

A COMPARATIVE STUDY OF THE LIPID PROTEIN AND MINERAL CONTENTS OF AFRICAN PEAR (*Dacryodes edulis*) SEED AND AVOCADO PEAR SEEDS

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Citation

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Abstract

The lipid, protein and mineral contents of African pear (*Dacryodes edulis*) seeds and avocado pear seeds were studied. The soaking method was applied to extract the lipid using hexane as solvent, the ashing method for extracting minerals, the kjeldahl method for protein content and the Bray No 1 method for phosphorus content. Results obtained show that for the African pear seed, the contents were: lipid (12.45%), protein (1.24%), sodium (0.87mg/100g), calcium (0.13mg/100g), iron (0.80mg/100g), potassium (1.66mg/100g), zinc (0.31mg/100g), magnesium (0.32mg/100g), phosphorus (10.34mg/100g) and ash (0.20%). For avocado pear seed: lipid (3.15%), protein (2.22%), sodium (1.54mg/100g), calcium (0.02mg/100g), iron (0.48mg/100g), potassium (1.10mg/100g), zinc (0.18mg/100g), magnesium (0.15mg/100g), phosphorus (7.70mg/100g) and ash (0.25%). Comparison shows that except for protein, sodium and ash contents, African pear seed has higher parameters of all studied than avocado pear seed.

INTRODUCTION

African pear (*Dacryodes edulis*) is consumed traditionally in Nigeria raw, roasted or boiled in hot water and is eaten alone or used in garnishing fresh maize. It is found in Sub-Saharan countries as Nigeria, Liberia, Cameroun and The Democratic Republic of Congo (1,2). It may be available for up to six months of the year (3-5). Goats and sheep eat the seeds of both African pear and avocado pear. The oil content of African pear is high (up to 18 – 70%) (1,6), making the seed to compare favourably with other oil bearing seeds such as palm kernel (40%), groundnuts (49%), cotton seed (36%) and soyabean (20%)(7).

The avocado fruit belongs to the family of Lauraceae which includes approximately 150 species, majority of which are habitat of tropical America. The fruit distinguishes itself from other fruits due to its high lipid content and is consumed as food, and as ingredient in the formulations of pharmaceutical and cosmetic products (8). Lipid concentration ranges from 15 to 30% in some species of avocado pear pulp; the seeds of the Fuerte cultivar contains about 1.87% lipids. The protein content of the pulp and seeds are 1.01 and 1.87% respectively. For California and Florida fruits, the protein content ranges from 1.21 – 2.26%

(1). Other constituents such as ash, fibre and carbohydrates exist in smaller quantities in pulp than in the seeds.

Work has been done on the lipid content of the African pear seed as well as the lipid protein, carbohydrate and fibre contents of avocado pear pulp and seed. The aim of this study was to determine the lipid, protein and mineral contents of the African and avocado pear seeds comparatively. The objectives included extracting the oil, ashing the cake and determining the mineral content. The Kjeldahl and Bray No 1 methods were used to determine the nitrogen and phosphorus contents respectively.

MATERIALS AND METHODS

MATERIALS

The ripe African pear and avocado pear fruits were purchased at Okigwe Road, Owerri, Nigeria. The B & L Spectronic –20 Electrophotometer and the UNICAM Solar Atomic Absorption Spectrophotometer (AAS 969) were obtained from the Chemistry Laboratory of the Federal University of Technology Owerri, Nigeria. The reagents used were of the analytical grade.

METHOD

PREPARATION OF THE SEED POWDER

The fruits were cut open to remove the seeds, which were then washed clean with distilled water. The seeds were chopped into small pieces and dried in an oven at 70°C until there was no significant change in weight. After cooling, the seeds were ground into powder in a porcelain mortar and pestle and sieved with sieve 40 mesh and stored in air-tight cellophane bags. This was done for both African pear seeds and avocado pear seeds.

EXTRACTION OF OIL

100g of the seed powder were introduced into a 500-ml beaker. 200ml of hexane were added to the powder which was allowed to stand after stirring, for 1 hour. The miscella was filtered through a weighed filter paper in a funnel into a weighed 1 litre distillation flask. Another 200ml of hexane were added, stirred, left to stand for 1 hour and filtered. 100ml of hexane were then added when the colour of the miscella was almost the colour of the hexane. The whole content of the beaker was poured into the funnel. The residue in the filter paper was finally washed with little amount of hexane. The total volume in the distillation flask was distilled. After distillation, the oil was heated in an oven at 80°C for 2 hours to remove trace solvent. This was done for both African pear and avocado pear seeds.

PROTEIN CONTENT DETERMINATION

The cake on the filter paper after oil extraction was heated to drive off traces of hexane. The Kjeldahl method was used to determine the percentage of nitrogen and hence the protein content.

MINERAL CONTENT DETERMINATION

The remaining quantity of the cake after protein content determination was ashed in a weighed porcelain dish at 350°C in a muffler furnace. After cooling, the ash was leached with 0.5mol/dm³ nitric acid solution. Samples of the leachate were introduced into sample bottles for analysis. The Unicam Solar Atomic Absorption Spectrophotometer was used to determine the sodium, calcium, potassium, zinc, and magnesium contents for both African pear and avocado pear seeds.

DETERMINATION OF PHOSPHORUS CONTENT

The Bray No 1 method was applied to determine the phosphorus content. 2ml samples of the leachate were pipetted into 20-ml test tubes. 5ml distilled water and 2ml

ammonium molybdate were added into each test tube. The content of each test tube was thoroughly mixed and 1ml SnCl₂. 2H₂O dilute solution added with proper mixing. After 5 minutes the transmittance of the solution was measured on the B & L Spectronic – 20 Electrophotometer at 660nm. Standard curves within the range of 0.2ppm were prepared. The absorbances of the standard solutions of phosphorus were taken at 660nm. The average absorbance was used to determine the phosphorus concentration for both African pear and avocado pear seeds.

RESULTS AND DISCUSSION

The lipid, protein and mineral contents of African pear and avocado pear seeds are in Table 1. The avocado pear seed oil was reddish-brown in colour while that of African pear seed oil was pale yellow. Both oils were odourless. The lipid content of avocado pear seed oil was found to be 3.15%. This value is higher than the findings of Bora et al (2001)(1). The difference may arise from the difference in specie and location. The lipid content of African pear seed was found to be 12.45% which is lower than the range reported by Gunstone and Norris (1982)(6). The protein contents of the African pear seed as determined was 2.22%, and 1.24% for avocado pear seed. The value for avocado pear seed is within the range reported by Bora et al (2001)(1).

The ash contents were found to be almost equal and in small quantity. The two seeds were found to contain high amount of phosphorus compared to the other elements. The reason for this is not known. The ratio of calcium in avocado pear seed to that of African pear seed (1:65) is high. Apart from protein and sodium contents, African pear seed exhibits a higher quality than avocado pear seed. The lipid of avocado pear seed is liquid at room temperature while that of the African pear seed congeals. This shows that African pear seed oil has higher amount of saturated fatty acids (10).

CONCLUSION

African pear seed contains high quantity of oil (12.5%) which is far higher than that of avocado pear seed (3.15%). The African pear seed can be an economic source of vegetable oil. Since goats and sheep eat the seeds of avocado pear and African pear and considering the mineral content especially of the African pear seed, use can be made of it as a potential source of supplement in animal feed. This makes the seeds especially those of the African pear which are being discarded now to be of economic value and encourage the cultivation of the plants.

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Figure 1

Table 1: Lipid, protein, mineral and ash contents of Avocado pear and African pear seeds

Constituent	Avocado pear seed	African pear seed
Lipid (%)	3.15	12.45
Protein (%)	2.22	1.24
Sodium (mg/100g)	1.54	0.87
Calcium (mg/100g)	0.02	0.13
Iron (mg/100g)	0.48	0.80
Potassium (mg/100g)	1.10	1.66
Zinc (mg/100g)	0.18	0.31
Magnesium (mg/100g)	0.15	0.32
Phosphorus (mg/100g)	7.70	10.34
Ash (%)	0.25	0.20

Figure 2

Table 2: Ratios of lipid, protein, mineral and ash contents of Avocado and African pear seeds

Constituent	Avocado pear seed	African pear seed
Lipid	1	4
Protein	1.7	1
Sodium	1.7	1
Calcium	1	6.5
Iron	1	1.7
Potassium	1	1.5
Zinc	1	1.7
Magnesium	1	2.1
Phosphorus	1	1.3
Ash	1.3	1

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