydrate and other nutrients. It also assist fatty acid reduction and also essential for catabolism of nutrients in the liver as well as eye and skin maintenances [48,49].

Niacin (vitamin B3) is necessary for the proper functioning of the skin, nervous system and intestinal track [24].

Vitamin C is one of the water soluble anti-oxidant. Vitamin that help to protects human tissue from been damaged by free radical.

Conclusion

The study showed that urena lobata leaves are rich in protein, fibre, ash as well as carbohydrates except in the raw leaves. Therefore these would be better sources of dietary carbohydrate, lipids and protein. It also revealed that raw leaves alone retained more of the nutrient than when it is been processed.

References

1. Agbanyim, Akuagwu NI, Ukpabi FI ,Chinwendu S (2013) Phytochemical Composition of piper guineresnce (Uziza leaves) and telfania occidentals (fluted pumpkin), preceding of annual international conference anachem, pp: 54-57.

2. Ajiwe VIE, Dinonyejiaku NN, Ajiwe AC, Chinwuba AJ, Chendo NM (2008) Preliminary study of the pharmaceutical constituents of emitia sonchifolia leaf. Anachem journal 2(2): 302-309.

3. Ajiwe VIE, Ofojekwu AM, Onuegbu TU, okonkwo IS (2007) A preliminary study on pharmaceutical constituent of Desmodium Velutinium leaf. Anachem journal 1: 192-196.

4. Akpuaka MU (2009) Essential of natural products chemistry. Manson publishers Enugu, Nigeria, pp: 74-75.

5. Alinor IJ (2007) Preliminary phytochemical and antibacterial activity screening of seeds of garcinia kola. J Chem Soc Nigeria 32(2): 41-47.

6. Balandrin MF, Klocke JA, Wrtele E, Boilingger WH (1985) Contents and purity of extract solasodine in some available species of solanum. Science and culture 56(5): 214 -216.

7. Cragg GM, Newman DJ, Sander KM (1997) Natural products in drugs discovery and development, J Nat Product 60(1): 52 -60.

8. Davis PH and Heywood VH (2001) Alkaloid, tannin and saponin contents of medical plants. Journal of medicinal aromatic plants science 23: 344-349.

9. Dey S (2006) Pharmaceuticals from plants Indian express newspaper (Mumbai) Ltd via express pharma.

10. Edeoga HO, Okwu DE, Mbaebie BO (2005) Phytochemical constituents of some Nigeria

medicinal plants. African journal of biotechnology 4(7): 685-688.

11. Gills LS (1992) Ethnomedical uses of plant in Nigeria, university of benin press, Nigeria pp: 276.

12. Harbone JB (1998) Phytochemical methods, a guide to modern techniques of plants analysis, 3rd edition, chapman and hall, an inprint of Thompson science 2 - 6 boundry row, London, UK, pp: 1-290.

13. Irvine AS (2001) Woody plants of Ghana (with special features to their uses). Oxford university press, oxford, pp: 871.

14. Miller MB, Hartsock TG, Erez B, Douglass L, Alston-Mills B (1994) Effects of diet calcium concentration during gestation and lactation on the milk composition of litter growth. J anim sci 72: 135-138.

15. Chhabilendra Roul (2009) The international jute commodity system. Northern book centre, pp: 294.

16. AOAC (2006) Official methods of analysis, 18th (Edn.). Association of official analytical chemists, Washington DC, USA.

17. Harbonej B (1973) Complavonoids. New York, comparatives biochemistry of the flavonoids. New York, Ny: academic press, pp: 221-222.

18. Pearson D (1976) Chemical analysis of food. Edinburgh, UK: Churchill Livingstone.

19. Arisa, Ngozi U, Adelekan, Aminat O, Adediran EA, et al. (2013) The effects of pretreatment of plaintain (Musa parasidiaca) Flour on the pasting and sensory characteristics of Biscuits. International journal of foods and nutrition sciences 2(1): 2165-5316.

20. Okwu DE, Josiah C (2006) Evaluation of the chemical composition of two Nigerian medicinal plants. African journal of biotechnology 5(4): 357-361.

21. Onumuka GL (2005) Food analysis and instrumentation. Theory and practice napthali prints, pp: 140-146.

22. Elijah YS, Tsando JM, Abdulfatai AO, Amos NT, Saheed M, et al. (2017) Nutritional assessment of urena lobata leaves. Fuw trend in science and technology journal 2(1A): 220-222.

23. Igwe A, Eleazu C (2016) Effect of processing on the Biochemical contents of Acanthus montenus (Nees) T. Anderson (Acanthaceae) leaves. Food sci Nutri 6(2): 388-394.

24. Eleazu CO, Eleazu KC (2013) Bioactive constituents and invitro anti-oxidants capacity of water leaves (talinum triangulare) as affected by domestically cooking. European journal of medicinal plants 3(4): 590-551.

25. Usunobun U, Okolie NP, Anyyanwu OG, Adegbegi AJ, Eghareuba ME (2015) phytochemical screening and proximate composition of *annona muricata* leaves. European journal of botany plant science and phytology 2(1): 18-28.

26. Bailey R (2008) The roles of proteins in the body. About.com Guide to biology.

27. Fagbohun ED, Asere RR and Egbebi AO (2012) chemical composition and antimicrobial activities of urena lobata l. (Malvaceae). Journal of medicinal plants research 6(12): 2256 -2260.

28. Hunt S, Groff IL, Holbrook J (1980) Nutrition, principles and chemical practice, John Wiley and Sons, New York 49(52): 459-462.

29. Rao CV, Newmark HL (1998) Chemo-preventive effect of squalence on colon cancer. Carcinogenesis 19: 287-290.

30. Ishida, H, Suzuno H, Sujiyam N, Innami S, Todokoro T (2000) National evaluation of chemical components of leaves stalks and stem of sweet potatoes (Ipomea batatas poir). Food chem 68: 359-367.

31. Antia BS, Akpan EJ, Okon PA and Umoren IU (2006) Nutritive and anti-nutritive evaluation of sweet potatoes (*Ipomea batatas*) leaves. pak J Nutr 5: 166-168.

32. Vunchi MA, Umar AN, King MA, Limon AA, Jrermiah G, et al. (2011) Proximate, vitamin and minerals composition of vitex doniana fruit pulp. Nigeria journal of basic and applied science 19(1): 97-101.

33. Okwu DE, Emenike IN (2006) Evaluation of the phytonutrients and

34. Li H, Wang Z, Liu Y (2003) Review in the study on tannins activity of cancer prevention and anticancer. Zhong-yao-cai 26(6): 444-448.

35. Adegboye MF, Akinpelu D A, Okoh A (2008) The bioactive and phytochemical properties of garcinia

kola (Heckel) seed extract on some pathogens. African journal of biotechnology 7(21): 3934-3938.

36. Bajai AM (2001) Effects of natural extracts of pineapple of dissatibility performance traits and nitrogen balance of boiler chicks'' Australian journal of basic and applied sciences 5(20): 10-30.

37. Just MJ, Recio MC, Giner RM, Cualla MJ, Manez S, et al. (1998) Anti-inflammatory activity of unusual unpins saponins from Buplearum fruticesences. Plants med 64(5): 404-407.

38. Liu J, Henkel T (2002) Traditional chineese medicina (TCH): are polyphenols and saponin the key ingredients triggering biological activities? Curr Med Chem 9: 1483-1485.

39. Sodipo OA, Akinniyi JA, Bamosu JU (2000) Studies on certain characteristics of bark of macruceras (K schemp) picrre Exbelle. Global JPure appl Sci 6: 83 - 87.

40. Okwu DE (2004) Phytochemical and vitamin contents of indigenous species of south eastern Nigeria. J Sustain Agric Emviron 6(1): 30-37.

41. Heinrich M, Barnes J, Gibbons S, Williamson EM (2004) Fundamental of pharmacology and phytotherapy. Churchill living stone, Elsevier science Ltd. UK.

42. Gurib-fakim A (2006) Medical plants. Traditions of yesterday and drugs tomorrow. Mol Aspects Med 27(1): 1-93.

43. Pourmorad F, Hosseininehr SJ, Shahabimajd N (2006) Antioxidants activities phenol and flavonoids contents of somes selected iraninon medicinal plants. Afri J Biotec 5(11): 1142-1145.

44. Rafat HS, Cillard BS, Collard NT (2008) Hydroxy radicals scavenging activity of flavonoid. Journal of phytochemistry 26(9): 2409-2491.

45. Omale J, Okafor PN (2008) Comparatives antioxidants capacity membranes stabilization, polyphenol composition and cytotoxicity of the leaf and stem of cissus multistaiata. Afri J Biotechnol 7(17): 3129-3133.

46. Rice-Evans CA, Miller NJ, Bolwell PG, Bramley PM, Pridham JB (1995) The relative activity of plants-derived polyphenol flavonoid tree radical Res 22: 375-383.

47. Tanphaichitr V, Wood R (1982) nutritional review 5th (Edn.). The nutritional foundation Inc. Washington DC, pp: 277.

48. White H, Merrill A (1988) Reboflain-binding proteins. Ann Rev Nutr 8: 279-299.

49. Khairul I, Khan MZH, Sarkar MAR, Nurul A, Sark SK (2013) Change in acidity, TSS, and sugar contents at different storage periods of the postharvest mango (mangitera indica L.) influenced by bavislin DF. International journal of food science 2013: 8.