

Nutrition Potential, Amino Acid Content and Mineral Analysis of *Telfaira Occidentalis* Vegetable Leaf Protein Concentrates

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Abstract: Freshly harvested *Telfaira Occidentalis* green vegetable was authenticated and processed for its vegetable leaf protein concentrates with a view to evaluate its proximate constituents, amino acid content and mineral composition. Proximate analysis was determined using standard analytical technique. The nutrient composition of the protein/leaf concentrates revealed the moisture content (74.12 ± 0.01), Crude fat (11.05 ± 1.05), Crude fibre (2.86 ± 0.00), (27.83 ± 2.16). the mineral contents of the sample indicated that Mg, K, Na and Ca are the most abundant minerals with the following values Na; (100.3 ± 0.73), Mg: (109.7 ± 0.41), K; (81.3 ± 0.73), Ca: (75.3 ± 0.8), other minerals that were present in the sample in trace concentration are Fe (4.71 ± 0.51), Zn (3.20 ± 0.24), Mn (0.02 ± 0.11) and Cu (0.10 ± 0.01), while selenium and lead were indicating that the leaf concentrate is fit for dietary consumption. The amino acid profile reveals favourable nutritional balance with the presence of essential and non-essential amino acid, with tryptophan and selenocysteine being limiting amino acid.

Keywords: leaf protein concentrates, *Telfaira occidentalis*, Amino acid, proximate analysis.

1. Introduction

Vegetable has the ability to synthesis proteins from a wide range of virtually unlimited and readily available primary materials such as carbon (iv) oxide and water in the presence of sunlight(Oke 1973). They contain nutrients described as components of foods that are needed by the body in adequate amounts in order to grow, reproduce and to live a normal healthy life (Saidu and Adunbarin, 1998).

However, it is well known that proteins are of prime importance to health and are often deficient in the diets of people in developing countries especially those in vulnerable group such as nursing mothers, expectant mothers, weanlings and pre-school children (Fasuyi and Aletor, 2005). Since last world war, emphasis has been placed o the need to increase the dietary protein, particularly by the use of locally grown vegetable protein as well as the increased use of edible fish meals as a result of the realization that the diet in under developed countries is chronically low in protein leading to malnutrition and widespread deficiency diseases. (Dairo and Adanlawo 2006).

Deficiency occurs mainly because developing countries are unable to produce enough cheap proteins for their populations and also due to the fact that the supply of protein from animal source is becoming inadequate over the years which are further worsened by an increase in competition between man and animal (Fasuyi 2006)

As a result of this, nutritionists are constantly researching on the suitability of green vegetables as a means of replacing proteins from animal sources which are very expensive and economically unviable. There was also a search for non conventional protein sources for use as both functional food

ingredients and nutritional supplements (Aletor, V. A. and Fasuyi, A. O. (1999).

Furthermore, the search through the literature reveals some interesting information about nutrient composition of *Telfaira occidentalis* vegetable, functional properties and its medicinal value. But there is scanty information about leaf protein concentrates of *Telfaira occidentalis*. It is therefore the purpose of this paper to evaluate the nutritional potential, mineral content, and amino acid composition of *Telfaira occidentalis* leaf protein concentrates.

2. Materials and Methods

Preparation of leaf concentrates; Fresh vegetable species of *Telfaira occidentalis* was purchased from the farm site situated near Erelu dam in Oyo town. The sample was authenticated at Forest research institute Ibadan. The vegetable was washed with distilled water, the leaves were plucked and stems were trimmed. Leaf protein concentrate was obtained by passing the leaves through the locally produced mincer. The pulped juice was separated from the crushed fibre by passing the mixture through the cotton cloth followed by pressing with a screw cloth.

The pulped green juice was coagulated by steaming between 80°C and 90°C in order to coagulate the leaf concentrate. The coagulant was then washed with water pressed and air dried prior to chemical analysis; amino acid composition, functional properties and mineral content.

Amino acid Analysis and proximate composition of the leaf protein concentrates were determined by adopting procedures of AOAC 1990. The amino acids determined by methods described by Sparkman et al (1958) after the dried samples have been defatted using mixture of chloroform and

ethanol in ratio 2:4 respectively followed by acid hydrolysis using 6.0M Hydrochloric acid and evaporated in rotary evaporator.

3. Mineral Analysis

Sample (1.0g) was weighed and subjected to dry ashing in a well cleaned porcelain crucible at 550°C in a muffle furnace. The resultant ash was dissolved in 5.0ml of HNO₃/HCl/H₂O (1:2:3) and heated gently on a heating mantle until brown fumes disappeared. 5.0ml of distilled water was added to the sample in Erlenmeyer flask and heated until a colourless solution was obtained. The mineral solution was filtered into 100.0ml volumetric flask through filter paper, and the volume was made to the mark with distilled water. The solution was analyzed on triplicate for its elemental composition using Perkin Elmer 403 atomic absorption spectrophotometer.

4. Results and Discussion

The proximate composition of *Telfaira occidentalis* were presented in Table 1. The moisture content reported for this sample was 74.12 ± 0.01, this value is higher compared to moisture content ranges of 7.31 to 66.45 reported for some Nigerian vegetables by Akubugwo et al, 2007. However, higher proportion of moisture in food lowers the storage duration. But high moisture in food influences the rate of food digestion and Peristaltic movement on consumption.

Table 1: Proximate composition of *Telfaira occidentalis* leaf protein concentrates g/100g

Moisture	74.12 ± 0.01
Crude Fat	11.05 ± 1.05
Crude Fibre	2.86 ± 0.00
Crude Protein	54.80 ± 0.5
Ash	4.40 ± 0.18
Carbohydrate	27.83 ± 2.16

Crude fat content was 11.05 ± 1.05. Fat in food determines the amount of energy available. The value obtained in this sample was slightly higher than 9.6 and 10.9 reported value of Adeyeye and Omotayo (2011) for *Amaranthus hybridus* and *Telfaira occidentalis* vegetable. This means that the energy level of this leaf protein concentrate is higher than green vegetable.

Crude fibre concentration value was 2.86 ± 0.00 the value is higher than 1.6 reported for cancer *Amaranthus hybridus* by Aletor and Fasuyi (1999). Fibre in food independently lowers blood pressure and reduces the risk of cardio vascular diseases. The value is however lower than 4.63 reported for water hyacinth by wolverton et al (1997).

The crude protein content is 54.80 ± 0.51. these values were higher than 8.23 reported for *Indigofera astragalina* leaves and 4.6 reported for *Mormodica foecide* leaves consumed in Switzerland (Gafar et al 2011). the value is also higher than 24.85 reported for sweet potatoe leaves and *Talium triangulare* with value of 31.00 (Akindahunsi and Salawu, 2005) this indicates that *Telfaira occidentalis* leaf concentrate are good sources of daily proteins. The ash

content of the sample was 4.40 ± 0.48. The value was higher compared to 1.8% reported for sweet potatoe leaves (Asibey-Berko and Tayie 1999) but lower than 19.61 in *Amarathus hybridus* leaves (Nwaogu et al, 2000). The ash content indicates that the sample should be rich in mineral elements. The concentration of Nitrogen free extract was 27.83 ± 2.16. The value is lower than 8.28 and 54.20 reported for *Cochorus tridens* and *Ipomea batatas* leaves respectively (Asibey Berko and Tayie 1999). Carbohydrates and lipids are the principal sources of energy this indicate that this sample can contribute meaningfully to the daily energy requirement of man (Hassan et al., 2006)

Table 2: Level of Mineral Element in *Telfaira occidentalis* leaf protein concentrates.

Mg	109.7 ± 0.41
K	81.3 ± 0.73
Na	100.3 ± 0.73
Ca	75.3 ± 0.86
Fe	4.71 ± 0.51
Zn	3.20 ± 0.24
Mn	0.02 ± 0.11
Se	ND
Cu	0.10 ± 0.01
Pb	ND

Table 2 present concentration of mineral element in *Telfaira occidentalis*. Magnesium is the most abundant of the minerals analysed. Magnesium plays a vital role in calcium metabolism in bone. It is important mineral element in connection with circulatory diseases such as ischemic heart diseases. The value of magnesium content of the sample is 109.7 ± 0.41 the value is high compared to 23.18 ± 0.4 reported for amaranthus hybridus (Nwaogu et al, 2000) and 96.5 ± 0.96 reported for *Vernomia amygdalina* leaf protein concentrate (Sodamade 2013). The recommended dietary allowance of adult male us 350mg (NRC 1989). Therefore, *Telfaira occidentalis* can contribute 31.34%. Sodium content of *Telfaira occidentalis* leaf protein concentrates is 100.3 ± 0.73 this value is high compared to 45.0 reported for *Sienna obtusifoliat* and 5.00 reported for *Tribus terrestris* leaves (Hassan et al, 2005) high sodium content in food is of great concern to health because too much of sodium could lead to high blood pressure. *Telfaira occidentalis* leaf protein concentrates may not be good diet for hypertensive patient.

Calcium content of *Telfaira occidentalis* leaf protein concentrates is 75.3 ± 0.86mg/100g the value is lower than 151.6 ± 1.40 reported for *Vernonia amygdalina* leaf protein concentrate (Sodamade 2013). This value is also higher than 9.41 reported for *Momordica balsamina* leaves. (Hassan and Umar 2006). The recommended Dietary allowance for calcium for adult men is 1/200mg (NRC 1989) and *Telfaira occidentalis* can contribute significance amount to dietary calcium.

Potassium content reported by *Cassia siama* leaves (Ngaski 2006). Reasonable sodium-potassium ratio in the diet assists in the prevention of hypertension and arterio sclerosis and for normal protein retention, during growth stage.

Iron content of *Telfaira occidentalis* is 4.71 ± 0.51mg/100g the value is lower than *T. teresstis* but higher than 1.9 ± 1.12 reported for *Celosia agentia* leaf protein concentrates

(Sodamade et al, 2011). Iron is required for haemoglobin formation and its deficiency leads to anaemia. The recommended Dietary Allowance value of iron for male adult is 10-15mg (NRC, 1989). *Telfaira occidentalis* can contribute 27.34% to RDA of the iron.

Zinc concentration of *Telfaira occidentalis* is 3.20 ± 0.24 mg/100g. The value is higher compared to 0.02mg/100g reported for *Diospyrus mespilliformis* (Hassan et al, 2004) and 0.10 ± 0.00 mg/100g reported for *Terrestris leavage* but lower when compared to 6.85 ± 1.00 mg/100g reported for *Talium triangulare* by (Fasuyi 2006). Zinc plays a vital role in gene expression regulation of cellular growth and participates as a co-factor of enzymes responsible for carbohydrates, protein and nucleic acid metabolism (Gafar et al, 2011). The recommended Dietary Allowance Value of zinc could be obtained by mixing it with the food that is richer in zinc.

Manganese is one of the element required in small concentration, it acts as in activator of many enzymes. Manganese concentration of the sample is 0.02 ± 0.11 mg/100g. Selenium and lead was not detected in the sample while copper was present in the concentration of 0.10 ± 0.01 . Copper plays a vital role in haemoglobin formation and it contribute to iron and energy metabolism (Gauong W.F 2003).. Too much of lead and Selenium in food are not good in food since they can lead to food poisoning.

Table 3 present amino acid content of *Telfaira occidentalis* leaf protein concentrates, out of the seventeen amino acid determined, Gutaminic acid has the highest value (10.06), aspartic acid, acid (7.81) leucine (6.75). The recommended dietary allowance of glutamic acid is 21.6g for males and 20.0g for female. These values were higher than that of *Telfaira occidentalis*. However, other values obtained for other amino acids are generally favourable compared with FAO/WHO/UNU (1991) recommended daily allowance (Table 4)

From this Table, the recommended value for lysine is 5.8 while 4.30 is reported for *Telfaira occidentalis* leaf protein concentrates. The recommended value for threonine is 3.40 which are higher than 2.61 reported for sample. *Telfaira occidentalis* appears to be a better source of other amino acid than those recorded in the reference Table. The total essential amino acid value of *Telfaira occidentalis* is 31.52 while the total value of the non-essential amino acid is 20.05.

Table 3: Amino Acid present in *Telfaira occidentalis* Leaf Protein Concentrates

Amino Acid	<i>Telfaira occidentalis</i>
Lysine	4.30
Histidine	2.33
Arginine	5.03
Aspartic Acid	7.81
Threonine	2.61
Serine	2.01
Glutamic Acid	10.06
Proline	2.00
Glx cine	1.02
Alanine	2.18
Cystine	2.90
Valine	3.77
Methionine	1.11
Isoleucine	2.95
Leucine	6.75
Tyrosnvie	3.20
Phenylalasin	4.50

Table 4: FAO/WHO/UNU Reference Value of Amino Acid

Amino Acid	Reference Value
Lysine	5.8
Methionine +Cysitne	2.5
Threonine	3.4
Tryptopljan	1.0
Valine	3.5
Leucine	6.6
Isoleucine	2.8
Phenyl Alanine + Tyrosine	6.3

Table 5

Non-Essential Amino Acid	MG/100G
Alanine	2.18
Arginine	5.03
Aspartic Acid	7.81
Glycine	1.02
Proline	2.00
Serine	2.01
Total	20.05

Table 6

Essential Amino Acid	MG/100G
Leucine	6.75
Isoleucine	2.95
Lysine	4.30
Methonine	1.11
Phenyl Alanine	4.50
Threonine	2.61
Tryptohan	ND
Valine	3.77
Histidine	2.33
Tyrosine	3.20
Selenolysteine	ND
Total	31.52

5. Conclusion

Leaf protein concentrates of *Telfaira occidentalis* reveals an interesting value of proximate composition and mineral content but leaf protein concentrates is not a food on its own

but could be incorporated in food ingredients and various drug bodies.

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