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Research Article

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Comparative Studies on Nutritional Evaluation of Wild yam (*Discorea villosa*) and Other Varieties for Human Consumption

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Abstract The wild yam, *Discorea Villosa, alata* and *bulbifera* tubers used for this study, was obtained from the farm in Rufus Giwa Polytechnic, Owo, Ondo State. The samples were prepared by cleaning, washing, peeling and cutting into smaller sizes, dried for one month. The sample were powdered in Willey milled at 60 mesh size and stored in screw cap bottle at room temperature for further analysis. The samples were evaluated for its nutritional quality, from the present investigation, it is observed that most of the yams were found to be a good source of protein but that of *villosa* (7.44±0.04) is higher than that of *alata* (5.15±0.10) and *bulbifera* (4.88±0.14). Lipids were significantly low in *villosa* (0.04±0.02) than the rest, *alata* (5.28±0.18) and *bulbifera* (6.14±0.11). Crude fibre, moisture contents of the three samples had no significant difference while carloric value of *villosa* in terms of carbohydrates was higher (81.12±2.98) than the rest. No significant difference in vitamin contents while potassium was higher in *villosa* (24.30±1.78) than *alata* (7.86±0.14) and *bulbifera* (15.54±0.30) in terms of minerals composition. These tubers which have great potentials to serve as a source of very necessary nutrients can be used as food for humans and animals

Keywords: proximate, vitamins, starch, soluble protein, mineral composition, *villosa*

Introduction

Yams are root and tuber crops that have been in existence and are widely distributed throughout the tropic with only a few members in the temperate region of the world [1]. Yams are a premium crop in the Nigerian food system and Nigeria is the world largest producer with an aggregate annual output in excess of 50% of total world production. In Nigeria there are about 50-60 species of yam but only five or six species are important as food. Unfortunately, some of these food crops have been under exploited for their food value, [2] for example *Discorea villosa* (wild yam). With ever increasing population pressure and fast depletion of natural resources, it has become extremely important to diversify the present day agricultural produce in order to meet various human needs because the world food crisis has been and will continue to be a major obstacle to humanity [3]. It has been suggested they have nutritional superiority when compared with other tropical roots crops [4]. They are reported as good source of essential dietary nutrients. It has also been reported that a few yam species contain some toxic compounds and can impact serious health implications [5]. Wild yams *(Discorea villosa)* make a significant contribution in the diets of the tribal people in India. The tubers were found with high amount protein, a good portion of essential amino acids and appeared as a fairly good source of many dietary minerals. However their wider utilization regarding the chemical and nutritional content of wild tuber is meagre [6]. The reasons for the limited use of wild yam (*Discorea villosa*) include

unpalatable bitter taste and high post harvest hardening of the tubers [7]. Yams such as the edible starch tubers are of cultural economic and nutritional importance in the tropical and subtropical region of the world, in fact they are one of the principal sources of food and nutrient energy for many people in the tropics [8]. So the significant of the study is primarily aimed at providing information and attention to the enormous importance of wild yam *(Discorea villosa)* and meant to provide information erroneous believe that the wild yam is not fit for consumption as the tubers were found with high amount of protein and good proportion of phytonutrients and can also serve as a fair source of many dietary minerals [9] when compared with other *Discorea* species.

Materials and Methods

The wild yam *(Discorea villosa)* and other two yams white yam *(Discorea alata)* and water yam *(Discorea bulbifera)* collected was prepared by washing with water and thereafter it was peeled and rewashed again and later slashed into different sizes and sundried for one month. The sample were powdered in Willey mill 60 mesh sizes and stored in screw cap bottle at room temperature for further analysis. The moisture content was determined by drying the sample in an oven at 110 °C for 24 hours and was expressed on a percentage basis. Nitrogen content was estimated by the micro-kjelhdhal method and crude protein was calculated (Nx6.25). The contents of crude lipids, crude fibre and ash were estimated [10]. Nitrogen free extract was obtained by difference method by subtracting the sum of protein, fat, ash and fibre from total dry matter [11] from the triple acid digested of the sample, Sodium, Potassium, Calcium, Magnesium, Magnesium, Manganese, Iron, Copper, Zinc were analysed using an atomic absorption spectrophotometer (Perkin Elmer Model 500) [10] while phosphorus was estimated colorimetrically. The total soluble protein of the extract was estimated by the method of lowry *et al* [12]. The total starch and sugar content were determined by the titrimetric method of Moorthy and Padmaja [13]. Data were analysed using the statistical analysis system SPSS and analysis of variance and mean separation were calculated by the general linear model procedure.

Result and Discussion

Table 1: Result of the proximate composition of *Discorea villosa* (wild yam), *alata and bulbifera*

Parameters (g/100g)	*D. villosa* (Wild Yam)	*D. alata* (White Yam)	*D. bulbifera* (Water Yam)
Crude protein	7.44±0.04	5.15±0.10	4.88±0.14
Crude fat	0.04±0.02	5.28±0.18	6.14±0.11
Crude fibre	2.5±0.07	3.96±0.17	3.48±0.17
Ash content	0.5±0.01	3.56±0.02	3.31±0.04
Moisture content	8.80±0.02	8.81±0.02	8.87±0.03
Carbohydrate	81.12±2.98	78.00±0.11	75.65±0.12

Mean ± standard deviation of triplicate determination

Table 1 shows the proximate composition of *Discorea villosa* (wild yam). The result of the assessment were crude protein 7.44 ± 0.04, crude fat 0.04 ± 0.02, crude fibre 2.5 ± 0.07, ash content 0.5 ± 0.01, moisture content 8.80 ± 0.02, while carbohydrate was 81.12 ± 2.98. The result shows that *Discorea villosa* is highly proteinous with the value of 7.44 ± 0.04, the sample is however comparably higher than reported values of 5.15% for white yam, 4.88% for water yam and 3.64% for sweet potatoes [14]. The lipids are mainly structural lipids and are of limited nutritional importance. The lipid however contributes to the palatability of the crops. The lipid content of the sample is quite reasonable as all root crops exhibit very low lipid content. The lipid content was 0.04 ± 0.02. The fibre content of the sample was $2.5 \pm 0.07\%$ and is quite significant and comparably higher than that of water yam (0.65%) and sweet potatoes (0.17%) reported by Bhandari *et al* [5]. Fibre is regarded as essential, as it absorbs water and provides roughage for the bowels, assisting intestinal transits. Very low fibre in foods is however helpful to digestive process but it lowers the vitamin and enzymes content of the food materials. The carbohydrate value of the sample was found to be high, that is $81.12 \pm 2.98\%$ this is quite reasonable as the dry matter of most root crops is made up of about $60 - 90\%$ carbohydrate. Carbohydrate contents of white yam is (78%), water yam is (75.65%) and sweet potatoes is (82.55%) [15]. The moisture value of the sample was 8.80 ± 0.02. The low moisture content

show that it could be stored for longer period of time without going bad, and also increase the shelve life [9] while the ash content of the sample was very low $0.5 \pm 0.01\%$. These compare well with edible yam species.

Table 2: Mineral composition of *Discorea villosa* (wild yam) in g/100g compare with other species

Parameters (g/100g)	*D. villosa* (Wild Yam)	*D. alata* (White Yam)	*D. bulbifera* (Water Yam)
Potassium (K)	24.30±1.78	7.86±0.14	15.54±0.36
Sodium (Na)	0.23±0.24	0.44±0.31	0.78±0.07
Calcium(Ca)	0.065±0.13	4.48±0.11	3.38±0.09
Magnesium (mg)	3.85±0.71	0.24±0.19	0.19±0.20
Iron (Fe)	1.50±0.11	0.06±0.21	0.09±0.14
Manganese (Mn)	0.38±0.01	0.11±0.14	0.02±0.4
Copper (Cu)	0.80±0.24	0.23±0.01	0.15±0.03
Zinc (Zn)	0.042±0.06	6.56±0.07	3.96±1.07

Mean ± standard deviation of triplicate determination.

Table 2 gives the mineral composition of *Discorea villosa*. The minerals detected in the sample and their values were potassium 24.32g/100g,sodium 0.23g/100g, calcium 0.665g/100g, magnesium 3.85g/100g, iron 1.50g/100g, manganese 0.38g/100g, copper 0.80g/100g, zinc 0.042g/100g. The high content of potassium can be utilized beneficially in the diets of people who take diuretics to control hypertension and suffer from excessive excretion of potassium through the body fluid [3]. The manganese content of the wild yam was found to be a little high when compared to other *Discorea* species; all tubers appeared to have a higher level of manganese content compared to Estimated Safe and Adequate Daily Intake (ESADDI) of infants, adults and children NRC/NAS, 1980. The magnesium content was found to be more when compared to that of other *Discorea* species. All the tubers were found to contain higher magnesium content than that of RDA's of NRC/NAS [16] for infant and children. From the table, the potassium and sodium ratio is very reasonable and are of additional nutritional benefits especially for patient with high blood pressure who have to restrict sodium intake, however, high potassium foods are omitted in the diets of people with renal failure [17].

Table 3: Starch, Soluble protein, Total sugar and Vitamins (Niacin and ascorbic acid) content of *Discorea villosa, alata and bulbifera*

Parameters	*D. villosa* (Wild Yam)	*D. alata* (White Yam)	*D. bulbifera* (Water Yam)
Starch (g/100g)	48.14±0.21	45.03±0.20	37.05±0.16
Niacin (mg/100g)	30.15±0.25	38.20±0.24	35.70±0.21
Ascorbic Acid (mg/100g)	64.2±0.21	75.01±1.22	90.04±0.86
Soluble Protein (g/100g)	1.30±0.15	1.35±0.31	2.15±0.30
Total Sugar (g/100g)	1.10±0.10	1.20±0.11	2.72±0.03

Mean ± standard deviation of triplicate determination

The amount of starch (Table 3) estimated in the three tubers were higher than that of the earlier report in the species of *Discorea* [18]. The Niacin content in the tubers of *Discorea alata, D. bulbifera* was found to be higher than that of *Discorea villosa* and other species [19]. The starch content of *Discorea villosa, D. bulbifera and D. alata* was found to be more edible compared with the earlier reports of same wild edible yams [18]. This difference may be due to some edaphic factors. Among the investigated tuber, *D. bulbifera, D. alata* and *Discorea villosa, Discorea bulbifera* registered the highest ascorbic acid content than the earlier stated tubers of *D. alata* and D. villosa [20]. While the soluble protein and sugar content of *Discorea villosa, alata* and *bulbifera* were found to be higher in *D. bulbifera* than the other studied *Alata* and *Villosa.*

Conclusion

All these tubers under analytical observation revealed that they all have great potentials to serve as sources of very necessary nutrients as food for humans and animals. Based on the nutritive evaluation studied on the wild yam, it can be summarised that most of them were found to have lower values for protein, lipid, crude fibre, starch, vitamins and minerals than wild yam.

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