Original Research Article

Minerals, vitamins and Amino acids compositions of *Melanthera biflora*

ABSTRACT

The minerals, vitamins and Amino acids composition of *Melanthera biflora* leaves were investigated using standard methods. The result shows that of the eleven vitamins detected; only vitamin C was found in moderately high amount (99.37mg/100g), while the rest were found in insignificant amount. Ten minerals element were detected, including iron (14.63) copper (2.32). Cobalt (0.04) manganese (5.13), calcium (93.52) magnesium (126.17), potassium (71.39) sodium (32.37), phosphorus 36.50, selenium (0.006) all in mg/100g. The leaves had a high content of the essentials amino acids (47.5%) and moderate levels of non-essential amino acid (45.94%), sulphur -containing amino acids (5.69%) and aromatic amino acids (10.49%). It is very rich in Leucine (11.32%) and contains all the essentials amino acids except tryptophan. This result shows that the leaves contain an appreciable amount of nutrients, vitamins and minerals that could be included in diets to supplement our daily dietary allowance.

Keywords: minerals, vitamins, amino acids, essentials

INTRODUCTION

Green leafy vegetables occupy an important place among the food crops as they provide adequate amount of vitamins and minerals for human consumption. They are also rich source of carotene, ascorbic riboflavin, folic acids, among others. They also contain many minerals like calcium, iron and phosphorus (Fasujy, 2006).

Plants constitute an important source of natural products which differ widely in terms of structure and biological properties. They have played a remarkable role in food industries, local consumption as well as in the orthodox medicine of various countries.

Generally vegetables species abound in the world. Green leafy vegetables constitute an indispensable constituent of human diet in Africa and in West Africa in particular (Osagie and Offiong 1988). Nigeria is blessed with great natural tropical rainforest that is characterized by viable soil where vegetables of high nutritional value are grown. Most of these vegetables are not well known hence not consumed as their nutritional composition are not known. The present study therefore is aimed at evaluating the mineral, vitamins and amino acid compositions of *Melanthera biflora*, tropical leafy vegetables found in southeastern Nigeria.

Melanthera biflora is a perennial herbaceous plant which belongs to the family of sterecae. Its common name is beach daisy. It is known among the

Igbos as “Akwuwa” and “akwuba” among the Efiks in the Cross Rivers State of Nigeria. It produces luxiorous edible leaves which are used in making soup

MATERIALS AND METHODS

Sample Collection

The leaves of *Melenthera Biflora* were harvested fresh from “Ude” plantation in okon, Aku, in Ohafia Local Government of Abia State and was later identified by a taxonomist in the herbarium of the department of plant science. University of Port Harcourt Dr. Edwin Nwosu.

Sample Preparation

The harvested vegetable leaves were stalked, washed with cold running tap dried in an oven at 60^0c for 24 hours, after the drying the leaves were grounded into a fine powder using a mortar and a pestle and sieved to pass through a 40-mesh sieve an stored in an air-tight container under refrigerated temperature for further use.

Determination of Mineral Composition

The sample was investigated for elemental composition by using atomic absorption spectrophotometer (AAS), Bulk Scientific model AVG 210. Appropriate working standard solutions were prepared for each element. The calibration curve was obtained for concentration versus absorbance. The data were statistically analyzed by fitting of straight line by least square method. All elements were determined in the leaf under this investigation procedure.

Laboratory procedures for the preparation and determination of macro and micronutrients were used as outlined by Shah et al. (2009) for plant samples.

Vitamin Determination

Vitamins were determined by the Meyer Spectrophotometric method of Morton (1942) as described by the Association of Vitamin Chemists AOAC (2006).

AMINO ACID EXTRACTION

Modified AOAC Method 982 30, 2006 was followed in the extraction of the sample for the ammo acid analysis.

The dried and pulverized sample was made to be free of water by ensuring constant weight for a period of time in the laboratory.

The sample of 10.0g was weighed into the 250ml conical flask capacity. The sample was defatted by extracting the fat content of the sample with 30ml of the petroleum spirit three with soxhlet that was equipped with thimble. The sample was hydrolyzed three times for complete hydrolysis to be achieved.

The amino acid content of the sample was recovered by extracting with 30ml of the dichloromethane three times before concentrating to 1.0ml. The concentrated extract was derivatized for volatility that is suitable for gas chromatography analysis.

RESULT AND DISCUSSION

Table 1 Mineral composition of *Melanthera biflora* leaves

Minerals	**Amount (mg/100g)**	**% Composition**
Iron	14.67	3.829
Copper	2.322	0.608
Cobalt	0.041	0.011
Manganese	5.125	1.342
Calcium	93.516	24.481
Magnesium	16.17	33.029
Potassium	71.39	18.690
Sodium	32.373	8.476
Phosphorus	36.50	9.555
Selenium	0.006	0.0016
Total	**381.999**	

Table 2 Comparison of mineral composition of *Melanthera biflora* leaves with the WHO recommended daily allowance

Minerals	***Melantera biflora* (mg/100g)**	**RDA**
Iron	14.627	15 mg
Copper	2.322	2 mg
Cobalt	0.041	Less than 20 mg
Manganese	5.125	5 mg
Calcium	93.516	1000 mg
Magnesium	126.171	350 mg
Potassium	71.39	3500 mg
Sodium	32.373	2400 mg
Phosphorus	36.50	1000 mg
Selenium	0.006	35 µg

End Note: Percentages are based on the weight of the compounds per the total extract of its family.

Table 3 The vitamin composition of *Melanthera biflora* leaves

Vitamins	**Amount (mg/100g)**	**% Composition**
Vitamin B_3	150.3	0.324
Vitamin B_5	0.003	0.065
Vitamin B_6	0.0072	0.016
Vitamin C	46107	99.37
Vitamin A	0.0038	0.0082
Vitamin B_1	0.0035	0.0075
Vitamin B_2	0.0085	0.0018
Vitamin D	0.0038	0.0082
Vitamin E	0.0085	0.0085
Vitamin B9 (folic acid)	0.0077	0.0017
Vitamin K	0.012	0.026
Vitamin B_{12}	0.0015	0.0032

Table 4 Comparison of vitamin from leaves of *Melanthera biflora* with WHO recommended daily allowance

Vitamins	***Melanthera biflora* (mg/100g)**	**RDA**
Vitamin B_3	0.324	20 mg
Vitamin B_4	0.065	1.2 mg
Vitamin B_6	0.16	1-2 mg
Vitamin C	99.37	75 mg
Vitamin A	0.0082	600 mg
Vitamin B_1	0.0075	1.4 mg
Vitamin B_2	0.0018	1.5 mg
Vitamin D	0.0082	10 µg
Vitamin E	0.0085	8-10 mg
Vitamin B_9 (folate)	0.0017	40 µg
Vitamin K	0.026	50-100 mg
Vitamin B_{12}	0.0032	1-2 µg

Table 5 Amino acid composition of *Melanthera biflora* leaves

Amino acid	**Amount (x 10^1) (mg/100g)**	**% Composition**
Glycine	0.239	3.40
Alanine	0.390	5.55
Serine	0.233	3.32
Proline	0.275	3.92
Valine	0.382	5.44
Threonine	0.410	5.84
Isoleucine	0.414	5.90
Leucine	0.795	11.32
Aspartate	0.936	13.33
Lysine	0.370	5.27
Methionine	0.087	1.25
Glutamate	1.007	14.34
Phenylalanine	0.411	5.85
Histidine	0.187	2.66
Arginine	0.465	6.62
Tyrosine	0.320	4.56
Cystine	0.101	1.44
Total	**70.22**	

Table 6 Comparison of essential amino acid and composition of *Melanthera biflora* with World Health Organization Recommend daily amount of essential amino acid

Amino acid	*Melanthera biflora*	mg/kg boiled	mg/70 kg	mg/100 kg
Histidine	18.7	10	700	1,000
Isoleucine	41.4	20	1,400	2,000
Leucine	79.5	39	2,730	3,900
Lysine	37.0	30	2,100	3,000
Methionine	0.86	45 (total)	1,050	1,500
phenylalanine	41	25 (total)	1,750	2,500
Threonine	41	15	1,050	1,500
Tryptophan	-	4	280	400
Valine	38.2	26	1,820	2600
Cysteine	1-0.07	-	-	-

Table 7 Comparison of chemical scores of *Melenthera biflora* leaves with WHO reference protein pattern

Amino acid	Reference pattern mg/g protein amino acid score. (%)			
	Human milk (%)	Whole egg mg/g	A	B
Glycine	22 ± 2	2.89	82.3	15.45
Alanine	46 ±2	5.49	71.00	13.88
Serine	61± 4	6.07	38.4	5.44
Proline	95±5	2.92	94.2	4.13
Valine	51±2	6.02	63.5	10.67
Threonine	44±1	3.41	120.6	13.27
Isoleucine	53±3	50.00	8.3	11.13
Leucine	104±3	6.80	116.9	10.88
Aspartate	86±9	6.09	155.7	15.5
Lysine	71±6	4.64	34.6	2.64
Methionine	61±09	8.01	34.6	2.64
Glutamate	190±8	10.89	93.2	7.55
Phenylalanine	37±1	4.94	83.2	15.8
Histidine	23±2	1.67	111.9	11.57
Arginine	36±3	4.54	102.4	18.39
Tyrosine	46±2	3.21	97.7	9.91
Cystine	20±2.6	1.88	53.7	7.2

A = *Melanthera biflora* compared with human milk

B = *Melanthera biflora* compared fowl egg protein pattern

DISCUSSION

The leaves of *Melanthera biflora* had higher calcium, sodium and magnesium than *A. hybridus* (Oguntona, 1998), but lower potassium content. From the above result, we can infer that *Melanthera biflora* are sources of soluble minerals, which help in the maintenance of acid-base balance of the body tissues. These minerals help complete the absorption of vitamins, proteins, fats and carbohydrates of the food (Islam et al., 2004). Calcium and

120 iron are important elements needed by the cells and tissue of the bodies,
121 especially as they form component of enzymes and electron transducers (Olaiya
122 and Adebisi, 2009). Calcium is required for bone and teeth formation and in
123 the proper functioning of the nervous system. The high calcium concentration
124 in *Melanthera biflora* suggests that it could be more advantageous to the body
125 in the functions associated with the mineral. It has been suggested that
126 commonly consumed leafy vegetables are superior sources of calcium
127 compared to milk (Oke, 1966). Deficiency of calcium can lead to malformation
128 of bones and shells. Magnesium and potassium are needed for maintaining the
129 acid – base balance in the body; magnesium is an obligate cofactor for DNA
130 synthesis, while potassium is required for muscle and nerves functions.
131 *Melanthera biflora* is rich in magnesium, and so, can be used to supplement
132 low magnesium based stable foods such as cassava. It is therefore
133 recommended for hypertensive patients since magnesium has a hypotensive
134 effect. The iron content of *Melanthera biflora* was higher than those of *T.*
135 *occidentalis* and *A. hybridus* (Olaiyi and Adebisi, 2009), and would be beneficial
136 for anaemic patients. Therefore *Melanthera biflora* can serve as an excellent
137 source of minerals for human nutrition.

138 **Vitamin composition of *Melanthera biflora* leaves**

139 The *Melanthera biflora* is rich in ascorbic acid, which is higher than the
140 concentration previously reported for some other stable vegetables such *T.*
141 *occidentalis*, *T. triangular*, C. *argentea*, S. *nodiflorium*, *B. alba*, *S. acthiopica*, *A.*

caudatus, *A. hybridus*, *C. pepo* and *Amaratus Spinosus* (Olaiya and Adebisi, 2009). The body cannot synthesis ascorbic acid, so it must be obtained entirely through diet, in this connection, *Melanthera biflora* should serve as a good source of the water soluble vitamin. Ascorbic acid is essential for the healthy formation of bones and teeth. It is a powerful antioxidant (Szeto et al., 2002) whose deficiency results in scurvy with swellings of the joints and gums, loosening of the teeth and haemorrhages of the skin and mucus membrane. Niacin, thiamine and riboflavin play important roles in nutrient metabolism, *Melanthera biflora* is also a good source of these micronutrients.

Amino acid composition of the leaves of *Melanthera biflora*

Melanthera biflora leaf contains higher total essential amino acid (47.5%) than total non-essential amino acid (45.94%) but has higher total aromatic amino acid (10.44%) than total sulphur containing amino acid (5.56%). *Melanthera biflora* is rich in essential amino acids, leucine, isoleucine, valine, phenylalanine, lysine, histidine and threonine and can meet the minimum daily requirements for them (FAO/WHO/UNU, 1991). The dominant essential amino acid is leucine (11.32%) and is higher than that of *G. latifolium* (2.25) and *Vernonia amydalina* 1.66 (Afolabi 2007). In comparison to the egg protein and human milk protein reference, the green leafy vegetable score higher than those previously reported for G *latifolium* and v.*amydalina* (Afolabi 2007).

Conclusion

This result reveals that the leaves contain an appreciable amount of nutrients, Vitamin, Amino acid and mineral elements that should be included in diets to supplement our daily allowance needed by the body. So it is my believed that these results will help to stimulate the consumption or utilization of this leafy vegetable as a good source of nutrients, need for healthy growths.

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