

Effect of Domestic Processing Method on the Proximate and Anti-Nutritional Components of *Cnidoscolus Aconitifolius* Leaf.

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Abstract: The effect of domestic processing method on the proximate and anti-nutritional content of the leaf of *Cnidoscolus aconitifolius* was properly investigated using standard method. The proximate result shows that there were high content of ash, protein, fibre, and carbohydrate, with ranges of 2.20 ± 0.6 - 2.67 ± 0.5 , 2.91 ± 3.0 - 3.60 ± 1.0 , 1.43 ± 0.1 - 2.50 ± 0.1 and 8.79 ± 2.6 - 9.65 ± 1.6 respectively and fat between 78.33 ± 0.10 - 86.30 ± 0.28 . Little concentrations of phytate, oxalate and tannin, with ranges of $0.22 \pm 0.01\%$ - $0.35\% \pm 0.01\%$, $0.14 \pm 0.02\%$ - $0.41 \pm 0.09\%$ and $1.64 \pm 0.03\%$ - $1.94 \pm 0.02\%$ were observed. The concentrations of these anti-nutrients were controlled by the treatment process. This result proves that *Cnidoscolus aconitifolius* leaves has highly rich nutrients and therefore should be recommended for used as food condiments and feeds for farm animals. The treatment processes affected to a great extent the concentration of the anti-nutritional components of *Cnidoscolus aconitifolius* leaves.

Keywords: Proximate, Anti-nutrition, nutrition, domestic processing methods, *Cnidoscolusa conitifolius*.

I. Introduction

Vegetables are part of a plant that is consumed by human as food. The need to add value to the existing food items should not be neglected in Nigeria. In most developed nations of the world, most of the green vegetables are either canned or refrigerated to increase their shelf life and nutritional potential. In more advanced nations some are fractionated and used as condiments in the foods for aged, pre-school children and some vulnerable groups (Eggum, 1970; Barbeau, 1989). However, green vegetables have long been recognized (Byerb, 1961, Oke, 1968; Aletor *et al.*, 2002) as the cheapest and most abundant potential because of their ability to synthesize amino acids from a wide range of virtually unlimited and readily available primary material such as water, CO₂, and atmospheric nitrogen in sunlight. (Agbede *et al.*, 2012).

In addition, the cellulose-free protein could be stored dry and use as condiment. Available literature (Eggum, 1970; Agbede *et al.*, 2007; Agbede and Aletor, 2003 & 2004) clearly states that apart from lower methionine and cystine content, the amino acids profiles of the leaf protein from most species compare favorably and surpass those of FAO/WHO (1973) and whole egg amino acid pattern.

Cnidoscolus aconitifolius is attractive monoecious shrub 3-5m tall (Breckon, 1979), containing a white latex with a thick pale trunk plant usually harmed with stinging pair, but activated form are not harmful. Four cultivars of *Cnidoscolus aconitifolius* on the basis of morphological differences have been identified as Chayamansa, Esteralla, Picuda, and Redonda (Ross, *et al.*, 2002) and Chayamansa is the most domesticated of the four varieties. It grows in moist and dry thickets in an open forest from sea-level up to 1300m altitude. However, the presence of inherent toxic factors or anti-nutritional components in plants has been one major obstacle in harnessing the full benefits of the nutritional value of plant food, vegetables inclusive (Liener, 1969; Nwokolo and Bragg, 1977, Lewis and Frenwick, 1987). Many food processing technique have been highlighted as possible means of reducing or eliminating the anti-nutrients in foods or plants. (Fasuyi and Aletor, 2005). This study is designed to provide information on the effect of processing method on the proximate composition while trying to reduce the anti-nutritional factors in the leaves of *Cnidoscolus aconitifolius*.

II. Materials And Methods

Collections of Plant Material/Sample

Cnidoscolus aconitifolius leaves were harvested fresh at natural habitat in Nekede, Owerri, Imo State and was authenticated by a botanist in the Department of Environmental biology, Federal Polytechnic Nekede.

Sample Preparation

The fresh leaves of *Cnidoscolus aconitifolius* were washed and rinsed with running tap water. And were divided into parts; the first part was boiled for 5minutes; second part was boiling for 10minutes, the third for 15minutes, fourth for 20minutes and the fifth for 25minutes. The boiled samples were labeled accordingly as A, B, C, D, and E. The sixth portion was steamed and labeled F while the seventh left fresh served as control and labeled G. All the samples were sundried separately and ground into fine powder for analysis.

Proximate Analysis

The proximate compositions of the samples were determined in triplicate for moisture, fat, ash, and crude fibre, using methods described by Onwuka, (2005). The amount of nitrogen was determined by the micro-kjeldahl method and the percentage of nitrogen was converted to crude protein by multiplying by 6.25. The nitrogen free extract was determined by difference.

Determination of Anti-Nutrients

Tannin was determined as described by Van-Burden Robinson (1981). Phytate and oxalate were determined as described by Onwuka (2005).

Statistical Analysis

All measurements were carried out in triplicate and means and standard deviation determined. Analysis of variances (ANOVA) was used to determine the differences between the means at (P<0.05) level of significance

III. Result And Discussion

Result

Table 1: Result for proximate analysis of *Cnidoscopus aconitifoliusin* (%)

Sample	Moisture	Fat	Ash	Protein	Fibre	Carbohydrate
A	82.90±0.10 ^a	0.30±0.5 ^a	2.50±0.2 ^a	3.50±0.2 ^a	1.90±0.1 ^a	9.90±0.6 ^a
B	78.33±0.10 ^b	0.27±0.5 ^b	2.20±0.6 ^a	2.91±3.0 ^b	1.43±0.1 ^a	8.79±2.6 ^a
C	62.80±0.60 ^b	0.22±0.5 ^b	2.16±0.7 ^b	2.83±5.5 ^b	0.41±0.0 ^b	8.90±5.9 ^a
D	56.50±0.50 ^b	0.16±0.5 ^c	2.09±0.2 ^b	2.65±7.3 ^b	0.37±0.0 ^b	7.25±5.0 ^b
E	53.10±0.36 ^c	0.11±0.1 ^c	2.02±0.5 ^b	2.34±6.6 ^b	0.30±0.3 ^b	7.29±7.1 ^b
F	83.40±0.28 ^a	0.32±0.8 ^a	2.33±1.1 ^a	3.42±0.5 ^a	1.92±0.3 ^a	9.84±0.8 ^a
G	86.30±0.28 ^a	0.47±0.23 ^a	2.67±0.5 ^a	3.60±1.0 ^a	2.50±0.1 ^a	9.65±1.6 ^a

Values are means ±standard deviation (SD); means with different superscripts in the same column were significantly different (P< 0.05).

Table 2: Anti-nutritional analysis of *Cnidoscopus aconitifoliusin* (%)

SAMPLES	PHYTATE	OXALATE	TANNINS
A	0.22±0.01 ^a	0.40±0.08 ^a	1.77±0.00 ^b
B	0.23±0.02 ^a	0.20±0.04 ^b	1.85±0.03 ^a
C	0.28±0.03 ^a	0.14±0.02 ^b	1.75±0.04 ^b
D	0.34±0.03 ^b	0.16±0.04 ^b	1.73±0.14 ^b
E	0.32±0.02 ^b	0.17±0.02 ^b	1.64±0.03 ^b
F	0.23±0.01 ^a	0.28±0.03 ^b	1.86±0.01 ^a
G	0.35±0.01 ^b	0.41±0.09 ^a	1.94±0.02 ^a

Values are means ±standard deviation (SD); means with different superscripts in the same column were significantly different (P< 0.05).

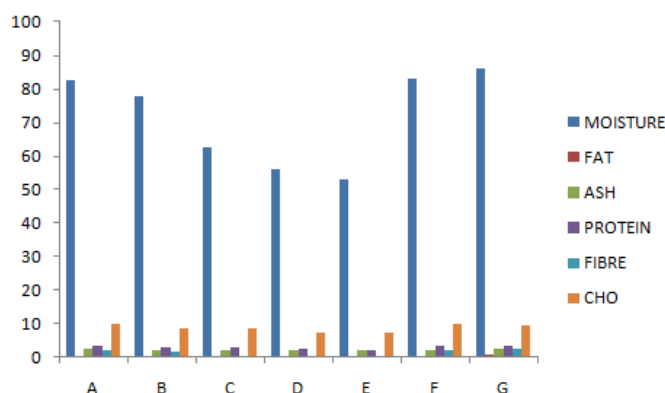


Figure 1: Graphical representation of proximate composition of processed *Cnidoscopus aconitifoliusin*.

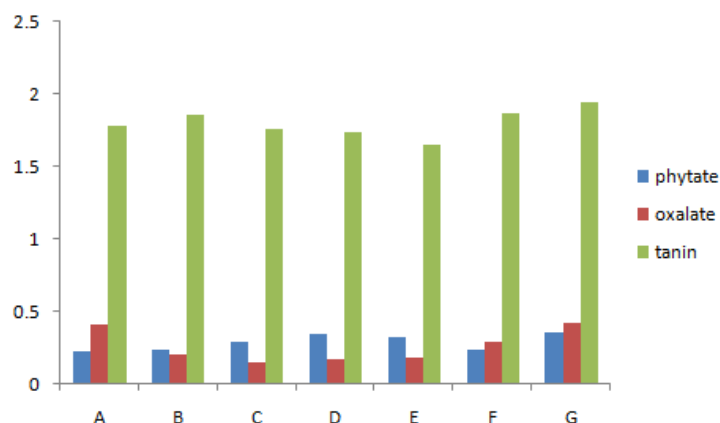


Figure 2: Graphical representation of anti-nutritional properties of processed *Cnidoscopus aconitifolius*.

IV. Discussion

Table 1: represents the result of the proximate analysis of leaves of *Cnidoscopus aconitifolius*. From the table, the moisture content of the boiled leaves ranges from 62.80 ± 0.60 to 53.10 ± 0.36 and the steamed leaves is 82.40 ± 0.28 (%). The result shows significant difference ($P < 0.05$) between the fresh sample and the processed ones. The steamed had the highest moisture content followed by the control. The high moisture content of the steamed and the control would increase the growth of microorganism which will reduce the storage life. The moisture content of the boiled is within the value reported for *O. gratissimum* (8.00%) and *H. esculentus* (8.00%) by Akindahunsi and Salawu (2005). And the result is significantly higher than the moisture reported for *Cnidoscopus aconitifolius* ($12.86 \pm 0.02\%$) by shettu et al., (2014).

The fat content value ranges from 0.30 ± 0.5 to 0.11 ± 0.1 ; the steam sample has 0.32 ± 0.8 and 0.47 ± 0.23 for the fresh sample. The result shows that there is significant difference ($P < 0.05$) between all the samples and the fresh sample. This implies that the boiling process decreases the fat content of the leaf than the steam. The fat content gotten is higher than that report for *Cnidoscopus aconitifolius* which is (7.39%) by shiltu et al. (2014), it's also higher than those reported for *Amaranthu hybridus* 14.80% and *Calchorus africanum* by Akindahunsi and Salawu (2005). Dietary fats function in the increase of palatability of food by absorbing and retaining flavours (Ifon and Bassir, 1979). The ash content is a reflection of the mineral contents preserved in the food materials. The ash value ranges from 2.50 ± 0.2 to 2.02 ± 0.5 for the boiled samples, $2.33 \pm 1.1\%$ for steam and $2.67 \pm 0.5\%$ for the fresh sample. This shows that there is significant difference between the values of the treated samples at 0.05 level of significance. The ash content values is lower than that reported for *Cnidoscopus aconitifolius* (14.22%) by Shittu et al. (2014) and that reported for the leaves of *A. viridus* (22.84%) by Pandly et al. (2006). The protein content shows no significant difference ($P > 0.05$) between the boiled sample at 5, 10 and 15mins intervals with the control (fresh sample) but there is significant difference between the other samples and the control at 0.05 level of significance. The protein value ranges is in accordance to what Shittu, et al. (2014) reported for *Cnidoscopus aconitifolius* (14.7%) and is lower to the values reported for protein of some treated samples of *Cnidoscopus aconitifolius* by Aye (2012) which is 24.97% for sundried sample. While is almost in range with the ether extract reported on the same research which 12.87% for L.P.C., 8.90% for cooked and 10.67% with the sundried. Plant foods that provide more than 12% of their calorific value from protein have been shown to be food source of protein (Ali, 2009). The fibre content of the samples ranges from 8.0 ± 0.1 to $8.50 \pm 1\%$. The sample (control) shows no significant difference with all the treated samples except the boiled sample at 5mins interval. The fibre content of *Cnidoscopus aconitifolius* falls within the range of (8.50-20.9%) reported for some Nigerian vegetables (Isong and Idiong, 1997), and is lower than the value reported for *Cnidoscopus aconitifolius* by Shittu (2014) which is (16.57%). The indigestible cellulose they contain may absorb water and provide roughage for better functioning of the alimentary system. (Wardlaw and Smith, 2009). Dietary fibre can reduce serum cholesterol level, hypertension, diabetes, breast cancer, and constipation (Ishida, et al., 2000). The carbohydrate content result show significant different ($p < 0.05$) between the values of the fresh sample and the other treated samples, but there is no significant different ($P > 0.05$) between the value of steamed sample and the boiled for 20 and 25mins. The value is within the range reported by Shittu (2014) for *Cnidoscopus aconitifolius* (44.31%). The high value obtained for carbohydrate in this study makes the leave a good source of energy for man and animals.

Table 2: present the result of the anti-nutritional analysis of *Cnidoscopus aconitifolius* leaves. The phytate values shows no significant differences ($P > 0.05$) between boiled at 20 and 25mins. But shows significant difference ($P < 0.05$) between the other samples. The phytate values ranges from 0.22 ± 0.01 – $0.35 \pm 0.01\%$ phytate. The fresh sample tends to have the highest level of phytate. Phytate binds with important

minerals, such as calcium, iron and zinc forming insoluble precipitate and are less absorbable in the intestine. This process can therefore contribute to iron and zinc deficiencies in people whose diets rely on this food for mineral intake such as those in developing countries and vegetarians (Hurell, 2003; American dietetic and Dietitians, 2003). Phytic acid also causes chelating of the vitamin niacin (B₃), the deficiency of which is known as pellegra (Anderson, 2005). The oxalic acid result showed significant difference (P<0.05) between the entire sample except for samples boiled for 5mins and the steamed sample which shows insignificant difference (P>0.05). The oxalic acid content is lower than that reported by Agbede et al., (2012) for *Cnidoscopus aconitifolius*, *V. amygdalina*, *B. alba* and *Manihot spp.* which are 3.74, 1.31, 2.61 and 3.00g/100g respectively. Oxalic acid combines with divalent metallic cations such as calcium and iron II to form crystals of the corresponding oxalates which are then excreted in urine as minute crystals. These oxalates can form larger kidney stones that can obstruct the kidney tubules. Oxalate can also cause kidney disorders, gout, rheumatoid arthritis, or certain forms of chronic vulvar pains. (Loe, 2005). Tannin result showed significant differences between the samples at 0.05 level of significance, except for the sample boiled for 10mins and steam samples which values show no significant differences. Comparing the values of the processed samples of *Cnidoscopus aconitifolius* with that reported by Agbede et al. (2012) for *Cnidoscopus aconitifolius*, *V. amygdalina*, *B. pilosa* and *A. viridis* are higher than the reported values which are 0.11, 0.33, 1.02 and 0.05g/100g respectively. Tannin is traditionally known as an anti-nutrient, it is now known that their beneficial or anti-nutritional properties depend upon their chemical structures. Condensed tannins inhibit herbivore digestion by binding to consumed plant proteins and making them more difficult for animals to digest and by interfering with protein absorption and digestive enzymes. Histatins, another type of salivary proteins also precipitate tannins from solution, thus preventing alimentary adsorption (Shimada, 2006).

V. Conclusion

The leaves of *Cnidoscopus aconitifolius* has shown to be rich in nutrients and the best processing method which has the highest level of nutrient is steamed and the boiled sample at 5mins. Thus, it is advised that the method be employed when preparing the leave of *Cnidoscopus aconitifolius* to reserve more nutrients. And the anti-nutritional result shows that it is advisable to process the leave to reduce the biomolecule which might hinder total absorption of the nutrients in food.

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