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Evaluating the effect of Varying Drying Air Temperatures on Quality Attributes of Avocado (*Persea Americana*) Peels

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***Abstract*— Avocado (Persea americana) belongs to the family of Lauraceae. The processing of this fruit, as well as its fresh consumption, results in large amounts of waste, such as peels and seeds. The peels were dried at 40, 50, 60, 65 and 70 °C using oven dryer with a constant air velocity 1.4 m/s and open sun drying. The bioactive (flavonoids, total phenols and vitamin C) and nutritional content (carbohydrate, fat, fibre, protein, energy and ash content) of the avocado peel was investigated. The drying process took place mainly in the falling rate period indicating that water removal at the initial stage of the drying process was high and there was a rapid decrease as drying continued until equilibrium was reached. The ash, fibre, protein, vitamin c, flavonoids and metabolic energy content increase rapidly with an increase in the drying temperature. There was decrease in the fat, total phenolic content and moisture content of the dried avocado peels in this research. The Nutritional results obtained showed avocado peels had high contents of carbohydrate (40.732 % at 70 °C), fibre (35.187 % at 60 °C) and phenols (25.643 % at 50 °C) and therefore could be used as alternative sources of nutrients and also be added in foods avoiding waste and adding value to the fruit. The results showed that the peels are rich in antioxidants, fibre, flavonoids which helps to fight free radical damage and cancer in mammals and could be use as additive in foods.*

***Keywords*— Avocado, Lauraceae, antioxidants, fibre, flavonoids.**

I. INTRODUCTION

Avocado (*Persea americana*) tree produces a large, fleshy, pear-shaped fruit with a single large oblate seed with two cotyledons enclosed in a thin, brown, papery seed coat often adhering to the flesh cavity; itcomes from the family of *Lauraceae*, genus *Perseal*, subgenus *Persea* and *Eurodaphne* (Duarte *et al*., 2016; Morton, 2020). The avocado fruit is a drupe constituted by epicarp (peel), mesocarp (pulp), and endocarp (seed). Research has proven that the avocado fruit contains essential micro-nutrients for human consumption such as vitamins, minerals and polyphenols. The oil of the fruit has medicinal properties and the peels contains significant amounts of minerals (Rotta *et al*., 2016). The fruit is considered a major topical fruit because it contains omega fatty acid and fat-soluble vitamins D and E at median levels and vitamins A and B which are lacking in other fruits (Duarte *et al*., 2016). The avocado fruit is a perennial plant that can be grown on rough locations and is highly perishable; in addition to its natural perishability, several factors such as mechanical damage, compression and cut, physiological, chemical and biochemical changes are responsible to changes in colour, aroma, taste and texture of the fruit (Duarte *et al*., 2016).

Duarte *et al*. (2016) reported that in 2011, world avocado production reached 4.4 million tons, increasing about 20% from 2007 to 2011; this also increases the quota of waste generated from avocado. Fruit peels, such as avocado peel, are normally not consumed and is consequently rejected. After an investigation on the properties avocado peel, it was noted as a source of nutrients and it was observed to contain phenolic and flavonoid compounds. Due to this investigation, Rotta *et al*. (2016) suggested a tea formulation as a way of reusing the discarded avocado peels. Waste is any material that is discarded, rejected, unwanted or abandoned matter intended for disposing, recycling, re-processing, recovery, re-use, or purification by a separate operation from that which produced the matter, or for sale, whether of any value or not (Lamb *et al*., 2012). Avocado peels are enormous and are about 11 % of the whole fruit, although this proportion vary among cultivars and it must be properly utilized. Extensive research shows that processing agricultural waste (e.g., fruit peels) increases the number of antioxidants compared to the flesh or pulp of the fruits (Rosero *et al*., 2019; Rotta *et al*., 2016; Tian, 2016). Waste has constituted a treat to the existence and well-being of living things on earth. Agricultural wastes vary across different farms and, it is initially not so easy to process except with the right recycling equipment and processing machinery (Industrial Waste Processing and Recovery, 2021). The usual approach to agricultural waste management has been discharge to the environment with or without treatment meanwhile, research has it that fruit residuals have high energy content and bioactive compounds. Extensive research shows that processing agricultural waste (e.g., fruit peels) increases the number of antioxidants compared to the flesh (Rosero *et al*., 2019; Rotta *et al*., 2016; Tian, 2016). Fruit peels or rinds are usually treated as a throwaway but sometimes they could be used as raw materials. One such example is the use of oranges, lemon and pomegranate rinds for preparing face pack and medicines (Fruit Peels, 2021).

Drying is the most commonly used and most energy-intensive unit operation in processing industries, it generally means the removal of water from a material. Drying, a very important method of food preservation is the process in which moisture is vaporized from the surface and within a material, when it comes in contact with air (Keey, 2011). This research is aimed at investigate the effect of air-drying temperature on the drying characteristics, nutritional and bioactive quality of avocado peels.

II. MATERIAL AND METHODS

a. Raw Material and Sample Preparation: Fresh avocados were obtained from a local market in Akure, Ondo State, Nigeria. The ripe avocado fruits were sorted to take out the damaged ones, they were washed with clean water to remove sand and foreign materials. The edible portions and seed of the avocado fruits were carefully separated from the peels. The samples were grouped and kept in a tray wrapped with foil paper in preparation for drying.

b. Chemicals: All the chemicals used were of analytical grade. Ammonium molybdate, Aluminum chloride, Folin Ciocalteu reagent, Gallic acid, Methanol, Sodium hydroxide, Sodium nitrate, Sodium phosphate, Sulfuric acid (H_2SO_4), hydrogen chloride, copper (II) sulphate ($CuSO_4$), ethanol.

2.1 Drying procedure

The drying experiments were performed using a laboratory model oven dryer (DHG-9053A, China) having a constant air velocity of 1.4 ms^{-1}. The dryer consisted of a tray, electrical heater, fan and a temperature controller (40 – 200 °C, dry bulb temperature). Approximately 100g avocado peels were loaded on a metal tray and dried in the oven at 70 °C, 60 °C, 65 °C, 50 °C and 40 °C. Weights of the trays and avocado peels were recorded at intervals of 1 hour during drying, using a digital balance with ±0.01g accuracy until the final moisture content was achieved.

2.2 Nutritional Quality

The nutritional quality investigated include:

a. **Moisture content:** The initial moisture content of the fresh sample of the avocado peels was determined by oven drying method set at 105 ±2 °C for 72 hours using ASABE S352. standard and applied by; Abodenyi, *et al.*, (2015); Oloyede, *et al*., (2015): Oniya, *et al*., (2016); Olabinjo, (2020). The experiment was replicated and the average weight recorded. The moisture content was evaluated using Equation 1.

$$M.C_{(wb)} = \frac{M_b - M_a}{M_b - M_c} * 100\% \qquad (1)$$

where:

MCwb is moisture content (% wet basis),

Mb is the weight of moisture can plus sample weight before oven-drying (g),

Ma is the weight of moisture can plus sample weight after oven-drying (g) and

Mc is weights of moisture can (g).

b. Carbohydrate: The carbohydrate content of the avocado peel was determined by estimation using the arithmetic difference method presented in Equation 2 (Rekha and Rose, 2016; Olabinjo, 2022).

$$\%\text{Carbohydrate} = 100 - (\%\text{ fat} + \%\text{ ash} + \%\text{ fibre} + \%\text{ protein}) \qquad 2$$

c. Crude Fibre: it was determined using acid and alkali hydrolysis method as described Oparuku *et al.* (2010); Olabinjo (2020). The ash obtained was cooled in a desiccator and weighed. The percentage crude fibre was calculated using the Equation 3.

$$\% \text{ Crude fibre} = \frac{\text{Loss in weight after drying}}{\text{weight of the sample}} \times 100. \quad (3)$$

d. Crude Protein: Protein content of the sample was determined using the Kjeldahl method reported by Rekha and Rose (2016). The total nitrogen was determined and multiplied by a conversion factor of 6.25 to obtain the protein content.

e. **Crude Fat:** It was extracted using AOAC (2012) standard method. About 50 mg of the extracted fat content of the sample was saponified for 5 minutes at 95 ℃ with 3.4 mL 0.5M KOH in dry methanol. The mixture was neutralized using 0.7M HCl. 3 mL of the 14 % boron trifluoride in methanol was added. The mixture was heated for 5 minutes at 90 ºC to achieve complete methylation.

f. Ash content: The ash content was determined using a method reported by Rekha and Rose (2016); Olabinjo (2020). Two grams of the sample was weighed into a crucible in a muffle furnace and heated at 130 °C for three hours until it became gray ash. The weight of ash was obtained by the difference as shown in Equation 4.

$$\%\text{Ash} = \frac{(\text{weight of empty crucible} + \text{ash}) - \text{weight of empty crucible}}{\text{Weight of sample taken}} \times 100 \quad (4)$$

g. Calculated metabolic energy: the metabolic energy in Kcal/100g presented in the sample was determined using Equation 5 as stated by (Akalu and Geleta, 2019). The metabolic energy is measured in Kcal/100g or KJ/100g

$$CME = (9 \times crude\ fat) + (4 \times protein\ conetent) + (4 \times carbohydrate\ content) \quad (5)$$

2.3 Bioactive Quality

The bioactive quality investigated in this work include the total phenolic content, flavonoids and vitamin C. The methods used in the determination of these compounds are as follows:

a. Flavonoids: The flavonoid content was determined using a reported protocol by Parsa *et al*. (2017). A clear solution was obtained by taking 0.3 mL extract (0.3 mg/mL in ethanol) and 3.4 mL of aqueous ethanol (30 %) in a test tube. Then 0.15 µL of aqueous sodium nitrite solution (0.5 M) was added followed by 0.15 µL aluminum chloride solution (0.3 M). After a time of 5 min, 1 mL NaOH solution (1 M) was added and the contents were mixed together before measuring its absorbance using UV visible spectrophotometer (UV-1700 Shimadzu) against a blank sample at 506 nm. The blank sample was prepared using the same procedure. In preparing the blank sample an equal volume of methanol was used to replace the plant extract.

b. Total Phenolic Content: Total phenolic contents (TPC) of various extracts were estimated by the method reported by Parsa *et al*. (2017). The sample of each extract was prepared by taking 4.3 mg extract in 10 mL of ethanol and irradiated with ultra-sonics for 5 min to obtain a homogenized solution. Later, 0.3 mL was taken in a test tube and 1 mL methanol; 3.16 mL of distilled water; 0.2 mL of Folin-Ciocalteu reagent were added. The test tube mixture was then incubated for 8 min at room temperature, thereafter 0.6 mL solution (10 %) of sodium carbonate was added in a test tube, covered with aluminum foil and incubated in hot water bath for half an hour at 40 °C. An equal volume of methanol was used to prepare the blank solution by the same procedure used for the preparation of the sample. The absorbance of all the samples was determined using a UV visible spectrophotometer (UV1700 Shimadzu) at 765 nm.

c. Vitamin C: vitamin C, otherwise called ascorbic acid was determined using a method reported by Olabinjo (2020). Thirty grams of the sample blended with reasonable amount of 0.4 % oxalic acid. (4 g/litre) and filtered by What man (No.1) filter paper. The ample volume completed to 250 ml with 0.4 oxalic acid. Twenty ml of filtrate pipetted into a conical flask and titrated with a known strength 2-6-dichlorophenol indophenol until a faint pink colour appeared. The dye strength determined by taking 5 ml oxalic acid 10 % (50 mg/00ml) and added to a standard ascorbic acid (0.05/250ml) oxalic acid 10 % titrated with 2-6-dichloerophenol indophenol (0.2 g/500ml) till faint pink colour expressed in mg/100g (AOAC, 2005).

III. RESULT AND DISCUSSIONS

3.1 Nutritional Composition of Avocado Peel

The results of the nutritional composition from this research were shown in Table 1. The nutritional composition of food materials includes the carbohydrate, crude fibre, crude fat or lipids, protein or amino acid, total sugar, energy content etc. this research investigates the major nutritional compositions of avocado peel. Duarte *et al*., (2016) reported that the avocado pulp contains from 13.5 to 24 % fat, 0.8 to 4.8% carbohydrate, 1.0 to 3.0% protein, 0.8 to 1.5% ash, 1.4 to 3.0% fibre, and energy density between 140 and 228 kcal (Duarte *et al*., 2016). However, the results (Table 1) from this research were found to have higher nutritional content than the pulp (the edible part) reported by Duarte et al., (2016).

a. Moisture content

The initial moisture content of the fresh sample of the avocado peels was determined by oven drying method (AOAC, 2010; Olabinjo, 2020; 2022). The initial moisture content (52.586 %) was reduced to 2.75, 5.82, 6.36, 6.37, 6.64 and 8.06 % wet basis at 70, 65, 60, 50, 40 °C and open sun respectively. It was also observed that at the beginning of the drying process the moisture movement decreased slowly, but at increased drying temperatures the moisture movement decreased rapidly until equilibrium moisture content (EMC) was reached. The Moisture content of the fresh samples was observed to be 52.586 % wet basis which was lower than those recorded by Rotta *et al*. (2016) ($65.05^a \pm 3.10$). Increase in drying temperature led a decrease in the moisture content of the sample. The lowest moisture content was recorded for samples dried at 70 ℃ to be about 2.689 %.

b. Crude fat content

Research has it that fats play a vital role in assisting health skin and hair, insulating body organs against shock, regulating body temperature and promoting health cell function (Olabinjo, 2020). Avocado peels had a high crude fat value of 18.988 %, this value is higher than those of the avocado pulp (13.5 – 24 %) as reported by Duarte *et al*. (2016); monkey cola seeds (1.45%) reported by Olabinjo (2020); avocado peel ($12.21^a \pm 0.28$) reported by Rotta *et al*. (2016) and papaya peels (2.44 ± 0.25c) reported Santos *et al*. (2014). However, the results from this research are lower than moringa seeds (47.1%) reported by Rekha and Rose (2016) and papaya seeds (29.72 ± 0.37a) reported by Santos *et al*. (2014). The crude fat of avocado peel contributes to the energy value and could be serve as a good source of oil. From the results presented in Table 1, a significant decrease in the value of the fat content of the avocado peels was observed. Sample oven dried at 50℃ (4.916%) had the lowest values for the fat content, which then increased to 6.441% and 7.441% when dried at 60℃ and 70℃ respectively.

c. Protein content

In Nigeria, plant proteins are a major source of food nutrient especially for the less privileged population. Proteins are needed to make life sustaining hormones, important brain chemicals, antibodies, digestive enzymes, and necessary elements for the manufacture of DNA (Olabinjo, 2020). Fresh avocado peels have a value of 4.069 %. The value of protein for fresh avocado peels in this research is slightly lower than protein content of monkey cola seeds (4.42 %), watermelon seeds and moringa seeds (30.9 ± 0.9 and 68.4 %) as reported by Olabinjo (2020) and Rekha and Rose (2016) respectively. Increase in drying temperature led to increase in protein content (at 70, 60, 500, 40 and open sun the value was 9.88 %, 13.027 %, 6.034 %, 11.234 % and 13.829 % respectively). However, samples dried at 50 ℃ (6.034 %) exhibited a significant decrease from 11.234 % (at 40 ℃).

d. Crude fibre content

Fibres helps to clean the digestive tract by removing potential carcinogens from the body and, they also support in the stoppage or absorption of excess cholesterol. Adequate intake of dietary fibre can lower the serum cholesterol level, risk of coronary heart disease, hypertension, constipation, breast cancer, diabetes and colon (Ishida *et al*., 2000 as cited by Olabinjo, 2020). Fibre, is a general word that includes various carbohydrates, hemicelluloses, cellulose, pectin, lignin, gum etc. Fibre enhances other sugars absorption by altering the emptying time of the gastric system and encourages insulin response (Javed *et al*., 2019). The fresh peels of avocado fruit contained crude fibre value of 12.981 % which is higher when compared to moringa seeds (1.2 %) reported by Rekha and Rose (2016), papaya seeds (8.79 ± 0.11c) reported by Santos *et al*. (2014). Avocado peels dried at 60 ℃ (35.187%) had values higher than those of papaya peels (33.05 ± 0.7b) reported by Santos *et al*. (2014). However, avocado peels dried at 70 ℃ (33.294 %) had values in the same range as papaya (33.05 ± 0.7b). From the results in Table 1, a significant increase in the crude fibre content of the avocado peel was observed as the drying temperature was increased. Samples dried at 70 ℃, 60 ℃, 50 ℃, 40 ℃ and under the sun had a crude fibre of 33.294 %, 35.187 %, 30.805 %, 32.182 % and 35.55 % respectively.

e. Ash content

The ash content avocado peels recorded was about 2.298 % for the fresh samples, this value is lower than the value of Rotta *et al*. (2016) avocado peel ($5.43^a \pm 0.59$). It was higher than the ash content of monkey cola seeds (1.150 %) as reported by Olabinjo (2020); potato peels (0.6 – 1.6 g/100g) as reported by Javed *et al*. (2019) and lower than the value of ash content of papaya peels and seeds (11.85 ± 0.68a and 6.94 ± 0.79b respectively) as reported by Santos *et al*. (2014); potato peels (6%) as reported by Liang (2014) in Javed *et al*. (2019). However, the dried avocado peels had higher ash content than the values reported by other researchers. The avocado peels dried at 70℃, 60℃, 50℃, and 40℃ and under the sun had an ash content of 5.955%, 5.955%, 6.567%, 6.725% and 6.817% respectively. There was a significant increase between the fresh samples and samples dried at 40℃ which later decreases as the temperature was increased.

f. Carbohydrate content (by difference)

The carbohydrate constitutes a major class of naturally occur organic compound which is essential for maintenance of both plant and animals. The carbohydrate content of fresh avocado peel was found to be 9.078% and was lower than value of monkey cola seeds (26.81%) as reported by Olabinjo (2020); however, peels dried at 70℃ had values (40.732%) higher than those of the avocado o pulp (0.8 – 4.8%) as reported by Duarte *et al*. (2016), papaya seeds and peels (20.73 ± 0.68 and 9.67 ± 1.04b) respectively reported be Santos *et al*. (2014), moringa seeds (25.1 %) reported by Rekha and Rose (2016) and potato peels (8.7 – 12.4 g/100g) reported by (Javed *et al*., 2019). Carbohydrates from plants are one of the three major energy sources in food, along with protein and fat (Olabinjo, 2020). It was observed that an increase in the drying temperature led to an increase in the carbohydrate content of the avocado peel. Samples dried at 70 ℃ (40.732 %) had the highest value of carbohydrate content while those ovens dried at 40 ℃ (29.649 %) had the lowest values. Avocado peel sun dried had a value of about 24.679 %.

g. Calculated metabolic energy

The fresh avocado peels had an energy content of 223.48 Kcal/100g which is lower than the energy content of blanched papaya peel powder was 300 Kcal/100g and blanched papaya peel paste was 43 Kcal/100g as reported by Pavithra *et al*. (2017). The lowest and highest values for avocado peels were recorded for samples dried at 50℃ and 70℃ respectively (230.056 Kcal/100g and 269.417 Kcal/100g respectively). Other drying temperature had values of 235.501 Kcal/100g (60℃), 253.442 Kcal/100g (40℃) and 236.256 Kcal/100g for open sun drying.

3.2 Bioactive Composition of Avocado Peel

The results showed the presence of total phenolic content (TPC) and flavonoids in avocado peel, are accountable for the detected antioxidant properties, owing to their chemical constitution (Rotta *et al*., 2016). Rotta *et al*. (2016) reported that the antioxidant properties of food are widely studied due to their impact on the food quality and the importance of these compounds in maintaining human health. The results of the analysis presented in Table 2 shows that avocado peels are a rich source of bioactive compounds exhibiting antioxidant capacity, similar observations were made by Rosero *et al*. (2019).

a. Vitamin C

Vitamin C is also called ascorbic acid and it is used as an index of the nutrient quality for fruit and vegetable products (Olabinjo, 2020); insufficiency of vitamin C in diets causes the disease called scurvy, which is prevented by as little as 10 mg/day of vitamin C. Vitamin C content of the dried avocado peel ranges from 2.98 mg/100g – 14.303 mg/100g. The fresh avocado peels had vitamin C value of 7.941 mg/100g, the highest value of 14.303 mg/100g was recorded with peels dried at 70℃ followed by 60℃ with value of 13.020 mg/100g and least recorded by oven dried at 40℃ with value of 2.98 mg/100g. The vitamin C content of avocado peels is higher than monkey cola seeds, ranging from 1.108 – 2.229 mg/100g as reported by Olabinjo (2020). Most fruits and vegetables contain vitamin C, which can be reduced by application of heat; however, drying the avocado peels at 70℃ increase the vitamin C value. This proves that the avocado peels are good sources of vitamin C.

b. Flavonoids

Rotta *et al*. (2016) reported that the presence of TPC and flavonoids in avocado peel, are responsible for the antioxidant properties present, owing to their chemical constitution. From the results presented in Table 2, it was observed that increase in drying temperature led to an increase in the flavonoid content of the avocado peels. The fresh avocado peels (3.542 mg/100g) when oven dried at 40°C increased to 16.755 mg/100g. However, when oven dried at 50°C reduced to 16.101 mg/100g; this could be as a result of some unavoidable factors when trying to take the weight of the samples at hourly interval. Sample oven dried at 70 °C and 60 °C had the same value of 21.124 mg/100g; while samples sun dried had values of 21.8 mg/100g. The flavonoid content of the avocado peel oven dried at 60 °C is higher than those of orange peels (3.35±0.603^{A}), lime peels (4.85±0.971^{A}) and lemon peels (8.88±0.621^{B}) dried at 60°C as reported by Erba *et al*. (2020). All values (except those of the fresh samples) recorded in this report was found to be higher than those of dried pomelo peels (4.65±0.02) and bitter orange peels (5.88±0.047) as reported by Pandey *et al*. (2019).

c. Total Phenolic Content (TPC)

Parsa *et al*. (2017) reported that phenolic compounds are usually found in both nonedible and edible plants, which exhibit several biological effects including antioxidant activity. The TPC value of fresh avocado peels recorded in this study was 44.716 mg/100g which was higher than TPC value of monkey cola seeds (14.148 mg/100g) reported by Olabinjo (2020). An increase in drying temperature led to decrease in the value of the TPC; samples dried at 40℃, 50℃, 60℃ and 70℃ had values of about 32.986%, 25.643%, 20.944% and 22.744% respectively. Sun dried samples on the other hand had the least value of about 18.025%. The values of TPC obtained in this research was found to be lower than avocado peel extract (1058.0 ± 59.7g mg GAE/g dried extract) recorded by Rosero *et al*. (2019). However, it was found to be higher than the values pomelo peels (16.09±0.07 mg GAE/g dried extract) and bitter orange peels (6.03±0.05 mg GAE/g dried extract) as reported by Pandey *et al*. (2019).

Table 1: Nutritional Composition of Avocado Peel

S/N	PARAMETER	FRESH	70°C	60°C	50°C	40°C	OPEN SUN
1	Crude fat content (%)	18.988	7.441	6.441	4.916	9.99	9.136
2	Carbohydrate content (by difference) (%)	9.078	40.732	31.356	40.419	29.649	24.678
3	Protein content (%)	4.069	9.88	13.027	6.034	11.234	13.829
4	Moisture content (%)	52.586	2.698	8.034	9.99	10.22	10.489
5	Crude fibre content (%)	12.981	33.294	35.187	30.805	32.182	35.55
6	Ash content (%)	2.298	5.955	5.955	6.567	6.725	6.817
7	Calculated Metabolic Energy	223.48	269.417	235.501	230.056	253.442	236.256

Table 2: Bioactive Composition of Avocado Peel

S/N	SAMPLE	VITAMIN C (mg/100g)	FLAVONOIDS (mg/100g)	TPC (mg/g)
1	Fresh	7.941	3.542	44.716
2	70°C	14.303	21.124	22.744
3	60°C	13.02	21.124	20.944
4	50°C	12.98	16.101	25.643
5	40°C	2.298	16.755	32.986
6	Open sun	9.59	21.8	18.025

IV. CONCLUSION

Fruit peels, such as avocado peel, are not generally consumed and are therefore discarded. After an investigation on the properties, the results showed that avocado peels are rich sources of nutrients and subsequently can be good sources for antioxidants which helps to fight free radicals and cancer. Analysing all the results, it was observed that avocado peel stood out for the following parameters: fibre, ash, phenolic compounds, vitamin C, metabolic energy and carbohydrate. For example, samples dried at 60 °C had values of 35.187 % (fibre), 5.955 % (ash), 20.944 mg/g (phenolic content), 13.02 mg/100g (vitamin C), 235.501 % (metabolic energy), 31.356 % (carbohydrate), 6.441 % (fat), 13.027 % (protein), and 21.124 mg/100g (flavonoids). The knowledge about the nutritional and bioactive composition of avocado peels subjected to drying provides useful information for industries interested in using avocado by-products (the peel flour can be used for dye adsorption), reducing waste, and adding value to the fruit bringing benefits to the environment.

The avocado peels should be dried at mild air-drying temperature between 40 °C and 50 °C to maintain high nutritional and bioactive compounds such as ash, fat, fibre, protein, carbohydrate, metabolic energy, vitamin C, flavonoid and phenolic content. Awareness on the nutritional and bioactive properties of agricultural waste such as avocado peels should be done, to enhance their usage in communities and also to reduce waste.

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