EduMatika: Jurnal MIPA
Vol. 4, No. 4, Desember 2024, pp. 125~128



# Phytochemical analysis of soursop peel, with the extraction and characterization of its oil

**Chika Mary Ezeiheukwu[1], Dozie John Okongwu[2]**
[1,2]Nwafor Orizu College of Education, Nigeria
Email: ezechika784@gmail.com; dozieokongwu@yahoo.com

**ABSTRAK**

Kulit sirsak (Annona muricata) dianalisis untuk mengetahui komposisi proksimatnya. Kulit sirsak mengandung 3,2% minyak hijau tua, 10,65% protein kasar, 21,3% air, 3,8% abu, 12,69% serat kasar, 31,31% karbohidrat dan 4,40% abu. Komposisi unsur kulit sirsak ditentukan dengan menggunakan Spektroskopi Serapan Atom. Kulit sirsak mengandung Kalsium (32,45 mg/100 g), magnesium (48,23 mg/100 g), seng (125,15 mg/100 g), fosfor (128,24 mg/100 g), besi (72,52 mg/100 g) dan mangan (3,82 mg/100 g). Ekstraksi minyak dari kulit sirsak juga dilakukan dengan menggunakan metode ekstraksi sohxlet. Beberapa Karakteristik kimia minyak ditentukan. Hasil penelitian menunjukkan minyak tersebut memiliki bilangan penyabunan sebesar 131,84 mg, bilangan iod sebesar 66,68 mg/100 g, bilangan asam lemak bebas sebesar 3,64 mg, dan bilangan asam oleat sebesar 0,1889 mg.

**Kata Kunci: fitokimia kulit buah sirsak; komposisi buah sirsak; analisis unsur aas; ekstraksi minyak buah sirsak; limbah hayati kulit buah sirsak**

**ABSTRACT**

*Soursop (Annona muricata) peels was analysed for its proximate composition. It was found to contain 3.2 % dark green oil, 10.65 % crude protein, 21.3% moisture, 3.8 % ash, 12.69 % crude fiber, 31.31 % carbohydrates and 4.40 % ash. The elemental composition of the peel was determined, using Atomic Absorption Spectroscopy. It was found to contain Calcium (32.45 mg/100 g), magnesium (48.23 mg/100 g), zinc (125.15 mg/100 g), phosphorus (128.24 mg/100 g), iron (72.52 mg/100 g) and manganese (3.82 mg/100 g). Extraction of oil from the peel was also carried out using sohxlet extraction method. Some chemical Characteristics of the oil was determined. The result showed that the oil has a saponification value of 131.84 mg, iodine value of 66.68 mg/100 g, free fatty acid value of 3.64 mg, and oleic acid value of 0.1889 mg.*

**Keywords: soursop peel phytochemicals; annona muricata composition; elemental analysis aas; soursop oil extraction; fruit peel biowaste**

***Corresponding Author:***
Chika Mary Ezeiheukwu,
Nwafor Orizu College of Education Nsugbe,
No. 1 college road, Abata, Nsugbe 432108, Anambra, Nigeria
Email: ezechika784@gmail.com

## 1. INTRODUCTION

Fruits are nature's marvelous gift to mankind, they are life-enhancing medicines packed with vitamins, minerals, antioxidants and many phytonutrients. They have long been an imperative part of the human diet. Fruit peel is the outer skin or covering of fruits. As fruits ripens, the peels become easily separable example, in soursop, banana, mango etc. Peels are often discarded due to preference or habit or in an attempt to reduce exposure to pesticides. However, removing the peels may mean removing one of the most nutrient-rich parts of the plant. While, the exact amount of fiber varies, fresh fruits and vegetables may contain up to one-third or more fiber before the outer layers are removed. Fruit peels are also rich in essential oil which gives characteristic aroma to the fruit.

Annona muricata (Annonaceae) know as Soursop due to its soured and acidic nature of the ripe fruit pulp has gained tremendous fame owing to its rich nutritional profile. It is an ovally shaped fruit, which is usually 15-30 cm long, with soft green curved spines, white cotton-like mesocarp that has a nice flavour, and black seeds. Soursop fruit is made up of 4 % core, 8 % seeds, 20 % peel, and 67 % edible pulp by weight.

Soursop is a well-known annona fruit basically for industrial purpose because it does not oxidize, and posseses a highly juicy pulp from the fruit during processing (Palma, C., Contreras, E., Urra, J. and Martınez, M. J., 2011). Soursop fruits are usually consumed as fresh fruits (as salads and desserts) but are also widely used in semi-processed and processed products such as candies, custard, ice cream, sherbets, jelly, tarts, syrup and nectar. About 33% of soursop fruit waste are usually generated during the fruit processing into juice (Mesquita, P. C., Rodrigues, L. G. G., Mazzutti, S., da Silva, M., Vitali, L., and Lanza, M. (2021). It is an upright evergreen tree growing 5–10 meters in height. It is a shrubby plant located majorly in the rain forest regions of Nigeria, where it is used locally for ethnomedicinal purposes such as a laxative and also as a purgative, wound healing, etc. The unique phytochemical composition of this plant has resulted to its numerous health benefits (Agu K.C., Okolie N.P., Eze.G. I., Anionye J.C., and Falodun A. 2017).

Different wastes generated from fruit industries are of global concern. The international goal of "zero waste" can be achieved by the utilization of these wastes (ShaP., Modak D., Sakar S., Roy S. K., Sah S. P., GahtaniK, Bhattacharjee. S., 2023) as a raw material in food, cosmetic and Agricultural industries.

Ndamitso.M.M., Mustapha .S., Etsuyankpa .M.B., Jacob .J.O.; Adeshina .I.O. and Ekor, L, 2016 also reported that soursop peel can be utilized as a biosorbent for the removal of Pb+2, Cd+2 and Co+2 ions from oil spill water, thus providing a cheap way of safeguarding human health, aquatic lives and soil fertility. In this study, soursop peel was analysed for its proximate and elemental composition. The peel oil was extracted and analyzed as well.

## 2. RESEARCH METHOD

### *A. Preparation of soursop peel for the proximate and elemental analysis*

A large quantity of the soursop fruits was bought from sellers in Aswani market, Isolo Local Government of Lagos State. The fruits were washed, and allowed to ripen within 4-6 days for easier separation of the peels from the fruits. Analysis of the peels was carried out in the department of Biochemistry, College of Medicine, Idiaraba, Lagos State.

A given amount of the peels was ground into fine particles, and dried in an air oven at 105 °C for 3 hours and, used for the proximate analysis. The dried sample is ashed in a muffle furnace at 550°C to obtain a whitish ash. After cooling, the ash is then treated with concentrated hydrochloric acid, transferred to a volumetric flask and diluted with deionized water before submission for atomic absorption spectrophotometry (AAS). The remaining raw sample is sundried and ground using a manual blender into a coarse texture for easy extraction of it's oil.

### *B. Proximate analysis of the fruit peels*

The Proximate composition of the fruit was carried out using the Association of Official Analytical Chemists methods, to determine the moisture, ash, crude fat, crude fiber, crude protein, and carbohydrate contents of the samples (AOAC, 2005). Protein was calculated from total nitrogen using the conversion factor 6.25. Carbohydrate was determined by difference. The extraction of oil from the dried soursop peel was carried out using a sohxlet extractor, and the rotary evaporator was used to separate the solvent from the filtrates, to obtain the crude fat. The elemental Analysis was carried out using AAS.

## 3. RESULTS AND DISCUSSION

### *A. The results of the proximate analysis of soursop peel*

The result of this study reveals that the peels of soursop have a higher carbohydrate (31.31%). It compares favourably with the composition of animal feeds and supplements. Generally, animals must have a ration containing high carbohydrates to maintain energy needed by the body for work. This also includes crude protein, crude fiber and ash with a low fat. Protein is needed for body building (growth) and maintenance as well as milk production. Without protein there would be no body weight gain nor milk production. The crude fat content of soursop peel obtained in this study is also in contrast to that obtained by Onyechi (2012) who reported no fat content in the fruit. The higher protein and content of the soursop peel (10.95%) when compared to that of the pulp (1.38+_ 0.01 %) as reported by Akomolafe S.F and Ajayi O.B (2015) is an indication that the peel had concentrates of protein than the pulp. The higher ash value of soursop peel (4.4%) was lower than (1.99 +_ 0.01 %) also obtained by Akomolafe S.F and Ajayi O.B (2015) is an indication that the peels are good sources of minerals and therefore can be used in diet supplementation. The result of the peels understudy is similar to the values reported by Feumba .D.R., Ashwini .R.P. and Ragu S. M. (2016) of other peels; banana and orange (10.44+_0.38 % and 9.73+_0.67 % protein respectively), pineapple (4.39+_ 0.14% ash), pawpaw (12.16 % crude fibre and 37.49+_0.77 % carbohydrates), and pomegranate (3.36 % lipids) which is also comparable to 3.2 % fat of the present study. The ash content of soursop peel (4.4%) is also comparable to mango peels (3.88%) by Omutubga, S. K., Ashifat, A. A., Kehinde, A. S., Olayinke, O. O. and Edugbola, G.O. (2012). The proximate composition of soursop peels is as shown in table 1 below.

Table 1. The proximate composition of soursop peels

| Parameters | Percentage (%) |
|---|---|
| Carbohydrates | 31.31 |
| Crude protein | 10.65 |
| Moisture | 25.68 |
| Ash | 4.40 |
| Crude fiber | 12.69 |
| Fat | 3.21 |

### *B. The elemental composition of Soursop peels*

The electrolytic balance of the blood fluid are related to Na, K, Mg and Zn adequacy. Table 2 shows that soursop peels can be used in food industries (e g biscuit), and animal feed formulation because it contains calcium (32.43 mg/) for building strong bones and teeth in human, and strengthening egg shells in poultry. It contains Zinc (125 mg/100) Magnesium (43.23 mg/100 g and Phosphorus (128.24 12 mg/100 g which increases fertility and sensitivity of smell in farm animals. It also contains trace elements such as Iron (72.54 ppm), Manganese (3.32 ppm) which is needed in animal nutrition. Iron is a mineral that is naturally present in many foods, added to some food products, and available as a dietary supplement, iron is an essential component of haemoglobin, an erythrocyte protein that transfers oxygen from the lungs to the tissues. These minerals are vital components of animal nutrition which is required for poultry and dairy animal nutritions which is important for growth, development, higher milk production, reproduction and good health (Gupta. G., Upadhyay D., and Chand K., 2020). These minerals are inorganic co-factors that aids metabolic processes (Iheanacho and Udebuani, 2009).

Table 2. The elemental composition of Soursop peels

| Elements | Composition (mg/100g) |
|---|---|
| Calcium | 32.43 |
| Magnesium | 48.23 |
| Iron | 72.54 |
| Zinc | 125.15 |
| Manganese | 3.320 |
| Phosphorus | 128.24 |

Table 3 shows that the oil extracted from soursop peel is a non-drying class of oil (iodine value = 66.68 mg/100g), having a moderate saponification value (requires 131.84mg of KOH to saponify 1g of its oil). This oil is therefore edible, and can be used in food and cosmetic industries for the production of creams, and products which does not require a high saponification value.

Table 3. Characteristics of the oil from soursop peel

| Characteristics | Values |
|---|---|
| Saponification | 131.84 |
| Iodine value | 66.68mg/100g |
| Oleic acid | 0.18894 |
| Free fatty acid | 3.64 |

## 4. CONCLUSION

The present study reveals that that the peels of soursop (*Annona muricata*) is rich in carbohydrates, protein, fiber and some macro and micro nutrients such as Calcium, Zinc, Iron, Phosphorus and Magnesium. The chemical Characteristics of its oil shows that it is a non-drying oil with a moderate saponification value, and so could be used in cosmetic industries.

The other phytochemicals levels such as the antioxidants, could be studied to give the chemical assay of this peel. The Climatic and seasonal influences over soursop component should also be studied. It would then be possible to determine the specific potentials of the Soursop plant. Unlike, oranges, mangoes, and bananas which are widespread and largely cultivated in different parts of Nigeria, soursop is sparsely distributed in gardens of Southern and very few Eastern parts of the country. Based on my findings, I therefore recommend a large-scale cultivation os soursop sop.

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