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Biochemical Changes And Amino Acid Profile Of "Ogiri" Produced From Castor Oil Seed (Ricinus Communis)

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ABSTRACT

The biochemical changes and amino acid profile of "ogiri" produced from castor oil seed (*Ricinus communis*) was studied. Castor oil seeds were fermented by the traditional method commonly used by local producers in Eastern Nigeria. Selected biochemical constituents of fermented seed were compared with those of unfermented seed. The proximate composition of the fermented and unfermented seeds were analyzed using standard method (AOAC). The amino acid profile was determined using Technicon Sequential Multi Samples Amino Acid Analyzer. There was a significant decrease in the content of all the amino acids from unprocessed to processed (fermented) samples ($P<0.05$) except in proline where the difference is insignificant ($P>0.05$). The tritrable acidity decreased significantly as fermentation proceeded (from 0.41±0.11g/100ml to 0.10±0.06g/100ml) while volatile acidity increased as fermentation proceeded (from 0.06g/100ml to 0.1g/100ml). The pH decreased from 7.0±0.27 to 5.2±0.45 and increased thereafter. The biochemical changes and amino acid profile of "ogiri" has been established.

Keywords: Biochemical Changes, Amino Acid, Ogiri, Castor Oil, Seed and Ricinus communis

INTRODUCTION

"Ogiri" is an oily paste produced mainly from melon seed and consumed in West African countries [1]. Apart from melon seeds (*Citrullus vulgaris*) which is a regular substrate used for production of "Ogiri", castor oil seeds (*Ricinus communis*) climbing melon seed ("*Cucumeropsis*) and fluted pumpkin (*Teflairia occidentalis*) seed are also used as alternative substrate for "ogiri" production [2,3,4,5]. Traditional "ogiri' from castor oil seed is based on fermentation by species of microorganisms which may be indigenous to the seeds or occur in the processing environment [6,7,8,9]. Fermentation is a technique of biological conversion of complex substrate into compounds by various microorganisms and fermented foods are prepared from plants and animal materials processes which microorganisms play a vital role in modifying the substrate physically, naturally and sensorily [10]. These organisms can cause desirable changes in various foods such as development of flavour, shelf life extension through lactic acid, alcohol, acetic acid and alkaline fermentation and enhancement of food quality with protein, amino acids and vitamins [11].

Fermentation improves the digestibility, nutritive value and flavour of raw seeds or the seeds cannot be consumed in their raw state. In Africa, fermented foods play a major role in the diet whereby many staple foods undergo fermentation before they are consumed [12,13,14]. The organic acids occur in fermented products as a result of hydrolysis, biochemical metabolism and microbial activity [15,16]. It is reported that proteolysis is the most principal and complex biochemical events occurring during the preparation of some legume based fermented condiments and the degradable products, amino acids not only have considerable influence on the nutritional values but also contribute directly to the taste characteristics, in some cases serving directly as precursors of aromatic products [17]. The influence of biochemical transformation that occur during fermentation on the concentrations of proteins, essential amino acids, essential fatty acids and minerals among others on this food will also have implications for nutrition [18]. There is also report on biochemical

changes during fermentation of this condiment by [19]. This work will not only report the biochemical change during the fermentation of "ogiri" from castor oil seed but will also determine the amino acid profile of both the unprocessed and processed fermented castor oil seed.

Materials and Methods

The castor oil seed samples used in this research were bought in open markets in various parts of Nigeria. Traditional method of processing castor oil seed "ogiri" was adopted in the laboratory prepared "ogiri" as described by [3]. About 900g of mature castor seeds were sorted, dehulled, washed and wrapped tightly with flamed plantain leaves (*Musa sapientum*). Eight wraps of 100g each were boiled with water for six hours after which the boiled seeds were drained, stored in basket and left to ferment at room temperature prior to mashing into smooth paste. The paste was then wrapped in blanched plantain leaves (*Musa sapientum*) and allowed to ferment for the development of characteristic "ogiri" taste and aroma.

Chemical Analysis

For chemical analysis, both unfermented and fermenting samples were extracted using soxhlet extraction apparatus (GT301) (AOAC) dried, hydrolyzed, and defatted prior to various chemical and amino acid analysis. Estimation of protein was done using Kjeldhal digestion of estimation of protein. Estimation of carbohydrate was done by difference. Moisture content was determined by moisture analyzer (MA45). Determination of volatile and titrable acidity were carried out by methods described by [6]. The mineral contents were estimated using smart spectrophotometer (Lamotte).

Determination of Amino Acid Profile

The amino acid profile of the samples were determined by the method of [4]. The samples were dried, defatted, hydrolyzed, evaporated in the rotary evaporator and loaded into Technicon Sequential Multi-sample amino acid Analyzer (TSM). Free fatty acid content was estimated using the method of American Oil Chemists Society [3]. The pH was also determined using pH meter (JENWAY 3510).

Results and Discussion

The moisture content of the fermented products was higher (40.34±0.01%) than in the unfermented samples (4.86±0.03%). The crude fibre content of the unfermented samples were higher (2.50±0.01%) than that of fermented samples (2.00±1.00%). There was a decrease in the fat content of the samples from unprocessed seeds (34.82±0.1%) to (25.20±0.10%) in the fermented samples. The protein content was higher in the unprocessed samples (4.30±0.10) than in fermented samples (3.90±0.10%). The free fatty acid was higher in the fermented samples (17.68±0.02%) than in the unprocessed samples (16.64±0.01%). The carbohydrate content was higher in the fermented samples (55.02±0.01%) than in the unprocessed samples (46.51±0.02%). The ash content was higher in the fermented products (3.2±0.17%) than in the unprocessed samples (3.0±1.00%). The tritrable acidity was higher in fermented product (0.62±0.01g/100ml) than in the unprocessedsamples (0.25±0.01g/100ml). The volatile acidity increased from (0.05±0.01g/100ml) in the unfermented samples to (0.08±0.01g/100ml) in the fermented products. The pH ranged from 5.4±0.10 to 7.2±0.17 in the unprocessed and processed samples. There was a general decrease in the mineral contents of the samples from the unprocessed to fermented samples except in iron where the reverse is the case. There was a general decrease in the amino acid contents from the unprocessed to fermented samples except in arginine, isolucine and leucine. Glutamic and aspartic acid were the most concentrated amino acids and this agrees with the earlier report trend of glutamic and aspartic acid being the most concentrated amino acids in oil seeds [8]. Methionine

was the least concentrated and this is in agreement with [14,16]. The low concentration of methionine, cystine and tryptophain was also observed by [11]. The pH increase during fermentation has also been reported by [2]. The increase in pH could be attributable to the ability of fermenting organisms to degrade protein [13]. The increase in the moisture count of the fermented product agrees closely with the report of [15]. It is believed that materials containing high moisture content has less storage stability than those with lower moisture content [2] and the increase in moisture content of the processed fermented products has also been reported by [6]. The increase in the volatile acidity indicates similar increase in the production of free fatty acids by hipolytic fermenting organisms [9]. Also the chemical decomposition of fat by hydrolysis or oxidation destroys nutrients in food. Similar observation was made by [13]. The decrease in the cadmium, lead, calcium and magnesium contents was also observed by [15]. However, the presence of lead and cadmium poses a public health hazard to consumers. Mineral assessment is essential to guarantee the quality of any food product. Some minerals and vital for proper functioning of the body while others are toxic [3].

Table 1: Proximate Composition of Unprocessed and Fermented Castor Oil Seeds (*Ricinus communis*)

	Unprocessed	Fermented
Moisture Content (%)	4.86±0.03	40.34±0.01
Crude Fibre (%)	2.50±0.10	2.00±1.00
Fat (%)	34.82±0.01	25.20±0.10
Protein (%)	4.30±0.10	3.90±0.10
Free Fatty Acid (mg/ml)	16.64±0.01	17.68±0.02
Carbohydrates (%)	46.51±0.03	55.02±0.01
Ash (%)	3.0±1.00	3.2±0.17
Titrable Acidity (g/100ml)	0.25±0.01	0.62±0.01
Volatile Acidity (g/100ml)	0.05±0.01	0.08±0.01
pH	6.4±0.10	7.2±0.17

Table 2: Mineral Content of Unprocessed and Fermented Castor Oil (*Ricinus communis*) Seeds

	Unprocessed	Fermented
Calcium (ppm)	26.00±1.00	20.00±1.00
Copper (ppm)	0.33±0.02	0.18±0.01
Cadmium (ppm)	0.63±0.02	0.60±0.10
Lead (ppm)	0.20±0.01	0.01±0.01
Iron (ppm)	0.50±0.10	0.80±0.10
Magnesium	9.30±0.10	0.1±0.10

Table 3: Amino Acid Profile of Unprocessed and Fermented Castor Oil (*Ricinus communis*) Seeds

Amino Acid (g/100g Protein)	Unprocessed	Fermented
Lysine	3.79±0.01	3.49±0.01
Histidine	3.02±0.01	2.83±0.01
Arginine	7.83±0.01	8.01±0.01
Aspartic acid	8.33±0.02	7.64±0.01
Threonine	3.15±0.02	2.49±0.01
Serine	3.49±0.02	3.11±0.01
Glutamic acid	13.43±0.01	12.93±0.01
Proline	2.90±0.10	2.90±0.10
Glycine	4.50±0.10	4.01±0.01
Alanine	4.02±0.01	3.72±0.01
Cystine	1.52±0.01	1.29±0.01
Valine	5.20±0.10	3.68±0.01
Methionine	1.63±0.02	1.31±0.01
Isoleucine	3.02±0.01	3.13±0.01
Leucine	5.60±0.10	5.81±0.01
Tryosine	2.48±0.02	2.3±0.01
Phenylalanine	4.49±0.01	4.23±0.01
Tryptophan	1.11±0.01	1.09±0.01

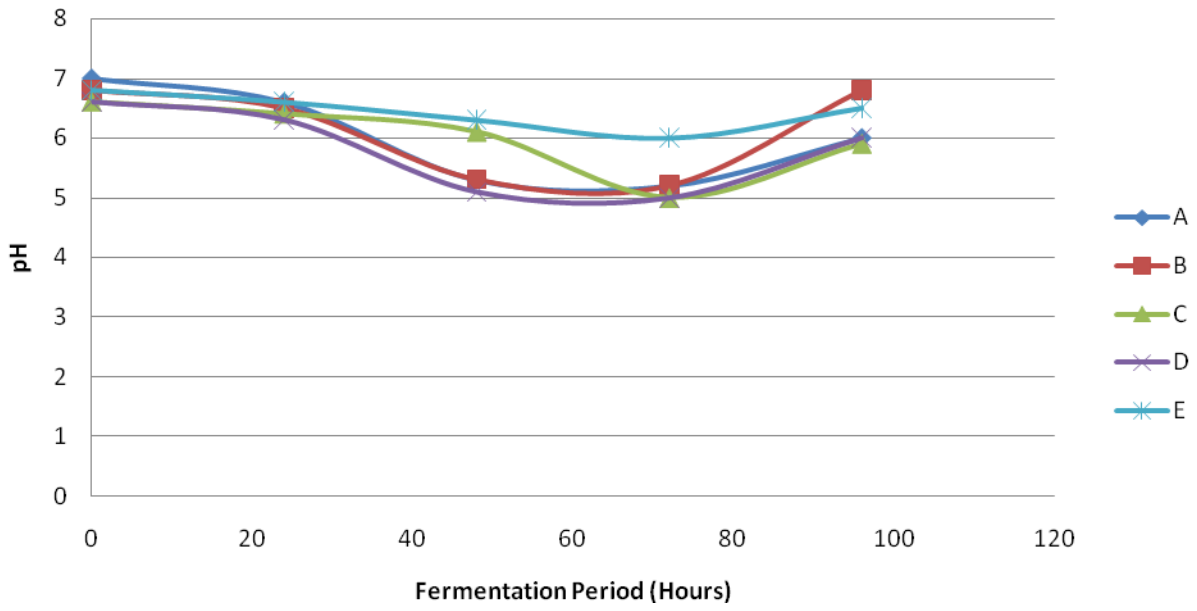

Fig 1: Effect on Fermentation Period on the pH of "Ogiri" from Castor Oil Seed Samples

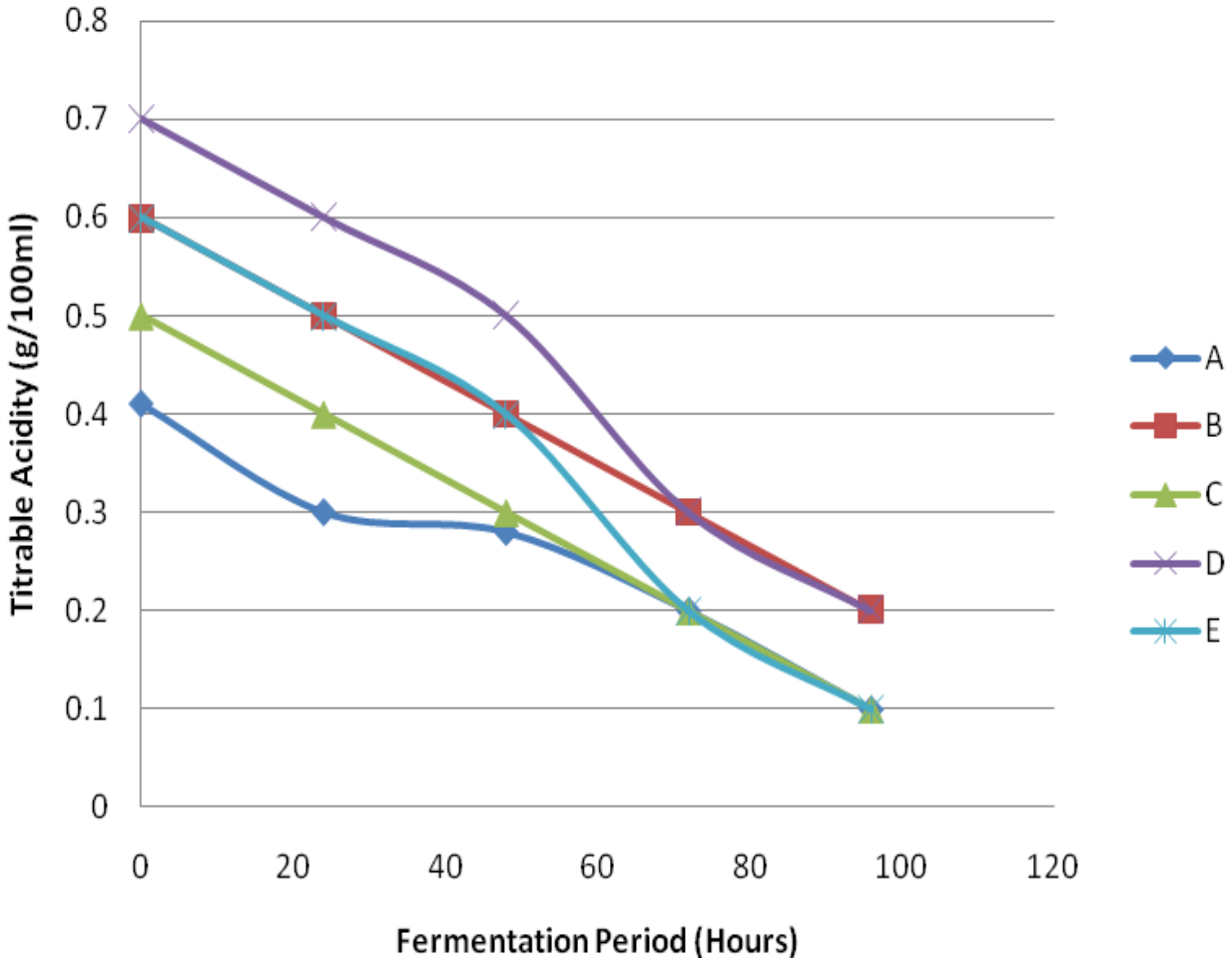

Fig 2: Effect of Fermentation Period on the Titrable Acidity of Castor Oil seed Samples

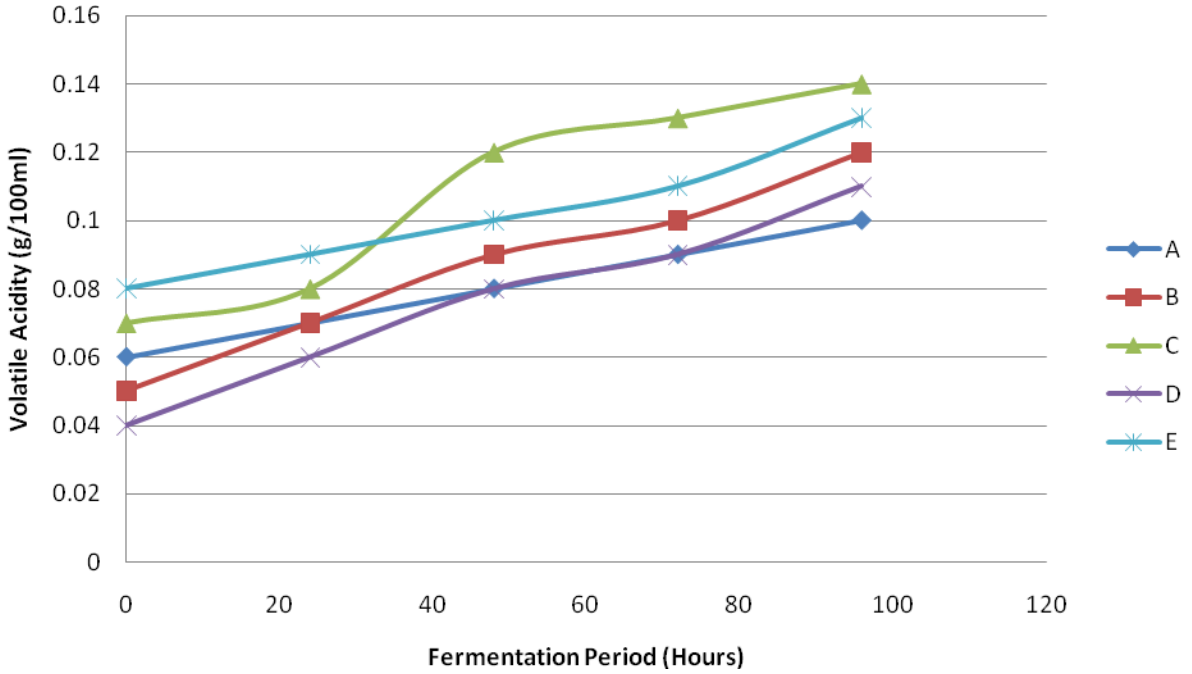

Fig 3: Effect of Fermentation Period on the Volatile Acidity of "ogiri" from Castor Oil Seeds Samples

CONCLUSION

Biochemical, mineral profile and amino acid profile of "ogiri" produced from castor oil seeds have been established in this work. The characteristic "ogiri" aroma and flavour may be as a result of production of fatty acids, and amino acids especially glutamic acid during fermentation.

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