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NUTRIENT COMPOSITION OF SOME GREEN LEAFY VEGETABLES CONSUMED IN SOKOTO

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ABSTRACT

The nutrient composition of some green leafy vegetables consumed in Sokoto was investigated. Of those studied, Brassica integrifolia ***(Kabeji)*** *was found to have the highest crude protein content (29.5 ± 0.7%); Talinum triangulare* ***(Gurai)*** *has the highest contents of ash (28.0 ± 1.1%), while highest sodium and potassium contents were seen in Corchorus olitorius* ***(Ayayyo)*** *(301.0 + 1.0 mg/100 g) and (505.0 ± 2.5 mg/100 g) respectively. Amaranthus caudatus* ***(Alaiyafo)*** *has the highest calcium, iron and magnesium contents (19.0 ± 5.0, 325.0 ± 0.5 and 1020 ± 2.5 mg/100 g) respectively; while the highest phytic acid content was found in Moringa oleifera* ***(Zogala)*** *(200.00 ± 2.5 mg/100 g). Highest phosphorous content was obtained in Talinum triangulare.*

INTRODUCTION

In the tropical countries, vegetables are understood to mean the leafy outgrowth of plants used as food and include those plants and parts of plants used in making soups or serve as integral parts of the main source of meal (Ihekoronye and Ngoddy, 1985).

Vegetables occupy an important place in nutrition. They are widely consumed all over the world. The green leafy vegetables which form the subject of this study are widely consumed in the northern part of Nigeria. The manner in which they are eaten vary. *L. sativa* (**Latas**) for example is eaten raw as part of the salad dish; while *M. oleifera* and *H. cannabinus* (**Rama**) are boiled before eating. Others like *A. caudatus* fall under the category of soup ingredients.

Irrespective of the mode of consumption, the leafy vegetables are nutritionally very useful, though, unlike the root and seed vegetables, they are not good sources of energy because of their low calorific value (≈10 - 50 kcal/100 g) (Hill, 1979). Considerable amounts of vitamins and minerals are supplied by the green leafy vegetables. They are well-known for their content of vitamin A or its precursor β-carotene and vitamin C. They are also chief sources of such mineral elements as calcium and iron (Davidson et al., 1979). In addition, they are good sources of dietary fibre - the presence of which, in the diet, promote gut motility. Furthermore, their presence in the diet help promote satiety (Davidson et al., 1979).

From the foregoing, it can be said that vegetables are an important component of a balanced diet of any community. A comparative study of the nutrient value of the green leafy vegetables consumed in Sokoto State of Nigeria was therefore undertaken.

MATERIALS AND METHODS

Fourteen green leafy vegetables commonly eaten in Sokoto, namely: *Lactuca sativa*, *Corchorus tridens* (**Lalo**), *Vernonia amygdalina* (**Shuwaka**), *Hibiscus sabdariffa* (**Sure** or **Yakuwa**), *Amaranthus caudatus* , *Allium cepa* (**Ganyen albasa**), *Talinum triangulare* (**Gurai**), *Solanum incanum* (**Ganyen gauta**), *Brassica integrifolia* (**Kabeji**), *Moringa oleifera*, *Solanum nigrum* (**Gautan Kaji**) *Corchorus olitorius*, *Ocimum basilicum* (**Doddoya**) and *Ceratotheca sesamoides* (**Kalkashi**) were obtained from various gardens located in Sokoto metropolis and neighbourhood. The leafy and other edible parts of the vegetables were separated from the non-edible portions. The former were thoroughly rinsed, weighed and thermostatted at 30°C. The dried samples were then used for the different determinations carried out.

The crude protein content of the sample was estimated according to the Kjeldahl method of total nitrogen determination (Mitchell, 1962). The ash content was determined as described by Oyeleke (1978). The sodium and potassium ion contents were determined using Corning 400 flame photometer while calcium and magnesium ions were determined using Atomic absorption spectrophotometry. The method of McCance and Widdonson (1935) was followed in the determination of phytate. Iron was determined colorimetrically using 1,10-phenanthroline as a chromogen, and the absorbance was read at 515 nm using spectronic-21.

RESULTS AND DISCUSSIONS

The nutrient status of fourteen green leafy vegetables consumed in Sokoto are summarised in Tables 1 and 2.

With crude protein contents ranging between 12.4 ± 0.1 to 29.5 ± 0.7% (Table 1), the green leafy vegetables are obviously important sources of the nutrient. Significantly ($P<0.05$), higher phosphorous contents were seen in *T. triangulare*, *V. amygdalina* and *A. caudatus*. Since there is a positive relationship between the levels of Ca and P in the body on one hand, and phytate on the other hand limits the bioavailability of both minerals, any vegetable with less phytate could be a better source of these minerals.

It is however apparent from the results that none of the vegetables studied could independently provide the recommended dietary intake of 800 mg, especially when the results are interpreted vis-a-vis the feeding habits of the inhabitants of the area of study, whereby little quantities of these vegetables are used as soup ingredients There is, therefore, the need for complementation from better sources such as milk meat, poultry and fish.

Table 1: Proximate composition (%) of some green leafy vegetables consumed in Sokoto.

Vegetable	Crude Protein ± SD	Moisture ± SD	Ash ± SD
L. sativa	15.6 ± 0.1	93.4 ± 0.7	15.7 ± 1.1
V. amygdalina	22.9 ± 0.0	75.5 ± 1.0	9.6 ± 1.0
H. sabdariffa	12.4 ± 0.6	80.9 ± 0.9	9.2 ± 1.5
A. cepa	20.9 ± 0.1	88.6 ± 1.5	13.6 ± 0.6
C. Tridens	20.9 ± 0.6	68.7 ± 1.0	13.5 ± 1.0
A. caudatus	13.7 ± 0.8	81.1 ± 2.0	17.2 ± 0.9
T. triangulare	19.8 ± 0.6	91.2 ± 3.3	28.0 ± 1.1
S. incanum	20.6 ± 0.2	87.8 ± 0.6	13.6 ± 2.1
B. integrifolia	29.5 ± 0.7	93.2 ± 1.0	17.2 ± 0.5
M. oleifera	26.4 ± 0.3	73.2 ± 0.6	19.9 ± 2.0
S. nigrum	27.3 ± 0.3	85.0 ± 0.9	17.4 ± 1.7
C. olitorius	25.7 ± 0.1	58.0 ± 2.5	15.8 ± 2.6
O. basilicum	18.1 ± 0.1	88.5 ± 1.7	15.5 ± 3.1
C. sesamoides	17.9 ± 0.1	92.9 ± 1.6	19.0 ± 3.3

The sodium content of most of the green leafy vegetables is quite appreciable relative to the recommended daily allowance (RDA). For example, RDA for Na = 200 mg/day, Ca = 400 - 500, K = 510 and Mg = 350 mg/day (Wilson and Fisher, 1959). However, they only appear to complement the chief sources like common salt, milk, meat, egg and seasoning agents. This is so even in individuals whose diets does not often include milk, meat and egg. This is why in most healthy persons, there is little chance of an occurrence of Na deficiency, but there is a chance of excess (Williams, 1977; Krause and Mahan, 1984).

The utilisation of vegetable calcium is not as high as milk calcium because the increased gastro-intestinal motility caused by the bulk of vegetable increases the rate of passage of food through the intestinal tract. In green leafy vegetables, the fact that calcium is contained within the cell whose cellulose wall is digested with difficulty often limits the availability of calcium (Alvioli, 1971). Also considerable calcium may be lost in the preparation of vegetables if thick skins are removed, or the dark green leaves discarded.

Hallberg et. al. (1991) reported that calcium inhibits iron absorption in dose-related manner. They found that about 165 mg calcium could interefre with iron absorption and by reducing the amount of calcium in ones diet, or increasing the bioavailability of dietary iron, the inhibitory effect could be overcome. On this ground, therefore, there will be very minimum interference on the availability of iron from these vegetables considering the Ca:Fe ratio which is considerably low (in favour of Fe) in all the vegetables studied. The interaction is expected to be especially minimal in *T. triangulare*, *L. sativa*, *V. amygdalina* and *A. cepa*. However, the high amount of phosphorous in these vegetables may not make this feasible.

Table 2: Mineral content (mg/100 g) of some green leafy vegetables consumed in Sokoto.

VEGETABLE	Sodium (Na) ± SD	Potassium (K) ± SD	Calcium (Ca) ± SD	Iron (Fe) ± SD	Magnesium (Mg) ± SD	Phosphorus (P) ± SD	Phytic acid ± SD
L. sativa	151.5 ± 1.1	272.5 ± 2.5	40.0 ± 0.6	199.0 ± 1.0	480.0 ± 1.0	250.0 ± 1.3	154.0 ± 4.0
V. amygdalina	102.5 ± 2.5	210.0 ± 9.5	37.5 ± 2.5	182.0 ± 2.0	194.5 ± 1.5	360.0 ± 2.0	90.0 ± 0.1
H. sabderiffa	195.0 ± 5.0	205.0 ± 5.0	80.0 ± 0.4	170.0 ± 5.0	440.0 ± 0.5	195.0 ± 5.0	70.0 ± 0.1
A. cepa	50.0 ± 0.5	274.0 ± 1.5	50.0 ± 0.1	178.5 ± 5.0	274.5 ± 1.5	166.0 ± 1.0	13.0 ± 0.0
C. Tridens	295.5 ± 4.0	429.5 ± 2.5	69.5 ± 0.5	325.0 ± 0.5	382.0 ±2.0	640.0 ± 0.5	69.1 ± 0.5
A. caudatus	100.0 ± 0.1	248.0 ± 2.0	195.0 ± 5.0	292.0 ± 2.0	1020.0 ± 2.5	282.5 ± 2.5	137.0 ± 0.1
T. triangulare	100.0 ± 1.0	230.0 ± 0.1	20.0 ± 0.2	149.0 ± 1.0	862.5 ± 2.5	442.5 ± 2.5	187.5 ± 2.0
S. incanum	237.5 ± 0.5	370.0 ± 3.0	80.0 ± 04	200.5 ± 0.5	439.5 ± 0.5	197.5 ± 2.5	132.5 ± 2.5
B. integrifolia	151.0 ± 2.0	400.0 ± 1.0	ND	110.0 ± 0.5	ND	185.0 ± 5.0	130.0 ± 1.0
M. oleifera	152.0 ± 2.0	275.0 ± 5.0	ND	145.0 ± 5.0	ND	190.0 ± 4.0	200.0 ± 2.5
S. nigrum	150.0 ± 0.5	380.0 ± 1.5	ND	205.0 ± 5.0	ND	200.0 ± 9.5	139.0 ± 1.0
C. olitorius	301.0 ± 2.0	510.0 ± 2.5	ND	300.0 ± 2.0	ND	200.0 ± 3.0	60.0 ± 2.0
O. basilicum	201.0 ± 1.4	351.0 ± 2.4	86.5 ± 2.7	206.6 ± 2.4	346.2 ± 5.3	196.6 ± 4.7	ND
C. sesamoides	180.0 ± 0.8	300.0 ± 2.0	82.6 ± 1.8	260.0 ± 1.0	406.2 ± 7.1	170.0 ± 2.2	ND

ND = NOT DETERMINED.

Potassium, like other minerals, is a vital mineral element. Nonetheless, no dietary requirement is specified for it. The usual diet (Krause and Mahan, 1984) contains from 2 to 4 g daily; which seem adequate for common need taking into consideration the recommended daily allowance of 510 mg/day for it as reported by Wilson and Fisher (1959). The leafy vegetables contribute appreciably in the supply of dietary potassium. Though, most of those studied are rich in the element, *Corchorus* spp. are the richest in potassium.

Leafy vegetables appear to have appreciable amounts of magnesium. With the exception of *V. amygdalina*, almost all the leafy vegetables studied are very rich in the element to the extent that 100 g of the vegetables can provide the adult RDA. However, since calcium and magnesium antagonise each other, and also the presence of calcium and phytate decrease the intestinal absorption of magnesium (Krause and Mahan, 1984) these factors should be taken into consideration when choosing a source of dietary magnesium from amongst the vegetables studied. *A. Caudatus* and *T. triangulare* seem to be better sources of the element.

Only about 5% of the iron in most vegetable foods such as rice, corn, spinach, and wheat is absorbed whereas 20% of that in meat is absorbed. High bulk in the diet deprives the utilisation of iron. This may account for the reported poor absorption of iron (approx. 1 - 2%) often noted from green leafy vegetables such as spinach. The high phytic acid content in these vegetables may reduce their value as sources of iron due to interaction of iron with the acid to form an insoluble complex. Excess phosphorous may also have an inhibitory effect on iron absorption. The role of calcium in iron absorption had earlier been discussed (Hallberg et. al., 1989b).

The bioavailability of the iron contained in the vegetables and other foodstuffs could be further enhanced by either reducing the intake of foods containing inhibitors of iron absorption like phytate or increasing intake of foods such as meat and ascorbic acid which enhance its absorption (Hallberg et. al., 1989a).

CONCLUSION

From the foregoing, it could be seen that the green leafy vegetables consumed in Sokoto State are rich in protein and mineral elements. With careful selection, combination and complementation, the vegetables can meet protein, mineral and probably other nutritional requirements of the populace. This becomes more apparent when one consideres other foodstuff along which the vegetables are consumed with. The consumption of these green leafy vegetables should therefore be encouraged especially among the rural inhabitants who pay less attention to some of the Leafy vegetables studied.

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