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Amino acid composition of *Tetracarpidium conophorum*

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ABSTRACT

The amino acids content of conophor nut (*Tetracarpidum conophorum*) was determined. The total essential amino acids (TEAA) was 274mg/g crude protein out of a total amino acids of 573mg/g. The most concentrated amino acid was glutamic acid (134mg/g). Leucine has the lowest essential amino acid score of 0.32 thereby making it the first limiting amino acid. Isoleucine had the highest level of score (0.80) followed by lysine with a score of 0.70. The leucine/isoleucine ratio was 0.71. Since most of the essential amino acids were high, it could serve as a food supplement.

Key words: Amino acids, *Tetracarpidium conophorum.*

INTRODUCTION

Although tree nuts have been used for food since antiquity, the potentials of most tree nuts have not been fully exploited. In Nigeria, the situation is not different for conophor nut (*Tetracarpidium conophorum*), although there is no yield record of its annual production. Conophor nut is a tropical climbing shrub. It belongs to the family euphobiaceae. This exotic, perennial wild fruit is grown in the traditional farming system of the lowland humid tropics of Nigeria between 4^0 15' and 8^0N of the equator (Okafor, 1983).

The fruit is a four-winged and ribbed capsule, containing subglobose seeds with thin brown shell and yellowish kernel. Ogunsua and Adebona (1983) stated that the oil from the shelled nut contains over 60% linolenic acid which predisposes it for use as edible oil and industrial production of valuable products (soap, varnish, etc).This indigenous snack food is harvested at the same time as fresh maize between May and August. Like other edible nuts, it can serve in food fortification and as a special treat to be added to candy, cakes, cookies or prepared as salted snacks (desioye, 1981). Ige *et al* (1984) had worked on the functional properties of conophor seeds.

The vast majority of Nigerians are not only improperly fed but underfed (Oyenuga, 1968) and the widespread use of wild fruits, vegetables and nuts to supplement the traditional diets helps to alleviate this problem. The objective of this study was to determine the amino acids composition of *Tetracarpidium conophorum*.

MATERIAL AND METHODS

Collection and treatment of sample

T. conophorum sample was purchased at Oba market, Ado-Ekiti, Ekiti State, Nigeria. The sample was purchased in the month of June. The sample is common and well known, hence, no special identification was required.

The shells of conophor nuts were carefully removed to recover the edible part. The edible part were cut open into small pieces and over-dried at 95-105°C until dried and ground into fine powder. The (cooked) edible conophor nuts were used for the analysis.

Determination of amino acid

Crude protein determination

The micro-Kjeldahl method as described by Pearson (19766) was followed to determine the

crude protein. The nitrogen percent was converted to percent protein by multiplying it with 6.25.

Defatting

About 2.0g of each sample was weighed into the extraction thimble and the fat was extracted with chloroform/methanol mixture using Soxhlet extraction apparatus (AOAC,1990). The extraction lasted for 5 – 6 hours.

Hydrolysis of Sample

Between 30 - 35mg of the defatted sample was weighed into the glass ampoule. 7ml of 6M HCl was added and oxygen was expelled by passing nitrogen gas into the amploule. The glass ampoule was then sealed with bunsen flame and put in an oven preset at 105^{0}C +5^{0}C for 22 hours. The ampoule was allowed to cool before breaking open at the tip and the content was filtered to remove the humans (FAO/WHO, 1991).

The filterate was then evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved with 5ml of acetate buffer and stored in plastic specimen bottles which were kept in the deep freezer.

Sample analysis

The method of analysis was by ion exchange chromatography (IEC) (FAO/WHO,1991). The amount loaded for the sample was between 5-10 microlitre. This was dispensed into the cartridge of the analyzer. The technicon Sequential Multisample (TSM) Amino Acid Analyser (Technicon Instruments Corporation, New York) was used for the analysis. The TSM analyzer was designed to separate and analyze free acidic, neutral and basic acids (FAO/WHO,1991) of the hydrolysate. The period of an analysis lasted for 76 minutes. The gas flow rate was 0.50ml/min and the column temperature was kept at 60^{0}C with reproducibility consistent within +3%. The net height of each peak produced by the chart record of the TSM (each representing an amino acid) was measured and calculated.

Statistical analysis

From the amino acids result, the amino acid scores (FAO,1990) and the F test values at $p<0.05$ for essential amino acids versus non-essential amino acids, essential amino acids versus essential amino acids with the sample and amino acid scores were calculated.

RESULTS

The amino acids composition is depicted in Table 1. The most concentrated acid was glutamic acid (Glu) (an acidic amino acid) with a value of 134mg/g crude protein (cp). Arginine (Arg) was the most abundant essential amino acid with a value of 70.6mg/g cp.

Table 2 depicts the essential, non-essential, neutral, acidic and basic amino acids of the sample. The percent total essential amino acids (% TEAA) with or without histidine (His) was 47.9 and 42.3.

Table 3 contains the provisional amino acid scoring pattern with the current result in another column. Isoleucine (Ile) had the highest score of 0.80 while the limiting amino acid was leu (0.32).

Table 1: Amino acids profile of *Tetracarpidium conophorum* (mg/g crude protein dry weight)

Amino acid	Concentration
Lysine (Lys)[a]	38.6
Histidine (His)[a]	31.7
Arginine (Arg)[a]	70.6
Aspartic acid (Asp)	49.0
Threonine (Thr)[a]	13.9
Serine (Ser)	16.4
Glutamic acid (Glu)	134
Proline (Pro)	22.0
Glycine (Gly)	24.7
Alanine (Ala)	31.2
Cystine (Cys)	11.5
Valine (Val)[a]	24.1
Methionine (Met)[a]	9.86
Isoleucine (Ile)[a]	32.0
Leucine (Leu)[a]	22.7
Tyrosine (Tyr)	9.77
Phenylalanine (Phe)[a]	30.7

[a] Essential amino acids.

Table 2: Essential, non-essential, neutral, acidic and basic amino acids (mg/g crude protein) of the sample

Amino acid	Level
Total amino acid (TAA)	573
Total non-essential amino acid (TNEAA)	299
Total essential amino acid (TEAA)	
with Histidine	274
no Histidine	243
Percent total non-essential Amino acid (%TNEAA)	51.2
Percent total essential aminoacid (%TEAA)	
with Histidine	47.9
no Histidine	42.3
Total neutral amino acid(TNAA), % TNAA	43.5
Total acidic amino acid(TAAA), % TAAA	32.0

Table 3: Provisional amino acid scoring pattern and Amino acid scores of the sample

Amino acid	Suggested level (mg/g Protein)	Score
Isoleucine	40	0.80
Leucine	70	0.32
Lysine	55	0.70
Methionine + Cystine	35	0.61
Phenylalanine + Tyrosine	60	0.68
Threonine	40	0.35
Tryptophan	10	-
Valine	50	0.48

DISCUSSION

The major abundant amino acids in *T conophorum* were Glu and followed by Arg. This trend was not similar to what obtained in some oilseeds (Olaofe et al,1983,1994).

Many parameters are depicted in Table2. The total amino acids (TAA) was 573mg/gcp. This value was lower than the reported value in dehulled African yam bean (AYB) (703) – 917mg/gcp (Adeyeye, 1997). The total non-essential amino acids (TNEAA) of 298.68mg/gcp was low when compared to AYB of 327 – 454mg/gcp.

The TNEAA was high in the sample with percentage value of 52.1 showing that they formed the bulk of the amino acids. The total essential amino acids (TEAA) were lower than the values in oilseed (Olaofe et al, 1994) which were 534mg/g (melon seed), 383mg/g (pumpkin seed) and 536mg/g (gourd seed); it was also lower than that of soybean (444mg/g) (Kuni *et al*,1991). These literature results showed that the sample (Table 2) had slightly lower qualities compared with the samples cited. The total neutral amino acids (TNAA) were the most concentrated in the sample while the total basic amino acid (TBAA) were lowest in concentration.

The quality of dietary protein can be measured in various ways (FAO/WHO 1991) but basically it is the ration of available amino acids in the food or diet compared with needs expressed as a ratio (FAO, 1970). Using the data from Table 1, together with the scoring pattern from Table 3, the value of the scores of the essential amino acids in the sample were found as follow:

$$\text{Amino acid Score} = \frac{\text{mg of amino acid per g of test protein}}{\text{mg of amino acid per g of protein in reference pattern}}$$

The limiting amino acid in *T. conophorum* was Leu meaning that this would be the first amino acid to be corrected for in the sample. Some amino acid scores were close to unity in the sample. *T. conophorum* was deficient in Leu, Thr and Val. However, it could still be used to fortify maize food products which are widely used as weaning foods for children in most African countries (Akinde *et al,* 1971). Both His and Arg are particularly essential for children(Harper, 1984) and the results showed that *T. conophorum* would be a good source for the two amino acids. The percentage of cystine in the total sulphur amino acid was 53.9 which was higher than in animal proteins but close to the value of 62.9 in the coconut endosperm (Adeyeye, 2004).

The data for the TNEAA, TEAA and essential amino acid scores (EAAS) were all subjected to F test as follows: TEAA/TNEAA, TEAA/TEAA and EAAS/EAAS. In *T. conophorum* TEAA/TNEAA value was Fc (5.44)>Ft (3.50) at $p<0.05$, result was significant; but in both TEAA/TEAA and EAAS/EAAS Fc<Ft, results were not significant at $p<0.05$.

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