PHYSIOCHEMICAL AND FATTY ACID PROFILE OF AFRICAN PEACH FRUIT OIL

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Abstract
The oil extracted from *Nauclear latifolia* fruit using n-haxane was analysed for its physical and chemical properties viz: Acid value, Saponification value, iodine value, peroxide value, Free fatty acid,Specific gravity and conductivity using standard methods. The percentage yield of the extracted oil was 11.157 ± 0.12. The oil was liquid at room temperature with golden yellow colour with pleasant fruity smell. The Acid value, Saponification value, iodine value, peroxide value, free fatty acid, Specific gravity and conductivity were observed to be 2.244 mg KOH/g, 96.77 mg KOH/g, 4.404 g I2/100g, 4.414 mequiv O2/kg, 4.488%, 1.006 and 0.003 respectively. The fatty acid present include: methy myristate (4.81%), cis-10-heptadecenoic acid (4.97%), heptadecanoid acid (2.97%), cis-13, 16-docasadienol acid (2.93%), cis-10-pentadecenoic acid (2.22%), 9-hexadecanoid acid (3.48%), heptadecenoic acid (2.94%). The results of the fatty acid profile revealed that the oil will be relevant for industrial purpose.

Keyword: Nauclear latifolia, physiochemical, fatty acid.

Introduction

The use of various parts of plants in the prevention and treatment of many ailments is now experiencing positive awareness especially amongst the rural dwellers because of the availability, cheaper prices, effectiveness and resistance to disease caused organisms (Arowosegbe *et al.,* 2020).. Many plants synthesize substance ares useful in the maintenance of health in man and animals. These are called bioactive substances called secondary metabolites that include aromatic substances, most of which are phenols or oxygen substituted derivative such as tannins, terpeninoids, alkaloids (Chellappandian *et al.,* 2012). The World Health Organization (WHO 2001) estimated that up to 80% of the world's population rely on plants for their primary health care, while in Nigeria, a WHO survey estimated that up to 75% of the population personally used plants in various forms or to managing their health challenges. Medicinal plants play a significant role in the provision of nutritious food to man (Thangaraj *et al.,* 2014).Fat and oil are group of compounds known as lipids. Fats are of animal origin and are solids at room temperature, while oils are of plants (vegetable) origin and liquids at room temperature. Edible Fats and oils are the third most important macro nutrient required by the body after carbohydrates and proteins (Youdim, 2019). They are rich sources of vitamins and contain two and a half times the energy provided by carbohydrates. In addition, fats and oils also contain essential fatty acids which are not manufactured by the body and as such must be obtained from diets containing fats and oils (Aremu et al., 2015). Oil consist of mixture of organic compounds which are basically triacylglycerol, diacylglycerol , monoacylglycerol, free fatty acid and other minor compounds such as phospholipids, phytosterol , tocopherols and so on (Hamm *et al.,* 2013). The quest for oil cannot be overdo due to its application in food industries as flavor and its nutritional importance in diet. Over 40 million tons of fats and oils are consumed globally by man annually (Dhiman *et al*., 2009) and the demand is on the increase with the increasing human population. Therefore, over the years efforts have been made to annex an alternative sources of oils to support the available ones In order to fill the gap in finding the non-edible for non-edible industrial uses so as to reduce the pressure on the food- non-food uses of oils. However an assessment of the potential use of oil extracts demands reliable information about the physiochemical characteristics of the oils (Aremu *et al*., 2015; Ikhuoria and Maliki, 2007). It is on these facts that this research was carried out, to extract oil from *Nauclear latifolia* fruit and also to analyse its physiochemical properties to unfold its quality in order to give an indication for its application. *Nauclear latifolia* (family: Rubiacceae} is a medicinal plant found in tropical

Africa and Asia. It is used traditionally in the management of various tropical diseases such as typhod, diabetis, malarial etc.. *Nauclea latifolia* is native to Africa and Asia (Gidado *et al.,* 2005). It is widely distributed throughout the forest and tropical forests of Benin, Burkina Faso, Cameroon, Democratic Republic of Congo, Ghana and Nigeria (Lamidi *et al.,* 1995). In Nigeria, it is found in areas like Kontagora, Abuja, Shaki, Akwa Ibom, Cross River, Enugu, Abakaliki and other parts of the country.

Its generic name is derived from the Greek word "sarco" (fleshy) and "cephalus" (headed) in reference to the flowers. The specific epithet is derived from the Latin word "lati" (broad) and "folius" (leaved) (Arbonnier, 2000). Three other related species *N. pobeguini, N. diderichii*, and *N. vanderguchtii* are forest trees. *N. Diderichii* is planted in Omo forest reserve, Nigeria. In the folk medicine, the species *N. diderichii* and *N. orientalis* are used in the same way as *N. latifolia*. Some of them, including *N. latifolia*, are used in sub-Saharan traditional system of medicine to treat several diseases suggesting that they may represent a natural source of pharmacologically active substances (Karou *et al.,* 2011). *N. latifolia* is commonly known as "Ubulu inu" among the Igbos in the Eastern part of Nigeria; as "Tafashiya" or "Marga" or "tabashiya" or "tuwon biri" among the Hausas in the Northern part of Nigeria; as "Egbesi" among the Yoruba in the Western part of Nigeria, "Mbom-ibong'' in Ibibio and as "Itu" among the Itsekiri, mahyann (Fali) language. The common name include Pin cushion tree (English) or African peach or scille maritime (French) (Arise *et al.,* 2012).

Aim of the study

The aim of this research work is to explore the physio chemical properties of African peach oil

Materials and method

Sample collection and preparation

The sample African peach fruit was obtained from Rector's village of Federal Polytechnic, Ado-Ekiti. The sample was brought to Chemistry laboratory of the Federal Polytechnic, Ado-Ekiti, Ekiti state, Nigeria.

Sample preparation

The samples were cleaned, chopped into pieces and dried at room temperature for two weks. It was later grinded into powder and stored in air-tight polythene bags for further analysis. Powdered sample (100g) was loaded into a thimble and placed in the refluxing unit of the Soxhlet apparatus with n-hexane as extraction solvent. The extracts were de-solventized with the rotary evaporator to obtain the fruit oil.

A= Fruit of African peach,

B= The pieces of the sample when chopped,

C= The powdered sample after grinding,

Gas chromatography-Mass spectroscopy (GC-MS) system

This is an efficient technique used for identification and quantification of fatty acid present in substances. The unknown organic substances present in the oil were identified.

Physicochemical properties

The Physicochemical properties of the oil were carried out. The colour and smell of the oil was determined by visual observation and use of the sense of smell. Specific gravity was determined using 25ml capacity density bottles according to Pearson (1980) at 29°C. The percentage yield was obtained as ratio of the weight of oil extracted to the weight of sample, multiplied by 100. The saponification values (SV), acid values (AV) and iodine values (IV) were determined using the official method of analysis (A.O.A.C, 1995). Peroxide values were determined using the AOCS Surplus method Cd 853 (AOCS, 1992). Statistical Analysis One way analysis of variance (ANOVA) was carried out to assess the significant differences in the data obtained. The mean of the data was compared using SPSS (Statistical package for Social Scientist).

RESULTS AND DISCUSSION

The Physical and chemical properties of the oil sample are represented in Tables 1 and 2. The extracted oil is liquid at room temperature. This shows a confirmation that the oil have some attributes of unsaturation. The colour of Africa peach fruit oil (APFO) was golden yellow which is comparable to pale yellow observed by (Kabiru et al., 2019) and is different from the dark brown reported for Rubber seed oil by (Asuquo et al., 2012 and Ebewele et al., 2010) and brownish yellow (Maliki et al.,2020). The colour also different from light green observed for African pear seed oil reported by (Salimon et al., 2012) and as also observed by (Ajiwe ,2000) but in disagreement with (Ajayi, 2002) who recorded dark yellow and honey-like colour observed for Africastar apple( ). The physical appearance and pleasant odour of APFO makes it a little bit desirable and as edible oil, just like Africa pear seed oil and cotton seed oil which also have nice appearance and pleasant odour which makes them desirable as edible oils. This is different from to the odour observed for Rubber seed oil as reported by (Salimon et al., 2012). The specific gravity and conductivity was found to be 1.006 and 0.03 respectively.

Oil quality and its composition are the key factors for the viability of an oil source. In this research work, the percent oil content of the APFO was 13.27% The oil content for APS recorded in the present study was however higher than the 11.10% amd higher than 10.71% gotten for Africa star apple (Adebayo et al., 2012). This high yield could be attributed to genetic factor, fruit species and extraction used solvent. This is far lower than some seed bearing oil such rubber seed (RS), African pear seed (APS) and cotton seed (CS) which has 42.967 ± 0.59%, 19.427 ±

0.13% and 35.433 ± 0.86% respectively. The table below represent the physiochemical properties of the Africa peach fruit oil (APFO). Acid value is a measure of the amount of free fatty acids present in fat and oil, it also gives an indication of the rancidity, edibility and is used to determine the freshness of the oil (Ononogbu, 2002). The higher the acid value level, the higher the quantity of free fatty acid and its polycondensation reaction. The acid value obtained for APFO (2.244± 0.81mg KOH/g).this is very low compare with Rubber seed oil (32.600 ± 0.81 c mg KOH/g) but comparable to Africa peach oil (8.731 ± 0.45 b mg KOH/g), Cotton seed oil (6.840 ± 0.51 a mg KOH/g) (Maliki et al., 2020) and African star apple (4.50 mgKOH/g) (Adebayo et al., 2012). The acid value of APFO is higher than Rubber seed oil (1.68 mgKOH/g) as recorded by (Asuquo et al., 2012). Free fatty acid (FFA) was observed to be 4.75%, the concentration of free fatty acid in an oil sample is an indication of low self-life. The value obtain for FFA is higher than 0.91% and 2.24% obtained for Soursop seed oil and *Jatropha* respectively (Adepoju *etal* ., 2012).

The Gas chromatography mass spectrometry analysis (GC-MS) is an essential tool for quatification and identification of fattybacid. The spectral analysis of the oil sample shows seven peaks that corresponds to seven fatty acid and other oganic substances present in the oil sample of African peach fruit. These were confirmed by their retention time and percentage area. The major fatty acid present include: methy myristate (4.81%), CIS-10-heptadecenoic acid (4.97%), heptadecanoid acid (2.97%), cis-13, 16-docasadienol acid (2.93%), cis-10-pentadecenoic acid (2.22%), 9-hexadecanoid acid(3.48%), heptadecenoic acid(2.94%). These were difrent from fatty acid (Oliec acid, linoleic acid and linolenic acid) obtained from rapeseed oil using GC-MS (Avram et al., 2014)

CONCLUSION

Results obtained from this study showed that the oils extract was golden yellow in colour with pleasant smell , The percent yield of the oil was 11.34%. The extracts was liquid at room temperature and with low melting point signifying that they can all be classified as oils with some levels of unsaturation. . It has 4.75% free fatty acid and saponification value of 96.77±6.80mg/KOH/g. the oil may be edible due to its low percentage in free fatty acid. This suggest that the oil will be edible, but the low percentage yield may afford a setback.

Recommendation

Base on the results observed, it is hereby reconmeneded that the toxicity of the oil should be investigated, its medicinal importance and antimicrobial activities of the oil should be explored.

REFRENCES

Adebayo S. EOrehvba B.A, Adeoye P.A, Musa JJ,Fase OJ, 2012. Solvent extraction and characterization of African star apple (*C. albidum*) seed. Acad Res inter 3(2): 178- 183

Adepoju T.F, olawale O, Okunola AA, Olatunji EF. 2014. Solvent extraction of oil from soursop oilseed and its quality characterization. Inter J sustain energy environ Res 3(2): 80-89.

Ajayi I. A. and Oderinde, R.A. (2002). Studies on the Oil Characteristics of Dacryodes Edulis Pulp and Seed. Discovery and innovation: 14(1-2): 20-24.

Avram M, Stoica A, Dobre T, Streseu M. 2014. Extraction of vegetable oil from ground seeds by percolation techniques. UPB Science Bull Series B 76(2): 13-22

Ononogbu I.C, 2002. Lipid in human existence. Nsuka Nigeria: AP Express Publisher, pp. 2-9

Agarwal, D.K., Singh, P., Chokrabarty, M., Shaikh, A.J. and Gayay, S. G. (2003). Cotton seed oil Quality, Utilization and processing. Central Institute for Cotton Research Nagpur. Technical Bulletin from CICR No:25.

AOAC (1995). Official Method of Analysis. Association of Official Analytical Chemists, Arlington VA. 16(4): 1-45. AOCS (1992). Official methods and recommended practices of the American Oil Chemists Society (4th ed.), Champaign, American Oil Chemists' Society, USA 1-54.

Arbonnier, M. (2000). Arbres, Arbustes et Lianes des Zones Seches d'Afrique de l'Ouest. Ist Edn. CIRAD Publishers, Paris, ISBN: 2-87614-431-X, pp: 541.

Aremu, M.O., Ibrahim, H. and Bamidele, T.O. (2015). Physicochemical Characteristics of the Oils Extracted from Some Nigerian Plant Foods – A Review. Chemical and Process Engineering Research, 32: 36- 52. www.iiste.org ISSN 2224-7467 (Paper) ISSN 2225-0913 (Online) Vol.32, 2015.

Arise, R.O., Akintola, A.A., Olarinoye, J.B., Balogun, E.A. (2012). Effects of *Nauclea latifolia* stem on lipid profile and some Enzymes

of Rat Liver and Kidney. *International Journal of Pharmacology*. 10 (3):

Arisa, N. U. and Lazarus, A. (2008). Production and refining of Dacryodes edulis "native pear seeds oil. African Journal of Biotechnology, 7 (9):1344-1346 http://www.academicjournals.org/AJB

Arowosegbe, S. Olanipekun M. K. and Olowoyeye O.J; (2020). Influence of Location on the Phytochemical, Nutritional and Mineral Composition of the Leaves of *Moringa oleifera* (LAM) Grown in Ekiti State, *Bulletin of Pure and Applied Sciences*. Vol.39 B, No.1: P.40-5.

Asuquo, J. E., Anusiem, A.C.I. and Etim, E.E. (2012). Extraction and Characterization of Rubber Seed Oil. International Journal of Modern Chemistry, 1(3): 109-115.

Chellappandian M, Mutheeswaran S, Pandikumar P, Duraipandiyan V, and Ignacimuthu S; (2012). Quantitative ethnobotany of traditional Siddha medical practitioners from Radhapuram taluk of Tirunelveli District, Tamil Nadu, *India Journal of Ethnopharmacology* Vol.143. (2) Pg. 540-547. 92.

Dhiman, A.K., Shama, K.D., Attri, S. (2009). Funtionality constituents and processing of pumpkin: a review. Journal of food Science and Technology, 46(5), 411 – 417.

Ebewele, R.O., A.F. Iyayi and Hymore, F.K. (2010). Considerations of the extraction process and potential technical applications of Nigerian rubber seed oil. International Journal of the Physical Sciences, 5(6): 826-831.

Gumuskese, A.S. and Cakaloz, T. (1992). Chemical and physical changes in cottonseed oil during deodorization. Journal of the American Oil Chemists' Society, 69(4):392-393.DOI:10.1007/BF02636075.

Gidado, A, Ameh, D.A, and Atawodi, S.E. (2005). Effect of *Nauclea latifolia* leaves aqueous extracts on blood glucose levels of normal and alloxan-induced diabetic rats. *African Journal of Biotechnology.* 4(1): 91-93.

Hamm W, Hamilton RJ, Calliauw G. 2013. Edible oil processing. 2nd Edition. Chichester UK: Wiley Blackwell Ltd., pp. 1–13.

Ikhuoria, E. U. and Maliki, M. (2007). Characterization of avocado pear (Persea americana) and African pear (Dacryodes edulis) extracts. *African Journal of Biotechnology,* 6 (7): 950-952

KabiruH. D., YinusaI., AdamD. S., & AbdulmalikM. F. (2019). Physicochemical characterization and antimicrobial properties of *nauclea latifolia* (Smith) seed oil. *fudma journal of sciences*, *3*(4), 372 - 379.

Karou, S.D, Tchacondo, T., lboudo, D.P, and Simpore, J. (2011). SubSaharan Rubiaciaea: A review of their traditional uses, phytochemistry and biological activities. *Pakistan Journal of Biolological Science.* 14: 149 -169.

Lamidi, M.E, Oliver, R., Faurel, L., Debrauwer, L., Nze, E., and Balandsard. G. (1995). Quinovic acid glycosides from *Nauclea diderichic*. Planta Med. 61: 280 – 81.

Salimon, J., Abdullah, B.M. and Salih, N. (2012). Rubber (Hevea brasiliensis) seed oil toxicity effect and Linamarin compound analysis. Lipids Health Disease., 11: 74 https://doi.org/10.1186/1476-511X-11-74.

Pearson, D. (1980). The Chemical Analysis of Food. Scheckwahtong Printing Press, Churchill, Livingstone, Q Edinburgh, 476–496.

World Health Organization; (2001). Antimalarial drug combination therapy: report of a WHO technical consultation, April 4-5 Geneva. WHO/CDS/RBM/2001. 35.

Youdim, A. (2019). MSD Manual for customer. Carbohydrates, Proteins, and Fats. David Geffen School of Medicine at UCLA.

Appendix

*-Fatty acid profile of the extracted African peach fruit oil

1	Methy myristate	15.979	4.81
2	CIS-10-heptadecenoic acid	20.122	4.97
3	Heptadecanoid acid	20.585	2.97
4	Cis-13,16-docasadienol acid	28.110	2.93
5	Cis-10-pentadecenoic acid	17.604	2.22
6	9-hexadecanoid acid	18.760	3.48
7	Octanoic acid	3.636	2.94

Parameter	properties		
Odour	Pleasant	Colour	Golden yellow
State at room temp.	Liquid	conductivity	003
Specific gravity	1.006	moisture content	2.4%
Acid value	2.244± 0.81mg KOH/g	Peroxide value	4.44±2.77meq/kg $^{-1}$
Free fatty acid	4.75%	Iodine value	2.900±0.16g/100g
Saponification value	96.77±6.80mg/KOH/g		

Peack No	Name	Retention Time	Peack Area(%)