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Research Article

Effect of Temperature and Time Combinations on Colour Characteristics, Mineraland Vitamin Content Raw and Roasted Cashew Kernel

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ABSTRACT

This study aimed at evaluating the effect of temperature and time combinations on some selected quality characteristics cashew kernel roasted at (100–160°C) and time (20–60 min) using standard methods. Raw and roastedcashew nuts were analyzed for changes in colour, mineral and vitamin composition. The result showed that six macro-elements and water and fat soluble vitamins were identified in both raw and roasted cashew kernel. The percentageloss in the analyzed mineral (Na, K, Ca, Mg, P and selenium) for different roasting conditions showed the trend: 100C<120C<140C<160C. Mineral analysis showed increases of potassium (39.2%) and calcium (28.2%). Vitamins B1, B2 and B3 contents were significantly reduced (P<0.05) after roasting with 30.6%, 25.6% and 34.7% destruction, respectively. Colour dimension showed lightness (40.79-64.75), redness(3.86-13.86), yellowness(12.29-28.58), chroma (43.07-64.74), BI (25.28-128.66), ΔE(4.71-28.78). Changes in lightness, redness, yellowness values were significantly (p<0.05) affected by roasting condition with BI increased with increased in roasting temperature. The findings of this study suggest the need to create awareness on potential nutritional benefits of cashew kernel consumption as it has appreciable amount of important micronutrients.

Keywords: Roasting; Cashew nut; Colour; Mineral; Vitamin; Cashew kernel

INTRODUCTION

Tree nuts are major dietary components which have been reported to bring about reduced incidence of coronary heart disease. Edible tree nuts are rich sources of lipids, proteins, vitamins and minerals in significant amounts which are believed to have beneficial effects on human health due to the presence of higher unsaturated fatty acids [1]. This protective effect of nuts may be through multiple mechanisms due to the presence of nutrients and bioactive substances present in nuts. Vitamin E delays the oxidation process by eliminating the free-fatty acid radicals, although it can neither completely prevent the autoxidation of lipids nor reverse the formation of peroxides. Due to its role as a scavenger of freeradicals, vitamin E is also believed to protect against onset of chronic diseases such as cancer and cardiovascular diseases [2]. Thus, it is heavily in demand as a supplementary nutrient. Natural food sources are of increasing interest to the consumer and industry. This study considers roasting as a technique to reduce cashew kernel loss which provides important product attributes. During roasting, moisture in nuts is reduced from 4–6% to 1–3% which gives rise to desirable crisp texture. Also, when nuts are roasted heavily at high temperatures for longer periods, the sugars in cashew nut can decrease, which may also bring about physico-chemical changes in colour, vitamin and carbohydrate content. and therefore decreases the quality of nuts. Usually, roasted nuts are more susceptible to oxidation suggesting that vitamin E might be less stable in roasted nuts during storage. Several authors have shown in their studies that consumption of nuts have the ability to prevent chronic diseases in human due to the presence of ascorbic acid, tocopherol, phenolic compounds and anthocyanin, hence therefore play an important role in human nutrition [3]. Also, nuts have also been reported to promote weight maintenance [4]. Therefore, determination of roasting conditions (temperature-time combinations) more precisely would ensure the production of good quality cashew kernel. The effects of time-temperature profile on the kernel colour, mineral, vitamin

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content of roasted cashew nut have not been reported. There is no report showing changes in mineral, vitamin and changes in colour characteristics of fresh and roasted cashew nut despite the fact that cashew kernels are widely consumed and tend to be nutritious. There is still lack of sufficient information on the colour, mineral and vitamin composition of raw and roasted cashew kernel. An understanding and knowledge of the composition of these parameters may encourage wider acceptability and utilization for nutraceutical purposes. Also, this information is necessary for improvement and design of roasting process for maximizing nutrient retention. Conceivably, cashew kernel could be used in human food formulations especially in low hypertension risk areas where quality food shortage is endemic and could also be used to replace the more expensive conventional plant protein food resources, such as, soy bean and groundnut cake in monogastric animal diets to enhance animal protein production and consumption in this region. Measurement of cashew nut colour has been suggested as an indirect index of degree of roasting [5]Many authors use colour as a quality control indicator for processes because brown pigments increase as browning and caramelization reactions progress. Colour measurement is important in design, simulation and optimization process; hence, measuring the colour can be used as a standard method and for developing colour sorting device [6]. Therefore, it is necessary to understand these changes during roasting so as to obtain a better quality roasted cashew nut. Thus, this study was carried out to evaluate the effect of roasting degree on colour characteristics, mineral and vitamin content raw and roasted cashew kernel grown in Nigeria.

MATERIALS AND METHODS

Materials

The Brazilian Jumbo" cultivar of cashew nuts was obtained Cocoa Research Institute of Nigeria (CRIN), Ibadan, Nigeria. The dried raw cashew nuts were sorted to remove diseased and immature nuts and were packaged in sterile bottles for further processing.

Roasting procedure for cashew kernel

The cashew kernel processing procedure involves steaming of raw cashew nut to obtain the kernel, drying of the kernel which is followed by roasting process as described by modified method of [7]. The roasting process for cashew kernel was carried out by the method described by [8] where they were roasted at a temperature of 100°C, 120°C,140°C, and 160°C for 20-60 min and cooled to room temperature in desiccators and then stored in glass bottles for analysis.

Chemical analysiS

Determination of vitamin content of raw and roasted cashew nut:

The vitamin content of the raw and wasted sample was analyzed using modified method. The sample was allowed to attain the laboratory atmospheric condition on the bench after the removal from storage chamber at temperature of 4°C. The sample was ground and completely homogenized in the mortar with pestle to avoid the formation of balls. 0.1 g of the sample was weighed into 10 ml beaker and extracted in the container by the method above. After the extraction, the extract was concentrated to 1.0 ml for the chromatographic analysis using GC-FID where the following vitamins are tocopherol (vitamins E), thiamine(vitamins B1), riboflavin(vitamin B2), niacin(vitamin B3) and cobalamin (vitamin B12) and vitamin K, pyridoxine (vitamins B6), vitamin A and folate were evaluated. The vitamins were analyzed using gas chromatography (HP 6890 Powered with HP chemstation Rev. A09.01 [1206] software with a flame ionization detector. The carrier gas was hydrogen at a flow rate of 1.0 ml/min. A capillary column, HP5MS (30 m x 0.25 mm × 0.25 µm) was used for the fatty acid analysis. Injector temperature used was split injector, detector temperature and column temperatures were 320°C and 150°C, respectively. Injection quantity was 1 µl. The oven was programmed at initial temperature of 50°C; first ramped was curved out at 5°C /min to 150°C and 2nd ramped at 10°C /min to 250°C. Hydrogen pressure used was 22 psi and compressed air was set at 28 psi. The mineral content were identified by comparing their retention times to those of a standard mixture of minerals and the peak areas were integrated and expressed in mg/100g.

Determination of mineral element composition:

The elemental composition of watermelon sample was determined by dry ashing method in which about 0.5 g of the samples was weighed into a clean, dry crucible and the content was ashed in a muffle furnace at 600°C for 4 h. The ash was then cooled and dissolved in dilute HCl (HCl: glass distilled water 1:3, v/v) in which a few drops of concentrated nitric acid is then added. The content was then transferred to 50 ml volumetric flask and the volume was made up to the 50 ml mark by distilled water and allowed to cool. The solution obtained was then used for the determination of the element sodium, potassium, selenium and Magnesium was determined using appropriate lamps; Calcium was evaluated by flame photometer (Model, 405, Corning, UK) and phosphorus was determined with vanadomolybdate using a spectrophotometer at 425 nm. The minerals were reported as mg/100 g.

Determination of colour dimension of roasted cashew nut:

Roasted samples were stored in the plastic bags and stored at 4°C until used for color measurement. All color measurement was determined within 10 days of roasting and after manual blanching to remove the skin. The measurements were conducted after milling each sample to constant grind size at 5 different parts of the resulting sample. Outside colour of 20 randomly selected cashew kernels was measure for every sample referred as whole kernel measurement while measurement carried out after milling each sample to constant grind size was referred to as ground state measurement [9] Commission Internationale de I'Eclairage (CIE) tristimulus L* a* b* parameters were determined using color meter.

The colorimeter operates on the CIE L*, a*,b* colour scheme. The L-, a- and b- values are the three dimensions of the measured color which gives specific color value of the material. L-value represents light dark spectrum with a range of 0 (black) to 100(white), a-value represents green red spectrum with arrange of -60 (green) to +60(red), b-value represents blue-yellow spectrum with a range of -60 (blue) to +60 (yellow) and 0 is neutral. The instrument was first standardized (L*=78.14, a*=4.16, b*=-5.97) with a Business Xerox 80gm-2 white paper with 136 CIE whiteness D65. The colour meter was placed on the sample by allowing the sensor to touch the sample; multiple measurements of several points on samples were made.

Statistical analysis

Data collected from all experiments were in triplicates and data expressed as means ± standard deviations. The data were subjected to one-way analysis of variance (ANOVA) and differences between treatment means were separated using Duncan's Multiple Range Test (DMRT) out to assess significant differences between means ($p<0.05$). All statistical procedures were carried out according to methods of Steel, while computation was done using SAS software package.

RESULTS AND DISCUSSION

Changes in vitamin content of cashew nut roasted at different conditions

The effect of roasting temperature and time combinations on both water and fat soluble vitamin content of raw and roasted cashew nut were presented. Samples roasted at 140°C for 20 min had the highest vitamin B1(thiamine) content (0.38 mg/100 g), this is followed by samples roasted at 120°C for 20 min (0.37 mg/100 g) while samples roasted at 140°C for 40 min had the highest value (0.27 mg/100 g). However, vitamin B2 (riboflavin) content of 0.033 mg/100 g was highest for cashew nut roasted at 140°C for 20 min. Vitamin B3 (niacin) content of 1.36 mg/100 g was obtained for cashew roasted at 160°C for 60 min while the lowest value of 1.00 was obtained for samples roasted at 160°C for 20 min. Vitamin B4 was highly insignificant in cashew nut with highest value of 0.0025 mg/100 g obtained for cashew nut roasted at 100°C for 60 min while a value of 0.0018 mg/100 g was obtained for samples roasted at 160°C and 120°C for 20 min. Vitamin B5 (pantothenic acid) was highest for samples roasted at 160°C for 60 min (1.27 mg/100 g) and lowest for samples roasted at 100°C for 60 min. Vitamin B6 was highest for cashew nut roasted at 120°C for 60 min (1.27 mg/100 g) and lowest for samples roasted at 100°C for 20 min (0.34 mg/100 g). Vitamin E (tocopherol) content was highest in samples roasted at 100°C for 20 min and lowest in samples roasted at 120°C for 40 min (1.03 mg/100 g). Vitamins are organic compounds that promote and regulate essential biochemical reactions within the human body, which is generally unable to synthesize these compounds. They have to be obtained from food in trace amounts for growth, health, and reproduction and their inadequacy in the diet may give rise to overt symptoms of deficiency. Vitamins do not take part in the conversion fat and carbohydrates into energy but rather involve in formation of bone and tissue. Vitamins are diverse group of organic compounds that are nutritionally essential micronutrients, hence they are known as accessory food factors. The variations in the levels of the macronutrients may be as a result of different geographical locations, methods of cultivation, soil types, processing methods which they were subjected.

Riboflavin is essential for cellular energy metabolism, supports hormone production, neurotransmitter function, healthy eyes and skin, and the production of red blood cells Riboflavin contents were also significant affected by roasting degree at $p<0.05$. Riboflavin content decreased most at 160°C for 60 min.Losses in thiamine and riboflavin levels could be related to thermal destruction. Heat-liability of thiamine is higher [10]. Decrease in thiamine (32.4%) and riboflavin (30%) contents were reported for roasted maize by [11,12] reported 0–8% thiamine for hazel nut 0–75% riboflavin losses during processing of foods. They also stated that low temperature-long time treatment caused less thiamine losses than high temperature-short time treatment. A lack of vitamins or a diet that does not provide adequate amounts of certain vitamins can upset the body's internal balance or block one or more metabolic reactions. Vitamin E functions as an antioxidant to protect cellular membranes from destruction by preventing the oxidation of unsaturated fatty acids in the phospholipids. Its antioxidative function involves the reduction of free radicals, preventing the potentially deleterious reactions of highly reactive oxidizing species [13]. Vitamin E is a primary antioxidant which can break the chain reaction during the propagation of free radical reactions due to the reactivity of the phenolics hydrogen on its hydroxyl group in the chroman ring system [14-17]. Vitamin E acts as a major peroxyl radical scavenger in biomembranes, resulting in stabilization of membranes. Free radical–induced oxidative damage to membrane lipids is regarded as a critical initiating event leading to cell injury [17]. Biological membranes contain a relatively high portion of polyunsaturated lipids which become susceptible to oxidation. Lipid oxidation is associated with the loss of membrane polyunsaturated fatty acidsand the formation of hydroperoxides, free radical intermediates, and other secondary products. This process may disturb the structure of membranes and affect the permeability and functions of the membrane, including activation of phospholipase and disturbance of the critical calcium homeostasis [18-20]. Lipid oxidationproducts including hydroperoxides, aldehydes, and epoxides may react with essential proteins, enzymes, and nucleic acids, causing irreversible damage to the cells. Vitamin E is also believed to act as a membrane stabilizer by forming complexes with the products of membrane lipid hydrolysis such as lysophospholipids and free fatty acids [21]. VitaminE and fatty acid molecules are assumed to form a complex by a hydrogen bonding [22]. Stated that the stability of the fatty acid complexes with vitamin E increased as the number of fatty acid double bonds increase. Vitamin E delays the oxidation process by eliminating the free-fatty acid

radicals, although it can neither completely prevent the autoxidation of lipids nor reverse the formation of peroxides. Due to its role as a scavenger of free radicals, vitamin E is also believed to protect against onset of chronic diseases, mainly cancer and cardiovascular diseases [23]. Thus, it is heavily in demand as a supplementary nutrient. Natural food sources are of increasing interest to the consumer and industry. The content of vitamin E in cashew nut oil gradually increased ($p \leq 0.05$) as the roasting temperature and time increased. The content of vitamin E roasted at 20, 40 and 60min at 160°C were 1.14, 1.21 and 1.26 mg/100 g respectively [24]. Reported that the content of vitamin E (α- tocopherol) in sesame oil prepared by microwave oven heating decreased over time. On the other [25] reported that the level of vitamin E in sesame oil prepared by electric oven heating was increased by roasting temperature up to 200°C [26]. Also reported that a heat pretreatment over a range of 100°C to 175°C by a convection oven caused an increase in the level and yield of vitamin E in rice bran oil [27]. Had a similar result from corn fiber oil but opined that the heat-induced increase in the level of vitamin E in corn hull suggested that a significant amount of vitamin E (α-tocopherol) is bound to protein or linked to phosphate and that heat break these bonds. It is possible that a similar phenomenon occurs in cashew nut germ in which bonds linking the α-tocopherol and γ- tocopherol with phosphate or phospholipids are broken by heat during roasting (Figure 1-10).

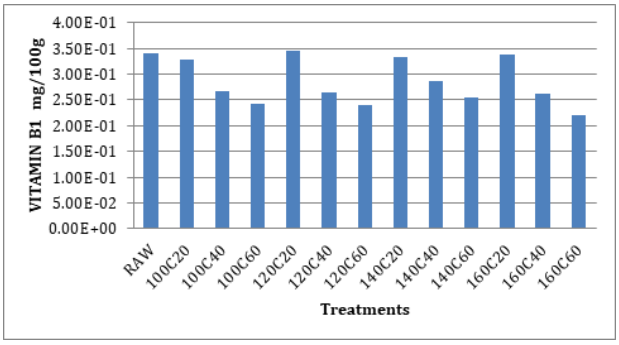

Figure 1: Changes in Vitamin B1 content of cashew nut during roasting.

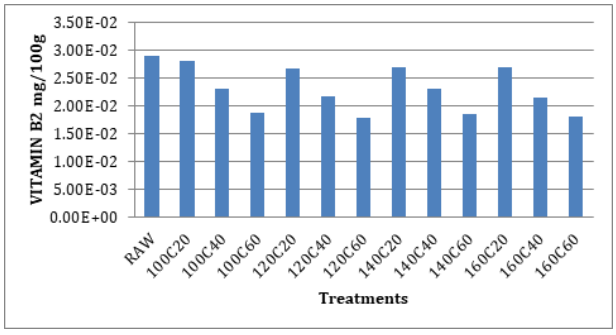

Figure 2: Changes in vitamin B2 content of cashew nut during roasting.

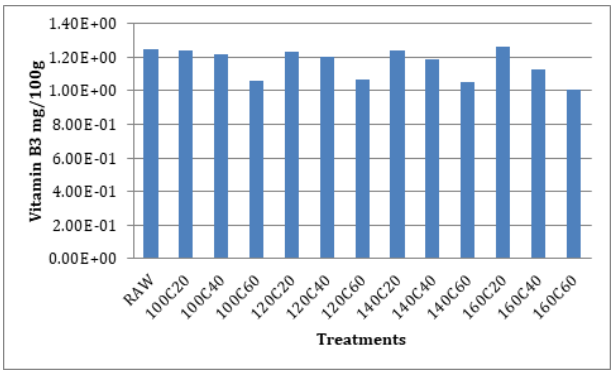

Figure 3: Changes in vitamin B3 content of cashew nut during roasting.

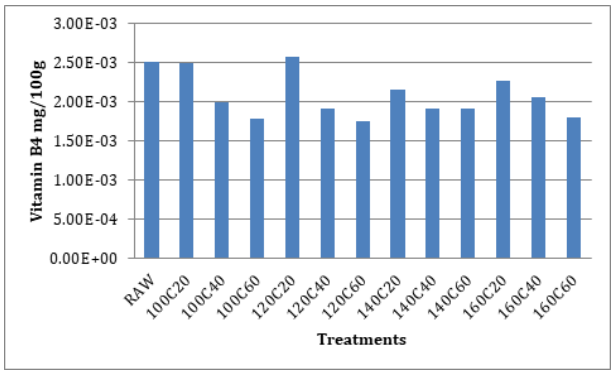

Figure 4: Changes in vitamin B4 content of cashew nut during roasting.

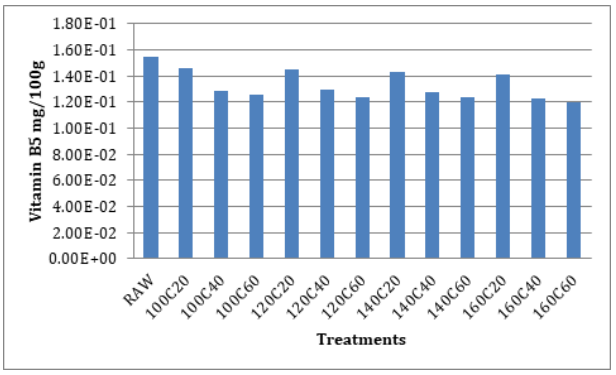

Figure 5: Changes in vitamin B5 content of cashew nut during roasting.

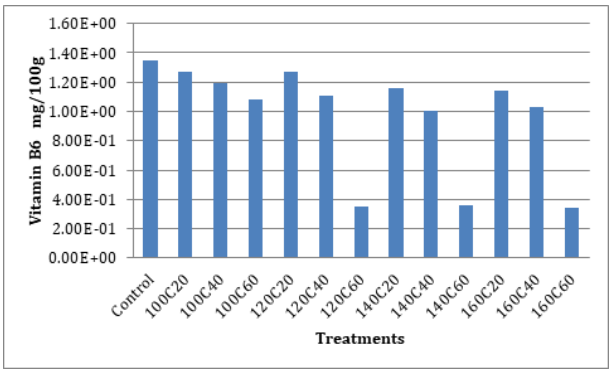

Figure 6: Changes in vitamin B6 content of cashew nut during.

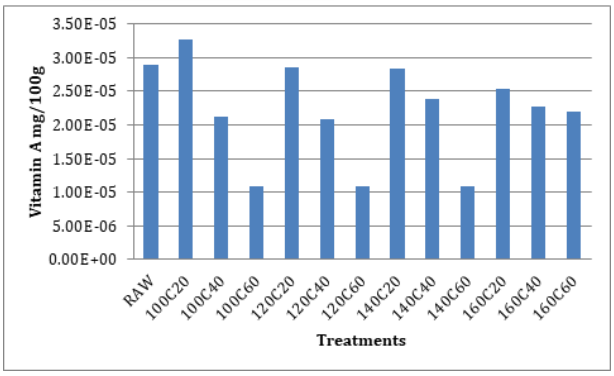

Figure 7: Changes in vitamin A content of cashew nut during roasting.

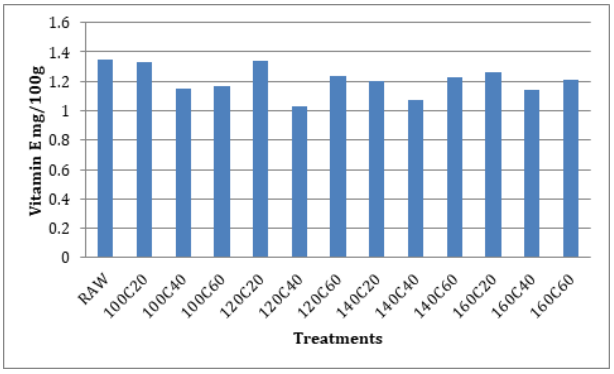

Figure 8: Changes in vitamin E content of cashew nut during roasting.

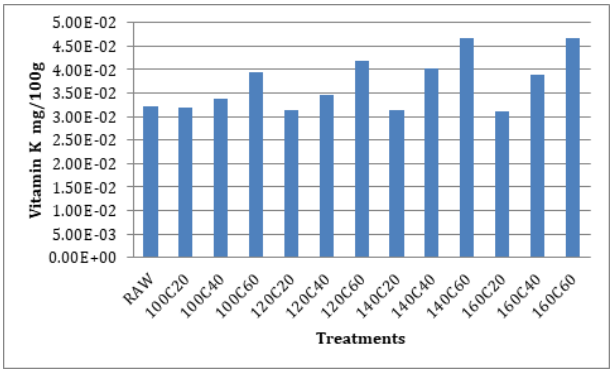

Figure 9: Changes in vitamin K content of cashew nut during roasting.

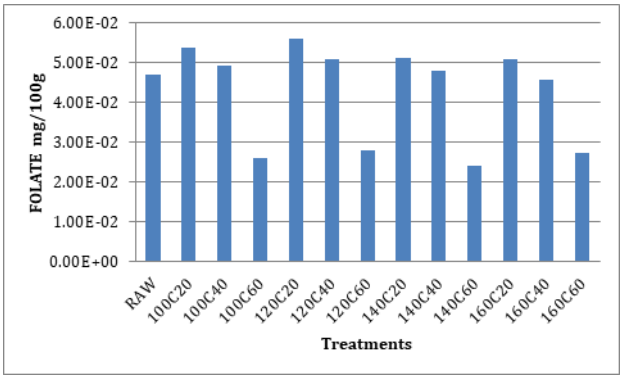

Figure 10: Changes in folate content of cashew nut during roasting.

The vitamin composition of cashew kernel shows that they are good sources of vitamins and the presence of these vitamins can contribute to normal growth of body cells and skin, proper immune function, normal vision, cell development, gene expression and maintenance of epithelial cell functions [28]. Vitamin B6 was present in a reasonable amount and it helps in formation of red blood cells and maintenance of brain function. This vitamin also plays an important role in the proteins that are part of many chemical reactions in the body. Vitamin B12 is involved in formation of red blood cells and vitamin K aids in blood clotting [29]. The antioxidant vitamin E was present in the raw and roasted seeds of cashew kernel and they neutralize free radicals that can accumulate in the body which in turn, leads to aging and some diseases. Therefore, the seeds of cashew kernel may possess ameliorative potentials if supplemented with other anti- oxidant rich plants against diseases linked with oxidative stress. This decrease in the amount of vitamin B1 may be due to rapid utilization of vitamin B1 for optimum growth and other functions at a higher rate than its synthesis during roasting [30]. The variations in the levels of the vitamins may be as a result of different geographical locations, methods of cultivation, type of soil, processing methods such as steaming, drying and roasting which they were subjected to.

Changes in mineral content of cashew kernel roasted at different conditions

Temperature were significant in all mineral present in the roasted cashew nut. About 22% loss (% loss=100-% retention in roasted cashew nut) in magnesium content of roasted cashew nut.

On the other hand, roasting at 160oC caused a significant increase in the level of calcium of cashew nut over roasting up to 60 min at $p<0.05$. Increase in of 25% compared to initial values of calcium was observed. The level of selenium in cashew nut were significantly decreased by roasting at all temperatures ($p<0.05$). After roasting for 60min at 160oC, potassium loss was

18.54%, sodium loss was 23% and selenium loss was 56%. Loss for selenium was the highest followed by sodium. The higher the degree of roasting, the higher is the vitamin lost. Roasting time had a significant effect on vitamin and mineral content. Samples roasted for 20, 40 and 60min showed a significant vitamin and mineral loss as roasting time increased. Samples roasted at 120°C, 140°C and 160°C followed the same trend. The ratio of sodium to potassium (Na/K) is 0.03 while the ratio of calcium to potassium (Ca/P) is 0.02. This value is very low for all the roasted samples. All the roasted samples contained good amount of calcium, magnesium, sodium, phosphorus and potassium. The results revealed that cashew nut may provide a sufficient amount of mineral to meet the human mineral requirement (Recommended Dietary Allowance) (NRC/NAS, 1989). However, excess of one mineral may prevent others being absorbed and utilized properly. The least abundant mineral were selenium (0.025–0.011 mg/100 g) and sodium (11.93–21.86 mg/100 g) while potassium was found to be the most abundant mineral (642.114–541.53 mg/100 g). This is in close agreement with the observation of [31-34] that potassium was the most predominant mineral in Nigerian Agricultural products. Magnesium content was (231.96–293.95 mg/100 g) and it has been reported to be an activator of many enzymes system and maintains the electrical potential in nerves [35]. The results showed that calcium (Ca) content of raw was 37.95 ± 2.81 mg/100 g db, while it reached 47.60 ± 2.82 mg/100 g after 60 min of roasting at 160°C. It can be observed that calcium content of raw cashew nut was influenced significantly by roasting conditions. This result is similar to those found by who reported that total mineral content of raw peanut increased as a result of roasting process while it did not agree with those found. Also, calcium content in this study is very low compared to values reported for bambara-maize blend flour and some green leafy vegetables consumed in Nigeria. Calcium in conjunction with phosphorus, magnesium, manganese, vitamin A, C and D, chlorine with protein are all involved in bone formation especially in infants and for growth and maintenance [36].Calcium is also important in blood clothing, muscle contraction and certain enzymes in metabolic processes. Phosphorus was found to be next highest mineral component (583.51 ± 4.96 to 473.96 ± 2.83 mg/100 g). Phosphorus plays an important role in the basic bio-chemical mechanism in which energy is obtained for the processes of life. It is an essential component of the blood and a constituent of certain enzymes and hormones which control the working of the body. Phosphorus is always found with calcium in the body both contributing to the blood. The percentage loss in the analyzed mineral (Na, K, Ca, Mg, P and selenium) calculated from the result in Table 1 for different roasting conditions showed the trend: 100°C >120°C >140°C >160°C.

Changes in colour characteristics of cashew kernel during roasting

Changes in color of whole and ground (paste) cashew nut during roasting were determined and expressed as CIELAB L*, a*, b* values were presented. The L*, a*, b* values of raw whole cashew nut were 64.75, 4.12 and 12.29 respectively. The value of L* for roasted whole cashew nut ranged between 59.95-40.78; while the ground measurement was between 59.95–57.02; a* values ranged between 3.84-13.84while ground state measurement ranged between 3.84 and 16.06; b*values ranged between 19.94 and 28.52. Samples roasted at 100°C for 20 min had the highest L* value of 59.95 while samples roasted at 160°C for 60 min had the lowest L*- value of 40.78 [37-39]. Samples roasted at 140°C for 60 min had the highest a*-value of 16.06. The highest hue angle of 79.13 was obtained for cashew nut roasted at 160°C for 20 min. This is followed by samples roasted at 100°C for 20 min which gave hueangle value of 79.10. The lowest hue angle of 58.44 was obtained from cashew nut roasted at 140°C for 60 min. The highest Chroma value obtained from samples roasted at 100°C for 60 min (60.78) while the lowest value (43.06) was obtained for samples roasted at 160°C for 60 min. The highest browning index (128.66) was obtained for samples roasted at 160°C for 60 min while the lowest browning index (44.34) was obtained for cashew nut roasted at 100°C for 20 min. The highest ΔE value (28.74) was obtained from samples roasted at 160°C for 60 min; this is followed by samples roasted at 160°C for 40 min (27.55) [39].The lowest value of ΔE (6.83) was obtained from samples roasted at 100°C for 20 min. Colour value determination have reported to be used for quality control during thermal processing operation and also can be used to monitor roasting operations by controlling the degree of colour formation during roasting operation because the brown pigments increased as browning and caramelization reaction progress. CIE tri-stimulus (L*(black-white component, luminosity), a*(green to red component) and b*(yellow to blue component) values) parameters provide an objective means of evaluating the colour characteristics of cashew kernel [40]. The effect of roasting temperature and time of cashew nut on CIE tristimulus colour parameters and the calculated delta Chroma (ΔC) and colour difference (ΔE) of raw and roasted cashew nut. Colour is an important parameter in roasted nut quality. The final quality of the roasted nut depend on the thermal performance of the hot air oven is control and what the thermo-mechanical history of the product inside the hot air oven. The changes of L, a, and b values of roasted cashew nut were significantly ($p<.0.05$) affected by roasting conditions. The L-value of the raw (control sample) is 64.75, while the L-values of the roasted samples were between 40.79 and 59.95. High

roasting temperature and roasting time resulted in low L-values. Increased product temperature decreased the brightness of the samples. The a-values indicating the greennessto redness of the roasted product varied from 3.86 to 16.08 while the a*-value of raw sample was 4.12. The high values of a*-values were due to high roasting temperature and exposure timeused. The changes of a*-values were significantly related to roasting temperature ($p<0.05$) [41-43]. The b*-values indicate the yellowness of the roasted samples which varied from 19.96 to 28.55; while the value of the raw sample was 12.29. The b*- values of the roasted samples showed a marked increase in yellowness. The values varied marginally indicating no appreciable change on the yellow-blue axis. The changes of b*- values were significantly related to product temperature at $p<0.05$. Differences in the color parameters could be due to non-enzymatic reaction which occurred during the roasting (drying) process. Browning was more prevalent in the samples roasted at high temperature and longer exposure time and also due to presence of sugar [44-48]. The initial lightening and main browning period during roasting were also previously reported. The higher roasting temperature and longer exposure time resulted in higher a-values and b-values. The higher a* and b* values which increased in redness and yellowness respectively are indication of browning [49-51]. The BIrepresents purity of brown colour and also signifies the colour change of the roasted cashew nut compared with its unroasted samples. As roasting temperature and time increased, the BI values increased, this effect was more pronounced at higher temperature and time. The increase in b- values confirmed the change in kernel colour towards the darker region [52]. An almost twofold increase in BI values was observed at higher values of roasting duration and temperature (140°C, 40min; 140°C, 60min; 160°C, 20min; 160°C, 40min; and 160°C, 60min), rendering the kernel darker and unacceptable. Similar results were obtained during roasting of hazelnut. The hue angle is another parameter frequently used to characterized colour in food products. Hue angle has been usedextensively in the evaluation of colour parameter in green vegetables, fruits and meat ΔE values increased with increasing air temperature and time, as in a* and b*-values. A combination of roasting temperature and time is the correct factor that affect browning reaction during roasting process and effort to predict product temperature are necessary to quantify and predict the color development of cashew nut during roasting.

CONCLUSION

Results obtained in this work showed that roasting significantly affects the proximate and mineral composition of raw coconut sample. Significant increases were observed in all the mineral content analyzed. Whole kernel measurement produced higher L-value, higher b-value and lower a-value when compared with to ground state measurement due to internal browning of cashew nut during roasting. The rate of color development differs under different roasting conditions. Based on the color and sensory assessments of the cashew nuts, the use of hot air drying as a processing for roasting for roasting cashew nut reduces processing time and leads to a cashew nut product with better flavor and uniform color. Minerals and vitamins were detected in reasonable amounts. Processing caused varied alterations in the micronutrient composition of cashew kernel, most of which maximizes its usefulness as quality nutritional plant. The results are valuable or useful as scientific guidance for the roasting process that better satisfy demands of the cashew nut oil industries for better flavour. The total mineral (vitamin E (tocopherol)) and phenolic contents could be taken into consideration by cashew breeders as selection criteria for developing genotypes with modified seed quality trait in Anacardium occidentale.

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