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NUTRITIONAL COMPOSITION OF FLOUR FROM AVOCADO PEAR (*PERSA AMERICANA)* PEELS AND SEEDS

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Abstract: **Flour obtained from avocado pear (*Persa americana*) seed and peel was analysed for nutritional composition to create an industrial use for avocado pear wastes as well as reduce environmental hazard and carbon footprint caused by these wastes. Fifteen avocado peels were separated from their fleshy mesocarp and their seeds were pulled out. Both peels and seeds were separately sun-dried and ground to powder. The flours obtained for both peels and seeds were analysed for moisture, ash, lipid, fibre, protein and carbohydrate content using the standard analytical methods. Results showed that avocado peel flour had moisture (13.00 %), ash (12.00 %), lipid (15.80%), fibre (13.00 %), protein (25.46 %) and carbohydrate (20.74 %) while avocado seed flour had moisture (14.00 %), ash (13.90 %), lipid (23.10 %), fibre (9.00 %), protein (24.11 %) and carbohydrate (15.89 %) respectively. Both avocado peels and seeds contain substantial nutrients that can meet the protein and fat requirements of the body. Thus, rather than throw the waste and further contribute to environmental hazard and carbon footprint, these wastes can be added to formulate human swallow and animal feeds.**

Keywords: **flour, avocado seed, avocado peel, fruit wastes.**

1. INTRODUCTION

Avocados are available in abundance in all tropical parts of Nigeria but are greatly underutilized. The low utilization of the fruit amongst consumers results in a lot of fruits going to waste every time it is in season. Studies have shown that avocados are rich in macro nutrients like carbohydrate, vitamin C and proteins (Henry, Mtaita and Kimaro, 2015).

Avocados are usually consumed directly as fruit or can be made into juice and smoothies. With the advancement of science now, many avocados are modified into cakes, salads and other processed foods. Some people only consume meat from the avocado and discard the avocado seeds which contributes to increased carbon footprint and environmental hazard when disposed.

Avocado seeds are rich in vitamin C, vitamin B2, vitamin B3, protein, and potassium. Avocado seeds can be used and made in the form of flour (Terati, Zikrullah, Marlisa, Nurul and Tri, 2020). The nutritional composition of avocado seed has been previously reported by many researchers (Ifesan *et al.,* 2015) and its applications in ethno-medicine, from treatment for diarrhea, dysentery, toothaches, intestinal parasites has also been reported (Henry *et al.,* 2015).

Flour is a biological material and when obtained from different sources can vary considerably in its protein quality, ash, moisture, enzymatic activity, colour and physical properties. It is essential for bakers to be aware of any variations in these characteristics from one flour source to the next (AACC, 2020).

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Great importance has been attached to flour from peels and seeds of avocado (*persa americana*), this is because of their nutritional composition and health benefits to mankind. Due to this fact, the demand for avocado flour has increased. This work will therefore investigate the nutritional composition of flour from avocado seeds and peels, and compare their nutrient values with other flours used as food supplement, baking and swallow.

2. MATERIALS AND METHODS

The avocado fruit was bought from Watt Market in Calabar South, it was left to ripe, after which the seed was separated from the peel (back) and was dried in room temperature for 5 days after, it was sun-dried for 1 week, then oven dried for three days. After drying, it was pulverized to powder, sieved and stored in a container for use. The seeds were dried, minced by means of a grater and dried to a constant weight in an oven at 50^{o}C. It was then grounded to powder and stored in a container.

The flour from avocado peels and seeds was analysed for moisture, ash, fat, carbohydrates, crude fibre and protein using the standard methods by Association of Official Analytical Chemists (AOAC, 1990).

3. RESULTS AND DISCUSSION

Table 1: Proximate Analysis of Avocado Seed and Peel

Components	Seed (%)	Peel (%)
Moisture content	14.00 ± 2.00	13.00 ± 1.00
Ash content	13.90 ± 4.10	12.00 ± 2.00
Lipid content	23.10 ± 2.90	15.80 ± 1.80
Fibre content	9.00 ± 1.00	13.00 ± 1.00
Protein content	24.11 ± 0.01	25.46 ± 0.01
Carbohydrate content	15.89 ± 0.001	20.74 ± 0.01
*Result is presented in mean standard deviation of double determinations		

The nutritional composition of flour from avocado peels and seeds are presented in Table 1. Results revealed that both seed and peel compared favourably for moisture, ash and protein content but had a wide difference in lipid, fibre and carbohydrate content. Flour obtained from avocado peels had higher fibre, lipid and carbohydrate content as compared to the flour obtained from the seeds. This is probably because avocado peel is directly attached to the nutrient source which is the branch while the seed is further away and receives little nutrient from the branch.

Moisture content is, simply, how much water is in a product. It influences the physical properties of a substance, including weight, density, viscosity, conductivity, and others. It is important to keep moisture as close to 14 % as possible as flour greater than 14 % is not stable at room temperature. Organisms naturally present in the flour will start to grow at high moisture producing off odours and flavours (AACC, 2020). Avocado peel has a moisture content of 13.00 % and avocado seed has 14.00 %, indicating that avocado seed requires a lot of time to dry before grinding. The moisture content of both avocado peels and seeds lies in the acceptable limit (14 %) for flour by the American Association of Cereal Chemists (AACC). The value for moisture content obtained in this study is similar to 15 % in avocado seed flour reported by Olaleye *et al* (2020) and Ejiofor *et al* (2018).

The ash content in food refers to the minerals and inorganics left after the food sample has been heated to a very high temperature removing moisture, volatiles, and organics. The most common minerals and inorganics are calcium, magnesium, sodium and potassium but in smaller quantities there can also be traces of manganese, zinc, iron and others. The value of ash is 13.90 % in avocado seeds and 12.00 % in avocado peels. This implies that we can obtain more ash in avocado seed than the peel. In general, ash content should not be higher than 3 % as higher ash can impact the taste, texture and stability of foods (CAC, 2011). The ash content of avocado seeds (13.90 %) and peels (12 %) are higher than 2.40 %; 1.38 % and 2.41% present in avocado seeds reported by Ejiofor *et al* (2018), Olaleye *et al* (2020) and Ifesan *et al* (2015) respectively.

Lipid content is a good measure of the storage conditions of a flour. Flours with high levels of free fatty acids (above 2.0 – 2.5 %) will be more subjected to rancidity than will sound flours. This is of little importance in bread but quite important in dry products such as swallow, cookies, etc. (AACC, 2020). Based on the results obtained in this study, the lipid content of avocado seed (23.10 %) is higher than that of the peel (15.80 %), indicating that the seed contain more oil than that of the peels. The lipid content of both avocado peels and seeds are within the acceptable range (10 – 25 %) recommended by Food and Agriculture Organization (FAO, 2004) for the fat content of complementary foods. The lipid content obtained in this study is higher than 2.71 %; 6.05% and 17.90 % present in avocado seeds as reported by Olaleye *et al* (2020); Terati *et al* (2020) and Ejiofor *et al* (2018) respectively.

The crude fiber is the indigestible cellulose, lignin, pentosans, and other components in foods (Ebunoluwa, Idowu, Adeola, OKe, and Omoniyi, 2017). Fibre stimulates digestion and also encourages the production of important intestinal bacteria. Avocado peel contains more fibre (13.00 %) than that of the seed (9.00 %), from the results obtained in this study. This suggests that flour from avocado seeds and peels may have health promoting benefits for ruminants and non-ruminants. Since they have high amount of crude fibre, it could help to reduce the level of cholesterol in the body and also aid digestion. In addition, it could also help to reduce the level of glucose in the body, thus, it may be used for the treatment of some diseases in ruminant animals (Fai *et al*., 2013). The amount of fiber present in both avocado seeds and peels is higher than 7.1% and 5.33% reported in avocado seeds by Ifesan *et al* (2015) and Olaleye *et al* (2020).

Proteins are needed for properly functioning of the body. They are the basis of body structure such as skin and hair and of other substances such as enzymes and antibodies. Protein is an essential component in the diet needed for survival of both humans and animals, the basic function in nutrition requires amino acids. Based on the results of this study, avocado peel contains 25.46 % protein while the seed contains 24.11 %. Both avocado seeds and peels are rich sources of protein and hence their flour can be used to formulate food products. The amount of protein obtained in this study is higher than 15.98 % present in avocado seeds as reported by Olaleye *et al* (2020).

Carbohydrates are the source of energy which are also important in the functioning of the brain, heart, nervous, digestive and immune system (Olaleye *et al.,* 2020). Avocado peels have a higher carbohydrate content (20.74 %) than that of the seed (15.89 %). Carbohydrate contents of both avocado peels and seed were within the recommended 60%–75%, recommended by CAC (2011). The amount of carbohydrate present in flour from both avocado seeds and peels in this study is lower than 44.70% and 49.03% reported in avocado seeds by Ifesan *et al* (2015) and Ejiofor *et al* (2018).

4. CONCLUSION

The nutritional composition of flour obtained from avocado seeds and peels showed that avocado flour possesses nutritional qualities that may be further investigated for application in food industry rather than constituting waste or nuisance to the environment.

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