



Physicochemical and nutritional characteristics of roasted cashew kernels produced and sold in Burkina Faso

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ABSTRACT

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In Burkina Faso, cashew nuts are the main form of valorization of the cashew fruit (*Anacardium occidentale* L.). Cashew nut processing produces various products of different quality. This study aimed to determine the nutritional quality of roasted cashew kernels sold in Burkina Faso. Thirty-eight samples were collected in Ouagadougou and Bobo Dioulasso, the two largest cities of the country. Physicochemical and nutritional analyses were carried out using standard methods. The results revealed a significant difference between the samples for all the parameters analyzed. The water content of roasted cashew kernels ranged from $2.17 \pm 0.28\%$ to $2.69 \pm 0.32\%$, the ash from $2.58 \pm 0.15\%$ to $2.87 \pm 0.15\%$, the acid values from 2.04 ± 0.59 mg KOH/g to 2.84 ± 0.71 mg KOH/g, the fat from $46.23 \pm 1.97\%$ to $47.99 \pm 1.59\%$, the protein from $19.60 \pm 1.80\%$ to $20.50 \pm 1.94\%$, the carbohydrate from $27.66 \pm 0.76\%$ to $27.70 \pm 0.67\%$, and the energy value from 608.93 ± 1.18 Kcal/100g to 620.99 ± 2.07 Kcal/100g. Mineral analysis revealed that roasted cashew kernels had sodium content of 41.59 ± 22.36 mg/100g to 63.38 ± 12.53 mg/100g, calcium of 32.70 ± 2.13 mg/100g to 45.73 ± 5.30 mg/100g, iron of 5.75 ± 0.70 mg/100g to 7.22 ± 1.03 mg/100g, and zinc of 7.26 ± 1.15 mg/100g to 8.13 ± 0.55 mg/100g. This study showed that cashew kernels sold in Burkina Faso are rich in macronutrients and minerals and could be a good source of nutrients for the human body.

Contribution/Originality: This study contributes to the existing literature by providing information on the nutritional composition of roasted cashew kernels frequently consumed in Burkina Faso. It is one of the few studies investigating the influence of traditional processing on the nutritional composition of roasted cashew kernels commonly eaten in Burkina Faso.

1. INTRODUCTION

Originally from Brazil, the cashew tree (*Anacardium occidentale* L.) is now widely present in tropical areas. It grows at altitudes below 1000 m and prefers warm tropical climates with alternating wet and dry seasons. It adapts to various soils and does not require very rich soil (Lautié, Dornier, De Souza, & Reynes, 2001). Cashew kernels constitute the main form of valorization of the cashew fruit. They are very popular because of their dual nutritional and medicinal virtues. Nutritionally, previous work has shown that almonds are rich in micronutrients including

vitamins A, C, trace elements, and minerals such as calcium (Ca), potassium (K), phosphorus (P), magnesium (Mg), sodium (Na), iron (Fe), copper (Cu), manganese (Mn), and zinc (Zn). They are also rich in proteins, lipids, and carbohydrates (Assunção & Mercadante, 2003; Dakuyo et al., 2022). These nutrients promote the proper functioning of the body. On a medicinal level, several clinical and epidemiological studies have shown that consumption of cashew nuts would have a hypocholesterolemic effect (Mukuddem-Petersen, Oosthuizen, & Jerling, 2005) and would reduce the risk of cardiovascular diseases and type 2 diabetes (Lovejoy, 2005).

Cashew cultivation occupies an important place in agricultural production in Burkina Faso. The main production areas are located in the Cascades, South-West, Hauts-Bassins, and Centre-West regions. In 2021, national cashew production was estimated at nearly 137,722 T (FAOSTAT, 2021). Almost all of the production is exported to Ivory Coast, Asia, Europe, and the United States; only 10% of this production is transformed on-site. There are a few industrial units for the production of white kernels, which are concentrated in cashew nut production areas. On the other hand, the production of roasted kernels is almost artisanal. The processing of cashew kernels gives rise to a varied range of finished products, within which coexist products of very variable nutritional and hygienic quality depending on the technological processes to which they are subjected and the actors who transform them. In addition, cashew kernels are very hygroscopic and sensitive to microbial damage. Given the increasing consumption of cashew nuts in recent years and consumer demands, it is relevant to assess the nutritional quality of these products. Several studies have been conducted on the composition and nutritional quality of cashew nuts from Burkina Faso (Dakuyo et al., 2022; Semporé et al., 2024; Semporé, Songré-Ouattara, Tarpaga, Bationo, & Dicko, 2021), but few studies have focused on cashew kernels sold commercially in Burkina Faso. This study aimed to evaluate the physicochemical and nutritional quality of roasted cashew kernels sold commercially in Burkina Faso.

2. MATERIAL AND METHODS

2.1. Sampling

Sampling was carried out in twelve (12) districts of Ouagadougou and seven (7) districts of Bobo-Dioulasso. In each district, two samples of roasted cashew kernels were collected from points of sale, avoiding duplicates. Twenty-four (24) samples were collected in Ouagadougou and 14 in Bobo-Dioulasso. In total, thirty-eight (38) samples of roasted cashew kernels were collected.

2.2. Methods of Physicochemical Analyses

The physicochemical parameters (water content, total ash, acid value), macronutrients (fats, proteins, lipids), energy value, and micronutrients (minerals) of roasted cashew nut samples were determined.

2.2.1. Determination of Water Content

The moisture content of roasted cashew nut samples was determined by differential weighing before and after oven drying at 103 ± 2 °C according to ISO 665 (2020). For this purpose, 5 g of the sample (Pe) were weighed in a nacelle (Pv) and then placed in an oven at 105 °C overnight. The nacelles were then removed from the oven, cooled in a desiccator for 30 minutes, weighed again, and the final weight (Pf) recorded. The operation is repeated until a practically constant mass is obtained. The water content was calculated using the following formula.

$$H (\%) = \frac{[Pe - (Pf - Pv)]}{Pe} * 100 \quad (1)$$

H: Water content.

Pe: Test sample.

Pv: Weight of the empty nacelle.

Pf: Final weight of the nacelle.

2.2.2. Determination of Total Ash Content

The total ash content of roasted cashew kernels was determined by incineration at 550 °C according to ISO 2171 (2007). Five (5) grams of the sample (Pe) were weighed in a crucible (Pv) and subjected to incineration in a muffle oven at 550 °C for 4 h. The crucibles were then removed from the oven, cooled in a desiccator for 30 minutes, and weighed (Pf).

The ash content was calculated according to the following equation.

$$C(\%) = \frac{Pf - Pv}{Pe} * 100 \quad (2)$$

C: Ash content.

Pe: Test sample.

Pf: Final weight of crucible.

Pv: Empty weight of the crucible.

2.2.3. Determination of Fat Content

The fat content of the roasted cashew kernels samples was determined according to ISO 659 (2009) using hexane as the solvent. Five (5) grams of the ground sample (Pe) were placed in an extraction cartridge, plugged with cotton, and then placed in a Soxhlet extractor. Two hundred (200) milliliters of hexane were introduced into a pre-weighed flask (Pv) connected to the extractor. Extractions were carried out for 4 hours, and the solvent was evaporated by distillation using a rotary evaporator. The flasks were then oven-dried for 1 hour, cooled in a desiccator for 30 minutes, and weighed (Pf). The fat content was calculated using the following equation.

$$F(\%) = \frac{Pf - Pv}{Pe} * 100 \quad (3)$$

F: Fat content.

Pf: Final weight of the flask.

Pv: Empty weight of the flask.

Pe: Test sample.

2.2.4. Determination of Protein Content

The protein content of cashew kernels was determined by the Kjeldahl method according to ISO 1871 (2009). This method is based on the determination of total nitrogen. A 0.2 g test portion of the sample was placed in a Kjeldahl flask, and 10 mL of sulfuric acid and one Kjeltabs catalyst pellet were added. Mineralization was carried out at 420 °C for 5 hours. The flasks were then cooled to a temperature of 50-60 °C. The flasks containing the mineralized samples were then placed in a Kjeldahl apparatus for automatic distillation and titration. For this purpose, 50 mL of distilled water and NaOH were automatically introduced during the distillation, followed by titration with 0.1 N sulfuric acid. The distillate was titrated until the indicator changed color from green to pink. A blank was treated using the same procedure as the samples. The protein content was calculated using the following formula.

$$P(\%) = \frac{14 \times N \times (Ve - Vb) \times 10^{-3}}{Pe} \times 6.25 \times 100 \quad (4)$$

P: Protein content.

Ve: Volume of sulfuric acid used for titration of the sample (ml).

Vb: Volume of sulfuric acid used for titration of the blank (ml).

N: Concentration of sulfuric acid.

Pe: Test sample (g).

6.25: Conversion factor of nitrogen into proteins.

14: Molar mass of nitrogen.

2.2.5. Determination of Carbohydrate Content

The carbohydrate content of cashew kernels was determined by the differential method used by Egan, Kirk, and Sawyer (1981) according to the following equation.

$$G (\%) = 100 - (H + C + F + P) \quad (5)$$

G: Carbohydrate content.

H: Water content (%).

C: Ash content (%).

F: Fat content (%).

P: Protein content (%).

2.2.6. Determination of the Theoretical Energy Value

The theoretical energy value of cashew kernels was calculated using the coefficients of Atwater and Benedict (1899).

$$EV (\text{kcal}/100 \text{ g}) = (P * 4 \text{ Kcal}) + (F * 9 \text{ Kcal}) + (G * 4 \text{ Kcal}) \quad (6)$$

EV: Energy value.

G: Carbohydrate content (%).

F: Fat content (%).

P: Protein content (%).

2.2.7. Determination of Acid Value

The acid value of roasted cashew kernel samples was obtained according to the method described by ISO 729 (1988). Five (5) grams of ground sample were weighed into an Erlenmeyer flask. Then, 30 mL of boiling ethanol were added. After adding a few drops of phenolphthalein, the mixture was titrated with 0.1 N KOH until a persistent pink color was obtained for a few seconds. A blank was prepared with 30 mL of ethanol. The acid value was calculated using the following formula.

$$IA (\text{mg KOH/g}) = \frac{M * C * (V_e - V_0)}{P_e} \quad (7)$$

IA: Acid value.

V_e = Volume of KOH used for the titration of the sample.

V_0 = Volume of KOH used for the titration of the blank.

M = Molar mass of potassium hydroxide (KOH).

C = Concentration of KOH.

P_e = Test portion.

2.2.8. Minerals Determination

The minerals (zinc, iron, calcium, sodium) were quantified by atomic absorption spectrometry (PerkinElmer PinAacle 900H). Specific instrumental parameters were used for each mineral (Table 1). Mineral extraction was performed after incinerating 5 g of each sample of roasted cashew kernels in a muffle furnace at 550 °C for 10 hours, followed by dissolving the ash with hydrochloric acid. The range of standard solutions used to construct the standard curves consisted of concentrations of 1 mg/L, 6 mg/L, 2 mg/L, and 15 mg/L for zinc, iron, calcium, and sodium, respectively.

Table 1. Mineral dosage parameters.

Minerals	Gas	Wavelength (nm)	Gas flow rate
Iron (Fe)	Air-Acetylene	248.3	0.8-1 l/min
Zinc (Zn)	Air-Acetylene	213.9	0.9-1.2 l/min
Sodium (Na)	Air-Acetylene	589.0	0.9-1.2 l/min
Calcium (Ca)	Air-Acetylene	422.7	0.9-1.2 l/min

2.3. Statistical Analysis

The data were processed with the XLSTAT software version 7.5.2. One-way analyses of variance (ANOVA) were performed using the Tukey test. Differences between means are considered significant when $p < 0.05$. All values are reported as means $\pm$ standard deviation.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Physicochemical and Nutritional Characteristics of Roasted Cashew Kernels

The physicochemical and nutritional characteristics of roasted cashew kernels sold in Burkina Faso are presented in Table 2. Average water contents of roasted cashew kernels ranged from $2.17 \pm 0.28\%$ (Bobo Dioulasso) to $2.69 \pm 0.32\%$ (Ouagadougou). Average ash contents ranged from $2.58 \pm 0.15\%$ (Bobo Dioulasso) to $2.87 \pm 0.15\%$ (Ouagadougou). Average acid values ranged from 2.04 ± 0.59 mg KOH/g (Ouagadougou) to 2.84 ± 0.71 mg KOH/g (Bobo Dioulasso). Average fat contents ranged from $46.23 \pm 1.97\%$ (Ouagadougou) to $47.99 \pm 1.59\%$ (Bobo Dioulasso). Average protein contents ranged from $19.60 \pm 1.80\%$ (Bobo Dioulasso) to $20.50 \pm 1.94\%$ (Ouagadougou). Carbohydrate contents ranged from $27.66 \pm 0.76\%$ (Bobo Dioulasso) to $27.70 \pm 0.67\%$ (Ouagadougou). Energy values ranged from 608.93 ± 1.18 Kcal/100g (Ouagadougou) to 620.99 ± 2.07 Kcal/100g (Bobo Dioulasso).

Analysis of variance showed that there is a significant difference between the physicochemical and nutritional characteristics of the different samples of roasted cashew kernels collected from the same locality.

Table 2. Physicochemical and nutritional characteristics of roasted cashew nuts.

Localities	Samples	Water content (%)	Fat (%)	Protein (%)	Carbohydrates (%)	Ash (%)	Acid value (mgKOH/g)	Energy value (Kcal/100g)
Ouagadougou	1	2.62 ± 0.05 ^{gh}	47.81 ± 0.93 ^{bcde}	20.48 ± 1.04 ^{defgh}	26.24 ± 0.13 ^f	2.85 ± 0.03 ^{efgh}	2.80 ± 0.05 ^{bc}	617.20 ± 4.75 ^{bc}
	2	2.42 ± 0.01 ^j	47.21 ± 0.56 ^{cdefg}	19.90 ± 0.56 ^{fgh}	27.42 ± 0.00 ^{cde}	3.05 ± 0.00 ^c	1.36 ± 0.06 ^k	614.18 ± 2.85 ^{cdef}
	3	3.09 ± 0.02 ^b	47.98 ± 0.66 ^{bcd}	18.82 ± 0.87 ^{hi}	27.24 ± 0.26 ^{de}	2.87 ± 0.07 ^{efg}	1.72 ± 0.11 ^{fghijk}	616.07 ± 3.51 ^{bcd}
	4	2.12 ± 0.05 ^l	47.58 ± 0.48 ^{cdef}	20.04 ± 0.79 ^{efgh}	27.43 ± 0.28 ^{cde}	2.84 ± 0.03 ^{efgh}	2.74 ± 0.03 ^{bc}	618.05 ± 2.35 ^{bc}
	5	3.08 ± 0.00 ^{bc}	49.34 ± 0.33 ^{ab}	15.84 ± 0.02 ^j	29.05 ± 0.30 ^a	2.70 ± 0.06 ^{ijkl}	1.88 ± 0.34 ^{efgh}	623.58 ± 1.89 ^{ab}
	6	2.54 ± 0.00 ^{hi}	45.99 ± 0.95 ^{ghij}	20.81 ± 0.69 ^{defg}	27.83 ± 0.28 ^{bcde}	2.83 ± 0.03 ^{fgh}	1.50 ± 0.03 ^{hijk}	608.44 ± 4.61 ^{efgh}
	7	2.74 ± 0.03 ^f	45.74 ± 0.64 ^{hijk}	20.81 ± 0.98 ^{defg}	27.61 ± 0.28 ^{bcde}	3.10 ± 0.03 ^{bc}	1.52 ± 0.03 ^{hijk}	605.32 ± 2.98 ^{ghij}
	8	2.34 ± 0.07 ^{jk}	44.29 ± 0.94 ^{kl}	22.02 ± 0.89 ^{bcd}	28.20 ± 0.13 ^{abcd}	3.15 ± 0.00 ^{ab}	1.86 ± 0.08 ^{efghi}	599.47 ± 4.41 ^{ij}
	9	2.42 ± 0.04 ^j	50.07 ± 0.01 ^a	17.81 ± 0.23 ⁱ	27.02 ± 0.28 ^{ef}	2.68 ± 0.00 ^l	1.78 ± 0.14 ^{fghij}	629.93 ± 0.09 ^a
	10	2.79 ± 0.05 ^f	44.57 ± 0.64 ^{jkl}	22.18 ± 0.29 ^{bcd}	27.61 ± 0.28 ^{bcde}	2.85 ± 0.02 ^{efgh}	2.00 ± 0.28 ^{efg}	600.29 ± 3.42 ^{ij}
	11	2.34 ± 0.03 ^k	45.71 ± 0.48 ^{hijkl}	21.85 ± 0.24 ^{bcde}	27.43 ± 0.28 ^{cde}	2.68 ± 0.00 ^l	2.60 ± 0.17 ^c	608.47 ± 2.28 ^{efgh}
	12	2.33 ± 0.01 ^k	46.67 ± 0.71 ^{defgh}	20.47 ± 0.90 ^{defgh}	27.64 ± 0.28 ^{bcde}	2.90 ± 0.10 ^{ef}	2.80 ± 0.06 ^{bc}	612.43 ± 3.87 ^{cdefg}
	13	2.98 ± 0.02 ^d	44.19 ± 1.17 ^{lm}	22.70 ± 0.55 ^{abc}	27.38 ± 0.64 ^{cde}	2.75 ± 0.04 ^{hijkl}	1.48 ± 0.11 ^{ijk}	598.01 ± 5.74 ^j
	14	2.98 ± 0.02 ^d	45.56 ± 0.33 ^{ijkl}	20.67 ± 1.01 ^{defg}	27.92 ± 0.71 ^{bcde}	2.87 ± 0.00 ^{efg}	1.88 ± 0.56 ^{efgh}	604.40 ± 1.74 ^{hij}
	15	3.31 ± 0.04 ^a	45.80 ± 0.91 ^{hijk}	19.96 ± 1.90 ^{fgh}	28.14 ± 1.05 ^{abcd}	2.79 ± 0.03 ^{ghij}	2.04 ± 0.34 ^{ef}	604.59 ± 1.74 ^{hij}
	16	2.90 ± 0.05 ^e	44.57 ± 0.63 ^{jkl}	21.95 ± 0.01 ^{bcd}	27.71 ± 0.65 ^{bcde}	2.87 ± 0.01 ^{efg}	1.72 ± 0.00 ^{fghijk}	599.80 ± 3.00 ^{ij}
	17	3.00 ± 0.03 ^{cd}	46.19 ± 1.06 ^{ghijk}	20.69 ± 0.77 ^{defg}	27.09 ± 0.40 ^{ef}	3.03 ± 0.09 ^{cd}	1.64 ± 0.00 ^{ghijk}	606.85 ± 4.81 ^{fghi}
	18	2.50 ± 0.01 ⁱ	47.53 ± 0.44 ^{cdef}	18.67 ± 0.00 ^{hi}	28.52 ± 0.42 ^{ab}	2.79 ± 0.03 ^{ghijk}	1.68 ± 0.06 ^{fghijk}	616.49 ± 2.25 ^{bcd}
	19	3.05 ± 0.05 ^{bcd}	46.32 ± 1.00 ^{fghi}	19.11 ± 1.65 ^{ghi}	28.28 ± 0.71 ^{abc}	3.24 ± 0.00 ^a	3.08 ± 0.11 ^{ab}	606.46 ± 5.19 ^{ghi}
	20	2.56 ± 0.04 ^{hi}	47.48 ± 0.13 ^{cdefg}	19.16 ± 0.81 ^{ghi}	27.92 ± 0.71 ^{bcde}	2.88 ± 0.01 ^{efg}	3.34 ± 0.20 ^a	615.63 ± 0.79 ^{cde}
	21	2.57 ± 0.00 ^{ghi}	48.37 ± 1.24 ^{bc}	19.10 ± 1.82 ^{ghi}	27.04 ± 0.43 ^{ef}	2.93 ± 0.14 ^{de}	2.48 ± 0.17 ^{cd}	619.83 ± 5.64 ^{bc}
	22	2.27 ± 0.02 ^k	45.81 ± 0.69 ^{hijk}	21.46 ± 0.83 ^{cdef}	27.74 ± 0.13 ^{bcde}	2.72 ± 0.03 ^{ijkl}	2.20 ± 0.23 ^{de}	609.09 ± 3.41 ^{defgh}
	23	2.64 ± 0.08 ^g	42.15 ± 0.92 ⁿ	24.11 ± 0.29 ^a	28.41 ± 0.71 ^{ab}	2.69 ± 0.00 ^{kl}	1.36 ± 0.06 ^k	589.42 ± 4.30 ^k
	24	2.98 ± 0.04 ^d	42.68 ± 0.03 ^{mn}	23.48 ± 0.30 ^{ab}	28.06 ± 0.30 ^{bcd}	2.80 ± 0.00 ^{fghi}	1.46 ± 0.09 ^{jk}	590.31 ± 0.32 ^k
	Mean ± SD	2.69 ± 0.32	46.23 ± 1.97	20.50 ± 1.94	27.70 ± 0.67	2.87 ± 0.15	2.04 ± 0.59	608.93 ± 1.18
Bobo Dioulasso	25	2.70 ± 0.05 ^a	48.94 ± 0.30 ^{bc}	17.01 ± 0.57 ^{fg}	28.69 ± 0.30 ^a	2.65 ± 0.02 ^{bc}	3.52 ± 0.06 ^a	623.30 ± 1.63 ^{bc}
	26	2.29 ± 0.10 ^c	48.11 ± 0.20 ^{cd}	19.37 ± 0.18 ^{cd}	27.50 ± 0.13 ^{bcd}	2.73 ± 0.05 ^b	2.40 ± 0.06 ^e	620.50 ± 1.62 ^{cd}
	27	2.21 ± 0.00 ^c	48.59 ± 0.32 ^{bcd}	18.51 ± 0.86 ^{de}	28.25 ± 0.56 ^{ab}	2.44 ± 0.02 ^{ef}	3.43 ± 0.06 ^a	624.36 ± 1.70 ^{bc}
	28	2.06 ± 0.00 ^{de}	46.99 ± 0.17 ^{ef}	20.54 ± 0.19 ^{bc}	28.01 ± 0.40 ^{abcd}	2.42 ± 0.05 ^f	2.30 ± 0.03 ^e	617.05 ± 0.66 ^{de}
	29	2.27 ± 0.06 ^c	44.94 ± 0.50 ^g	21.73 ± 0.25 ^{ab}	28.67 ± 0.28 ^a	2.40 ± 0.02 ^f	2.70 ± 0.03 ^{cd}	606.00 ± 2.35 ^f
	30	2.27 ± 0.09 ^c	46.98 ± 0.64 ^{ef}	20.63 ± 0.47 ^{bc}	27.54 ± 0.28 ^{bcd}	2.57 ± 0.03 ^{cd}	1.46 ± 0.08 ^f	615.53 ± 2.72 ^e
	31	2.07 ± 0.03 ^d	51.65 ± 0.12 ^a	16.03 ± 0.14 ^g	27.75 ± 0.26 ^{bcd}	2.50 ± 0.02 ^{de}	3.56 ± 0.23 ^a	639.98 ± 0.62 ^a
	32	1.95 ± 0.01 ^e	47.93 ± 0.63 ^{cde}	19.67 ± 1.04 ^{cd}	28.14 ± 0.42 ^{abc}	2.31 ± 0.00 ^g	2.68 ± 0.11 ^d	622.62 ± 3.21 ^{bc}
	33	1.75 ± 0.01 ^f	47.70 ± 0.61 ^{de}	20.52 ± 0.36 ^{bc}	27.22 ± 0.28 ^d	2.81 ± 0.05 ^a	3.06 ± 0.08 ^b	620.23 ± 2.88 ^{cde}
	34	2.24 ± 0.02 ^c	49.38 ± 0.29 ^b	17.87 ± 0.28 ^{ef}	27.82 ± 0.54 ^{bcd}	2.69 ± 0.00 ^b	3.47 ± 0.11 ^a	627.16 ± 1.53 ^b

Localities	Samples	Water content (%)	Fat (%)	Protein (%)	Carbohydrates (%)	Ash (%)	Acid value (mgKOH/g)	Energy value (Kcal/100g)
	35	1.79 ± 0.09 ^f	47.79 ± 0.11 ^{de}	20.25 ± 0.82 ^c	27.63 ± 0.57 ^{bcd}	2.54 ± 0.05 ^d	3.46 ± 0.08 ^a	621.60 ± 0.00 ^{cd}
	36	1.81 ± 0.02 ^f	48.62 ± 0.08 ^{bcd}	19.42 ± 0.30 ^{cd}	27.42 ± 0.28 ^{cd}	2.73 ± 0.07 ^{ab}	1.46 ± 0.08 ^f	624.91 ± 0.61 ^{bc}
	37	2.48 ± 0.03 ^b	48.30 ± 0.89 ^{cd}	20.33 ± 1.17 ^{bc}	26.33 ± 0.26 ^e	2.56 ± 0.06 ^d	2.92 ± 0.11 ^{bc}	621.33 ± 4.42 ^{cd}
	38	2.50 ± 0.04 ^b	45.99 ± 0.74 ^f	22.55 ± 1.19 ^a	26.28 ± 0.38 ^e	2.68 ± 0.02 ^b	3.36 ± 0.17 ^a	609.24 ± 3.44 ^f
	Mean ± SD	2.17 ± 0.28	47.99 ± 1.59	19.60 ± 1.80	27.66 ± 0.76	2.58 ± 0.15	2.84 ± 0.71	620.99 ± 2.07

Note: Values assigned the same letter in the same column for the same locality are not significantly different at the 5% probability threshold.
SD: Standard deviation.

3.1.2. Correlation Between Biochemical Parameters of Roasted Cashew Kernel

Figure 1 presents the results of the principal component analysis of the biochemical parameters of roasted cashew kernel. Principal component analysis (PCA) shows that the first three axes account for 84.6% of the total variance ($F1 = 50.5\%$, $F2 = 18.1\%$, $F3 = 15.9\%$), and the scree plot confirms the relevance of retaining 2 to 3 components.

The projection of individuals onto the factorial axes confirms the existence of well-differentiated profiles. On the $F1$ axis, individuals located on the positive side (right) correspond to products rich in fat and energy; for example, sample 31, positioned far to the right, illustrates a highly energetic profile. Conversely, individuals on the negative side of $F1$ (left), such as samples 23 and 24, represent samples rich in water, protein, and minerals, reflecting a less energy-dense composition. On the $F2$ axis, the positive part groups profiles with high water and mineral content, while the negative part highlights samples richer in protein. Finally, the $F3$ axis reveals an almost exclusively carbohydrate dimension, where individuals on the positive side are distinguished by a composition richer in carbohydrates, regardless of the gradients highlighted on $F1$ and $F2$. This distribution illustrates the diversity of nutritional profiles of roasted cashew kernel samples. The samples from Ouagadougou are rich in ash, water, and carbohydrates, while those from Bobo Dioulasso are rich in acidity, fats, and energy.

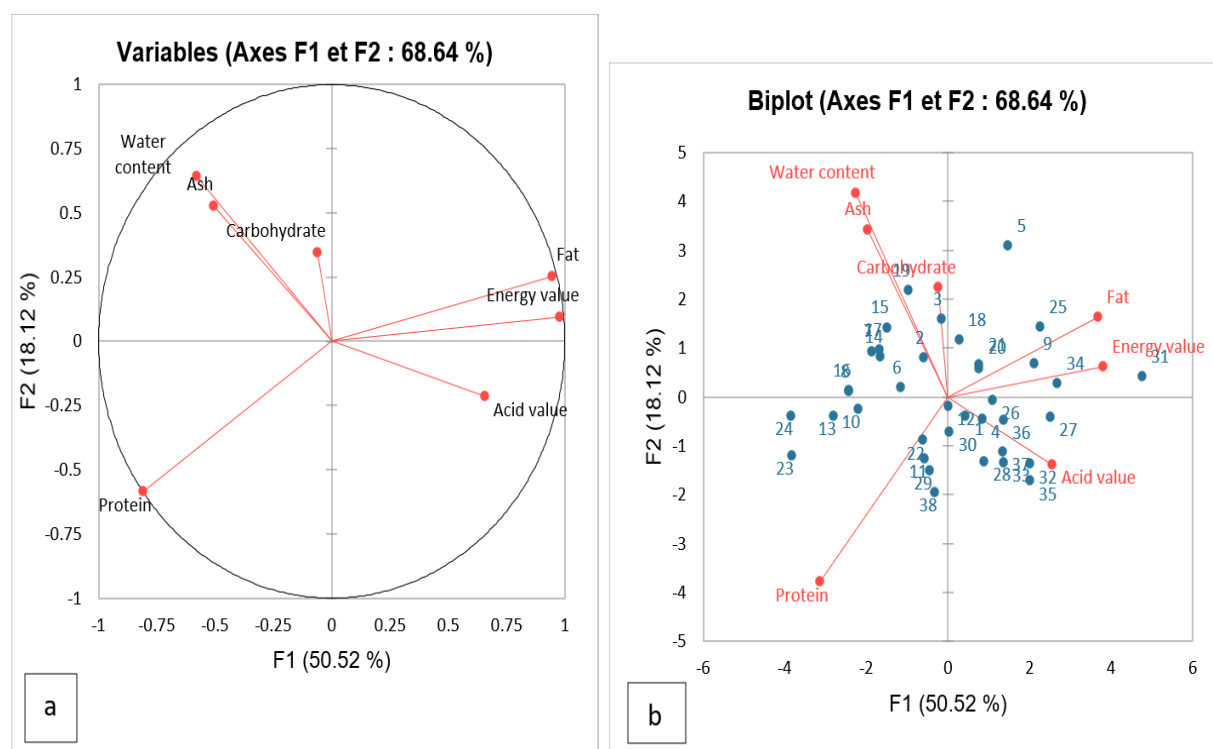


Figure 1. Principal component analysis of biochemical parameters of roasted cashew kernels.

3.1.3. Mineral Content of Roasted Cashew Kernels

The mineral composition of roasted cashew kernels sold in Burkina Faso is presented in Table 3. Roasted cashew kernels had average sodium contents of 41.59 ± 22.36 mg/100g (Ouagadougou) to 63.38 ± 12.53 mg/100g (Bobo Dioulasso), average calcium contents of 32.70 ± 2.13 mg/100g (Ouagadougou) to 45.73 ± 5.30 mg/100g (Bobo Dioulasso), average iron contents of 5.75 ± 0.70 mg/100g (Bobo Dioulasso) to 7.22 ± 1.03 mg/100g (Ouagadougou), and average zinc contents of 7.26 ± 1.15 mg/100g (Ouagadougou) to 8.13 ± 0.55 mg/100g (Bobo Dioulasso). Analysis of variance showed a significant difference between the mineral contents of roasted cashew kernel samples collected from the same locality.

Table 3. Mineral composition of roasted cashew kernel.

Localities	Samples	Na (mg/100g)	Ca (mg/100g)	Fe (mg/100g)	Zn (mg/100g)
Ouagadougou	1	23.52 ± 0.02 ^p	31.41 ± 0.01 ⁱ	7.26 ± 0.04 ⁱ	6.76 ± 0.04 ^l
	2	23.58 ± 0.02 ^p	35.68 ± 0.08 ^b	7.25 ± 0.06 ⁱ	7.14 ± 0.03 ^j
	3	25.75 ± 0.04 ⁿ	31.45 ± 0.04 ⁱ	5.95 ± 0.03 ⁿ	7.26 ± 0.04 ^{hi}
	4	25.75 ± 0.02 ⁿ	33.32 ± 0.13 ^f	5.85 ± 0.04 ^o	8.24 ± 0.04 ^d
	5	24.77 ± 0.01 ^o	36.57 ± 0.02 ^a	8.65 ± 0.02 ^a	8.14 ± 0.05 ^f
	6	24.73 ± 0.01 ^o	29.55 ± 0.02 ⁿ	8.55 ± 0.04 ^b	6.52 ± 0.01 ^m
	7	26.14 ± 0.01 ^m	28.55 ± 0.04 ^o	5.10 ± 0.03 ^p	4.22 ± 0.01 ^p
	8	26.26 ± 0.07 ^m	36.55 ± 0.04 ^a	5.05 ± 0.03 ^p	4.14 ± 0.06 ^q
	9	11.84 ± 0.08 ^r	29.67 ± 0.02 ^m	7.77 ± 0.02 ^{fg}	8.55 ± 0.04 ^b
	10	18.23 ± 0.03 ^q	31.18 ± 0.08 ^j	7.70 ± 0.02 ^g	8.16 ± 0.04 ^{ef}
	11	31.15 ± 0.08 ^k	32.18 ± 0.04 ^h	7.32 ± 0.05 ⁱ	8.76 ± 0.01 ^a
	12	30.20 ± 0.06 ^l	33.84 ± 0.03 ^d	7.54 ± 0.03 ^h	8.11 ± 0.01 ^f
	13	32.49 ± 0.37 ^j	33.22 ± 0.04 ^g	6.37 ± 0.02 ^l	6.41 ± 0.01 ⁿ
	14	33.14 ± 0.02 ⁱ	30.67 ± 0.04 ^l	6.26 ± 0.08 ^m	6.85 ± 0.04 ^k
	15	49.86 ± 0.01 ^e	31.27 ± 0.03 ^j	8.43 ± 0.03 ^c	7.63 ± 0.01 ^g
	16	48.17 ± 0.03 ^f	34.95 ± 0.04 ^c	8.55 ± 0.02 ^b	7.09 ± 0.01 ^j
	17	80.04 ± 0.03 ^b	32.16 ± 0.04 ^h	7.75 ± 0.04 ^g	8.20 ± 0.01 ^{de}
	18	86.46 ± 0.03 ^a	30.95 ± 0.02 ^k	7.54 ± 0.04 ^h	8.15 ± 0.01 ^{ef}
	19	80.18 ± 0.04 ^b	33.49 ± 0.02 ^e	6.65 ± 0.03 ^k	7.25 ± 0.02 ^{hi}
	20	48.12 ± 0.02 ^f	32.17 ± 0.02 ^h	7.84 ± 0.02 ^f	7.67 ± 0.02 ^g
	21	46.22 ± 0.02 ^h	33.91 ± 0.08 ^d	7.96 ± 0.01 ^e	8.34 ± 0.03 ^c
	22	78.23 ± 0.04 ^c	33.44 ± 0.01 ^e	6.65 ± 0.05 ^k	6.31 ± 0.01 ^o
	23	47.24 ± 0.04 ^g	34.93 ± 0.04 ^c	7.11 ± 0.01 ^j	7.22 ± 0.01 ⁱ
	24	76.23 ± 0.04 ^d	33.85 ± 0.04 ^d	8.25 ± 0.06 ^d	7.29 ± 0.01 ^h
	Mean ± SD	41.59 ± 22.36	32.70 ± 2.13	7.22 ± 1.03	7.26 ± 1.15
Bobo Dioulasso	25	47.12 ± 0.02 ^k	42.34 ± 0.04 ^h	5.24 ± 0.01 ^g	7.70 ± 0.14 ^e
	26	48.22 ± 0.01 ^j	42.18 ± 0.01 ⁱ	6.05 ± 0.04 ^d	7.16 ± 0.11 ^g
	27	56.81 ± 0.01 ⁱ	42.11 ± 0.01 ⁱ	5.10 ± 0.04 ^h	8.41 ± 0.04 ^b
	28	46.09 ± 0.01 ^m	47.54 ± 0.02 ^e	6.49 ± 0.01 ^b	9.10 ± 0.03 ^a
	29	79.31 ± 0.11 ^a	53.85 ± 0.04 ^b	6.13 ± 0.05 ^{cd}	9.04 ± 0.07 ^a
	30	78.84 ± 0.03 ^b	55.19 ± 0.01 ^a	7.35 ± 0.06 ^a	8.52 ± 0.01 ^b
	31	73.95 ± 0.02 ^e	39.15 ± 0.08 ^k	4.64 ± 0.03 ⁱ	7.96 ± 0.03 ^{cd}
	32	73.59 ± 0.01 ^f	38.76 ± 0.05 ^l	5.81 ± 0.01 ^e	7.39 ± 0.03 ^f
	33	64.99 ± 0.01 ^h	45.17 ± 0.02 ^f	5.55 ± 0.02 ^f	7.82 ± 0.02 ^{de}
	34	56.79 ± 0.05 ⁱ	41.02 ± 0.01 ^j	5.04 ± 0.04 ^h	7.90 ± 0.03 ^{de}
	35	74.49 ± 0.01 ^c	50.05 ± 0.04 ^d	5.63 ± 0.01 ^f	8.42 ± 0.03 ^b
	36	74.21 ± 0.01 ^d	52.19 ± 0.01 ^c	5.09 ± 0.02 ^h	7.81 ± 0.02 ^{de}
	37	66.27 ± 0.07 ^g	43.19 ± 0.01 ^g	6.15 ± 0.01 ^{cd}	8.14 ± 0.04 ^c
	38	46.62 ± 0.04 ^l	47.56 ± 0.01 ^e	6.24 ± 0.01 ^c	8.46 ± 0.01 ^b
	Mean ± SD	63.38 ± 12.53	45.73 ± 5.30	5.75 ± 0.70	8.13 ± 0.55

Note: Values assigned the same letter in the same column for the same locality are not significantly different at the 5% probability threshold. Na: Sodium, Ca: Calcium, Fe: iron, Zn: Zinc.

3.1.4. Correlation between Minerals of Roasted Cashew Kernels

Figure 2 presents the results of the principal component analysis (PCA) of the minerals of roasted cashew kernel. The PCA highlights excellent representation quality; the first three axes account for 92.9% of the total variance (F1 = 47.8%, F2 = 29.6%, F3 = 15.6%), and the bend in the scree plot confirms that it is relevant to retain at least two of them. The variables are structured into two distinct groups: a “macro-elements” block (calcium, Ca, and sodium, Na) strongly correlated with the first axis (F1) and reflecting the overall concentrations of major salts, and a “trace-elements” block (iron, Fe, and zinc, Zn) well represented on F2, indicative of trace metal contributions; it should be noted that sodium (Na) retains its own variability on F3, indicating relative independence from the other minerals. In summary, PCA reveals a clear structuring between macro-elements (Ca, Na) and trace elements (Fe, Zn), with a particular weight of sodium, allowing us to distinguish contrasting and complementary mineral profiles. The samples from Ouagadougou are rich in iron and zinc, while those from Bobo Dioulasso are rich in sodium and calcium.

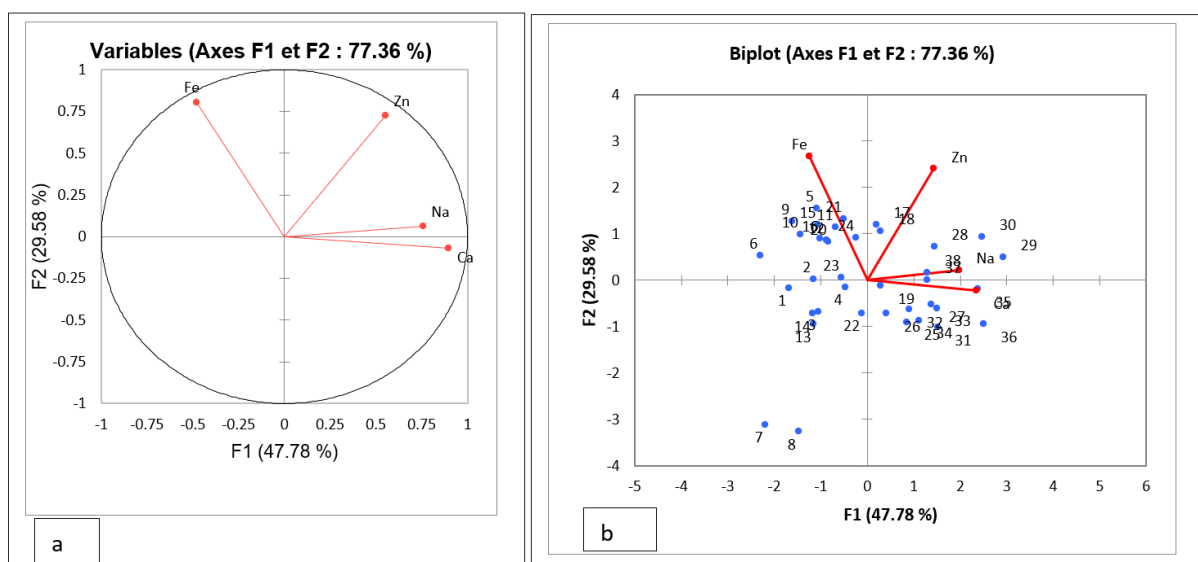


Figure 2. Principal component analysis of minerals of roasted cashew kernels.

3.2. Discussion

The water contents of roasted cashew kernel samples are close to those reported by Griffin and Dean (2017) and Liao, Zhao, Gong, Zhang, and Jiao (2018) who found water contents of 3.12% in roasted cashew kernels from India and 1.4% to 1.8% in hot-air roasted cashew kernels, respectively. Adebajo and Diyaolu (2003) and Orhevba and Yusuf (2016) reported higher water contents of 4.1 to 6.8% in roasted cashew kernels sold in Lagos city (Nigeria) and 4.96%–6.66% in cashew kernels roasted at different temperatures, respectively. The roasted cashew nut samples have a relatively low water content ($2.17 \pm 0.28\%$ to $2.69 \pm 0.32\%$), so they could be stored for long periods without microbial growth.

The fat contents of the roasted cashew kernel samples are close to those found by Kosoko et al. (2014); Griffin and Dean (2017) and Olalekan-Adeniran and Ogunwolu (2018) which were 43.25% to 45.62% for conventional and halogen oven roasted cashew nuts, 46.4% for dry roasted cashew nuts and 43.28% for oven roasted cashew nuts, respectively. Studies have shown that the oil extracted from cashew kernels is rich in oleic acid and that this oil is composed mainly of unsaturated fatty acids (Lima, de Oliveira Nobre, Magalhaes, & de Souza, 2015; Liu, Li, Xia, & Lin, 2023; Silué, Karamoko, Zannou-Tchoko, & Ahui, 2023). Linoleic acid is an essential fatty acid for humans, who cannot synthesize it. Unsaturated fatty acids have beneficial effects on health and contribute to the prevention of certain diseases (Mexis & Kontominas, 2009; Yang, 2009; Yang, Liu, & Halim, 2009). Samples of roasted cashew kernels are rich in fats ($46.23 \pm 1.97\%$ to $47.99 \pm 1.59\%$); people could benefit from the properties of cashew kernel oil through their consumption.

The protein contents of roasted cashew kernels are close to those reported by Kosoko et al. (2014), Griffin and Dean (2017), and Olalekan-Adeniran and Ogunwolu (2018) which were 16.55% to 18.39%, 17.5% and 17.37% for roasted cashew kernels using different techniques, respectively. Proteins serve a variety of functions; they act as structural components, biocatalysts (enzymes), antibodies, lubricants, messengers (hormones), and carriers. After digestion, the amino acids that compose food proteins are absorbed and used to synthesize body proteins (Berdanier & Zempleni, 2009). The samples of roasted cashew kernels have interesting protein contents ($19.60 \pm 1.80\%$ to $20.50 \pm 1.94\%$), and they constitute a good source of protein for the body.

The carbohydrate contents of roasted cashew kernel samples are close to those found by Kosoko et al. (2014) and Olalekan-Adeniran and Ogunwolu (2018) which were 29.10% to 30.04% and 28.03%, respectively. Carbohydrates provide as much as 60% of the daily energy intake (Berdanier & Zempleni, 2009). Carbohydrates are the second most abundant component of roasted cashew kernels ($27.66 \pm 0.76\%$ to $27.70 \pm 0.67\%$) after lipids. They are a good source of energy for the body. The energy values of the roasted cashew kernel samples are higher than those found by Kosoko

et al. (2014) and Olalekan-Adeniran and Ogunwolu (2018) which were 2407.58 ± 5.08 KJ/100g to 2480.04 ± 21 KJ/100g for conventional and halogen oven roasted cashew kernels and 2148.94 KJ/100g for oven roasted cashew kernels, respectively. The high energy value (608.93 ± 1.18 Kcal/100g to 620.99 ± 2.07 Kcal/100g) of the roasted cashew kernel samples could be explained by their high fat content. Roasted cashew nuts are a good energy-rich food, high in protein. The total ash contents of the roasted cashew kernel samples are close to those reported by Orhevba and Yusuf (2016) and Kosoko et al. (2014), which were 2.92% to 3.19% for cashew kernels roasted at different temperatures and $2.47 \pm 0.05\%$ to $2.53 \pm 0.08\%$ for cashew kernels roasted by hot air, respectively. Calcium contents of roasted cashew kernel samples are close to those found by Orhevba and Yusuf (2016) and Kosoko et al. (2014), which were 43.60 mg/100g to 47 mg/100g and 34.44 ± 0.049 mg/100g to 36.21 ± 0.82 mg/100g, respectively for cashew kernels roasted using different methods. Iron contents of roasted cashew kernel samples are close to those of Kosoko et al. (2014) who found iron contents of 5.78 ± 0.54 mg/100g to 5.92 ± 0.55 mg/100g and higher than those found by Abubakar, Abubakar, Ibrahim, and Ladan (2018) and Griffin and Dean (2017) which were 0.05 ± 0.02 mg/100g for industrially roasted cashew kernels and 21.2 ± 0.4 mg/Kg for dry roasted cashew kernels, respectively. The sodium contents of the roasted cashew kernel samples are higher than those reported by Abubakar et al. (2018) and Kosoko et al. (2014), which were 6.30 ± 1.98 mg/100g and 8.75 ± 0.55 mg/100g to 10.06 ± 0.88 mg/100g for cashew kernels roasted using different methods, respectively. The high sodium contents of the samples could be explained by the fact that salt is usually added to cashew kernels after frying. Zinc contents of roasted cashew kernel samples are close to that reported by Griffin and Dean (2017), which was 70.2 ± 1 mg/Kg for dry roasted cashew kernels and higher than that reported by Abubakar et al. (2018), which was 0.04 ± 0.01 mg/100g for industrially roasted cashew kernels. Macrominerals (sodium, potassium, chloride, calcium, phosphorus, and magnesium) act as electrolytes, and their importance is linked to this function. Most minerals are found in bones and teeth and therefore have a structural function; however, they also play a role in regulating metabolism (Berdanier & Zemleni, 2009).

The acid values of roasted cashew kernel samples are close to those reported by Liao et al. (2018), which were 1.59 ± 0.07 mg KOH/g to 2.04 ± 0.06 mg KOH/g for hot air roasted cashew kernels. Except for ten 10 samples, the acid values of roasted cashew kernel samples are in accordance with the National Standard of the People's Republic of China (2014), which stipulates that the acid value of kernels should not exceed 3 mg KOH/g. The acid value corresponds to the amount of free fatty acids present in an oil or fat. It indicates the oil's corrosiveness (oxidation, hydrolysis), its long-term stability, and the overall quality of its fatty acids. The acid value increases with time and deterioration. The acid value of the roasted cashew kernel samples being low (2.04 ± 0.59 mg KOH/g to 2.84 ± 0.71 mg KOH/g), they are of good quality.

The nutritional composition of roasted cashew kernels is influenced by cooking techniques. Indeed, Orhevba and Yusuf (2016) showed that roasting temperatures have an effect on the nutritional quality of cashew kernels. Kosoko et al. (2014) also showed that roasting methods have an effect on the nutritional quality of roasted cashew kernels. Climatic conditions, soil composition, growing conditions and the genetic evolution of cashew trees in each region can also influence the nutritional composition of cashew kernels (Ahmed, Abdalla, Inoue, Ping, & Babiker, 2014; Cheng, He, Yue, Wang, & Zhang, 2014; Giorgi, Madeo, Speranza, & Cocucci, 2010).

4. CONCLUSION

Roasted cashew kernels sold in Burkina Faso are rich in fat, carbohydrates, and proteins, making them a potential energy source. They also contain minerals such as zinc, iron, calcium, and sodium, which could help prevent certain metabolic diseases. The study's results may serve as a basis for developing a Burkinabe national standard on roasted cashew nuts.

It would be interesting to continue this study by determining the vitamin, fatty acid, and amino acid profile of roasted cashew kernels.

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REFERENCES

- Abubakar, S. M., Abubakar, H. A., Ibrahim, J., & Ladan, Z. S. (2018). Evaluation of nutrient content of raw and roasted cashew nut (*Anacardium occidentale*) kernel. *Biological and Environmental Sciences Journal for the Tropics*, 15(1), 41-46.
- Adebajo, L. O., & Diyaolu, S. A. (2003). Mycology and spoilage of retail cashew nuts. *African Journal of Biotechnology*, 2(10), 369-373. <https://doi.org/10.5897/AJB2003.000-1076>
- Ahmed, S. O., Abdalla, A. W. H., Inoue, T., Ping, A., & Babiker, E. E. (2014). Nutritional quality of grains of sorghum cultivar grown under different levels of micronutrients fertilization. *Food Chemistry*, 159, 374-380. <https://doi.org/10.1016/j.foodchem.2014.03.033>
- Assunção, R. B., & Mercadante, A. Z. (2003). Carotenoids and ascorbic acid composition from commercial products of cashew apple (*Anacardium occidentale* L.). *Journal of Food Composition and Analysis*, 16(6), 647-657. [https://doi.org/10.1016/S0889-1575\(03\)00098-X](https://doi.org/10.1016/S0889-1575(03)00098-X)
- Atwater, W. O., & Benedict, F. G. (1899). *Experiments on the metabolism of matter and energy in the human body*. Bulletin No. 69. Washington, DC: U.S. Department of Agriculture, Office of Experiment Stations.
- Berdanier, C. D., & Zempleni, J. (2009). *Advanced nutrition: macronutrients, micronutrients, and metabolism*. New York: Taylor & Francis Group.
- Cheng, G., He, Y.-N., Yue, T.-X., Wang, J., & Zhang, Z.-W. (2014). Effects of climatic conditions and soil properties on Cabernet Sauvignon berry growth and anthocyanin profiles. *Molecules*, 19(9), 13683-13703. <https://doi.org/10.3390/molecules190913683>
- Dakuyo, R., Konaté, K., Sanou, A., Kaboré, K., Sama, H., Bazié, D., . . . Dicko, M. H. (2022). Comparison of proximate and phytonutrient compositions of cashew nuts and apples from different geographical areas of Burkina Faso. *BioMed Research International*, 2022(1), 1800091. <https://doi.org/10.1155/2022/1800091>
- Egan, H., Kirk, R. S., & Sawyer, R. (1981). Pearson's chemical analyses of food. In (8th ed., pp. 591). Edinburgh: Churchill Livingstone.
- FAOSTAT. (2021). *Food and agricultural organization of the United Nations statistics division*. Rome, Italy: FAOSTAT.
- Giorgi, A., Madeo, M., Speranza, G., & Cocucci, M. (2010). Influence of environmental factors on composition of phenolic antioxidants of *Achillea collina* Becker ex Rchb. *Natural Product Research*, 24(16), 1546-1559. <https://doi.org/10.1080/14786419.2010.490656>
- Griffin, L. E., & Dean, L. L. (2017). Nutrient composition of raw, dry-roasted, and skin-on cashew nuts. *Journal of Food Research*, 6(6), 13-28. <https://doi.org/10.5539/jfr.v6n6p13>
- ISO 659. (2009). *ISO 659: Oilseeds—Determination of oil content (Reference method)* (4th ed.). Geneva, Switzerland: ISO.
- ISO 665. (2020). *ISO 665: Oilseeds—Determination of moisture and volatile matter content* (3rd ed.). Geneva, Switzerland: ISO.
- ISO 729. (1988). *ISO 729: Oilseeds—Determination of acidity of oils* (2nd ed.). Geneva, Switzerland: ISO.
- ISO 1871. (2009). *ISO 1871: Food and feed products—General guidelines for the determination of nitrogen by the Kjeldahl method* (2nd ed.). Geneva, Switzerland: ISO.
- ISO 2171. (2007). *ISO 2171: Cereals, pulses and by-products—Determination of ash yield by incineration* (4th ed.). Geneva, Switzerland: ISO.

- Kosoko, S. B., Oluwole, O. B., Daramola, A. O., Adepoju, M. A., Oyelakin, A. J., Tugbobo-Amisu, A. O., . . . Elemo, G. N. (2014). Comparative quality evaluation of roasted cashew nut kernel: Effect of roasting methods. *Advance Journal of Food Science and Technology*, 6(12), 1362-1371. <https://doi.org/10.19026/ajfst.6.211>
- Lautié, E., Dornier, M., De Souza, F. M., & Reynes, M. (2001). Cashew products: Characteristics, value chains and markets. *Fruits*, 56, 235-248.
- Liao, M., Zhao, Y., Gong, C., Zhang, H., & Jiao, S. (2018). Effects of hot air-assisted radio frequency roasting on quality and antioxidant activity of cashew nut kernels. *LWT - Food Science and Technology*, 93, 274-280. <https://doi.org/10.1016/j.lwt.2018.03.047>
- Lima, J. R., de Oliveira Nobre, A. C., Magalhaes, H. C. R., & de Souza, R. N. M. (2015). Chemical composition and fatty acid profile of kernels from different Brazilian cashew tree genotypes. *African Journal of Food Science*, 9(7), 390-394. <https://doi.org/10.5897/AJFS2015.1316>
- Liu, Y., Li, L., Xia, Q., & Lin, L. (2023). Analysis of physicochemical properties, lipid composition, and oxidative stability of cashew nut kernel oil. *Foods*, 12(4), 693. <https://doi.org/10.3390/foods12040693>
- Lovejoy, J. C. (2005). The impact of nuts on diabetes and diabetes risk. *Current Diabetes Reports*, 5(5), 379-384. <https://doi.org/10.1007/s11892-005-0097-x>
- Mexis, S. F., & Kontominas, M. G. (2009). Effect of γ -irradiation on the physicochemical and sensory properties of cashew nuts (*Anacardium occidentale* L.). *LWT - Food Science and Technology*, 42(9), 1501-1507. <https://doi.org/10.1016/j.lwt.2009.03.023>
- Mukuddem-Petersen, J., Oosthuizen, W., & Jerling, J. C. (2005). A systematic review of the effects of nuts on blood lipid profiles in humans. *The Journal of Nutrition*, 135(9), 2082-2089. <https://doi.org/10.1093/jn/135.9.2082>
- National Standard of the People's Republic of China. (2014). *GB 19300: National standard for food safety, nuts and seeds food*. Beijing, China: Standards Press of China.
- Olalekan-Adeniran, M. A., & Ogunwolu, S. O. (2018). Comparative quality evaluation of oven-roasted and honey-coated cashew (*Anacardium occidentale*, L.) nut produced using locally fabricated cashew nut processing machine in Nigeria. *International Journal of Environment, Agriculture and Biotechnology*, 3(5), 1796-1803. <https://doi.org/10.22161/ijeab/3.5.31>
- Orhevba, B. A., & Yusuf, I. B. (2016). Effect of roasting temperature on nutritional quality of cashew nut (*Anacardium occidentale*). *International Journal of Scientific & Technology Research*, 5(7), 182-184.
- Semporé, J. N., Bougma, S., Ouédraogo, E. R., Kagambega, W., Oboulbiga, E. B., Tarpaga, W. V., . . . Dicko, M. H. (2024). Evaluation of the post-selection nutritional composition and levels of compounds with antinutritional effects of cashew (*Anacardium occidentale* L.) accessions selected for productivity improvement. *Journal of Food Composition and Analysis*, 136, 106713. <https://doi.org/10.1016/j.jfca.2024.106713>
- Semporé, J. N., Songré-Ouattara, L. T., Tarpaga, W. V., Bationo, F., & Dicko, M. H. (2021). Comparison of proximate composition and nutritional qualities of fifty-three cashew accessions from Burkina Faso. *Food and Nutrition Sciences*, 12(9), 871-883
- Silué, F. E., Karamoko, M. M. V., Zannou-Tchoko, V. J., & Ahi, B. M. L. (2023). Evaluation of the physico-chemical composition and fatty acid profile of cashew nut oil (*Anacardium occidentale*) compared to sunflower oil. *Scholars Academic Journal of Biosciences*, 11(12), 428-433. <https://doi.org/10.36347/sajb.2023.v11i12.002>
- Yang, J. (2009). Brazil nuts and associated health benefits: A review. *LWT - Food Science and Technology*, 42(10), 1573-1580. <https://doi.org/10.1016/j.lwt.2009.05.019>
- Yang, J., Liu, R. H., & Halim, L. (2009). Antioxidant and antiproliferative activities of common edible nut seeds. *LWT - Food Science and Technology*, 42(1), 1-8. <https://doi.org/10.1016/j.lwt.2008.07.007>

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