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Original Research Article

Comparative Study of the Solvent Extraction and Characterization of Oil from the Seeds of Avocado, Bush Pear and Cashew

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Abstract: Due to their many purposes and functions for mankind, oils from fruits and seeds are given a lot of importance today. As a result, there is a higher demand for cashew, avocado, and bush pear oils. The Soxhlet extractor and petroleum ether as the extracting solvent are used in this work to extract and characterize the oils from the seeds of Cashew, Avocado, and Bush pear. Physical and chemical studies of the extracted oil were performed alongside with the identification of any trace metals. The findings assessed the yield, color, relative density, refractive index, acid value, peroxide value, iodine value, and saponification value free fatty acid for Bush pear, Avocado pear, and Cashew seeds. The yield (%) of the oil produced from the various seeds of cashew, avocado, and bush pear oils is of specific significance. This finding reveals highest oil yield of 38.2% in Avocado pear oil, compared to 34.4% and 27.4% oil yield in Bush pear seed, and Cashew seed, respectively. In addition to being edible, Bush pear and Cashew oil's low acid value of 6.4 mg KOH/g and 7.7 mg KOH/g, respectively compared to Avocado oil's low acid value of 14.6 mg KOH/g avocado suggests that Bush pear and Cashew oils finds good applications in the paint industry. The study also showed that potassium had the highest concentration of any metal, with 45.8 mg/100g in avocado oil, compared 24.9 mg/100g and 1.68 mg/100g for Cashew seed oil and Bush pear, respectively. Zinc had the lowest concentration, with a value of 0.38 mg/100g observed in Cashew compared with 1.32 mg/100g and 2.06 mg/100g for Bush pear and Avocado, respectively. Hence, this reveals that Oils extracted from Cashew finds good applications in the production of hydraulic oil with exceptional lubrication properties. The FTIR study shows that functional groups including alkanes, alkenes, carbonyls, etc. are present in the seed oils of Bush pear, Avocado pear, and Cashew seeds.

Keywords: Extraction, Avocado, Cashew, Bush Pear, Physio-Chemical Properties, Elemental Analysis.

1.0 INTRODUCTION

Most plants, especially those used in agriculture, have oil that can be extracted and may have some commercial value. Rural populations all over the world have been extracting edible oil from materials of plant origin using a variety of traditional ways since the dawn of human civilization. Due to their excellent nutritional content, several edible vegetable oils, such as those from avocado, ginger, cashew, etc. are used as table oils (CODEX-STAN, 2011). For instance, compared to proteins and carbs, which only provide 4 kcal of energy per gram, fats and oils are the most concentrated source of energy, delivering about 9 kcal per gram (Ali *et al.*, 2005). Additionally, they are used in industry as raw materials for the synthesis of polyols, polymers, resins, biodiesel, medicines, and other substances. Castor and jatropha oils, which are not suitable for human consumption, should be the center of attention in terms of industrial application. According to Kyari (2008) and Patel *et al.*, (2016), the increased demand for vegetable oils for both human consumption and industrial use has driven and supported the development and optimization of processes that result in the efficient production of oil with high quality and

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purity. The quantity of oil they contain, the amount of oil that can be extracted or recovered (% oil yield or % oil recovery), and the purity and quality of the derived oil are the main concerns associated with the utilization of oleaginous materials of plant origin. The majority of vegetable oils are produced from oilseeds, with the exception of palm and olive oils, which are extracted from their fruits (Ali *et al.*, 2005). Therefore, seed oils have maintained their high level of interest as a possible source of platform chemicals at both the laboratory and industrial scales (Ali *et al.*, 2005). Nevertheless, factors affecting seed oil yield include the type of oil seed used, the soil and ambient conditions surrounding the plant that produces the oil, the pretreatment process, and the specific extraction method(s) employed.

Oils from oilseeds and other seeds derived from food processing waste are well-known to be a significant source of oil (Between 15% and 50% of the total seed mass is made up of oil), which is frequently utilized in the food and feed sector as well as for cosmetic and pharmaceutical purposes (Ahmad *et al.*, 2020). In terms of nutrition, the seeds are a great source of essential unsaturated fatty acids, particularly omega-3 (linolenic acid) and omega-6 fatty acids, as well as other interesting bioactive substances like vitamins (E), phenolic acids, flavonoids, phytosterols, tocopherols, and carotenoid pigments.

Triacylglycerols (TAGs) are the primary chemical components of fats and oils in terms of composition. Vegetable oils, unlike animal oils, which are primarily composed of saturated fatty acids (SFAs), include a mixture of saturated and unsaturated fatty acids (UFAs) that are bound to TAG molecules, with the exception of coconut and palm kernel oils, which are primarily composed of saturated FAs. The UFAs can be either mono- or polyunsaturated (MUFAs or PUFAs). The physico-chemical characteristics of TAGs are substantially influenced by the types of fatty acids (FAs) that make up each oil in which they are found. While mixed TAGs have two or three different FAs in their molecules, simple TAGs only have one FA in each of its molecules.

Extraction is a separation technique that involves the removal of a solute from a mixture by chemical or physical means. It entails employing two immiscible phases to separate a solute from one phase into the other. The process of separating oil from animal waste, succulent fruits, olive palm, oil-bearing seeds, and nuts is known as oil extraction. Only preparation, solvent, contact, time, and temperature have any bearing on extraction.

Mechanical or physical methods could be used to complete the extraction procedure. chemical, solvent, or a mix of the two, technique. a mechanical process is used in a physical manner. “Mechanical or physical methods could be used to complete the extraction procedure. chemical, solvent, or a mix of the two, technique. a mechanical process is used in a physical manner (Chapuis, et al., 2014). A material, typically a liquid, that dissolves or is capable of dissolving the component of a solution present in greater amount is used in the chemical extraction process. Any liquid that allows the dissolution of another substance is referred to as a solvent. Benzene, carbon tetrachloride, isopropyl alcohol, ethanol, n-hexane and acetone are a few examples of common solvents.

The preferred solute substrate's maximal leaching properties are the primary factor in the solvent selection (Dutta *et al.*, 2015). Hexane, diethyl ether, petroleum ether, and ethanol are examples of regularly used solvents. High solvent-solute ratios, the volatility of the solvent in relation to the oil, the viscosity and polarity of the oil, cost, and market accessibility are other factors to be taken into account (Muzenda *et al.*, 2012; Takadas and Doker, 2017). Leaching, washing, decantation, and other terms are used in various sectors to describe the extraction process. The choice of solvents depends on a number of variables, including the oil's solubility in the solvent, the solvent's inertness toward the oil, the difference between the boiling points of the oil and the solvent, the solvent and oil's polarity, and the oil's intended purpose. Concise advantages and disadvantages of different extraction technologies are presented in table 1.

Table 1: Advantages and disadvantages of extraction technologies (Jahirul *et al.*, 2013; Bhuiya *et al.*, 2016).

Method	Advantages	Disadvantages
Supercritical fluid extraction (SFE)	Non-toxic solvent like CO2 is used Fast extraction Less separation cost	Expensive initial cost
Accelerated solvent extraction (ASE)	Less time and labor incentives High oil yield Relatively less solvent consumption	Very high initial cost Special equipment and skilled required Potential for solvent contamination
Mechanical press	Minor consumable costs No environmental problem Relatively inexpensive after initial capital cost	Filtration/ degumming required Low and inconsistent oil production

2.0 MATERIALS AND METHODS

2.1 MATERIALS

The many devices and tools employed in the experimentation include Hand gloves, an electric blender (CC-8 Model 1186/50), a wooden-handled knife, and a weighing scale (BL-P1D/ 20001) Filter paper (White man), Funnel, Cello tape, Pipette (100ml), Burette (100ml), Density bottle, Measuring cylinder (1000ml), Round bottom flask (1000ml), Beaker (200ml), Conical flask (100ml), Model HS-3V-1R stop watch, HH-S stainless steel water bath, thermometer, refractor, and clamp stand. The reagents of significance used when performing the reagents include petroleum ether, diethyl ether, Silver nitrate, Potassium dichromate, Silver nitrate, Sodium thiosulfate, Wiji's reagent, Potassium iodide, Methanol, Sodium carbonate, Sodium silicate purified water, Standard KOH, Acetic acid, Phenolphthalein indicator, Tetraoxosulphate (vi) acid, Standard NaOH, and Phenolphthalein indicator.

2.2 SAMPLE PREPARATION PRETREATMENT

The collection of the samples, dehulling, and drying of the samples are the primary preparation and pretreatment procedures used in the extraction process. The Abule Egba Market (Fruits Distribution Section), Agege Axis, Lagos State of Nigeria was where the fruits of the avocado pear, bush pear, and cashew were purchased. Bush pears and avocado pears were each cleaned under running water to get rid of any outside impurities like sand and dust. Additionally, the endocarps were taken out on their own, dried with a cabinet dryer, and pulverized with an automatic blender (Akpabio, 2011). The collected cashew nuts were sun dried for two weeks to produce a consistent bulk. They were decorated by roasting the nuts for 15 minutes, then shelling them to separate and get the cracked-free kernel. This was done manually by placing them on a flat stone and cracked with a wooden mallet (Idah *et al.*, 2014). The kernels were then blended using an automated blended to obtain coarse power sample

2.3 EXTRACTION OF THE OIL

Petroleum ether was used in the solvent extraction (Soxhlet extractor) process to remove the oil. It is a solid-liquid extraction procedure. According to the procedure outlined by (Okolie *et al.*, 2012), oil was extracted. Weighed were 200g of the pulverized seeds, which included cashew, avocado, and bush pear seeds. Following the measurement of the filter paper weights and the filter paper weights attached to the samples, the Soxhlet equipment was used to extract the oils. The oil yields were then determined in the same manner as in the earlier work by Odunlami *et al.*, (2020).

2.3.1 Physical Characterization of Oil Samples

- **Specific gravity (S.G)**

The specific gravity of seed/vegetable oils is dependent on their fatty acid composition, minor component and temperature (Fakhri and Quadir, 2011). Emptied specific gravity bottle was weighed and labeled as (M_e); the oil samples were dispensed into the specific gravity bottle, weighed and labeled as (M_o). The oil samples were substituted with water of the same volume and weighed to give (M_w). Thus, using the eqn. (1), the specific gravity of the oil samples determined:

$$\text{Specific gravity } \frac{M_o - M_e}{M_w - M_e} \qquad (1)$$

Where, Mo – specific gravity bottle + oil
Me – Empty specific gravity bottle
Mw – Specific gravity bottle + water

- **Color**

Following extraction, the samples will be placed in a beaker, and the color will be assessed visually.

- **Unsaponifiable Matter (U.M)**

The unsaponifiable matter was determined by dissolving the oil in alcoholic KOH and refluxed. The homogenous KOH was extracted with diethyl ether and filtered using pre-weighed filter paper, solid matter left in the filter paper was dried to a constant weight and was re-weighed.

- **Refractive Index (R.I)**

The presence of contaminants can be determined primarily by using the refractive index, which is used primarily to evaluate the change in unsaturation as the fat or oil is hydrogenated (Onyemetu *et al.*, 2018). An Abbe type refractometer 60/95, (Model 2754 T3- NE, Germany) was used to calculate the refractive indices of the samples. On the glass slide of the refractometer, a few droplets of the oil samples were placed. The refractive index was measured through the eyepiece at the no parallel position. Three readings on average were taken.

2.4 CHEMICAL CHARACTERIZATION OF THE OIL SAMPLES

- **Peroxide Value**

Peroxide value is a measure of oxidation during storage and freshness of lipid matrix (Atinafu and Bedemo, 2011). A low PV does not indicate that the oil is good; it only gives an indication of the current state of oxidation of oil sample (Ghost *et al.*, 2015). The peroxide value of the samples was determined by dissolving 0.5 ml of the oil in a solvent mixture of acetic acid and chloroform. Potassium iodide (1.3g) was added to the resulting solution. The mixture was placed in a dark cupboard for 1 hr., after which, 75 ml of distilled water was added, followed by 3 drops of starch indicator; the mixture was then titrated against 0.05M sodium thiosulphate. The peroxide value was calculated using eqn. (2):

$$P.V = \frac{S \times N \times 1000}{\text{Weight of sample}} \qquad (2)$$

Where, S = volume of $N_2S_2O_3$ for blank – volume of $N_2S_2O_3$ for sample
N = normality of $N_2S_2O_3$

- **Acid Value (A.V)**

The amount of free fatty acids in oil is measured by the acid value (Enengedi *et al.*, 2019). A 0.1 M KOH solution was used to neutralize 50ml of denatured alcohol (ethanol and diethyl ether, v/v), along with 3 drops of phenolphthalein indicator. In order to neutralize the solution in the presence of 3 drops of phenolphthalein, 0.5 ml of oil sample was added. The solution was then titrated against a 0.10 M potassium hydroxide solution until a persistent pink hue was achieved. This acid value was determined using eqn. (3):

$$A.V = \frac{\text{vol.of KOH used} \times \text{mass of KOH}}{\text{mass of sample}} \qquad (3)$$

- **Iodine Value (I.V)**

Iodine value, a metric for degree of unsaturation, is a distinguishing feature of seed oils and makes them a superior raw material for the soap and cosmetics industries (Hamilton, 1999). The Wiji technique was used to calculate the oil sample's Iodine value. Each oil sample (0.5 ml) was dispensed into a conical flask together with 5 ml of chloroform, 8 ml of Wiji's reagent, 9 ml of iodine trichloride, and 10 g of iodine in a solution of 300 ml chloroform and 700 ml acetic acid. After being stirred, the conical flask was left in the dark for one hour. Using a starch indicator, 7 ml of potassium iodide and 75 ml of distilled water were combined before being titrated against a 0.05M sodium thiosulphate solution. A blank test was carried out simultaneously without the fat under the same conditions. The iodine value was calculated using eqn. (4):

$$I.V = \frac{\text{Black sample} \times 0.01269}{\text{w}} \times 100 \qquad (4)$$

- **Saponification Value (S.V)**

The chain length is determined by the saponification value, which is a measure of the average molecular weight of the fatty acids in the oil sample. Additionally, SV is used to assess oil stability, determine the presence of contaminants, and detect adulteration (Akintayo & Bayer, 2002). Refluxing the alcoholic KOH solution of the oil allowed us to determine the oil samples' saponification values. 30 ml of 0.1M ethanoic KOH were added to 2 ml of the oil that had been weighed into a conical flask. The mixture was left to reflux boil for 30 minutes. Following the addition of 3 drops of phenolphthalein indicator, the heated mixture was titrated against 0.5 M HCL acid until the pink color vanished (end point). Similar steps were administered to the blank. The saponification value was calculated using eqn. (5):

$$S.V. = \frac{56.1(\text{blank} - \text{sample})\text{N}}{\text{w}} \quad (5)$$

Where, N = normality of HCL

W = weight of oil

3.4 Functional Group Test Using Fourier Transform Infrared Spectroscopy (FTIR)

The functional group of the oil samples were tested using Fourier transform infrared spectroscopy (FTIR) machine. The absorption frequency spectra were recorded and plotted against the wave number. The standard IR spectra of hydrocarbon was used to identify the functional group in the oil samples.

3.5 Elemental Analysis

Metals to be determined were sodium, calcium, potassium, iron and lead. This was achieved by digesting the samples using 5 ml (2:1) of 69.40% (w/w) nitric acid and 90.00% (w/w) perchloric acid. These metals were analyzed by Atomic Absorption Spectrophotometer (AAS).

3.0 RESULTS AND DISUSSION

3.1 Physiochemical Properties

3.1.1 Physical Properties

Table 2 is the physiochemical properties of the oil extracted from Avocado, Bush pear and Cashew. The properties of the oil from avocado, bush pear and cashew seeds oil were presented in figures 1 through 3. The physical properties investigated were yield relative density, and refractive index.

Table 2: Physiochemical Properties of Avocado, Bush pear and Cashew

Parameter	Avocado	Bush pear	Cashew
Oil yield%	34.4	38.2	24.4
Color	Light green	Light green	Dark brown
Relative density	0.923	0.911	0.902
Refractive index	1.44	1.46	1.42
Acid value (mgKOH/g)	14.6	7.7	6.4
Peroxide value (mEq/kg)	25.6	106.4	21
Iodine value (mgI2/100g)	66.43	34.04	43.1
Saponification value (mgKOH/g)	168.4	19.9	102.1
Free fatty acid	8.40	4.40	6.25

According to Fig. 1, cashew seed has the lowest Oil Yield whereas bush pear seed has the highest. Bush pear, avocado pear, and cashew seeds all produced 34.4%, 38.2%, and 27.4% of oil, respectively. According to Akinhanmi and Atasie (2008), the values for cashew (27.4) are a little lower than those for cashew oil (49.1) while the values for avocado and bush pear can be comparable to that of groundnut oil 50% (Mba *et al.*, 1974). Thus, fruits like the avocado, Bush pear, and cashew can be categorized as fatty fruits. Thus, the extracting solvent and sample location have an impact on oil yield.

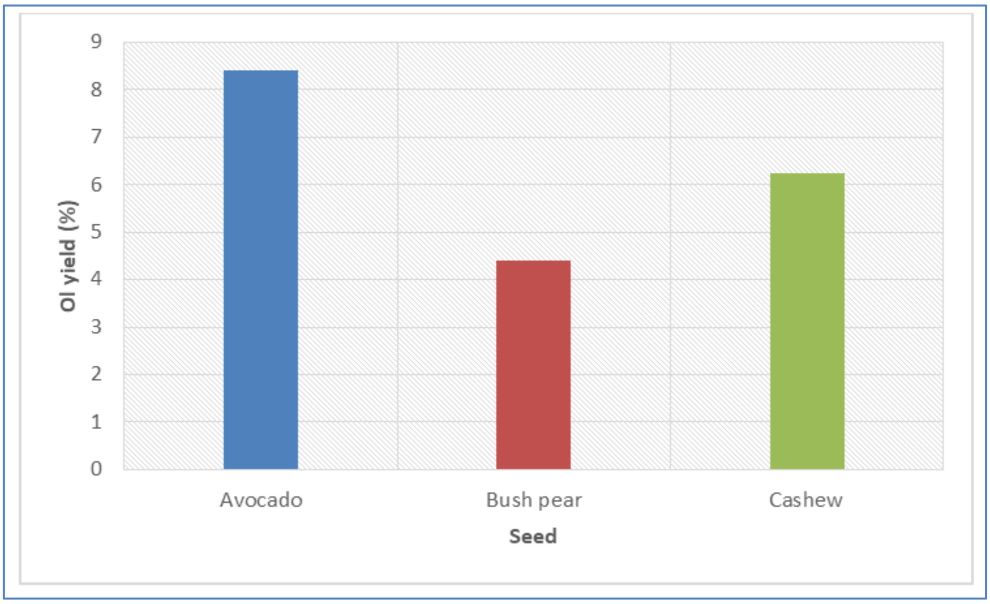

Fig.1: Oil Yield of Avocado, Bush pear and Cashew Seed Oil

According to Fig. 2, cashew seed oil has the lowest relative density whereas avocado seed oil has the highest. For avocado, bush pear, and cashew seed oil, the relative densities were 0.923, 0.911, and 0.902, respectively. The three oil samples' relative densities are all within the same range. While the relative densities of bush pear and cashew are in the range of (0.920 and 0.903) as reported by Abaldah and Imolosie (2014) for bush pear and cashew, respectively, the relative density of avocado is close to the 0.9122 recorded by (Evwierhoma and Ekop 2016). As the majority of seed oils range between 0.890 and 0.92, the relative density of the seed falls within the range for convectional seed oils, according to Furniss (1978).

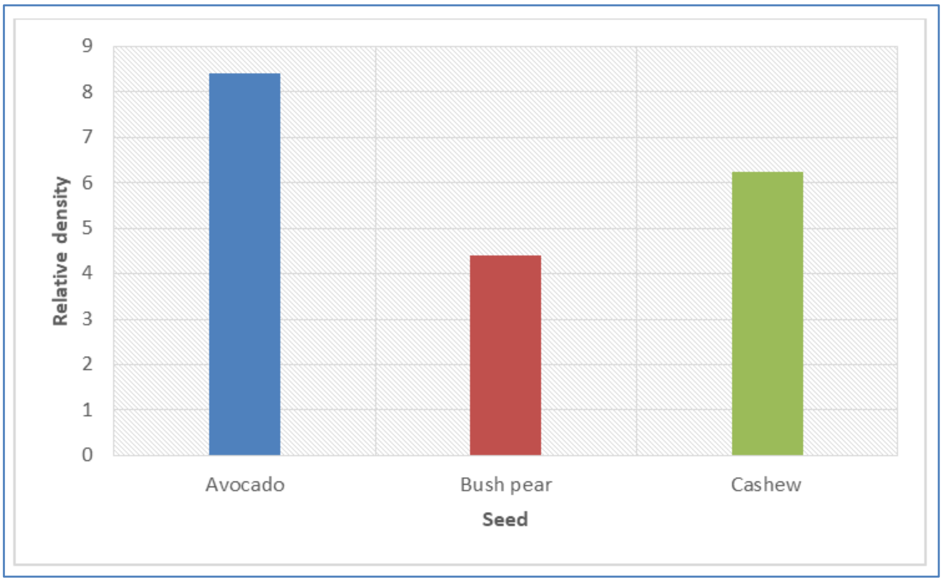

Fig. 2: Relative Density of Avocado, Bush pear and Cashew Seed Oil

Fig. 3 demonstrates that cashew seed oil has the lowest refractive index whereas avocado seed oil has the greatest. The refractive indices of avocado, bush pear, and cashew seed oil, which are 1.44, 1.46, and 1.42, respectively, are practically identical. The avocado value of 1.40 reported by Akpabio *et al.*, (2011), the bush pear value of 1.469 reported by Onyemetu (2012), and the cashew value of 1.423 reported by Abaldah and Imolosie (2014) are all closely linked to these values.

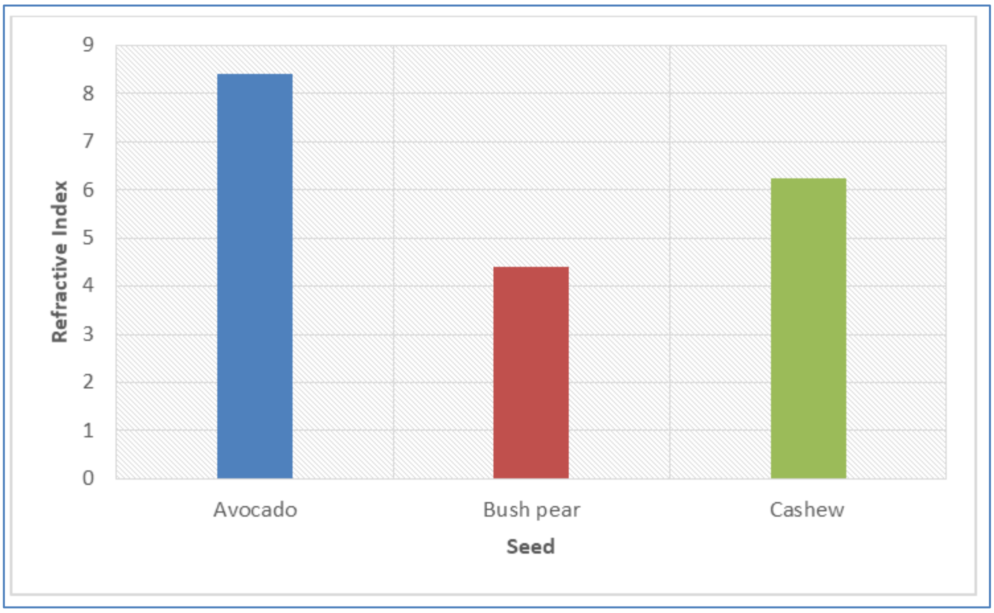

Fig. 3: Refractive Index of Avocado, Bush pear and Cashew Seed Oil

3.1.2 CHEMICAL PROPERTIES OF THE OIL

Fig. 4 demonstrates that cashew seed oil has the lowest acid value whereas avocado seed oil has the greatest. The seed oils of the avocado pear, bush pear, and cashew all had acid values of 14.6 mg KOH/g, 7.7 mg KOH/g, and 6.4 mg KOH/g, respectively. The values of avocado and bush pear are higher than 1.650 for avocado and 1.79 mgKOH/g for shea butter oil (Asuquo *et al.*, 2010), while cashew is in close accord with cashew nut 10.7 mgKOH/g (Akinhanmi and Atasie, 2008). Although the price of bush pear seed oil is lower, avocado pear seed oil offers more advantages for producing soap. Bush pear oil's low acid value (7.7 mgKOH/g) suggests that it might be useful for producing paint, and these values also suggest that the oil is edible. Oil is less susceptible to the phenomena of rancidification the lower its acid value, which is determined by how few free fatty acids it contains (Roger *et al.*, 2010).

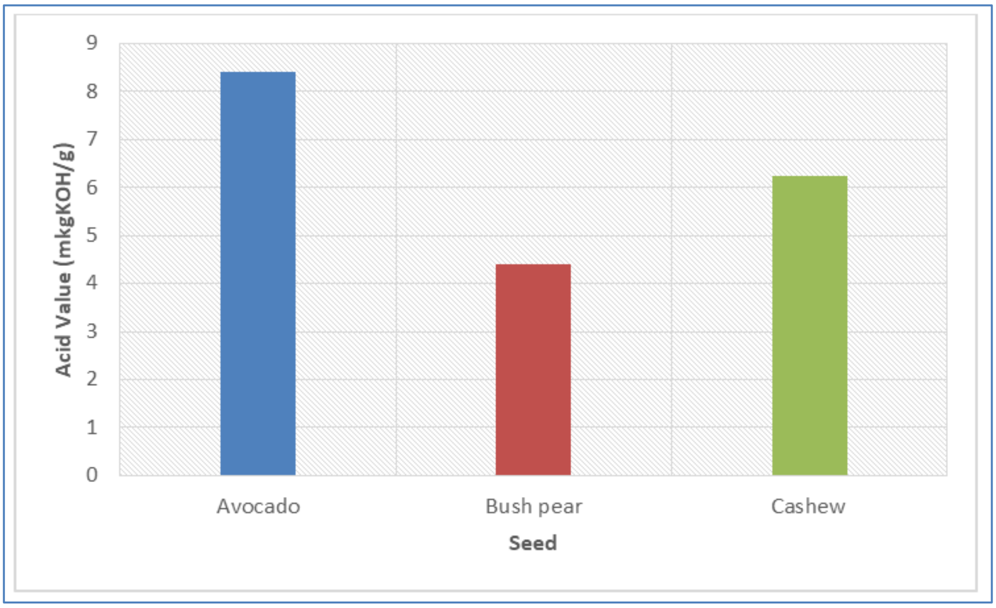

Fig. 4: Acid Value of Avocado, Bush pear and Cashew Seed Oil

Fig. 5 demonstrates that Bush pear seed oil has the lowest peroxide value and Avocado seed oil has the highest. The peroxide values for the oils were 25.6 mg/kg, 106.4 mg/kg, and 21.2 mg/kg for avocado, pear, bush pear, and cashew seed oil, respectively. When compared to avocado pear, pear, and cashew, bush pear seed oil is superior. Which oils will be most prone to oxidative rancidity can be identified using the peroxide value.

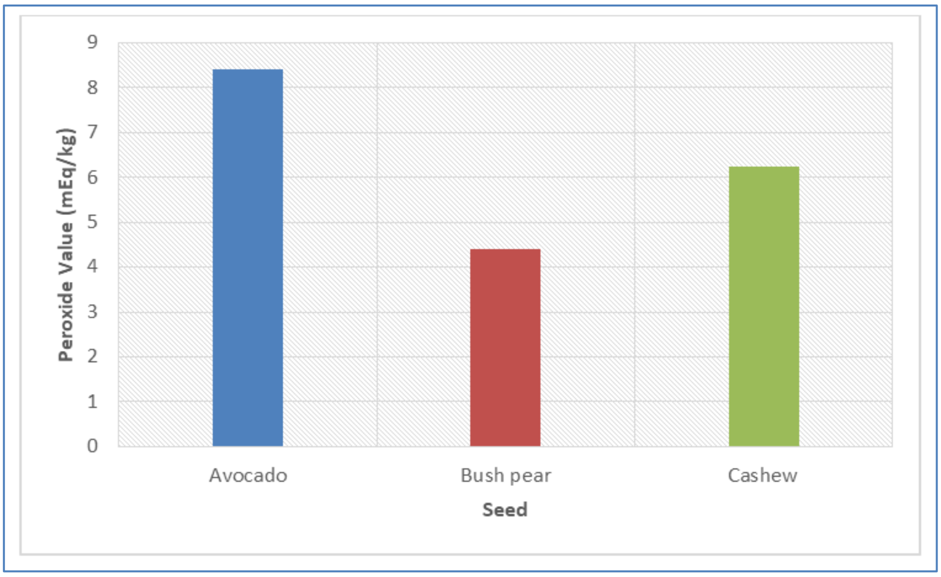

Fig. 5: Peroxide Value of Avocado, Bush pear and Cashew Seed Oil

According to Fig. 6, Bush pear seed oil has the lowest iodine value while Avocado seed oil has the greatest. The iodine content of cashew, bush pear, and avocado pear seed oils was 66.4 gI2/100 g, 45.6 gI2/100 g, and 43.1 gI2/100 g, respectively. These values are higher than those of cashew seed oil (Akinhanmi and Atasie, 2008) and palm kernel oil (Oyenuga *et al.*, 1975). Additionally, the iodine content of avocado is lower than that stated in worldwide journals of scientific and engineering research volume 7, 2016. Therefore, compared to bush pear and cashew, avocado pear oil will include a higher amount of unsaturated fatty acids. They are both non-drying oils, nevertheless, because their iodine values are less than 100 (Asuquo, 2008).

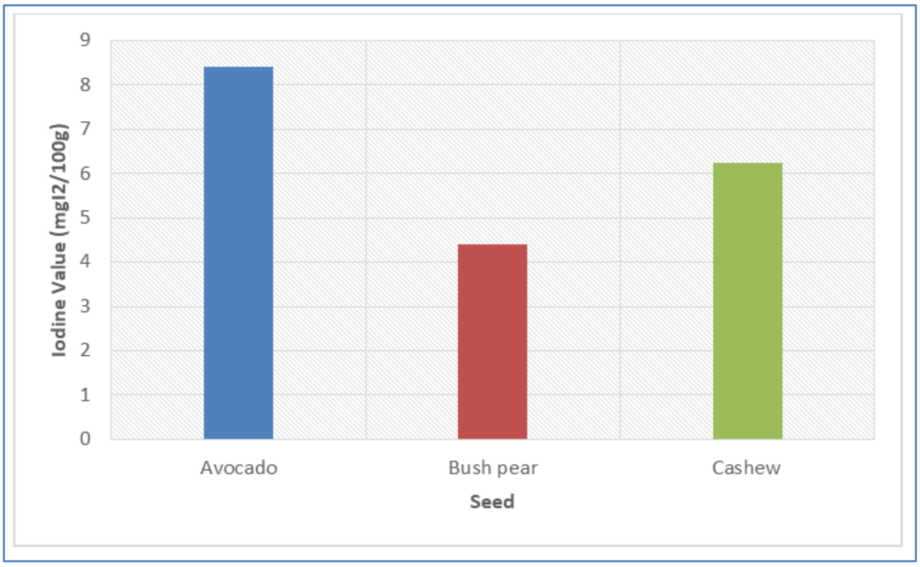

Fig. 6: Iodine Value of Avocado, Bush pear and Cashew Seed Oil

Fig. 7 demonstrates that bush pear oil has the lowest saponification value and avocado seed oil has the highest. The oil's saponification values for the seed oils of avocado pears, bush pears, and cashews were 168.4 mg KOH/g, 125.9 mg KOH/g, and 102.2 mg KOH/g, respectively. Avocado and pear oils can be compared to cotton seed oil (194.3), shea butter oil 185.20 (Asuquo *et al.*, 2010), and conophor seed oil (194.7) while cashew oil is slightly lower when compared to cashew oil 137.00 (Akinhanmi and Atasie, 2008) and slightly higher when compared to native pear oil 125.9. Oil's saponification value is one of the key factors in determining its suitability for use in soap production.

The acquired oils produced transparent solutions in water; this class of oil is among those that produce soaps with a soft consistency. Therefore, the oil could be utilized to create shaving creams since those products call for oils with a soft consistency.

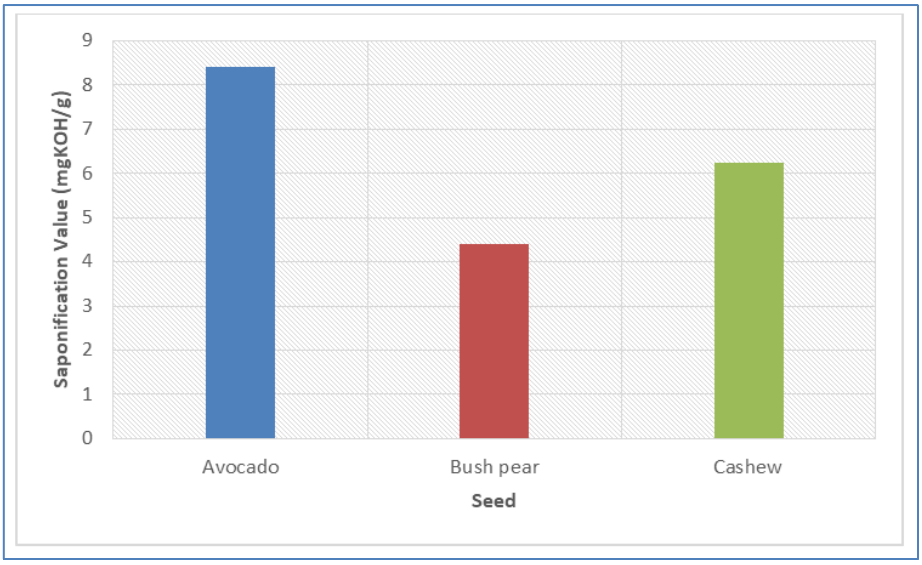

Fig. 7: Saponification Value of Avocado, Bush pear and Cashew Seed Oil

Fig. 8 shows that the free fatty acid value of Avocado seed oil is the highest while that of Bush pear seed oil has the lowest value. The values of the seed oil of avocado pear, bush pear and cashew were 8.4% and 4.4% and 6.25 respectively. Comparing these values, that of avocado pear is higher than that of bush pear and cashew. The free fatty acid value of cashew nut oil can be compared with that of cashew nut 5.4 % (Akinhami and Atasie, 2008).

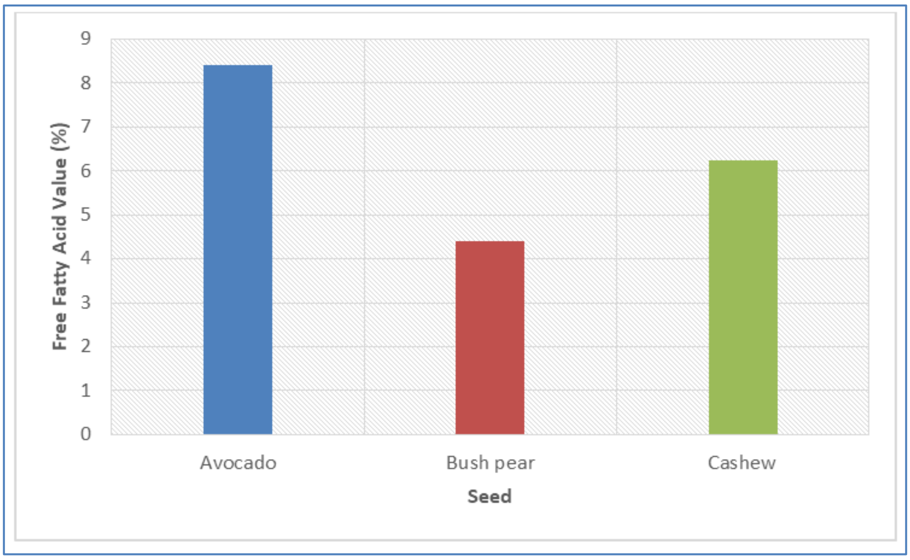

Fig.8: Free Fatty Acid value of Avocado, Bush pear and Cashew Seed Oil

3.2 ELEMENTAL ANALYSIS OF AVOCADO, BUSH PEAR, CASHEW

The elemental analysis of the various avocado, bush pear, and cashew fruits is presented in Table 3. These values are displayed in Figs. 9. With values of 45.8 mg/100g and 24.9 mg/100g, potassium is the metal with the highest concentration in cashew and avocado seed oils, respectively, while zinc and iron are the metals with the lowest concentrations in bush pear and avocado, respectively. The presence of trace metals is a critical component of edible oil quality (Odunlami *et al.*, 2020). Metallic nutrients for humans, especially for growth, include potassium, calcium, magnesium, iron, and zinc. Zinc (Zn) and iron (Fe) are toxic to plants and animals, even in trace concentrations (Pehlivan *et al.*, 2008). Because the iron (Fe) and zinc (Zn) contents in these oils were higher than the 0.1 maximum permissible concentration, the extracted oils will undergo additional processing to make them edible. The plot reveals that potassium (K) has the highest concentration of all the metals in avocado seed oil, whereas iron (Fe) has the lowest concentration. Potassium (K) has the highest concentration of all the metals in bush pear oil, while iron (Fe) has the lowest. Also, it reveals that Zinc (Zn) has the lowest concentration of all the metals in cashew oil, whereas potassium (K) has the highest concentration.

Table 3: Elemental Analysis of Avocado, Bush pear and Cashew

Elements	Avocado (mg/100g)	Bush pear (mg/100g)	Cashew (mg/100g)
Potassium	45.8	1.68	24.9
Calcium	19.6	1.23	18.6
Magnesium	12.3	1.32	19.8
Iron	1.08	1.02	1.65
Zinc	2.06	1.32	0.38

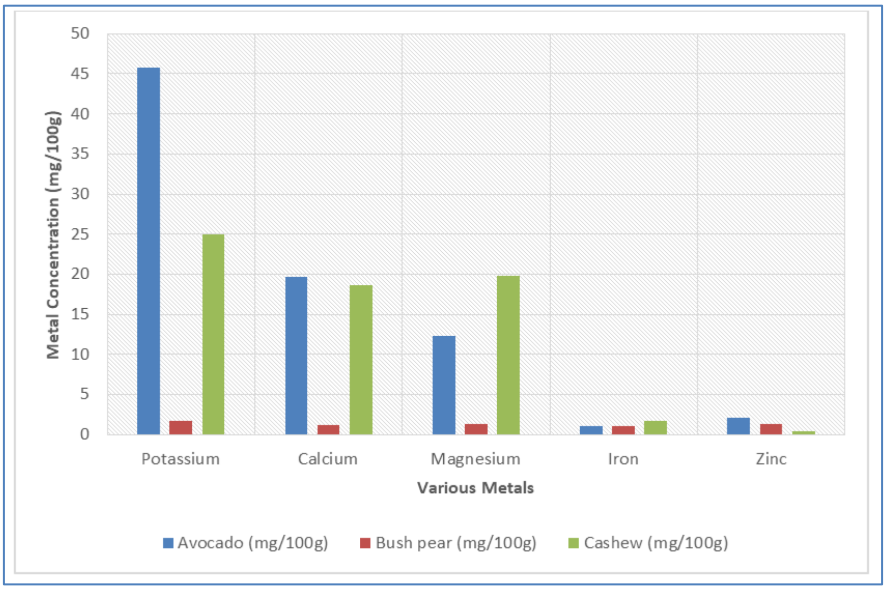

Fig. 9: Elemental Analysis of Avocado, Bush Pear and Cashew Seed Oil

3.3 FOURIER TRANSFORM INFARED (FTIR) SPECTROPHOTOMETRY ANALYSIS

Fig. 10 is the spectral analysis of avocado seed oil. The importance of FTIR analysis is to determine the number of functional groups and type in the extracted seed oils. The analysis shown below displayed the various peaks of the functional group present in seeds used. Avocado seed oil has a maximum transmittance of 62 and a minimum transmittance of 18. Out of 12 peaks on the result, 9 peaks were recorded on the single bond spectrum, no peak was observed on the triple bond spectrum, 3 peaks were observed on the double bond spectrum, while 7 peaks were observed on the finger print region skeletal vibration C-N,C-O.

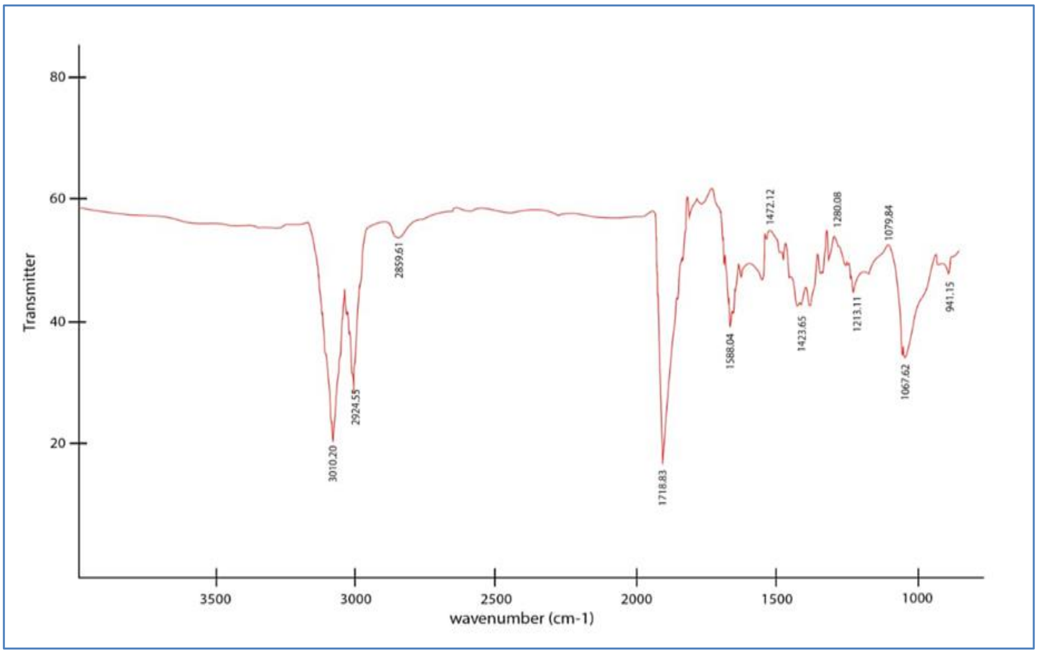

Fig. 10: Spectral Analysis of Avocado Seed Oil

Fig. 11 is the spectral analysis of Bush pear seed oil. Bush pear seed oil has a maximum transmittance of 68 and a minimum transmittance of 16. Out of 11 peaks on the result, 7 peaks were recorded on the single bond spectrum, no peak was observed on the triple bond spectrum, 4 peaks were observed on the double bond spectrum, while 7 peaks were observed on the finger print region skeletal vibration C-N,C-O.

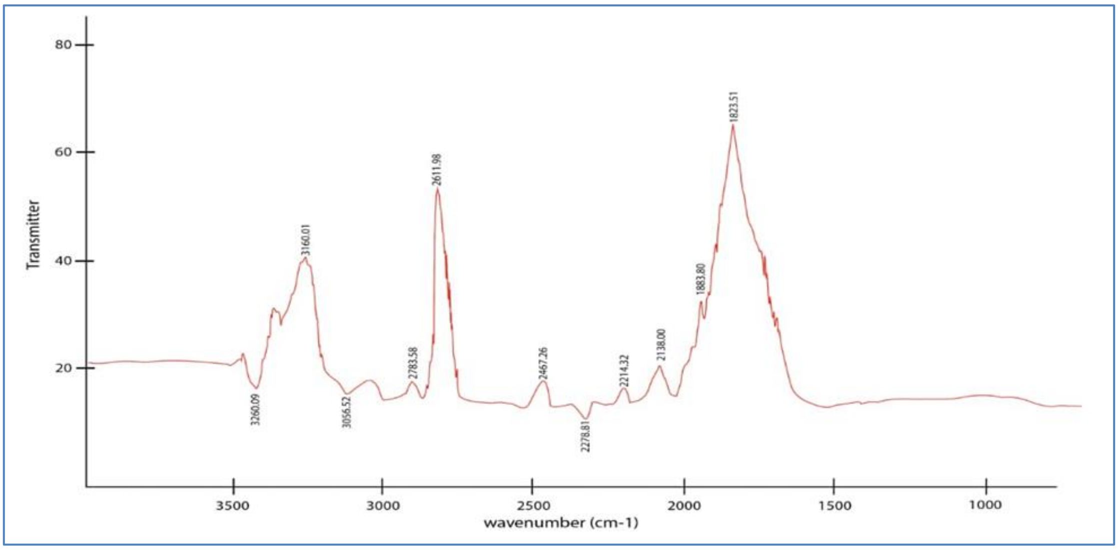

Fig.11: Spectral Analysis of Bush Pear Seed Oil.

Fig. 12 is the spectral analysis of Bush pear seed oil. Cashew seed oil has a maximum transmittance of 65 and a minimum transmittance of 21. Out of 12 peaks on the result, 8 peaks were recorded on the single bond spectrum, no peak was observed on the triple bond spectrum, 4 peaks were observed on the double bond spectrum, while 7 peaks were observed on the finger print region skeletal vibration C-N,C-O.

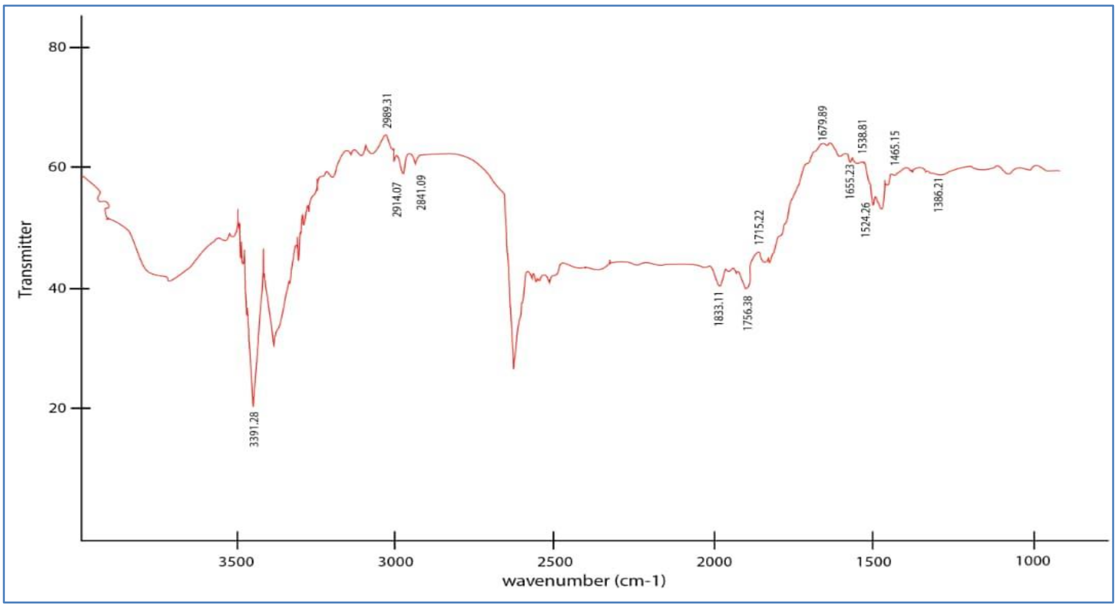

Fig.12: Spectral Analysis of Cashew Seed Oil

5.0 CONCLUSION

This research paper demonstrates the solvent extraction of oil from the seeds of avocado, bush pear and cashew in a Soxhlet apparatus. This method is proficient in providing satisfactory results and the oil contents in terms of yield, as well as characterization in terms of relative density, refractive index, acid value, peroxide value, iodine value, saponification value, free fatty acid value was performed. Also, the elemental analysis and spectral analysis revealing the various metal contents and functional groups, respectively were performed. The results revealed that high oil content in seeds implies that processing it for oil would be economically viable. The acid value which is an index of free fatty acid content due to enzymatic activity was found to vary between 6.4 and 14.6; these acid values require further reduction by refining for edible purpose.

Oil that is low in acidity is suitable for consumption, acidity less than 0.1mgKOH/g is usually the best. The peroxide value is monitored in order to study the effect of storage in accelerated conditions, the resistance against oxidation evaluated by the peroxide value. High saponification values are obtained, 168.4 for avocado, 19.9 for bush pear and 102.1 for cashew. These indicate that the oil is of soft consistency and could be used for shaving cream production. Also, the iodine value of bush pear is lower than that of avocado and cashew is an indication of the presence of unsaturated systems which are nutritionally and biochemically important. The FTIR analysis reveals that the seed oils contain functional groups such as alkanes, alkenes, carbonyls etc. hence, it can be concluded that oils extracted from these seeds are appreciably related in terms of physical, chemical and elemental properties and their functional groups.

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