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Nutritional and Physicochemical Characteristics of Cashew Nut (*Anacardium occidentale* L.) Grown in Pawe District, Northwestern Ethiopia

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***Abstract* – The nutritional and mineral contents of cashew nuts were studied by analyzing protein, carbohydrate, moisture, oil, ash, and fiber. The mean values of moisture, ash, protein, crude fat, crude fiber, and carbohydrate were 5.92, 2.64, 25.49, 49.34, 2.52, and 14.08% respectively. The mineral composition of cashew nut kernel showed Phosphorus (13.68mg/100g), Sodium (8.02mg/100g), Potassium (28.29mg/100g), Calcium (21.35mg/100g), Magnesium (33.02mg/100g), zinc (0.87mg/100g), and Iron (0.70mg/100g). The physicochemical property of cashew nut oil: refractive index, specific gravity, saponification value, iodine value, acid value, peroxide value, and color were 1.46, 0.96, 137.25mgKOH/g, 41.81mgKOH/g, 11.60mgKOH/g, 20.55mEq/kg, and light yellow, respectively. The cashew nut oil is nondrying and could not be used as soap making, but might be edible. However, further detailed research is required on the additional quality parameters and possible uses of cashew nut oil and cashew nut shell liquid.**

***Keywords* – Cashew, Proximate Composition, Oil, Cashew Nut Shell Liquid, Nutrition.**

I. INTRODUCTION

The cashew tree (*Anacardium occidentale* L.), a multipurpose perennial crop is belonging to the Anacardiaceae family. It is indigenous to Brazil and was introduced into other tropical regions such as India, Africa, Indonesia, and South East Asia in the 16th century by the Portuguese (Kapinga *et al*., 2010). Cashew fruit comprises the cashew apple, cashew nut shell, and cashew nut kernel (Achal, 2002). The cashew nut consists of an outer shell (epicarp), a tightly fitted inner shell (endocarp), and a strongly vesicant cashew nut shell liquid (CNSL) (Trox *et al*., 2010). The true fruit of the cashew tree is the nut, a kidney-shaped structure approximately 2 - 3 cm in length. The nut is attached to the end of a fleshy pulp called the cashew apple. Products derived from the nuts include the world's highly delighted roasted kernel snacks, kernel oil, and cashew nut shell liquid; and from the apple: juice, jam, and alcohol are among the products.

Cashew nut kernel is an edible nut rich in lipids, proteins, minerals (Lima *et al*., 2012), and health-beneficial bioactive compounds (Michalak and Kieltyka-Dadasiewicz, 2019; Trox *et al*., 2010). The cashew nut kernel has a pleasant taste and flavor and can be eaten raw, fried, and sometimes salted or sweetened with sugar. The kernel is considered to be of high nutritive quality. However, growing conditions and the variety of cashew may have an influence on kernel composition. Cashew nut is an important delicacy that is mainly used in confectionery and as a dessert nut. It was shown that the powdered milk used in the standard milk chocolate recipe can be replaced with 25% roasted cashew kernel. It also contains high food value with about 40-57% oil and 21% protein content (Fetuga *et al*., 1975).

Cashew is of considerable economic importance because their components have various economic uses (Fetuga *et al*., 1975). The cashew industry ranks third in the world production of edible nuts with an estimated value of US $ 2 billion, the world cashew nuts production comes from both wild and cultivated trees (FAO, 2000). In Ethiopia, little is known about the production and nutritional benefits of cashew nuts. Hence, the

objective of this experiment was to evaluate the physicochemical properties and nutritional characteristics of cashew nut kernel and kernel oil of cashew trees grown in Pawe District, Northwestern Ethiopia.

II. MATERIALS AND METHODS

Sample Collection and Preparation

Two accessions of cashew nut were obtained from Horticulture research program in Pawe Agricultural Research Center, Benishangul Gumuz, Ethiopia. For coding purpose, the two cashew nut accessions are assigned as P1 and P2 for the cashew nut having small conical red fruit and big conical red fruit, respectively. The cashew nut was sun dried and cracked manually by using wooden mallet by placing it on a flat stone. Protective hand glove was used to prevent burning sensation. The nuts were dried in oven dry at 40°C for 6 hours to make its bone dry. The covering testa were removed by squeezing and then winnowed to obtain cream color nuts. The dried sample were grounded and packed in air tight plastic bag in a refrigerator at 4°C until analysis (Aremu *et al*., 2006).

Nutritional Analysis

The proximate compositions of cashew kernel samples were determined using standard methods AOAC (2000). Moisture content was determined by heating 5.0 g of each sample to a constant weight in a crucible placed in an oven maintained at 105°C. Ash was determined by the incineration of 5.0g samples placed in a muffle furnace maintained at 550°C for 5 hours. Crude protein (% Total nitrogen x 6.25) was determined by Kildahl method (Kjeldahl, 1883). Crude fat was obtained by exhaustively extracting 5.0g of each sample in a Soxhlet apparatus using petroleum ether (boiling range 40-60°C) as the extractant. Dietary fiber was determined by digesting defatted samples with diluted (1.25%) sulphuric acid solution for 30 minutes at boiling point followed by digestion with 1.25% potassium hydroxide solution for the same duration. Total carbohydrate was determined by difference.

Extraction and Analysis of Kernel Oil

Cashew nut oil was extracted by soxhlet extractor using hexane as solvent. The physicochemical properties of cashew nut kernel oil (specific gravity, refractive index, acid value, saponification value, peroxide value and iodine value) were determined based on the standard procedures of AOAC (2000).

Data Analysis

The collected data is subjected to T- test using SAS software version 9.4 to test the mean difference at 5% level of significance.

III. RESULTS AND DISCUSSION

Proximate Composition

The proximate composition of cashew nut kernel studied are summarized in Table 1. The result indicated that only crude protein and crude fat contents showed significant difference ($P< 0.05$) between the two accessions. The moisture content is ranged from 5.84 to 6.00%. This moisture content result is in close agreement (5.52% and 5.9%) with previous works of Vincent *et al*. (2009) and Ogungbenle and Afolayan (2015), respectively.

However, it has lower moisture content than the report of Akinhanmi and Atasie (2008) whose value was 7.2%. Seeds having low moisture content could have longer storage time without spoilage. The ash content is ranged from 2.53 to 2.76%. This value is in agreement with the ash content of cashew nut (2.8%) reported by (Akinhanmi and Atasie, 2008). However, the ash content of this experiment was lower than the 3.12 to 3.49% values reported by (Adepoju *et al*., 2019). Protein contents of P2 and P1 were 24.76 and 26.22%, respectively and these results were in line with the findings of Ogungbenle and Afolayan (2015) (26.1%). Crude fat results were 48.40 and 50.19% for P1 and P2, respectively. These crude fat values are comparable with previous reports of (Shokunbi *et al.*, 2012) who evaluated five groundnut varieties for fat content and found values ranging between 48.06 and 50.66%. However, the fat content in this experiment was lower than the cashew kernel (54.17%) and Macadamia nut kernel (69.88%) of Liu *et al*. (2019).

Table 1. Proximate composition of Cashew nut kernel.

Sample	Moisture (%)	Ash (%)	Protein (%)	Crude Fat (%)	Crude fiber (%)	Carbohydrate (%)
P1	6.00	2.53	26.22	48.50	2.56	14.20
P2	5.84	2.76	24.76	50.19	2.49	13.97
Mean	5.92	2.64	25.49	49.34	2.52	14.08
Sig. (P< 0.05)	Ns	ns	*	*	ns	ns

P1, Cashew nut having small conical red fruit; P2, Cashew nut having big conical red fruit.

Mineral Composition of Cashew Nut Kernel

The mineral composition of cashew net kernel is summarized in Table 2. The result shows that there is no significant ($P \leq 0.05$) difference on the mineral composition between the two varieties of cashew nut kernels. Minerals are used for biological and physiological functions. The profile showed that the cashew nut kernel had the mean value of Na (8.02), K (28.29), P (13.68), Ca (21.35), Mg (33.02), Zn (0.87), and Fe (0.70mg/100g). This indicates that the cashew nut kernels are rich in minerals, and this result is in close agreement with the findings of (Vincent *et al.*, 2009).

Table 2. Mineral composition of Cashew nut kernel.

Sample	Na	K	P	Ca	Mg	Zn	Fe
	(mg/100g)						
P1	8.16	27.50	13.71	21.45	32.73	0.85	0.71
P2	7.88	29.08	13.65	21.25	33.31	0.89	0.69
Mean	8.02	28.29	13.68	21.35	33.02	0.87	0.70
Sig. (P< 0.05)	ns	ns	ns	ns	ns	ns	ns

Physicochemical Properties of Cashew Nut Kernel Oil

The physicochemical property of cashew nut oil is summarized in Table 3. The result indicated that there are no significant (P≤0.05) differences on the properties of oils between the two cashew nut varieties. The oil extracted from the cashew nut kernel have light yellow color. The mean values of refractive index and specific

gravity of cashew nut kernel were 1.46 and 0.96 respectively. The result is in agreement with the previous report by (Adepoju *et al*., 2019). The mean value of saponification value is 137.25 mg KOH/g. This result is in line with the saponification value of cashew nut kernel (137 mg KOH/g) reported by (Akinhanmi and Atasie, 2008). However, it has lower saponification value than palm kernel oil (280.5 mg KOH/g), coconut oil (257.5 mg KOH/g), and groundnut oil (195.5 mg KOH/g) as reported by (Amira *et al*., 2014). The low saponification value indicates that the oil may not be used for soap making.

The mean iodine value was 41.81mgKOH/100g, which is less than 100 and is classified as nondrying oil. This result of iodine is lower than previously reported value by Idah *et al.* (2014) (86.5 mg KOH/100g). Iodine value, which is an indication of the susceptibility of an oil to oxidation is used to quantify the amount of double bonds in an oil. Lower iodine value indicates the presence of lower fraction of unsaturated fatty acids in the seed (Audu *et al*., 2019) and its decreased oxidation potential. While the mean acid value was 11.60mgKOH/g, the mean peroxide value recorded 20.55mEq/kg. The peroxide value is an indication of the deterioration of lipids due to oxidation of double bonds of unsaturated fatty acid and is an index of rancidity. The low peroxide value indicates the slow oxidation of oils (Anyasor *et al*., 2009).

Table 3. Characteristics of Cashew nut kernel oil.

Sample	RI	SG	SV (mgKOH/g)	IV (mgKOH/g)	AV (mgKOH/g)	PV (mEq/kg)	Color
P1	1.44	0.94	138.00	41.70	11.45	20.54	Light yellow
P2	1.48	0.99	136.50	41.93	11.75	20.56	Light yellow
Mean	1.46	0.96	137.25	41.81	11.60	20.55	-
Sig. ($P<$ 0.05)	ns	ns	ns	ns	ns	ns	-

RI, Refractive Index; SG, Specific gravity; SV, Saponification value; IV, Iodine value; AV, Acid value; PV, Peroxide value.

IV. CONCLUSION

The result of this study showed that cashew nut kernel is nutritionally rich and is good source of protein, fat and minerals. The oil properties of cashew nut kernel are within the specification of most vegetable oils. This suggests that the cashew nut kernel oil can be edible after refinement but might not be used for soap making. However further detail researches are recommended on the cashew nut apple and cashew nut Shel liquid (CSL).

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