

## ASSESSMENT OF FATTY ACID PROFILE OF AVOCADO PEAR (*PERSEA AMERICANA*) OBTAINED FROM NSUKKA AREA OF ENUGU STATE, NIGERIA.

### ABSTRACT

The cholesterol and fatty acid assessment of Avocado pear were carried out. Avocado pear was locally sourced from Nsukka, Enugu State, Nigeria. The fruit was homogenized and oil was extracted by soxhlet extraction. The method of analysis involved oxitester analyzer equipment for cholesterol and gas chromatography (GC) for fatty acid. The result revealed that cholesterol was not present but fatty acid was present in the extracted avocado oil. After this analysis, it was also found that avocado pear contained many unsaturated fatty acid that is of health benefits. Examples are mono-unsaturated fatty acid such as oleic acid and poly-unsaturated fatty acid that lowers cholesterol level in the fruit and in the blood. These pharmacological properties made Avocado pear a potential source of cardiovascular drug. This pharmacological property of Avocado pear also shows its health benefits and medicinal values to human health. Avocado pear is a nutritious fruit that is good for human consumption in order to boost cardiovascular health.

**Keywords:** Avocado pear, Soxhlet, Cardiovascular health, Pharmacological property and Cholesterol

### INTRODUCTION

Avocado is a tropical tree which grows well and in abundance in Mexico. The unpopularity of the fruit amongst consumer's results in a lot of the fruits going to waste which thus creates the need for value adding by using the fruits instead of allowing it to waste. (Woolf, 2006).

The avocado comes from the *lauraceae* family with its scientific name; *Persea americana*. It is a native plant of Southern Mexico and Central America (Human, 2007). Interestingly, enough of the fruit was originally called *ahuacatl* by the *Aztecs* of ancient Mexico, the fruit later became known as *aguacate* by the Spanich in the 16<sup>th</sup> century and nicknamed the "alligator pears" by the English colonists who mistakenly substituted the fruits shape. The term *aguacate* eventually evolved into avocado by Americans who could not pronounce the Spanish. The avocado plant grows really well in warm weather with tropical or subtropical climates. The flowers when in bloom are very sensitive. There are three known varieties, namely, the Mexican, Guatemalan and the West Indian types (Eyres, 2010). Each of the three varieties thrives and grows really well under different conditions. The Mexican types flourish in Mediterranean climate and are native to dry subtropical plateaus. The Guatemalan types are native to cool, high altitude tropics while the West Indian variety thrive in humid and tropical climates.

The avocado fruit is a highly nutritious fruit with many studies having confirmed its positive effects on human health (Bergh, 2002; Eyres 2006). The utmost misperception amongst people on the healthfulness of the fruit is mainly attributed to its high fats content and so most nutritionist and dieticians either advise against it or to use it "sparingly" (Bergh 2002). Many studies and researches however, have proven that avocado in particular has low cholesterol contents and 70% of the fat contents are monounsaturated fat. This is considered a good fat because, it helps in lowering of the level of harmful cholesterol known as low Density Lipoprotiin (LDL) but maintains the level of the beneficial High Density Lipoprotein (HDL), the fat content also has low levels of polyunsaturated and saturated fat with slight variations according to cultivars and fruit maturity (Arpaia, 2006).

The aim of this study was to assess the fatty acid and cholesterol levels of avocado pear in order to ascertain its medicinal values.

## MATERIALS AND METHODS

### Samples collection /plant material

The plant material used for this research is avocado pear. The samples were collected from matured and riped avocado pears which were hand harvested from ten different varieties of avocado trees from Nsukka area of Enugu State, Nigeria. The pears were picked at matured green stage of development and allowed to ripe at room temperature for optimum eating quality within four days.

### STERILIZATION OF GLASS WARES

All glass wares used in this research work were washed with detergent, rinsed with distilled water and air dried. They were also sterilized on a hot air oven and each of the materials was wrapped with aluminium foil before sterilization.

### PREPARATION OF SAMPLE

The samples used for this practical were prepared by allowing the sample (avocado pear) to soften for 4-5 days so that the oil in it can be extracted. This process took 4 days at room temperature.

### EXTRACTION TECHNIQUES

#### Different methods were used to extract oil from edible avocado pear.

1. The first trialed method was high heat extraction of the oil by using the soxhlet solvent extraction method with chloroform. (b. P. 30-60°C) as the extracting solvent. This method took three days to finalize the final extraction of sample and with consistent monitoring for control of water and solvent used. The temperature required for this method to work is 90 -100°C.
2. The second trialed method was by malaxing of the fruit pulp which was carried out with the omnimixer set for approximately 2 hours or until oil starts dispersing and settling on the top then, centrifuged at RPM of 12,000 x g for another 1 hour. This method is the laboratory or bench top version for the widely used by oil manufacturing industries known as the "cold press" technology. Cold pressed avocado oil is defined as oil extracted using mechanical or physical means at temperatures below 50°C (Wong *et al.*, 2011). This process works by grinding of the pulp then transferring into malaxers for continuous malaxing with water that controls the temperature of the process to maintain below 50°C. The solid and liquid phases are left to settle prior to proper separation by centrifugation.

### TEST FOR CHOLESTEROL

The extracted oil from avocado was tested for cholesterol using the oxitester analyzer equipment.

#### PROCEDURE:

1. Select the parameter to measure from the menu: the system automatically selects the correct wave length.
2. Use the supplied pipette to add the correct volume of sample to the reagent contained in the cuvette.
3. Follow the displayed instructions.
4. The result was automatically calculated in a few minutes, displayed and printed by means of the on-board printer.

## TEST FOR FATTY ACID

The extracted oil from avocado pear was tested for fatty acid using the oxitester analyzer equipments. (See the procedure above as in cholesterol test). This equipment was also used to determine the free fatty acid value of the oil extracted from avocado pear.

## THE QUANTITATIVE ANALYSIS

The quantitative analysis of fatty acid was conducted using a gas chromatography (GC). The gas chromatography was also used to identify different fatty acids in the oil extracted from avocado pear.

## RESULTS

The oil yields from the two methods are listed in table 1.

	Method	Temperature	Oil yield (%)
1	Soxhlet extraction	90 -100°C	67.4
2	Centrifuge (cold press) 12,000 x g	45°C	74.5

**Table 1: Oil yield from two trial methods**

The cold pressed oil extraction yielded by far a high oil content compared to the soxhlet extraction. The cold press method does not require any reagent addition which reasonably can be used for consumption.

### FOR SOXHLET EXTRACTION

Weight of empty beaker = 32.6g

Weight of beaker + weight of solvent + weight of oil extracted = 100g.

% of oil extracted = weight of beaker with solvent – weight of empty beaker.

% of oil extracted + 100 – 33.6 = 67.4%

### FOR COLD PRESS

Weight of empty beaker = 25.5g

Weight of empty beaker with extracted oil = 100g

% of oil extracted = weight of empty beaker

With oil – weight of empty beaker.

% of oil extracted = 100-25.5

% of oil extracted = 100-25.5 = 74.5%.

After the analysis, it was found that the oil content of avocado pear was 18.4%. The result of the qualitative analysis shows that fatty acid was present in the oil extracted from the avocado pear.

#### ACID VALUE % OF FREE FATTY ACID

##### Chemical Characteristics for Extracted Avocado oil

Parameters	Standard value
Acid value (%)	0.2-2.0
Free fatty acid (% as oleic acid).	0.1 – 1.0

#### FATTY ACID PROFILE OF AVOCADO PEAR

##### FATTY ACID PROFILE FOR AVOCADO OIL

Fatty acid	Symbol	Percentage
Palmitic	C16 : 0	31.2
Stearic	C18:0	9.8
Palmitoleic	C 16: 1n-7	0.7
Oleic	C 18: 1n-9	38.7
Linoleic	C18: 2n-6	18.2
Linolenic	C18: 3n-3	1.2

Number before colon indicates number of carbon atoms in the fatty acid chain.

Number after colon indicates number of double bonds.

N indicates the double bond position in the chain.

## CHOLESTEROL

Avocado does not contain any cholesterol. Because of the combination of high amounts of polyunsaturated fats and monounsaturated fats and 0mg of cholesterol measured.

The result of the assessment showed avocado oil to have a moisture content of 1.6%, acid value (6.01mg KOH/g) and free fatty acid value (1.68%).

## DISCUSSION

Cardiovascular diseases remain the biggest cause of deaths worldwide, though over the two decades, cardiovascular mortality rates have declined in many high income countries. At the same time cardiovascular deaths have increased at an astonishingly fast rate in low income and middle income countries (McGill *et al.*, 2008; Ugwu *et al.*, 2013). Although cardiovascular diseases usually affect adults, the antecedents of cardiovascular disease, notably atherosclerosis begins early in life, making primary preventive efforts necessary from childhood (Ugwu *et al.*, 2013).

The assessment of cholesterol and fatty acid has already been carried out using Avocado pear which gave results that fatty acid is present in the avocado pear. It was also found that Avocado pear has no cholesterol. This also, makes the pear safe for cardiovascular patients.

The standard method of analysis used was able to identify really that avocado pear contains fatty acid due to the presence of polyunsaturated fatty acid and monounsaturated fatty acid in the avocado pears (Woolf *et al.*, 2009).

## CONCLUSION

The results of this study suggests that Avocado has low acid value, low cholesterol and high contents of polyunsaturated and monounsaturated fatty acid values which supports the reason avocado pears have been used in ethno-medical treatment of cardiovascular diseases.

## REFERENCES

1. Arpaia, M. (2006). Economic Analysis of Extraction of Avocado Oil in Massey University, *Journal of Internal Medicine*, 75(6): 143-155.
2. Ashworth, B.E, Freitas, S.P and Qassim, R.Y (2008). *Tree yield and Fruit Minerals Concentrations*. 11<sup>th</sup> ed.C.RS Press Ltd, New York. Pp 90- 98.
3. Auburn, B.E, Bulley, M. And Lund.C (2010). *The Fruit Trees*. 5<sup>th</sup> ed. CRS press Ltd New York. Pp.2-9.
4. Bergh, B.D (2002). *The Avocado and Human Nutrition*. 2<sup>nd</sup> ed. CRS press Ltd New York. Pp. 37-47
5. Chen, B./ S, Daguét .R and Berges, T. P (2009). *Health Nutrition*. 6<sup>th</sup> ed. Hill Press Ltd Pp. 121-128.
6. Eyrea, L(2010). *Nutrition and Human Health* National Academy Press Ltd. USA Pp. 150-161.
7. Human, T.P(2007). *Oil as a Byproduct of the Avocado*. 4<sup>th</sup> ed. Hill Press Companies New York. Pp. 159-162.
8. Hofman, P.J, Neeman, I.and Whiley,A .W(2002). *Human Nutrition* 5<sup>th</sup> ed. Hill Press Companies New York. Pp.80-89.
9. McGill HC, McMahan CA, Gidding SS. *Circulation* 2008; 117: 27-1216.

10. Reed, A. (2001). Health Benefit of Fruit in Oxford University. *Journal of Avocado Oil Production and Chemical Characteristics*; 64(9):77-85.
11. Rawls R.R.(2009). *Biochemistry*. 2<sup>nd</sup> ed. CRS Press Ltd New York. Pp2-10.
12. Thompson, J.F and Sherpa, N (2006). *Health Promoting Specialty Oils*. 9<sup>th</sup> ed. Hill Press Companies New York. PP.30-39.
13. Ugwu Okechukwu P.C., Nwodo Okwesili F.C., Joshua Parker E., Odo Christian E. and Ossai Emmanuel C. (2013). Effect of Ethanol Leaf Extract of *Moringa Oleifera* on the Lipid Profile of Mice. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 4(1):1324-1332.
14. Wang, Y and Woolf, A.B (2011). Influence of proportion of Skin present During Malaxing of Cold Pressed Avocado Oil. *Journal of American Oil Chemist Society* 6(2): 12-19.
15. Weegy, R.J, Ashton, B.O and Bulley .C (2010). *Avocado Oil Extraction*. 11<sup>th</sup> ed. National Academy Press Ltd USA. Pp.11-19.
16. Werman, M.J (2002). The Role of Fruit Mineral Composition on Fruit Softness. *Journal of Horticultural Science and Biotechnology* 80 (6)793-799.

**\*Ikeyi Adachukwu P., Ogonna Ann O. and Nnaji, Comfort C.**

Department of Science Laboratory Technology, Institute of Management and Technology (IMT), Enugu, Nigeria.

Email [oky9992000@yahoo.com](mailto:oky9992000@yahoo.com)