COMPARATIVE QUALITY EVALUATION ON NUTRITIONAL, MICROBIAL AND SENSORY QUALITY OF ROASTED CASHEW NUTS

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ABSTRACT

This study was conducted to determine the effect of two roasting methods on the chemical, microbial and sensory qualities of cashew kernels. Raw cashew nut was processed to obtain the plain cashew kernel and was divided into two portions which were subjected to different roasting treatments using pan and oven at a temperature of 200°C for 40mins. Proximate analysis showed that the pan roasted cashew kernel had the higher moisture content, protein, ash, fat and crude fiber values of 5.44±0.2%, 20.9±0.05%, 3.11±0.01%, 39.8±0.19% and 4.13±0.05%, respectively than the oven roasted. In oven roasted cashew kernel, moisture, protein, ash, fat and crude fibre content were lesser with values of 4.67±0.12%, 18.32±0.17%, 2.73±0.04%, 32.79±0.23%, 3.18±0.17%, respectively than the oven roasted sample using pan. However, the oven roasted cashew kernel has the highest carbohydrate content of 38.32±0.68%. The mineral analysis indicated that the oven roasted kernels had higher values except in the case of sodium (Na), which was higher in the pan roasted cashew nuts. The microbial assessment of the cashew kernels showed that oven roasted cashew kernel had a reduced value in the microbiological analysis carried out. The sensory evaluation shows that oven roasted cashew kernel had the highest overall acceptability sensory rating. This study indicated that oven will be better option for producing wholesome roasted cashew nut kernel with acceptable sensory qualities.

INTRODUCTION

Cashew nut (*Anarcadium occidental*) is a kidney-like shaped fruit widely grown in Africa and West indies. The Nuts have been recognized as a class of food that are rich in important nutrients including proteins and unsaturated fatty acids (Shakuntala and Shadasharaswamy, 1987); Borufau *et al.*, 2006). The cashew kernel is of high food value with about 40-57% oil and 21% protein content. Globally, cashew nut kernel (among other nuts) is an esteemed and highly priced food delicacy valued because of it pleasant taste and flavor (Irtwange and Oshodi, 2009). Also, nuts have been said to constitute a good source of chemical constituents and certain vital bioactive compounds of important health benefits in human beings (Yang, 2009); with scientific beneficial effect on health, particularly on chronic diseases such as hypertension and obesity, coronary heart disease and diabetes due to their high content of unsaturated fatty acids (Oliete *et al.*, 2008). Anarcadic acids are phenolic compounds present in cashew nut that could have some inhibitory action against Gram-positive bacteria, yeast and fungi. Roasting from time immemorial remains one of the common processing methods for nuts. During the process, the nuts become more crunchy and brittle leading to an overall increased palatability (Ozdemir and Derves, (2000); Saklar *et al.*, (2001); Abayomi *et al*., (2002). In roasted foods, *pyrazines* or alkyl-pyrazines are formed via Maillard reaction above 70 °C and contribute to roasted or cooked flavours. Drying has been identified as one of the processes occurring during roasting operation.

METHODOLOGY

SOURCE OF MATERIAL

Good quality cashew nuts were obtained from a produce farmer in Ilaro, Ogun State, Nigeria. Some preliminary quality tests (floatation and cut test) were used to ascertain the wholesomeness of the raw cashew nut.

Cashew nut processing method were through *OVEN ROASTING* and *OPEN PAN ROASTING*

PROXIMATE ANALYSIS

Proximate composition (moisture, crude protein, crude fat, ash and total carbohydrates) of the samples were carried out according to the standard official method of analysis of the association of official analysis of chemist (AOAC, 2000). The nitrogen content was determined by the micro Kjeldahl method which was subsequently converted to protein by multiplying by a factor of 6.25 while the carbohydrate content was determined by difference. Fatty acid and metabolizable energy (KJ/100g) was calculated using the formula described by Aremu *et al.,* (2006) as shown below

Calculated fatty acids = (0.86 X crude fat)

Calculated Metabolizable energy (KJ/100g) = (protein X 17) + (Fat X 37) + (Carbohydrate X 17).

MICROBIAL ANALYSIS

All glass wares were sterilized in the oven. The media was prepared by weighing 2.8g, and was dissolved in 100ml distilled water, sterilized and cooled 45^{o}C. the procedure involved for serial dilution begins with arrangement of the needed (require test tubes in a test tube rack with proper labeling (10^1, 10^2, 10^3, 10^4, ……. 10^n). 1ml of each dilution was pipette from the homogeneous mixture of the sample into the test tube 10^1, properly homogenized and withdrawn continuously into other test tubes until it gets to the desired dilution. The desired dilution was plated (10^{-4}) into different petri-dishes in duplicate containing nutrient agar incubated at 30^{o}C for 24hrs-48hrs.

SENSORY ANALYSIS

The cashew kernel samples were subjected to sensory evaluation to determine consumer preference among the different samples. Parameters such as color, taste, crispiness, flavor and overall acceptability were determined using a 9-point Hedonic scale. The cashew kernel samples were then presented in coded identical white saucer plates and the samples were tested individually by a 15-man panel. Mode of presentation of the three samples was completely randomized and water was provided to enable the panelists rinse their mouths after tasting each sample.

RESULTS

TABLE 1: RESULT OF PROXIMATE COMPOSITION OF PLAIN AND ROASTED CASHEW KERNEL SAMPLES SUBJECTED TO STATISTICAL ANALYSIS

PARAMETER	PBA	PBB	PBC
Moisture content	12.41^{a}±0.11	5.44^{b}±0.20	4.67^{c}±0.12
Protein	22.27^{a}±0.01	20.9^{b}±0.05	18.32^{c}±0.17
Fat	24.95^{c}±0.30	39.80^{a}±0.19	32.79^{b}±0.23
Crude oil	6.26^{a}±0.14	4.13^{b}±0.05	3.18^{c}±0.17
Ash	5.72^{a}±0.70	3.11^{b}±0.01	2.73^{c}±0.04
Carbohydrate	28.4^{b}±0.28	26.42^{c}±0.23	38.32^{a}±0.68
Fatty acid	5.38^{a}±0.12	3.56^{b}±0.04	2.28^{c}±0.11
Metabolizable energy (Kj/100g)	1784.82c±6.33	2276.94^{a}±3.89	2175.58^{b}±0.55

Values are mean of duplicate samples ± S.D values. Mean values having different subscript within the same row are significantly different (P<0.05).

KEY:

PBA **=** Plain cashew kernel. PBB = Pan roasted cashew kernel. PBC = Oven roasted cashew kernel

TABLE 2: RESULT OF MINERAL CONTENT (MG/100G) OF PLAN AND ROASTED CASHEW KERNEL SAMPLES SUBJECTED TO STATISTICAL ANALYSIS

Mineral element	PBA	PBB	PBC
Phosphorus (mg)	0.7^{a}±0.28	0.66^{b}±0.04	0.61^{b}±0.04
Iron (mg)	0.3^{b}±0.08	0.47^{a}±0.03	0.47^{a}±0.03
Magnesium (mg)	1.33^{a}±0.14	1.39^{b}±0.1	1.47^{a}±0.03
Sodium	0.83^{a}±0.03	0.82^{a}±0.17	0.063^{b}±0.06
Potassium (mg)	0.58^{b}±0.17	0.56^{b}±0.17	0.65^{a}±0.03

TABLE 3: MICROBIAL ANALYSIS OF PLAIN AND ROASTED CASHEW KERNEL SAMPLES

Microbial enumeration	PBA	PBB	PBC
Total variable count	5×10^5	25×10^5	2×10^5
Yeast and mold count	20×10^5	22×10^5	18×10^5
Coliform count	2×10^5	3×10^5	1×10^5
E. coli count	0	0	0
Staphylococcus count	3×10^5	13×10^5	3×10^5

TABLE 5: RESULT OF SENSORY SCORE OF PLAIN AND ROASTED CASHEW NUTS

Parameter	PBB	PBC
Color	7.73^{a}	7.53^{a}
Taste	7.93^{a}	7.27^{a}
Flavor	7.69^{a}	7.20^{a}
Crispiness	7.2^{a}	8.93^{ab}
Overall Acceptability	7.40^{a}	8.47^{ab}

DISCUSSION

Table 1, shows the results of the chemical composition of the plain and two roasted Cashew Kernels. The Ranges Of The Chemical Compositions Are Moisture Content (%) 4.67±0.12 to 12.41±0.11, Protein (%)18.32±0.17 to 22.27±0.01, Fat(%)24.95±0.30 to 39.80±0.19 Crude Fiber(%)3.18±0.11 to 6.26±0.14, Ash(%)2.73±0.04 to 5.72±0.070, Carbohydrate(%)26.42±0.23 to 38.32±0.68, Fatty acid (%)2.28±0.11 to 5.38±0.12 and metabolizable energy (Kj/100g) 1784.82±6.33 to 2276.94±3.89.

The moisture content values of the various cashew samples showed that roasting methods significantly ($P<0.05$) affected this parameter with cashew kernel roasted with oven processing the least moisture content followed by the cashew nut roasted with pan. There was reduction in the protein content of both roasted cashew kernels when compared to the plain cashew kernel with oven roasted kernel having a lesser protein content than pan roasted kernel.

The quantity of crude fibre present in the samples varied significantly ($P<0.05$). It is highest in the plain cashew kernel with oven roasted cashew kernel having the least value. The result of these findings is in

agreement with the outcome of similar study reported by Ayoola and Adeleye (2010). The result showed that there was a significant decrease ($P<0.05$) in the ash content of the roasted cashew kernels as against the plain cashew kernel. Pan roasted cashew kernel had the higher value as compared with the oven roasted cashew kernel.

The carbohydrate values obtained for the cashew kernels revealed a significant difference between the two roasted kernels and the oven roasted cashew kernel having the highest value. The fatty acid content of the cashew kernel samples followed the same trend with the plain cashew nut kernel having the highest value. The energy value in both samples showed an increase in the energy value with pan roasted cashew kernel having the highest. This highlights the importance of nuts in supplying the energy requirement of human being.

The mineral composition revealed a significant difference in some of the mineral analyzed as shown in Table 2, Phosphorus content (mg /100g) ranged from 0.61±0.04 to 0.7±0.28, Iron content (mg/100g) ranged from 0.3±0.08 to 0.47±0.03, Magnesium content (mg/100g) ranged from 1.33±0.41 to 1.39±0.1 Sodium content (mg/100g) ranged from 0.063±0.06 to 0.83±0.03 and Potassium ranged from 0.58±0.17 to 0.65±0.03. Both phosphorus and iron contents of the cashew kernel samples were not significantly ($P>0.05$) affected by the two roasting methods. Though for the phosphorus content, pan roasted cashew kernel had the highest value, it does not differ significantly with that of the oven roasted cashew kernel.

The microbial analysis revealed that the kernels are within the safe microbial standard and limits as shown in table 3. The results of the total viable count of the cashew kernel samples are within the microbial limits/standard of 10^4 to less than 10^6 cfu\g of ready-to-eat food products given by Fylde Borough council as extracted from manual of PHLSG (2008). The plain cashew kernel showed higher value compared to the other two samples due to its high moisture content which was reduced during roasting. The reduction in moisture content of the two roasted samples led to a reduction in their microbial load.

The sensory evaluation showed that there was no significant difference ($P<0.05$) in the color of both samples A and B though the values which ranged from 7.53-7.73 translate to 'like moderately' in the Hedonic scale used for the organoleptic analysis of the cashew nut samples. There was no significance difference ($P<0.05$) in the taste of the roasted cashew nuts. Sample A had the highest score of 7.93 while the least was recorded in sample B with 7.27.

There was significant difference ($P<0.05$) in terms crispness of the roasted cashew nuts. The value ranged from 8.93-7.2 which translates to 'like very much' and 'like moderately' on the Hedonic scale.

CONCLUSION

This study reveals that there is a significant difference in the nutritional and sensory characteristics of the cashew nuts roasted using the pan and oven method, suggesting that the oven is better equipment for roasting the nuts. The oven also provides an environment that helps reduce the microbial contamination during roasting thereby extending the shelf-life of the roasted cashew nuts.

RECOMMENDATION

The oven method of roasting kernels is most preferred over the pan roasting method. The oven is adjudged as better equipment for roasting the nuts. The oven provided an environment that helps reduce microbial contamination during roasting thereby extending the shelf-life of the roasted cashew kernel. Also, good sanitary condition should be ensured during processing by carrying out good manufacturing practices. This helps reduce microbial load. The roasted cashew nut kernel should be packaged is a tight container or polythene to assure a longer shelf-life. In addition, further research work should be carried out on the storability of the cashew nut samples after processing without using chemical preservatives. This is in view of the proven high nutritional value and health promoting attributes of properly roasted cashew nuts.

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