



Trends in  
**Applied Sciences  
Research**

ISSN 1819-3579



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## Compositional Evaluation of *Annona cherimoya* (Custard Apple) Fruit

I.A. Amoo, A.E. Emenike and V.O.E. Akpambang

Department of Chemistry, Federal University of Technology, Akure, Ondo State, Nigeria

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**Abstract:** The proximate composition, mineral and sugar contents of the seed and juice of the fruit of *Annona cherimoya* (Custard apple) were determined using standard methods while the physico-chemical properties and chemical composition of the seed oil and juice respectively were also evaluated using standard methods. The protein content of the seed is 17.36% while it is 4.48% for the juice. The fat content of the seed and juice are 29.39 and 1.56%, respectively, while the values for crude fibre are 32.46 and 7.53%, respectively. There are comparable carbohydrate contents of 10.32 and 10.52% for the seed and the juice, respectively. The food energy of the seed is 375.23 kcal while it is 74.04 KCAL for the juice. The seed contains substantial amount of calcium, sodium, potassium and magnesium which are better than the values obtained for the juice. The juice gives higher values of sugar than the seed. The invert sugar of the juice is 161.84 while it is 17.40 for the seed. The fructose content of the juice is 167.27 while it is 17.45 for the seed. The juice contains 268.13 hydrated maltose while the seed contains 26.21. The physico-chemical properties of the oil extracted from the seed has specific gravity of 0.740, acid value of 11.04, peroxide value of 24.04 and saponification value of 52.11. The juice proves to be a good source of vitamins A and C with the values 16.63 µg/100 g R.E. and 43.38 mg/100 g, respectively. The juice contains fixed acidity of 0.023% and volatile acidity of 0.004%. The total solid of the juice is 27.25% while the soluble solid is 10.00%. The analyses showed that *Annona cherimoya* fruit is a potential food source.

**Key words:** *Annona cherimoya*, sugar content, juice, seed oil, proximate composition, tropical fruit

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### INTRODUCTION

*Annona cherimoya* is a subtropical fruit tree that originated from frost-free valleys of the Andes at an altitude of between 700-2400 m. Its tree is erect but low branched and somewhat shrubby, ranging in height from 5 to 9 m. The leaves are deciduous, alternate, 2-ranked and having minutely hairy petioles. The shape of the leaves is ovate and pointed at the apex. The fruit is a compound fruit which is heart shaped and ranges from 150-500 g in weight. The fruit is easily broken or cut open, exposing the snow-white, juicy flesh, of pleasing aroma and delicious, sub-acid flavour and containing many hard, brown or black bean-like glossy seeds (Berrie *et al.*, 1987; Morton, 1987a). The common species in Nigeria is *Annona muricata* (sour sop). Fruits of *Annona* species are eaten fresh and the pulp can be used to flavour ice cream, or can be blended with orange juice, lime juice and frozen as ice cream (Morton, 1987b).

Ripe fruits of *A. cherimoya* are important part of diet which supply nutrients like vitamins A and C. The food value per 100 g of edible portion of ripe fruit shows moisture of 71.48-78.70 g, protein 1.07-1.40 g, fat 0.4-0.6 g, sodium 4-5 mg, calcium 17 mg, B-carotene 10 mg and ascorbic acid 50 mg (Morton, 1987b). They contain small amount of protein and fat when compared with some fruits (Ciba-Geigy, 1981).

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**Corresponding Author:** I.A. Amoo, Department of Chemistry, Federal University of Technology, Akure, Ondo State, Nigeria

The flowering of the plant has been found to be increased by mild to moderate drought without adversely affecting fruit set, though fruit size was decreased (George and Nissen, 2002). When freshly harvested fruits were subjected to high level of CO<sub>2</sub>, the flesh softening was inhibited but the phenylalanine ammonia-lyase (PAL) was not affected, it however, was affected by high ammonia level (Assis *et al.*, 2001; Maldonado *et al.*, 2002). Perfecti and Luis (2005) studied the characterization of 206 cherimoya and 4 atemoya cultivars and how they are affected by variations due to geographical distribution, fruit characterization and germplasm collection of cherimoya located in the Loja province (southern Ecuador) an important centre of origin of the Andean fruit, revealed that several trees in that region showed better fruit quality characteristics than the cultivars already being commercialized on large scale (Scheldeman *et al.*, 2006).

This study is aimed at determining the proximate composition of the juice and seed of *A. cherimoya*, their mineral and sugar contents, physicochemical properties of the seed oil and some chemical constituents of the juice of the fruit cultivated in southwestern Nigeria. This shall aid in the proper positioning and effective utilization of the fruit.

## **MATERIALS AND METHODS**

### **Materials**

The fruit of *A. cherimoya* used in this study was obtained in Akure. The juice was extracted by hand pressing. The part for moisture content was removed while the other part was dried at gentle heat. The seeds were kept in a tight container and stored in a refrigerator where samples were withdrawn for analysis.

### **Methods**

The moisture contents, ash and crude fat were determined using AOAC method (AOAC, 1984). The moisture content of the juice was determined by first evaporating some of the water on a crucible and then transferring the crucible into a hot air oven. The fat content was estimated after complete extraction using petroleum spirit (bp 40-60°C). The crude protein, crude fibre and carbohydrate were determined using Joslyn (1970) method. The protein content was estimated using micro-Kjeldahl method while the protein concentrate was obtained after defatting the samples. Carbohydrates was calculated by difference.

The mineral composition of the samples was determined using atomic absorption spectrophotometer after ashing and dissolving the samples in 10% hydrochloric acid. The sugar content was estimated using Lane and Eynon's method (Pearson, 1976).

Vitamins A and C content of the juice were determined using method of AOAC (1975). Other chemicals compositions viz fixed acidity, total titrable acidity, volatile acidity, total and soluble solids were determined using methods described in MCMFA (1982). The physicochemical properties of the extracted oil of the seed were estimated using the methods described by Pearson (1976). All the determinations were carried out in triplicate.

## **RESULTS AND DISCUSSION**

The juice contains 4.48% protein which is higher than 1.07-1.40 g observed by Morton (1987), this difference could be due to geographical variation. Defatting the samples substantially increased the protein values of both seed and juice from 17.36 and 4.48% to 24.62 and 12.26%, respectively (Table 1). This follows the trend of defatted samples reported by Akubor and Chukwu (1999). The protein content of full-fat seed of *cherimoya* is lower than 20.9% obtained for cashew kernel flour by Amoo (2005). Cherimoya seed has a high crude fibre content of 32.46%, which may be due to the fibre

Table 1: Proximate composition of *Ammona cherimoya* seed and juice

Components	Seed	Juice
Moisture (%)	9.67±0.23	75.66±0.68
Crude fibre (%)	32.46±0.85	7.53±0.59
Crude Fat (%)	29.39±0.18	1.56±0.09
Ash (%)	0.81±0.02	0.25±0.05
Crude protein (%)	17.36±1.73	4.48±0.91
Carbohydrate (%)	10.32±0.43	10.52±0.69
Food energy (KCAL)	375.23±0.68	74.04±0.51
Dry matter (%)	90.33±0.20	24.34±0.48
Protein concentrate (%)	24.62±0.00	12.62±0.20

Table 2: Mineral composition (g/100 g) of *Ammona cherimoya* seed and juice

Components	Seed	Juice
Calcium	12.52	4.13
Sodium	17.23	7.31
Potassium	21.34	8.28
Phosphorus	0.18	0.03
Zinc	0.73	0.30
Magnesium	19.32	7.29
Lead	ND	ND

\*ND = Not detected

Table 3: Sugar composition (mg/100 g) of *Ammona cherimoya* seed and Juice

Components	Seed	Juice
Invert sugar	17.40±0.24	161.84±5.06
Fructose	17.45±0.49	167.27±7.40
Hydrated maltose	26.21±0.64	268.13±7.09
Anhydrous maltose	21.12±0.49	207.63±3.70
Hydrated lactose	22.24±0.51	218.52±5.20
Dextrose	16.45±0.36	159.52±3.89

interlocking the seed and therefore, makes it useful for digestibility preparation (Pearson, 1976). The ash contents of both seed and juice are low (0.81 and 0.25%, respectively). The ash content of the seed is slightly higher than 0.63% reported for Bambara groundnut flour by Adebowale *et al.* (2002) and much lower than 2.08-2.16%, reported by Al-Hooti *et al.* (2002) for two varieties of tamer dates fruits.

The mineral composition in g 100 g shown in Table 2 shows that the seed and the juice, respectively contain calcium 12.52 and 4.13; sodium 17.23 and 7.31; potassium 21.34 and 8.28; magnesium 19.32 and 7.29; Zinc 0.73 and 0.30. The values are generally higher than those reported by Morton (1987b) for *cherimoya* and values reported by Al -Hooti *et al.* (2002) for concentrated date syrup of two varieties of tamer dates. The seeds are rich in some nutritive minerals and therefore could be utilized for animal feed formulation provided the phytochemical studies are done. The juice sample showed higher values for the types of sugar analysed than the values in the seed ( $p < 0.05$ ), as shown in Table 3. This is normal as seeds store sugars as polysaccharides. The juice of *cherimoya* was found to have fructose content of 167.27 mg/100 g which is much less than 1.35-3.61% reported for the different stages of maturity of yellow cane juice by Qudsieh *et al.* (2001).

The physicochemical properties of the extracted oil of the seed are shown in Table 4. The oil shows high level of unsaturation indicated by the iodine value of 145.07. The acid value is 11.04 which is higher than 5.64 reported for *Bauhinia racemosa* seed oil (Amoo and Moza, 1999). The saponification value of 52.11 was recorded which is lower than 343.73 for *B. racemosa*. The chemical composition of the juice shown in Table 5 indicate that juice contain 16.63 µg/100 R.E of vitamins A and 32.38 mg/100 of vitamins C (Morton, 1987b). These vitamins are essential vitamins needed by all categories of people in Nigeria. The total titratable acidity of 0.027% and fixed acidity of 0.023% were obtained for the juice.

Table 4: Physicochemical properties of *Annona cherimoya* seed oil

Components	Mean±SD
Specific gravity at 20°C	0.740
Refractive index	1.469
Acid value (mg KOH/g)	11.04±1.00
Iodine value	145.07±4.21
Peroxide value	24.04±0.04
Saponification value (mg KOH/g)	52.11±3.20
Unsaponifiable matter (%)	1.28±0.03

Table 5: Chemical composition of Juice of *Annona cherimoya* juice

Components	Mean±SD
Fixed acidity (%)	0.023±0.000
Total titrable acidity (%)	0.027±0.002
Volatile acidity (%)	0.004±0.001
Total solid (%)	27.25±0.04
Soluble solid (%)	10.00
Vitamin C (mg/100 g)	42.38±0.83
Vitamin A (µg/100 g RE)	16.63±0.61

## CONCLUSION

*Annona cherimoya* is a plant that has not been grown widely in Nigeria unlike *Annona muricata*. The result of this analysis has shown that the fruit of this plant can be a veritable food source especially in a low income economy. The cream colour and flavour of the juice gives it advantage in ice cream fortification. The seed could be used to develop animal feeds as a result of its nutritive values.

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