

# Composition and Anti-Nutritional Factors (Phyto-Nutrients) Present in both Red and Yellow Varieties of Sun-Dried Cashew Pulp

U. Okpanachi<sup>1, \*</sup>, J. A. Ayoade<sup>2</sup>, C. D. Tuleun<sup>2</sup>

<sup>1</sup>Department of Animal Production, Kogi State University, Anyigba, Nigeria

<sup>2</sup>College of Animal Science, Federal University of Agriculture, Makurdi, Nigeria

## Abstract

Pulps of both red and yellow cashew were picked from cashew plantations within and around Anyigba in Dekina Local Government Area of Kogi State. The collected pulps were washed, sliced and sun-dried. It was then milled and samples of the two varieties (red and yellow) were taken to the laboratory for both proximate composition and anti-nutritional factors analysis. Proximate composition of all the components for both varieties were not significantly affected ( $p > 0.05$ ) by variety. Numerically however, red cashew pulp had the highest dry matter, crude protein and crude fibre while the yellow variety had the highest ether extract, ash and carbohydrate values. Tannin, saponin, phytate, oxalate and flavonoids were analysed as anti-nutrients. None of the phytonutrients showed significant difference ( $p > 0.05$ ) and all the phytonutrients present in both varieties are far lower than those present in some similar feed stuff reported by some authors. The red cashew pulp had the highest values for Tannin, phytate and oxalate while the yellow variety recorded the highest values for saponin and flavonoids. It was concluded that phytonutrients present in the pulps of both cashew varieties are in very low amounts. It was recommended that since both varieties of cashew are rich in one component or the other, crop scientists should work towards increasing their production.

## Keywords

Red Cashew Pulp, Yellow Cashew Pulp, Protein, Tannin, Phyto-Nutrients

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## 1. Introduction

Cashew pulp is considered as a waste in cashew nut processing industry. Although there is growing awareness surrounding the economic importance of cashew production in Asian and African countries, the present practice in most established large-scale plantations is to allow the apples to fall from the trees naturally before harvesting the nuts. Cashew apple waste contents of crude protein (CP), crude fibre (CF), ether extract (EE) and ash were 187 (18.7%), 84, 24 and 54 g kg<sup>-1</sup> DM, respectively as reported by [1]". The CP, fat, ash, CF in g kg<sup>-1</sup> DM and digestible energy contents

reported by [2]” for dry cashew pulp (DCP) were 86.0 g kg<sup>-1</sup>, 99.6 g kg<sup>-1</sup>, 38.0 g kg<sup>-1</sup>, 116.0 g kg<sup>-1</sup> and 14.38 MJ, respectively. Cashew pulp are not popular, in part because of highly astringent taste which has been traced to the waxy layer on the skin that causes tongue and throat irritation after eating the cashew pulp. Astringent taste in cashew pulp may be defined as that acidic or harsh taste it has when eaten. Despite the high level of tannin content (causing astringency), cashew pulps could be processed into beverage owing to its fleshy pulp, soft peel and lack of seeds, high sugar concentration and strong exotic flavor ([3]”, [4]”). However, [5]” attributed the chemicals that cause this effect

\* Corresponding author

E-mail address: [ucheleg@yahoo.com](mailto:ucheleg@yahoo.com) (U. Okpanachi)

(astringency) to be polyphenols, which according to him, are rather like the tannin found in wine. This astringent property of the cashew pulp is typically removed by steaming the fruit for five minutes before washing it in cold water; alternatively boiling the fruit in salt water for five minutes or soaking it in gelatin solution reduces the concentration to palatable and acceptable levels ([6]”, [7]”). In as much as the juice is astringent and somewhat acrid due to 35% tannin content (in the red: less in the yellow) and 3% of an oily substance, the fruit is pressure-steamed for 5 to 15 minutes before candying or making into jam or chutney or extracting the juice for carbonated beverages, syrup or wine. Efforts are made to retain as much as possible the ascorbic acid. Food technologists in Costa Rica recently worked out an improved process for producing the locally popular candied, sun-dried cashew pulp. Failure to remove the tannin from the juice may account for a nutritional deficiency in heavy imbibers of cashew pulp wine, for tannin prevents the body's full assimilation of dietary protein [8]”. [9]” studied the fermentation of cashew apple into wine. The cashew wine obtained from their study was a light yellow (in appearance) beverage with alcohol content of 7.0%. This study is necessitated due to the limited information on the proximate composition and anti-nutrients of red and yellow cashew pulp.

## 2. Materials and Methods

### 2.1. Procurement and Preparation of Varieties of Cashew Pulp

The samples of both red and yellow cashew apple pulp were obtained from Anyigba and its environs. Anyigba is in Kogi State, Nigeria. They were washed, sliced with the aid of knives and chopping boards into bits, air-dried and moved to the glass house where they were properly dried. The dried cashew pulp were packaged, weighed and stored in a safe place. The dried cashew pulp was later milled and sent to the laboratories for analysis.

### 2.2. Proximate Composition Analysis

Samples of the two major varieties of cashew pulp were dried, milled and analysed for crude protein (CP), crude fibre (CF), ether extract (EE) and ash according to [10]”. Carbohydrate was determined by calculation by difference method [100- (protein+ fat + moisture + ash)]. All the proximate values were reported in percentages [11]”.

### 2.3. Determination of Anti-Nutritional Factors (Phytonutrients)

Samples of the two major varieties of cashew pulp were dried, milled and analysed for tannin, saponin, phytate,

oxalate and flavonoids. Screening and quantitative determination were done according to the procedures of [12]”, [13]” and [14]”.

### 2.4. Data Collection and Statistical Analysis

Data on proximate composition and anti-nutritional factors were collected and subjected to a one way analysis of variance (ANOVA) using SPSS, 16.0 Evaluation Version for windows in a Complete Randomized Design (CRD). Significant mean levels were separated using Least Significant Difference.

## 3. Results and Discussion

### 3.1. Effect of Variety on Chemical Composition of Sun-Dried Cashew Pulp Meal

The effect of variety on chemical composition of cashew pulp meal is presented in Table 1. The chemical composition of all the components for both varieties were not significantly affected ( $p > 0.05$ ). The values of dry matter, crude protein, crude fibre, ether extract, ash and carbohydrate were 88.78%; 89.20%, 13.82%; 16.96%, 6.71%; 7.08%, 10.62%; 10.41%, 2.85%; 2.48% and 54.79%; 52.28% for the sun-dried yellow and red cashew pulp meals respectively.

Table 1. Effect of Variety on Composition of Sun-Dried Cashew Pulp Meal.

Varieties of Cashew			
Components (%)	Yellow	Red	SEM
Dry matter	88.78	89.20	1.07 <sup>ns</sup>
Crude protein	13.82	16.96	0.93 <sup>ns</sup>
Crude fibre	6.71	7.08	0.83 <sup>ns</sup>
Ether extract	10.62	10.41	1.04 <sup>ns</sup>
Ash	2.85	2.48	0.16 <sup>ns</sup>
Carbohydrate	54.79	52.28	1.44 <sup>ns</sup>

SEM = Standard Error of Mean, ns = not significant

The dry matter content of 88.78% (for sun-dried yellow cashew pulp meal) and 89.20% (for sun-dried red cashew pulp meal) reported in this study are higher than 81% reported by [2]”. The crude protein (13.82%, for sun-dried yellow cashew pulp meal and 16.96%, for sun-dried red cashew pulp meal) of cashew pulp meal in this study are higher than 8.6%, 11.6%, 12.68% and 13.7% reported by [2]”, [15]”, [16]” and [17]” respectively, but lower than 18.7% reported by [1]”. The crude fibre (6.71%, for sun-dried yellow cashew pulp meal and 7.08%, for sun-dried red cashew pulp meal) in this study are close to 7.0% reported by [15]”, but lower than 8.4%, 10.05 %, 11.6 %, and 11.8% reported by [1]”, [16]”, [2]” and [17]” respectively. The ether extract (10.41%, for sun-dried red cashew pulp meal and 10.62%, for sun-dried yellow cashew pulp meal) in this study are higher than the 2.4%, 9.96%, and 9.6% reported by

[1]”, [2]” and [15]” respectively. The value of ash (2.48%, for sun-dried red cashew pulp meal and 2.85%, for sun-dried yellow cashew pulp meal) obtained here are higher than 1.06%, 1.8% and 1.4% reported by [16]”, [15]” [17]” respectively, but lower than 5.4% and 3.8% reported by [1]” and [2]”.

**Table 2.** Composition of Cashew Pulp Reported by Different Authors.

Nutrients	Fanimo <i>et al.</i>	Armah	Obioha	La Van
	(2003)	(2011)	(1992)	Kinh <i>et al.</i>
Crude Protein (%)	187 g kg <sup>-1</sup> (18.7)	8.6	11.6	13.7
Crude fibre (%)	84 g kg <sup>-1</sup> (8.4)	11.6	7.0	11.8
Ether extract (%)	24 g kg <sup>-1</sup> (2.4)	9.96	9.6	-
Ash (%)	54 g kg <sup>-1</sup> (5.4)	3.8	1.8	1.4
Nitrogen free extract (%)	-	-	69.9	-
Energy (kcal/kg)	-	3440.2	3490	-
pH	-	-	-	4.1

Methods of processing, handling, storage, variety, environment and other factors might have resulted in these differences in chemical composition since they authors cited all worked on cashew pulp.

### 3.2. Anti-nutritional Factors or Phytonutrients (Quantitative and Qualitative) in Varieties of Sun-Dried Cashew Pulp

The anti-nutritional factors or phytonutrients (quantitative and qualitative) in varieties of sun-dried cashew pulp is presented in Table 3. None of the phytonutrients showed significant difference ( $p > 0.05$ ). The values of saponin, tannin, flavonoid, phytate and oxalate were 0.1568%; 0.0701%, 0.0621%; 0.0877%, 0.0767%; 0.0438%, 0.3159%; 0.3661% and 0.0287%; 0.0327% for the sun-dried yellow and red cashew pulp meals respectively. The result showed that all the phytonutrients analysed are present in sun-dried cashew pulp, at different levels of intensity. The level of intensity of saponin in the red cashew variety is higher than that in the yellow variety. The level of intensity of tannin in both varieties is the same. Same level of intensity was also obtained for flavonoid, phytate and oxalate.

**Table 3.** Anti-Nutritional Factors or Phytonutrients (Quantitative and Qualitative) in Varieties of Sun-Dried Cashew Pulp.

Anti-nutrients (%)	Varieties of Cashew		
	Yellow	Red	SEM
Saponin	0.1568 (+)	0.0701(++)	0.0483 <sup>ns</sup>
Tannin	0.0621 (++)	0.0877 (++)	0.0282 <sup>ns</sup>
Flavonoid	0.0767 (+)	0.0438 (+)	0.0235 <sup>ns</sup>
Phytate	0.3159 (+)	0.3661 (+)	0.1246 <sup>ns</sup>
Oxalate	0.0287 (+)	0.0327 (+)	0.0101 <sup>ns</sup>

SEM = Standard Error of Mean, ns = Non- Significant at ( $p > 0.05$ ) (+) = Level of Intensity

The level of intensity of saponin in the red cashew variety is higher than that in the yellow variety. The level of intensity of tannin in both varieties is the same. Same level of intensity also goes for flavonoid, phytate and oxalate.

The values of 0.0701% (sun-dried red cashew pulp meal) and 0.1568% (sun-dried yellow cashew pulp meal) of saponin in this study for sun-dried cashew pulp meal are The value of saponin in this study for sun-dried cashew pulp is higher than 0.037% - 0.043% reported by [18]” for peels of some citrus fruits varieties. The saponin content of sun-dried cashew pulp were also observed to be far lower than 3% which was reported by [19]” to be responsible for cattle losses when they grazed on alfalfa (*Drymaria arenaroides*).

The values of 0.0621% (sun-dried yellow cashew pulp meal) and 0.0877% (sun-dried red cashew pulp meal) of tannin in this study for sun-dried cashew pulp meal are lower than the levels that can bring about an adverse effect in livestock as reported by other authors. [20]” reported that tannin range between 1% - 20% commonly found in cereals and legumes has adverse effect on non-ruminant. In ruminants however, dietary tannins of 2% - 3% have been shown to impact beneficial effects as they reduce protein degradation in the rumen by formation of tannin-protein complex. This complex is however dissociated post- ruminally at a lower pH and the protein becomes available for digestion [21]”.

The values of 0.0438% (sun-dried yellow cashew pulp meal) and 0.0767% (sun-dried red cashew pulp meal) of flavonoid in this study for sun-dried cashew pulp meal are higher than 0.025% - 0.045% reported by [22]” for citrus fruit peel meal, but lower than 0.09% reported by [23]” for fermented sweet orange (*Citrus senensis*) fruit peel meal. Flavonoids have been reported to function as pigments and antioxidants [19]”.

The values of 0.3159% (sun-dried yellow cashew pulp meal) and 0.3661% (sun-dried red cashew pulp meal) of phytate in this study for sun-dried cashew pulp meal are higher than 0.062% - 0.082% reported by [22]” for citrus fruit peel meal.

The values of 0.0287% (sun-dried yellow cashew pulp meal) and 0.0327% (sun-dried red cashew pulp meal) of oxalate in this study for sun-dried cashew pulp meal are lower than 0.033% - 0.048% reported by [22]” for citrus fruit peel meal and 1.34% reported by [23]” for fermented sweet orange (*Citrus senensis*) fruit peel meal. Monogastrics are susceptible to oxalate, such that a diet containing 0.020% can be deadly to chickens. In ruminants however, oxalate is broken down by *Oxalobacter formigenes* in the gut flora such that, sheep and goats are able to adapt to diets with relatively high oxalate, although introducing feeds high in oxalate has to be gradual to allow time for the animal to adapt to the oxalate [24]”.

## 4. Conclusion and Recommendations

Studies on proximate composition and anti-nutritional factors of sun-dried cashew pulp meal reveals that based on the proximate composition, the red cashew variety is richer in crude protein while the yellow cashew variety is richer in carbohydrate.

The values of Phytonutrients present in both cashew varieties as shown in this study are in very low amounts, lower than the levels that can bring about an adverse effect in livestock as reported by other authors. It was recommended that since both varieties of cashew are rich in one component or the other (e.g. the red variety is rich in protein, while the yellow variety is rich in carbohydrate), crop scientists should work towards increasing the production of both varieties (especially the red cashew variety) since the red variety is not mostly cultivated when compared to the yellow variety.

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