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ORIGINAL RESEARCH ARTICLE

Proximate and Anti-nutritional Analysis of locally produced Condiment (Cwande) in Zuru Local Government, Kebbi State, Nigeria.

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ABSTRACT
This study aimed to analyse the proximate and anti-nutritional components of Cwande in Zuru Local Government, Kebbi State. Five (5) samples in four (4) collection areas were collected and transported to Botany Laboratory Kebbi State University of Science and Technology, Aliero for analysis. The proximate and antinutrient parameters were analysed using the recommended AOAC (Association of Official Analytical Chemists) techniques. The results of the study showed that Cwande had high protein content (37.29±0.50%), followed by moisture (32.07±0.58%), fibre (14.80+3.06%), carbohydrate (7.62+0.81%), lipid (5.18+0.52%) and ash (3.02+1.76%). While the results of anti-nutritional composition showed that Cwande had high phytate composition (5.76 + 0.72) followed by saponins (5.51 + 0.61), cyanide (4.76 + 0.28) and oxalate (4.03 + 0.20). From these findings, it was discovered that Cwande condiments locally produced by Zuru people have good nutritional profile levels. However, the level of anti-nutrient contents in Cwande condiments is reduced. Further studies should be carry out to know the incidence of microbial flora of Cwande and also the toxins substances known to cause harmful effects to humans and animals.

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INTRODUCTION
Condiments possess essential nutrients (protein, carbohydrate, fats, moisture, fiber and ash) required for growth of the body and its preservation and may for that reason help lessen the effects of some of these nutrient deficiencies (Özcan, 2004). Antinutrients such as phytates, oxalates, saponins, cyanides and alkaloids present in condiments interfere with the bioavailability of minerals and vitamins. For a mineral to be absorbed in the body, they are required to be in their ionic states (Ogunka-Nnoka and Mepba, 2008).

For many years, the Zuru ethnic community in Kebbi State, Northwestern Nigeria, has taken great delight in producing and consuming locally-made condiments (Cwande) made from *hibiscus* seeds (Keta *et al.,* 2019). It is clear that these condiments have significantly impacted the community's eating patterns, serving not only as a tasty alternative to meat proteins but also as condiments and flavorings for soups (Keta *et al.,* 2019). In many respects, various varieties of locally made condiments are being promoted more widely across the nation and abroad. Different components have been utilised in creating local condiments, which has led to differences in their chemical composition. Fermented condiments can carry a stigma; they are frequently seen as nourishment for the underprivileged. Most of Nigeria's population relies primarily on food plants to meet their nutritional demands (Ndidi *et al.,* 2014).

In Nigeria, people mostly depend on plants for food. Legumes are the most efficient supply of vegetables of all tough plants, and they produce a large share of what is required in many parts of the world (Anigo *et al.,* 2015). Despite the variety and diversity of diets, malnutrition would only be reduced if indigenous food production, capacity, and understanding of the nutritional worth of particular native foods and their production significantly improved. Even while locally manufactured condiments have excellent nutritional value and are widely available, many developing nations like Nigeria need greater knowledge about their requirements for expanding their

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use (Anigo *et al.,* 2015). Kebbi State and Nigeria at large need to place a strong emphasis on finding out the scientific knowledge of nutritional and anti-nutritional benefits of regional condiments in order to reduce the consumption of commercial seasonings like Maggi. Hence, this study aimed to analyze the proximate and anti-nutritional compositions of Cwande in Zuru Local Government, Kebbi State, Nigeria.

MATERIALS AND METHODS

Sample Collection

Survey was conducted to collect Cwande samples in Zuru Local Government Area, Kebbi State, Nigeria. Five (5) samples in four (4) collection areas were collected, making a total of 20 samples and put in a sterilized polythene bag, then transported to Botany Laboratory, Kebbi State University of Science and Technology Aliero for analysis.

Sample Preparation

All the 20 samples were grounded to a fine powder using pestle and mortar to make a homogenized mixture, the homogenized mixture were then put in a clean labeled container pending analysis.

Nutritional Analysis

Determination of moisture content

A crucible was thoroughly washed and dried in the oven at 100°C for 30 minutes and allowed to cool inside desiccator. After cooling, it was weighed and the weight was recorded as (W_1). One gram (1g) of the sample was poured into crucible and weighed, the weight was recorded as (W_2). Then, the sample plus the crucible were placed in an oven at 100°C for 2 hours, cooled in a desiccator and weighed for 30 minutes. The process was repeated until a constant weight was obtained as (W_3). The values obtain were used to calculate the percentage of moisture content (Alabi *et al.,* 2005).

Determination of crude fiber

One gram (1g) of the sample was hydrolyzed in a beaker with petroleum ether after which it was refluxed for 30 minutes with 200 ml of a solution containing 1.25% H_2SO_4 per 100ml of solution. The solution will be filtered through filter paper. After filtration, the sample was washed in the boiled water until the sample is no longer acidic. The residue was then transferred through filter crucible and dried at 100°c for 2hours. The percentage crude fibre was calculated from the weight after drying and the weight of the sample (AOAC, 2002).

Determination of ash content

One gram (1g) of the sample was weighed into a previously ignited and weighed crucible. The crucible and content was ignited in a preheated muffle furnace at 650°C for 2 hours. The crucible was allowed to cooled in a desiccator to a constant weight, weighed and percentage ash content was calculated (AOAC, 2002).

Crude fat determination

This was done by Soxhlet extraction method. 250ml clean flask was dried in an oven at 105-110°C for about 30 minutes. One gram (1g) of the dried sample was weighed accurately into a labeled thimble then corresponding label cooled boiling flask was weighed. The boiling flask was filled about 100 ml of petroleum ether (Boiling point 40-60°C). Extraction thimble was plugged lightly with cotton wool while the soxhlet extractor apparatus was assembled and refluxed for about 3 hours. The Thimble was removed with care and petroleum ether to be collected on the top container of the set up and drained into flask for re-used. When the flask was free of petroleum ether, it was removed and dried at 105-110°C for 1 hour. The flask was transferred from the oven into a desiccator and allowed to cooled, and then weighed. The weight obtain was used to calculate the percentage fat (AOAC, 2002).

Determination of protein

This was done by Kjeldah method which remains the most popular method of protein determination.

(a) Protein digestion: One gram (1g) of sample was weighed into a Kjeldah flask. 5g of anhydrous sodium sulphate was added. This followed up with the addition of 1g of copper sulphate and 1 tablet of Kjeldah catalyst. Into the mixture, 25ml of concentrated sulphuric acid and 5 glass beads were introduced. In the fume cupboard, heating was done gently at first and then increased in heat with occasional shaking till solution assumed a green colour. The black particle showing at the tip and neck of the flask was allowed to cooled and washed with the distilled water. Reheating was done gently at first until the green colour disappeared and then allowed to cool. After the cooling, the digest was transferred with several washings into a 250 ml volumetric flask and filled to the mark with distilled water. Distillation was done using distillation apparatus (Alabi *et al.,* 2005).

(b) Protein distillation: The distillation apparatus was steamed for about 15minutes before usage. Under the condenser, 100ml conical flask containing 5ml of boric acid indicator was placed such that the condenser tip is under the liquid. 5ml of the digest was pipette into the body of apparatus through a small funnel aperture; the digest was washed down with distilled water followed by 5 ml of 60% NaOH solution. The mixture was steamed thoroughly for about 5-7 minutes to collect enough ammonium sulphate. Then receiving flask and the condensed water was removed. Titration of the solution was made in the receiving flask using (0.1m) sulphuric acid and calculation of the nitrogen content was done (AOAC, 2002).

Determination of carbohydrate

The total carbohydrate content of the sample was obtained from the relation; percentage carbohydrate = 100% - (moisture + ash + fat + crude fibre + protein) % (AOAC, 2002).

Anti-nutritional analysis

Determination of Phytate Content

Four gram (4.0g) of each sample was soaked in 100ml of 2% HCl for 3hrs and 25ml of the filtrate was titrated

with a standard iron (II) chloride solution using 0.3% ammonium thiocyanate as indicator until a brownish yellow colour appeared which was persisted for 5mins (Debela, 2002).

Determination of Oxalate Content

Seventy five (75ml) of 3.0M H_2SO_4 was added to 1g of ground sample, stir and filter. 25ml of the filtrates (extract) was titrated hot (80-90°C) against 0.05M $KMnO_4$ solution to the point when a faint pink colour appeared and then persisted for at least 30 seconds (Debela, 2002).

Determination of Cyanide Content

Four gram (4g) of each sample was soaked in a mixture containing 40ml of distilled water and 2ml of orthophosphoric acid, mix, stopped and left overnight at room temperature to free all bounded hydrocyanic acid. 5ml of the resulting mixture was distilled into 40ml of distilled water containing 0.1g of NaOH pellets. The distillate was made up to 50ml with distilled water and 20ml of this was titrated against 0.01M silver nitrate solution using 1.0ml of 5% potassium iodide solution to an end point indicated by a faint but permanent turbidity (AOAC, 2002).

Determination of Saponin Content

Five gram (5g) of each sample was dispersed in 100ml of 20% ethanol. The suspension was heated and filtered, and the residue was re-extracted with another 100ml of 20% ethanol. The combined extracts reduced to 40ml over a water bath at about 90°C. The concentrate was extracted with 20ml of diethyl ether and the ethereal layer was discarded. The aqueous layer was extracted twice with n-butanol and washed twice with 10ml of 5% aqueous sodium chloride. The solution was then evaporated over a water bath and dried to a constant weight (Debela, 2002).

RESULTS

Nutritional composition Cwande samples

The results of nutritional composition of Cwande sample is presented in Table 1. From the results, it can be seen that protein has the highest composition (37.29 + 0.50) followed by moisture (32.07 + 0.58), fibre (14.80 + 3.06), carbohydrate (7.62 + 0.81), lipid (5.18 + 0.52) and ash (3.02 + 1.76).

Table 1: Nutritional composition of Cwande sample

Parameter	Composition (%)
Moisture	32.07 + 0.58
Ash	3.02 + 1.76
Lipid	5.18 + 0.52
Fibre	14.80 + 3.06
Protein	37.29 + 0.50
Carbohydrate	7.62 + 0.81

Anti-nutritional composition of cwande samples

The results of anti-nutritional composition of Cwande sample is presented in Table 2. From the results, it can be seen that Phytate has the highest composition (5.76 + 0.72) followed by saponins (5.51 + 0.61), Cyanide (4.76 + 0.28) and Oxalate (4.03 + 0.20).

Table 2: Anti-nutritional composition of Cwande sample

Parameter	Composition
Phytate	5.76 + 0.72
Oxylate	4.03 + 0.20
Cyanide	4.76 + 0.28
Saponins	5.51 + 0.61

DISCUSSION

The study's proximate analysis showed that the samples' protein content was high. The processing procedure affects the protein content (Aremu *et al.,* 2011). The adoption of processing techniques including fermentation, soaking, and boiling/cooking may have boosted the high protein content of Cwande. The capacity of some microbes to release extracellular enzymes during the fermentation process may potentially contribute to the increase seen (Erukainure *et al.,* 2010). Another factor that may have contributed to the increase in the protein content of these condiments is the quick development of fungus in the form of single cell proteins (Sanusi *et al.,* 2013).

After protein, moisture is shown to be present in considerable amounts. The hydrolytic activity of the fermentation of the cotyledons may be the cause of the rise in moisture content in these condiments. It is also thought to be likely caused by the fermenting organisms' hydrolytic activity on the substrates, which releases moisture as one of their metabolic byproducts. The condiments' high moisture content could render them extremely susceptible to microbial attack and shorten their shelf life while being stored. Low moisture in the raw samples will extend the shelf life, especially during off-season storage (Adegunwa *et al.,* 2012).

There is a little amount of crude fat and crude fiber. The fact that Cwande condiments in their fermented state have lower crude fiber and fat contents as well as lower carbohydrate contents may be because the fermenting organisms have used part of the sugars for growth and metabolic processes. These findings are in line with the study by Achinewhu and Isichei (1990) on the fermentation of oil seeds. The loss of minerals during fermentation processes that occur from the stimulant effects of boiling and leaching may account for the reduced quantities of ash content seen in Cwande samples (Anigo *et al.,* 2015).

In this investigation, the antinutrient levels of cyanide, oxalate, phytate, and saponins were all reduced in all of the Cwande samples. Leaching into the cooking water may be to blame for the drop in antinutrient content (Effiong and Umoren, 2011). This decrease could possibly be the result of processing, native microbial activity, and native enzyme activity that breaks down these anti-nutrients. Numerous researchers had noticed

the typical, considerable decreases in the anti-nutrient levels following fermentation in various substrates (Olajide *et al.,* 2011). The phytase secreted by fungus, which hydrolyzes the phytic acid, may be the cause of the processed samples' lower phytic acid level (Oboh and Elusiyan, 2007). In treated samples, the concentration of saponins normally decreases in this study. One method for reducing saponins' harmful effects is fermentation (Dicko *et al.,* 2005). The raw seeds are often soaked, hydrated, and cooked before fermentation, and these activities have a decrease influence on the level of anti-nutritional elements in fermented food products. This is why anti-nutrient levels are generally lower in fermented food products. These results are consistent with previous researchers' findings (Ugwu *et al.,* 2006).

CONCLUSION

It is concluded from the results of this study that Cwande condiments locally produced by Zuru people in Kebbi State, Nigeria have good nutritional profile levels. However, the level of anti-nutrients in Cwande condiments is reduced in this study.

RECOMMENDATION

Due to the shortage of information in related to Cwande condiment, further studies should be carryout in order to know the incidence of microbial flora of Cwande and toxins substances which are known to be dangerous to humans and animals.

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