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Amino Acid Composition of Ten Commonly Eaten Indigenous Leafy Vegetables of South-West Nigeria

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Abstract The amino acid distribution patterns of ten indigenous leafy vegetables commonly eaten in South-West Nigeria were evaluated and compared using ion exchange chromatography. The vegetables studied were: *Talinium triangulare* (gbure), *Basella alba* (amunututu), *Telfaria occidentalis* (ugwu*), Occium gratissimum* (efinrin), Corchorus olitorius (ewedu), *Solanum macrocarpon* (igbagba), *Vernonia amyldalina* (ewuro), *Amaranthus cruenthus* (arowojeja), *Solanecio biafrae (worowo),* and *Cnidoscolus aconitifolius* (iyana ipaja).Amongst the seventeen amino acids investigated in the vegetables, aspartic acid was highest in concentration with an average concentration of 10.91 g/100g of crude protein (cp) while cysteine was lowest (with an average of 0.602 g/100g (cp) on a dry weight basis, the leaves that contained the highest total amino acids (TAA) was *Telfaria occidentalis* (72.55 g/100g) of crude protein (cp) followed by *Solanecio biafrae* (72.47 g/100g)cp with *Vernonia amygdalina* being the lowest (63.59g/100g)cp. While the limiting essential amino acid was methionine 0.83g/gcp, leucine (with an average of 0.74g/gcp) was the most abundant essential amino acid (EAA). The average percentage distribution of different group of amino acidsincludes: essential (30.23%); non-essential (52.64%); neutral (56.36%); acidic (28.56%); basic (15.00%) and aromatic (10.12%). This shows that the vegetables are rich in different groups of amino acids and good sources of quality protein and amino acids.

Keywords: *south-west leafy vegetables, amino acids, proteins, food analysis, food composition, essential amino acids*

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1. Introduction

Green leafy vegetables constitute an indispensable constituent of human diet in Africa generally and West Africa in particular [1]. The varieties of leafy vegetables utilized are diverse, ranging from leaves of annuals and shrubs to leaves of trees. Leafy vegetables are generally good sources of nutrients, important protective foods, highly beneficial for the maintenance of health and prevention of diseases as they contain valuable food ingredients which can be utilized to build up and repair the body. They are valuable in maintaining alkaline reserve in the body and are valued mainly for their high vitamin, dietary fibre and mineral contents [2]. The dark green leaves and deep yellow fruits provide a high amount of carotene, ascorbic acid and micro-minerals which play important roles in nutrient metabolism and slowing down of degenerative diseases [3].

Nigeria is endowed with a variety of traditional vegetables and different types are consumed by the various ethnic groups for different reasons. The utilization of leafy vegetable is part of Africa's cultural heritage and they play important roles in the customs, traditions and food culture of the African household. The wide variation in colour, shape, tastes, and textures of various vegetables have added an interesting touch to meals [4].

Adebooye et al., [5] reported that there are over 40 different indigenous leafy vegetables eaten in Nigeria and the South West alone accounted for 24 of them. Mensah et al., [6] similarly identified 29 different green leafy vegetables in Edo State, Nigeria. The growing attention on vegetables as vital dietary components is significant, as leafy vegetables have long been known to be indispensable ingredients in traditional sauces that accompany carbohydrate staples [7]. African indigenous and traditional leafy vegetables thus have a pivotal role in the success of the World Health Organization's (WHO) global initiative on fruits and vegetables consumption in the sub-continent. The joint WHO/FAO 2003 report on a global strategy on diet, physical activity and health recommended a minimum daily intake of 400g of fruits and vegetables for prevention of diseases WHO/FAO, [8], at their 2004 joint Kobe workshop, the WHO and FAO developed a framework that proposes ways to promote increased production, availability and access, and adequate consumption of fruits and vegetables [9].

In many African countries the fight against malnutrition and under-nourishment continues to be a basic goal of development and a variety of strategies is being applied. Strategies based on nutrient-rich foods like vegetables are considered essential [10]. Studies have repeatedly shown that increasing colon and stomach cancer correlate with low vegetable meals and it has been suggested that vegetables may help resist them. There is also increasing epidemiological evidence in favour of an association between nutrition and susceptibility to infection. Health disorders such as appendicitis, hemorrhoids, gall stones, heart diseases, obesity and constipation can be either corrected, or treated by copious consumption of vegetables [11]. The awareness of the populace on the significance of nutrition in health has resulted to an increasing quest for biochemical knowledge of the composition of foods.

Amino acids can be used as treatment for all sort of medical conditions. Out of many thousands of possible amino acids, humans requires only 20 different kinds, considering the vast numbers of amino acids and possible combinations that exist in nature, the number of amino acids essential to life is extremely small. Yet of the 20 amino acids required by humans for making protein, only 12 can be produced within the body, whereas the other 8, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, trytophan and valine must be obtained from the diet. In addition, adults are capable of synthesizing arginine and histidine but these amino acids are believed to be essential to growing children, meaning that children cannot produce them on their own and must be obtained from other external supplies [12].

Despite high availability of varieties of indigenous, wild, or semi-wild vegetables in Nigeria, especially the South-West, which are good sources of amino acids that is used for building the protein required for the body's requirements, many of such plants have been identified but lack of adequate data on their chemical composition has limited the prospect of their utilization. Secondly, the reports in literature on amino acids content of indigenous leafy vegetables are scanty and there is a great need to have a comprehensive documentation on them, hence the need for the present study.

2. Materials and Methods

2.1. Materials

The market survey in search of vegetables commonly eaten by the South-Western people of Nigeria was conducted. The survey showed that Ekiti State is blessed with all the common vegetables eaten by the people of South West and that representative samples could always be obtained from the main market or farm settlements in Ado Ekiti and Ikere Ekiti metropolis. *Telfaria occidentalis* (ugwu*)* was purchased from Oja Oba (King's market) at Ado –Ekiti while others were purchased directly from a vegetable farm at Ikere-Ekiti. Portions of the stem, leaves and flowers of the vegetables were taken to Herbarium in the Department of Plant Science, Ekiti State University, Ado-Ekiti for identification by Mr Femi Omotayo. Approximately, 60-100mg of each leafy vegetable was selected from each plant species and set aside for analysis. The fresh vegetables are listed in Table 1. All reagents used in the analysis were of laboratory grade. Chloroform, methanol, acetic acid and hydrochloric acid were purchased from Sigma-Aldrich (St. Louis) while sodium acetate was from Merck (Darmstadt, Germany). All amino acids standards were purchased from Sigma-Aldrich (St. Louis) with reagent grade ≥ 98-99.5%.

Table 1. Showing names of South-West indigenous vegetables

BOTANICAL NAME	FAMILY
Amaranthus cruenthus	*Amaranthaceae*
Basella alba	*Basellaceae*
Cnidoscolus aconitifolius	*Euphorbiaceae*
Corchorus olitorius	*Tiliaceae*
Occium gratissimum	*Lamiaceae*
Talinum triangulare	*Portulaceae*
Telfaria occidentalis	*Cucurbitaceae*
Solanecio biafrae	*Asteraceae*
Solanum macrocarpon	*Solanaceae*
Vernonia amygdalina	*Asteraceae*

2.2. Sample Preparation

The fresh leaves of the ten vegetables were washed thoroughly with distilled water, shredded separately and air-dried for one week. The leaves were then milled into a powdered form and 10g of each sample was removed randomly and stored in an airtight plastic container at 4^0C pending analysis. Analysis of samples started three weeks after the preparation.

2.3. Determination of Amino Acids

The amino acids profile of the vegetable samples were determined using methods described by AOAC, (1995). About 2 g of the sample was weighed into the extraction thimble and the fat extracted with chloroform -methanol using soxhlet extraction apparatus for 5-6 h.

30-35 mg of the defatted sample was weighed into glass ampoules, 7 mL of 6 M HCl was added and oxygen was expelled by passing nitrogen gas into the ampoule (to avoid possible oxidation of some amino acids during hydrolysis). The glass ampoule was then sealed with a bunsen flame and put into an oven at 105°C for 22 h. The sample was allowed to cool before breaking open at the tip and the content was filtered to remove the residue. The filtrate was then evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved with 5 mL of acetate buffer (pH 2.0) and stored in a plastic specimen bottle and kept in a deep freezer pending subsequent analysis. The Technicon Sequential Multisample Amino Acid Analyser (TSMAA), Technicon Instruments Corporation, New York was used for the analysis. The principle is based on ion-exchange chromatography (IEC) FAO/WHO, [13] and the equipment was designed to separate free acidic, neutral and basic acids of the hydrolysate.

5–10µl of each sample was injected into the cartridge of the analyzer and about 76 min elapsed for each analysis. The column flow rate was 0.50 ml/min at 60^oC with reproducibility consistent within ±3%. The experiment was done in duplicates. At the end of the analysis, the net height of each peak produced by the chart recorder or TSMAAA (each representing an amino acid) was measured, the half height recorded and the approximate area of each peak was calculated. The norleucinee equivalent (NE) for each amino acid in the standard mixture was also calculated using appropriate formula as indicated below before the amount of each amino acid present in the sample was calculated in g/100g protein. The net height of each peak produced by the chart record of the TSM representing an amino acid measured. The half height of the peak on the chart was measured and the area of the peak was then obtained by multiplying the height with the width at half height. The norleucine equivalent for each amino acid in the standard mixture was calculated using the formula:

NE = Area of norleucine peak/Area of each amino acid. A constant S was calculated for each amino acid in the standard mixture:

Sstd = NEstd x Mol.weight x μM AA_{std}

Then the amount of each amino acid in the sample was calculated in g/100g protein using the formula:

Concentration (g/100g protein) = NH x Width at NH/2 x S_{std} x C

C = Dilution factor x 16/sample Wt (g) x N % x 10 volume loaded÷ NH x W(Nor)

Where NH = net height

W = width at half height

Nor = Norleucine

AA = Amino Acid

The essential amino acid score was calculated using the following formula: amino acid score = amount of amino acid per test protein (mg/g)/amount of amino acid per protein in reference pattern (mg/g) ([14]. It was also calculated based on whole hen's egg [15]. The ratio of total essential amino acid (TEAA) to the total amino acid (TAA), i.e. (TEAA/TAA), total sulphur amino acid (TSAA), percentage cystine in TSAA (%Cys/TSAA), total aromatic amino acid (TArAA), and the Leu/Ile ratios were calculated. All data generated were analyzed statistically, calculated for were the mean, standard deviation and coefficient of variation percent using Microsoft Excel.

3. Results and Discussion

The amino acid composition of some commonly eaten indigenous vegetables in South Western Nigeria (Table 1) has been studied and the results were presented in Table 2.

Table 2. Amino acid composition of vegetables (g/100gcp)

	Total	Lys	Hys	Arg	Asp	Thr	Ser	Glu	Pro	Gly	Ala	Cys	Val	Met	Ile	Leu	Tyr	Phe
A.cruenthus	70.15	4.30	1.80	4.12	8.92	3.30	2.84	10.95	2.73	3.50	3.96	0.77	3.90	0.93	3.42	8.20	2.93	3.58
C. olitorius	66.46	4.21	1.99	4.00	9.10	3.00	2.04	10.05	2.73	3.61	3.89	0.50	3.30	0.75	3.00	7.35	3.24	3.70
C.chayamansa	66.74	4.60	2.21	3.73	8.50	3.25	1.93	9.98	3.00	3.04	4.00	0.58	3.66	0.80	3.36	7.80	2.50	3.80
S.macrocarpon	69.35	4.37	2.08	3.90	8.70	2.92	3.08	10.72	3.22	2.99	3.80	0.70	3.75	0.88	3.02	8.06	2.80	4.00
O.gratissimum	68.53	3.80	2.00	3.96	8.71	2.95	3.10	10.80	3.22	3.41	4.00	0.70	3.55	0.80	2.95	6.92	3.24	4.42
S.biafrae	72.47	3.63	2.14	4.51	8.64	3.44	3.01	12.60	2.92	3.51	4.25	0.45	4.10	0.88	3.61	7.76	3.10	3.92
B.alba	63.66	3.74	2.05	4.00	7.66	2.80	2.52	11.32	2.91	3.09	3.66	0.40	3.40	0.67	2.73	6.80	2.31	3.60
T.triangulare	67.90	4.00	2.24	4.36	8.03	3.25	2.89	11.25	3.00	3.27	3.85	0.52	3.66	0.77	3.02	7.06	2.63	4.10
V.amygdalina	63.59	3.65	1.81	3.81	7.91	2.61	2.80	10.43	2.83	3.16	3.77	0.60	3.06	0.72	2.83	6.84	2.93	3.83
T.occidentalis	72.55	4.60	1.93	4.51	9.25	3.40	2.90	11.02	2.92	3.70	4.10	0.80	4.06	1.10	3.50	7.60	3.24	3.92
Mean	68.14	4.13	2.03	4.09	8.54	3.09	2.71	10.91	3.95	3.33	3.93	0.60	3.64	0.83	3.14	7.40	2.89	3.89
S.D	2.99	0.42	0.15	0.28	0.52	0.28	0.42	0.75	0.17	0.25	0.17	0.14	0.33	0.12	0.30	0.52	0.31	0.24
C.V %	4.38	10.17	7.39	6.84	6.09	9.06	15.4	6.87	4.30	7.51	4.33	23.3	9.07	14.46	9.55	7.03	10.73	6.17

Results are expressed as means of two determinations (n=2).

A total of seventeen (17) amino acids were analyzed for in the ten vegetable samples which are: lysine (lys), histidine (hys), arginine (arg), aspartic acid (asp), threonine (thr), serine (ser), glutamic acid (glu), proline (pro), glycine (gly), alanine (ala), cysteine (cys), valine (val), methionine (met), isoleucine (ile), leucine (leucine (leu), tyrosine (tyr) and phenylalanine (phe).

The amino acid contents are generally high and the leaves that contain the highest total amino acids on a dry weight basis was *T.occidentalis* (72.6g/100gcp) followed by *S. biafrae* (72.5g/100gcp). Others ranged between 63.6-70.2g/100gcp. This is in agreement with the result by Olaiya and Adebisi, [16], which demonstrated that *T.occidentalis* had a highest protein content among the ten leafy vegetables in South – Western Nigeria. It is an indication that all the vegetables are good sources of protein.

Glutamic acid (Glu) had the highest concentration amongst other amino acids in all the ten samples (with an average of 10.9g/100gcp) followed by aspartic acid (with an average of 8.54g/100gcp) while cystine (cys) had the least value in all the vegetables (with an average value of 0.60g/100gcp). The glutamic acids of the ten vegetables were higher than the values reported for *Lima colarin* sp (10.1mg/g) by Adeyeye and Afolabi [17] but lower than the values reported for *Archatina marginata* (144.0mg/g). The asphartic acid content of the ten vegetables was also high compared to the value (1.14g/100gcp) reported for *Afzelia Africana* [18]. Therefore glutamic acid and aspartic acid had the highest concentration among their groups and are both acidic amino acids. The aspartic acid of the ten samples was higher than that obtained by Adeyeye et al., [19] for *solanum macrocarpon* (69.5mg/g) and *solanum aethiopicum* (72.3 mg/g). Table 2 further showed that the major abundant amino acids were glutamic acid, asphartic acid, leucine, lysine, and arginine with mean values 10.9, 85.4, 74.4, 41.3, and 40.9mg/gcp respectively. This is in agreement with the results obtained by Sobowale et al., [20], and Adeyeye and Afolabi,[17]. The vegetables contain reasonable concentrations of essential amino acids which the body cannot synthesize directly and are needed for the maintenance and repair in the body. Among the essential amino acids, leucine was highest in *A.cruenthus* (8.20g/100gcp) than in other vegetables. The next is lysine which is higher in *T. occidentalis* (4.62g/100gcp) than others. The least essential amino acid is methionine which ranged between 0.67 - 1.10g/100gcp with *T. occidentalis* having the highest content. Valine values are between 3.06 - 4.10g/100gcp with *V. amygdalina* having the least value while *S. biafrae* the highest value. Histidine values ranged between 1.80 - 2.21g/100gcp, *A. cruentus* had the least value while *C. aconitifolius* had the highest. Threonine content of samples is between 2.61 - 3.44g/100gcp with *V. amygdalina* having the least and *Solanum macrocarpon* the highest. Isoleucine values were between (2.73 - 3.61g/100gcp); *B. alba* had the least and *S. biafrae*, the highest value. Phenylalanine was generally high in samples with values ranging between 3.58 - 4.42g/100gcp, *A.cruenthus* had the least while *O.gratissium* had the highest value, *S.biafrae* and *B. alba* had the same value. Threonine value was between 2.61 - 3.44g/100gcp with *V. amygdalina* having the least value and *S.biafrae* the highest value. The CV% was generally low, indicating the closeness of the amino acids values.

Table 3 presents the summary of the calculated essential, non -essential, basic, acidic, neutral, aromatic and total sulphur amino acids (mg/gcp). The essential amino acids were further analyzed with and without histidine. Histidine is important for the synthesis of red and white blood cells. It is a precursor for histamine which is good for sexual arousal and improved blood flow. High dosage of histidine however increases stress and anxiety [12].

The content of TSAA was generally lower than the recommended values for Children (5.8g/100g cp) FAO/WHO (1990). The TARAA ranged from 5.91-7.66g/100gcp which is averagely within the range suggested for an ideal protein (6.8-11.8g/100gcp). The aromatic amino acids are precursors of epinephrine and thyroxin Robinson, (1987). The % CYST/TSAA ranged from (33.83-46.67), this is in agreement to the reported value for *Parkia biglobossa* seeds (44.4%) [21]. It has also been reported that most animal proteins are low in cystein and hence in CYST/TSAA ratios, for instance, 21.0%, 38.8% and 35.5% were reported for *Limicolaria sp*, *A.archantina* and *A.marginata* respectively [17]. Cysteine has a positive effect on mineral absorption, especially Zinc [22].

T. occidentalis had the highest value for the total amino acid with histidine TEAA (346.2mg/gcp) while sample of *V.amygdalina* had the least value (291.6mg/gcp). The mean value for all the ten vegetables was 322.8mg/gcp which is comparable to the value obtained by Akinyeye et al., [23] for *P.mildbraedi,* Omoyeni et al., [24] for *M.scandens* but higher compared to the reported value for *B.sapida (226.86mg/gcp) by* Akintayo et al., [25] and lower to the value obtained for *Limocolaria sp* (393mg/gcp) by Adeyeye et al., [26]. The mean total non - essential amino acid value of 358.7mg/gcp was low compared to 407mg/gcp for Kidney bean seed Olaofe et al., [27] but higher than the values reported by Akinyeye et al., [23] (345.30mg/gcp), Adeyeye et al., [28] (328mg/gcp) and Adeyeye et al., [29] (341mg/gcp) for *P. mildbraedi*, *A.occidentale* and fermented cocoa nibs respectively. The %TNEAA was 52.64% while %TEAA with histidine and % TEAA without histidine were 47.36% and 44.38% respectively. This is an indication that the protein is of high quality. The % of TNAA is 52.73% meaning that the bulk of the amino acid is neutral. The %CV are generally low except in %TSAA, indicating close agreement between results.

Table 3. Summary of the calculated essential, non-essential, acidic, basic, neutral, aromatic total sulphur amino acids for the vegetables

Samples	TAA	TEAA+HIS	TEAA-HIS	%TEAA+HIS	%TEAA-HIS	TNEAA	%TNEAA	TAAA	%TAAA
A.cruenthus	70.15	33.55	31.75	47.82	45.26	36.60	52.17	19.81	28.32
C. olitorius	66.46	31.30	29.31	47.10	44.10	35.16	52.90	19.15	28.81
C.chayamansa	66.74	33.21	31.00	49.76	46.45	33.53	50.24	18.48	27.68
S.macrocarpon	69.35	32.71	31.26	48.10	45.07	36.01	51.92	19.42	28.00
O.gratissimum	68.53	31.35	29.55	45.75	42.83	37.18	54.25	19.51	28.47
S.biafrae	72.47	33.99	31.85	46.90	43.95	38.48	53.09	21.24	29.31
B.alba	63.66	29.79	27.74	46.80	43.58	33.90	53.25	18.98	29.81
T.triangulare	67.90	32.46	30.22	47.81	44.51	35.44	52.19	19.28	28.39
V.amygdalina	63.59	29.16	27.35	45.86	43.01	34.43	54.14	18.34	28.84
T.occidentalis	72.55	34.62	32.69	47.72	45.06	37.93	52.28	20.27	27.94
Mean	68.14	32.28	30.23	47.36	44.38	35.87	52.64	19.45	28.56

Continued

Samples	TAA	TBAA	%TBAA	%TNAA	TNAA	TSAA	%TSAA	%CYS.in TSAA	TARAA	%TARAA
A.cruenthus	70.15	10.22	14.56	40.06	57.11	1.70	2.42	45.30	6.51	9.28
C. olitorius	66.46	10.20	15.35	37.11	55.83	1.25	1.88	40.00	6.94	10.40
C.chayamansa	66.74	10.50	15.79	37.72	56.51	1.38	2.07	42.00	6.30	9.44
S.macrocarpon	69.35	10.71	15.44	39.22	56.22	1.58	2.28	44.30	6.80	9.81
O.gratissimum	68.53	9.76	14.24	39.26	57.29	1.50	2.19	46.67	7.66	11.18
S.biafrae	72.47	10.28	14.19	40.95	56.51	1.33	1.84	33.83	7.02	9.69
B.alba	63.66	9.79	15.38	34.89	54.81	1.07	1.68	37.38	5.91	9.28
T.triangulare	67.90	10.60	15.11	38.02	55.99	1.39	1.89	40.50	6.83	9.91
V.amygdalina	63.59	9.27	14.75	35.98	56.58	1.32	2.08	45.45	6.76	10.68
T.occidentalis	72.55	11.04	15.22	41.24	56.84	1.90	2.62	42.11	7.16	11.45
Mean	68.14	10.24	15.00	38.45	56.36	1.44	2.34	41.75	6.78	10.12

Results are expressed as means of two determinations (n=2).
TAA-Total Amino Acids, TNEAA -Total Non-Essential Amino Acids, TEAA- Total Essential Amino acids, HIS –Histidine, TNAA-Total neutral amino Acids, TAAA-Total Acidic Amino Acids.
TAA-Total Amino Acids, TBAA -Total Basic Amino Acids, TSAA-Total Sulphur Amino Acids, TNAA-Total neutral amino Acids, TAAA-Total Acidic Amino Acids, TARA-Total Aromatic Amino Acids.

Table 4 presents the essential amino acid scoring pattern of the vegetables. It can be deduced from here that the limiting amino acid is methionine, while the most abundant is tyrosine. Others are also relatively high, which implies that the vegetables are good sources of protein and amino acids. Methionine has been reported to be the limiting amino acid in *P.mildbraedi* Akinyeye et al., [23] and fermented/non-fermented cocoa nibs [29].

Table 4. Amino acid whole hen's egg scoring pattern for the vegetables (EAA g/100gcp)

Botanical name	Lys	His	Leu	Thr	Iso	Met	Phe	Val
[a]Standard	6.20	2.40	8.30	5.10	5.60	3.20	5.10	7.50
A.cruenthus	0.69	0.75	0.99	0.65	0.61	0.29	0.70	0.52
C. olitorius	0.63	0.83	0.89	0.59	0.54	0.23	0.73	0.44
C.chayamansa	0.74	0.92	0.94	0.64	0.60	0.25	0.75	0.49
S.macrocarpon	0.76	0.87	0.96	0.57	0.54	0.28	0.78	0.50
O.gratissimum	0.61	0.83	0.83	0.58	0.53	0.25	0.87	0.47
S.biafrae	0.59	0.89	0.93	0.67	0.64	0.28	0.77	0.55
B.alba	0.60	0.85	0.82	0.55	0.49	0.21	0.71	0.45
T.triangulare	0.65	0.93	0.85	0.64	0.54	0.24	0.80	0.49
V.amygdalina	0.59	0.75	0.82	0.51	0.51	0.23	0.75	0.41
T.occidentalis	0.74	0.80	0.90	0.61	0.56	0.26	0.76	0.48
Mean	0.67	0.84	0.90	0.61	0.56	0.26	0.76	0.48

[a] Source: Paul et al., 1976.

Table 5 also presents the chemical score for the essential amino acid of the vegetables. Methionine was further confirmed to be the limiting amino acid while the most abundant is leucine. Generally, all the vegetables have high values of amino acids and this is a good indication that they possess high biological protein value.

Table 5. Amino acid chemical scores for vegetables (EAA g/100gcp)

Botanical name	Iso	Leu	Lys	Met	Phe	Thr	Try	Val	Met+ Cys	Phe + Try
[b]Standard (mg/gcp)	40	70	55	35	60	40	10	50	35	60
A.cruenthus	0.86	1.17	0.78	0.27	0.60	0.85	0.29	0.78	0.49	1.09
C. olitorius	0.75	1.01	0.77	0.21	0.67	0.75	3.24	0.66	0.21	1.15
C.chayamansa	0.84	1.11	0.84	0.23	0.63	0.81	2.50	0.73	0.39	1.05
S.macrocarpon	0.76	1.15	0.86	0.25	0.67	0.73	2.80	0.75	0.45	1.13
O.gratissimum	0.74	0.99	0.69	0.23	0.74	0.74	3.24	0.71	0.43	1.28
S.biafrae	0.90	1.11	0.66	0.25	0.65	0.57	3.10	0.82	0.38	0.82
B.alba	0.68	0.97	0.68	0.19	0.60	0.70	2.31	0.68	0.31	0.68
T.triangulare	0.76	1.00	0.73	0.22	0.07	0.81	2.63	0.73	0.37	1.12
V.amygdalina	0.71	0.98	0.66	0.21	0.64	0.65	2.93	0.61	0.38	1.13
T.occidentalis	0.88	1.09	0.84	0.31	0.65	0.85	3.24	0.81	0.54	1.19
Mean	0.85	1.08	0.78	0.24	0.59	0.75	2.63	0.88	0.52	1.10
SD	0.21	0.08	0.13	0.03	0.18	0.09	0.84	0.27	0.33	0.23
CV%	24.70	7.41	1.67	12.50	30.50	12.00	31.90	3.07	63.53	0.90

[b] Source: FAO, 1970.

4. Conclusion

The amino acid composition of ten commonly eaten indigenous vegetables in the South-West Nigeria had been documented. *Telfaria occidentalis* had the highest total amino acids value (72.55 g/100gcp) followed by *Solanecio biafrae* (72.47 g/100gcp), while *Vernonia amygdalina* had the least protein value (63.59 g/100gcp). The mean percent level of the total neutral amino acid (TNAA) for the ten samples was 56.36% indicating that it made up the bulk of the amino acids. All vegetables were found to be rich sources of protein and essential amino acids, and the results compared well with other reported values for other plants. The results further showed that if the vegetables are consumed in sufficient amount, it could contribute to meeting human nutritional needs and helps to combat diseases associated with malnutrition. From the results obtained from this finding, *T.occidentalis* was found to be the richest in amino acids generally consumed by the South-Western people of Nigeria, followed by *Solanecio biafrae*. They are therefore recommended as food supplements especially when animal proteins becomes expensive since they are relatively cheap sources of protein.

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