Chemical and Sensory Qualities of Local Spice Condiment Produced from White Kidney Bean (*Phaseolus vulgaris*)

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ABSTRACT

A study was carried out to develop dawadawa from white kidney bean. The proximate, anti nutrients composition and sensory properties of white kidney bean dawadawa were compared with those of soybean and locust bean dawadawa. The protein contain of kidney bean dawadawa was low than in seeds. The carbohydrate and fibre contents of the white kidney bean was significantly higher (P<0.05) than those of soybean and locust bean dawadawa but it has a lower fat content than soybean and locust bean. The level of the anti-nutrient was significantly higher (P<0.05) than others. The sensory attributes carried out shows that spicing of vegetable soup with white kidney been was significantly better (P<0.05) from vegetable soups spiced with either soybean or locust bean.

Keywords: White Kidney Bean, Proximate, Anti-Nutrient, Sensory Properties, Dawadawa

INTRODUCTION

Despite the fact that African countries are exhibiting rapid growth in animal rearing and poultry, most of populations of these nations are very poor and still find it difficult to afford proteins from animal sources. This has resulted in problems of protein-malnutrition and other nutritional deficiencies in children. Grain legumes play a special role in human diets especially in the developing countries (Uwagbute et al., 2000) where they account for 80% of dietary protein in Africa, Asia and South America (Aykroyd and Doughty, 1964). They are cheaper sources of proteins and serve as alternative to animal proteins providing protein content in the range of 20-24% (Hofvander and Underwood, 1987). They contain twice much as proteins as in cereals. (Fashakin and Ojo, 1985). In rural and urban areas in West Africa, fermented locust bean seeds are probably the most popular traditional food spice produced from locust bean seeds.

In Nigeria, fermented locust bean is called dawadawa or dawadawa in the Northern part (Hausas) and "iru" in the Southern part (Yoruba). Locust bean dawadawa from part of ingredients for various dishes especially soups and stews constituting part of the dietary protein. They serve as tasty complements in soups and substitutes for fish and meat (Achi, 2005). Traditionally, the food flavouring condiments from locust bean are prepared by uncontrolled solid state fermentation resulting in extensive hydrolysis of carbohydrates and protein components (Fetuga et al., 1973 and Eka, 1980). Today, developing countries are preparing traditional fermented condiment from different types of legumes (Okoruwa, 1999). Soybean has been used as an alternative to locust bean production for dawadawa (Okoruwa, 1999).

Different faster methods have been successfully adapted in processing dawadawa from soybean. This processing method are either by boiling or roasting of the soybean before the fermentation process. (Omafuvbe, 1994). Fermented condiments have also been produced from melon seeds, caster oil seeds, and Bambara groundnut (Odunfa, 1985, Barber and Achmewhu, 1992, Barimala et al., 1989).

White kidney bean is an underutilized grain legume which is distributed and known by a variety of local names (Muller and Tobin, 1980). It is an herbaceous annual plant domesticated independently in ancient mesoa America and now grown world wide for its edible bean, popular both dry and as a green bean (FAO STAT and FAO 2009).

AIM

To investigate the possibility of producing dawadawa of acceptable quality from kidney bean.

OBJECTIVES

To produce dawadawa from white kidney bean

To determine the chemical and sensory properties of dawadawa samples produced using standard methods.

Production of local spice from soybean.

The soybean was sorted and washed.

It was then placed in a pot quarterly filled with water and boiled for 30minutes and water was subsequently added to it until it is done. It was drained and washed with water until the peel or cover is of. It was then soaked in a mud from river bank mixed with water and allow to stay for 20-30minutes and the thoroughly washed until it is cleaned. It was then re-cooked and drain and covered up a local basket, calabash or banana leaved and covered up allow to ferment for minimum of 72hours (3 days). Salt is then added to bring out the taste and preserve the shelf life.

PRODUCTION OF LOCAL SPICE FROM WHITE KIDNEY BEAN

The white kidney bean was sorted and washed. It was then cooked for 30minutes. The water is drained and washed to peel off the skin. It was then recooked, while recooking iku kaun and potash was added to make it become more softer and to give it the nature of "iru pete" it was then pound into a banana leaf, local basket, calabash and wrapped while it to ferment for about 24hours or more.

PROXIMATE COMPOSITION ANALYSIS

Determination of Moisture Content

Moisture content determination was carried out using the air oven method. Crucible was washed and dried in an oven. The crucible was allowed to cool in the desiccator and weight was noted. A known weight of samples were then transferred into the crucibles and dried at temperature between 103-105°C. The dry samples were cooled in a desiccator and the weight noted.

They were later returned to the oven and the process continued until constant weights were obtained.

Calculation

$$\% \text{ moisture content} = \frac{\text{weight loss} \times 100}{\text{Weight of sample}}$$

Determination of Ash Content

A known weight of finely ground sample was weighed into clean, dried previously weighed crucible with lid (W1). The sample was ignited over a low flame of char the organic matter with lid removed. The crucible was then placed in muffle furnace. At 100°C for 6hr until it ashed completely. It was then transferred directly to desiccators, cooled and weighed immediately (W2).

$$\text{Percentage ash} = \frac{W_2 W_1 \times 100}{\text{Weight of sample}}$$

Determination of Crude Fat

The soxhlets extraction method (AOAC, 1996) was used. This method could only give the approximate fat content in a sample because all the substances soluble in chosen solvent (Petroleum ether, 40°C-60°C boiling range) were extracted from the sample. A known weight of sample was weight into a weighted filter paper and folded neatly.

This was put inside pre-weighed thimble (W_1). The thimble with the sample (W_2) was inserted into the soxhlets apparatus and extraction under reflux was carried out with petroleum either (40°C-60°C boiling range) for 6h at the end of the extraction, the thimble was dried in the oven for about 30minutes at 100°C to evaporate off the solvent and thimble was cooled in a desiccator and later weighed (W_3).

The fate extracted from a given quantity of sample was then calculated:

$$\% \text{ fat (w/w)} = \frac{\text{loss in weight of sample} \times 100}{\text{Original weight of sample}}$$

$W_2W_3 \times 100$

$= W_2\text{-}W_1$

Protein Determination

The crude protein content was determined using micro Kjeldahl method as described in AOAC (1996). 0.2077g of sample was weighed into a long necked Kjeldahl flask. 1 tablet of Kjeldahl catalyst was added to the sample in the flask with 25cm^3 of Conc H_2SO_4. The flask was swirled, gently clamped in an inclined position and heated electricity in a fume cupboard. The heating continue until a clear solution was obtained. The clear solution was cooled, poured into 100cm3 volumetric flask and made up to make with distilled water 10ml of the resulting mixture was pipette into a 100cm^3 conical flask and placed at the receiving end of the distillatory.

The conical flask was such that the delivery dipped completely into the boric acid inside the flask. 40% NaOH was used to liberate ammonia out of the digest under alkaline condition during the distillation 2 drops of methyl orange were always added to the round bottom flask containing the digested sample before 40% NaOH was added. As soon as the contents became alkaline, the red colour changed to yellow showing NaOH to be in excess. Steam was then generated into the distillation set using a steam chest. The liberated ammonia was trapped in the boric acid solution and about 50cm^3 of the solution collection into a conical flask. The solution in the flask was titrated against 0.1M HCl until the first permanent colour change was observed.

A blank sample was through the sample procedure and the titre value of the blank was used to correct the tire for sample.

% N = Molarity of Hcl x sample titre – blank titre) x 0.014 x DE x 100 Weight of sample used

% N was converted to the percentage crude protein by multiplying by 6.25.

Determination of Crude Fibre

Two Hundred (200ml) freshly prepared 1.25% H_2SO_4, were added to a known weight of the residue obtained from fat extraction, and this was brought to quick boil. Boiling was continued for 30minutes. The mixture was filtered and residue washed until it was free from acid. The residue was transferred quantitatively into a digestion flask, 1.25 NaoH was added and brought to boiling point quickly. Boiling was continued for 30minutes. The mixtures were filtered and residue washed free of

Proximate composition of white kidney bean, soy bean, and African locust bean dawadawa.

alkali. The residue was then washed with methylated spirit, thrice with petroleum ether using small quantities. It was allowed to properly drain and then residue with transferred to a silica dish (previously ignited at 105oC, the organic matter of the residue was burnt by igniting for 30minutes in a muffle furnace at 600°C. The residue was cooled and weighed. The loss on ignition was reported as crude fibre (AOAC, 1996).

Carbohydrate

The carbohydrate content was calculated by difference

% CHO = 100 – (Sum of the percentage of moisture, ash, fat, protein and crude fibre).

Table 1:

Samples	Moisture %	Protein %	Fat%	Fibre %	Ash %	Carbohydrate%
WKBD	50.83$^{c}\underline{+}$0.25	11.30$^{c}\underline{+}$0.26	103$^{c}\underline{+}$0.06	423$^{d}\underline{+}$0.05	3.33$^{c}\underline{+}$0.45	29^{d}.27$\underline{+}$0.42
ALBD	51.83$^{a}\underline{+}$0.29	16.27$^{b}\underline{+}$0.21	9.60$\underline{+}$0.00	3.60b$\underline{+}$0.40	4.47$^{b}\underline{+}$0.38	14^{b}.23$\underline{+}$0.25
SBD	51.73$^{b}\underline{+}$0.42	18.47$\underline{+}$0.12	12.43$^{a}\underline{+}$0.15	3.30$^{a}\underline{+}$0.40	5.37$^{d}\underline{+}$0.58	8.70$^{c}\underline{+}$0.26

Mean in the same column not found by the same letter are significantly different at 5% level of significance.

Key WKBD – White kidney bean dawadawa
ALBD – African Locust bean dawadawa
SLD – Soybean dawadawa

Anti-nutrient content of white kidney bean dawadawa in comparison with soy bean and locust bean dawadawa.

Table 2:

Samples	Tannin (mg/100g)	Phytate (mg/100g)
WKBD	13.86$^{c}\underline{+}$0.06	22^{a}40$\underline{+}$ 0.00
ALBD	11.60$^{b}\underline{+}$0.01	14.50$^{c}\underline{+}$0.17
SBD	8.43$\underline{+}$0.02	17.67$\underline{+}$0.12

Sensory analysis of white kidney bean dawadawa as a spice in spinash soup in comparison with soybean and locust bean dawadawa

Samples	Taste	Aroma	Appearance	Overall Acceptability
WKRD	7.44$^{a}\underline{+}$0.73	8.5$^{a}\underline{+}$0.53	7.56$^{a}\underline{+}$1.24	8.00$^{a}\underline{+}$1.00
ALBD	7.33$^{ab}\underline{+}$1.94	6.44$^{b}\underline{+}$1.94	7.33$^{b}\underline{+}$1.44	6.44$^{c}\underline{+}$2.07
SBD	7.56$^{b}\underline{+}$1.67	7.56$^{d}\underline{+}$1.67	7.22$^{c}\underline{+}$0.97	7.44$^{d}\underline{+}$1.67

Mean in the same column not followed by the same letter are significantly different at 5% level of significance.

Key WKBD – White kidney bean dawadawa
ALBD – African locust bean dawadwa
SDB – Soybean dawdawa

DISCUSSION

Proximate composition of dawadawa from three legumes of study (white kidney bean, African locust bean and soybean) are presented in table 1.

The protein content of kidney bean dawadawa was low than in the seeds. The reason which may be due to conventional method adopted. (Azokputa et al., 2006). Increase in protein content of locust bean sees processed into a condiment "iru". The carbohydrate and fibre content of the white kidney bean was significantly, (P<0.05) lower fat content in kidney bean dawadawa is an indication that the condiment will be nutritionally advantageous for people requiring low fat proteins diet and also make the spice less susceptible to rancidity.

The anti-nutrients in the white kidney bean was significantly high (P<0.05) than those of African locust bean and soybean dawadawa. With this, high level of anti-nutrients white beans should firstly be subjected to heat treatment such as autoclaving for 45 minutes (Udensil et al., 2005) has reported a remarkable result for mucuna bean.
Also, the days of fermentation can be extracted before the seeds is been processed into the condiment. Previous studies on castor oil seeds and Bambara groundnut also reported reduction in anti-nutrients as a result of fermentation (Odunfa, 1985, Barimaala et al., 1989).

Result of sensory analysis of the white kidney bean dawadawa as an ingredient in the population of spinash vegetable soup in comparison with those of African locust bean and soybean dawadawa are shown in table 3, the white kidney bean dawadawa was not significantly with (P<0.05) from the African locust bean and soy bean samples in taste. The Aroma of white kidney bean was significantly acceptable from that of soybean dawadawa and African locust bean. The characteristics ammonia flavour of dawadawa is due to formation of ammonia from amnnia acids (Barrimala et al., 1989). In overall acceptability, spicing of vegetable soups with white kidney was significantly better (P<0.05) from vegetable soups spiced with either soybean or locust bean.

CONCLUSION

Conclusion and Recommendations

This study shows that white kidney bean can also be utilized as an alternative cheaper material to either soybeans or soybeans or African locust bean in the production of dawadawa, thus expanding its utilization.

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Reference to this paper should be made as follows: Adenekan, M. K.; et al. (2016), Chemical and Sensory Qualities of Local Spice Condiment Produced from White Kidney Bean (*Phaseolus vulgaris*). *J. of Medical and Applied Biosciences,* Vol. 8, No. 1, Pp. 41 – 50.