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Some Physicochemical Properties of Cashew Nut (Anacardium Occidentale) and Palm Kernel (Elaeis Guineensis) Oil using Straight Run Gasoline

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Abstract- In this study, vegetable oil were extracted from cashew nut and palm kernel seeds using straight run gasoline and the oil was assessed for some physicochemical properties. The official standard methods of analysis gave the following results for both cashew nut and palm kernel oil respectively: Colour (24.6Y, 6.7R, 0.7B, 21.0Y, 5.0R 1.4B), specific gravity (0.96, 0.91), melting point (320C, 260C) moisture content (0.00%, 0.55%) fatty acid (5.4% Oleic, 5.9% lauric acid), acid value (10.7% Oleic acid, 10.7% lauric acid), saponification value (137mg KOH/g oil, 249mg KOH/g oil) peroxide value (7.95meq Peroxide/kg, 4.36 meq peroxide/kg) and iodine value (41.3mg iodine/100g. 20.6mg iodine/100g). The results showed that straight run gasoline can compete favorably with other solvents used in the extraction of vegetable oils.

Keywords- *Cashew nut, palm kernel, straight run gasoline.*

I. INTRODUCTION

There has been an increase in the world production of oil seeds over the last thirty years (1): this would appear to be related to the products and by-products as oils seeds are primarily grown for their oil and meal.

Vegetable oil is always at a higher price per ton than the cake, this is because the demand for oil is often higher than the cake.

Nut oils and seeds oil are receiving growing interest due to their high concentration of bioactive lipid components which have shown various health benefits.

Fats and oils, and their several lipid components can extensively be used in the food and also in cosmetics, pharmaceuticals, biodiesel paints and other. Oils from most edible oils seeds are used in the food industry, though there is growing emphasis on industrial utilization as feedstock for several industries with about 80% of the world production of vegetable oils for human consumption. The remaining 20% utilization is between animal and chemical industries. The ability of a particular oilseed fit into the growing industries depends on its utilization potential, rate of production, availability and ease of the processing technology.

Generally, oils and fats from seeds and nuts constitute an essential parts of man's diet. Fats and oil, together with proteins, carbohydrates, vitamins and minerals are the main nutrients required by the human body. The chief important of the vegetable oils lies in their food value.

Vegetable oils derived from plant seeds have been playing vital roles to provide comfort in human lives in various aspects. In the last few decades, there have been growing concerns over vegetable oils as source of material in preference to petroleum or mineral oil. The main factor for this concern is due to environmental issues that regard mineral oil as major contributor of volatile organic components which themselves are responsible for most of our present recalcitrant pollution problems threatening the ecology(3).

In Nigeria, the demand for vegetable oil has ever been widening as industrialist rely mostly on the popular vegetable oil such as palm kernel oil, soya bean oil, cotton seed oil and coconut seed oil for preparation of various products(4).

The cashew tree is native to Brazil and which was discovered by the Portuguese in the 16th century. The Portuguese later introduced it into the African and Asia colonies. The cashew tree is primarily cultivated for its fruit, which composes of a perishable "false fruit" or "cashew apple and a hard shelled nut where the cashew kernel is extracted from (5).

The oil palm tree known as the African oil palm has long been recognized in the tropical rain forest region of West African. The African palm is mostly cultivated for its fruits whereby two major oils are derived from Palm oil which is extracted from the pulp of the oil palm fruit and palm kernel oil which is extracted from the kernel found inside the nut or seed of the oil palm fruit (6).

Solvent extraction is the commonly used commercial technique to recover oil from oil seeds. Presently, hexane is the preferred solvent throughout the world due to its extraction efficiency and ease of availability, yet hexane has been categorized as hazardous air pollution (HAP) by the US environmental protection Agency and is included in the list of toxic chemicals (7). The maximum permissible limit for hexane in oil and the meal are 5ppm and 10ppm respectively (8). These problems have attracted researchers to find a

suitable alternative solvent. A numbers of solvents and their mixtures such as i-hexane, petroleum ether, alcohols etc. have been study. There are no available data in the literature regarding oil extraction from cashew nut seeds and palm kernel seed with straight run gasoline as the solvent. This paper therefore analyses some physicochemical properties of cashew nut oil and palm kernel oil using straight run gasoline.

II. MATERIAL AND METHODS

The nuts (cashew and palm kernel) that serves as samples for analysis were obtained from major markets at different states in Nigeria. The palm kernel nuts were obtained from Eyemoni market at Abonnema Town in Rivers State, while those of cashew were obtained from New Benin Market, Benin City, Edo State.

The hard shells were cracked and the nuts were collected, washed and dried in an oven at 40^0C for 4hours. The dried nuts were milled using manual blender. The oil extraction method used was soxhlet extraction using straight run gasoline as solvent. The crude oil samples were analyzed for some physiochemical properties such as colour, specific gravity, free fatty acid, moisture content, melting point, acid value, peroxide value, saponification value and iodine value using standard methods of analysis(9).

III. RESULT AND DISCUSSION

The results obtained from this work are presented in tables 1 and 2.

TABLE I. PHYSICAL PROPERTIES OF THE EXTRACTED OIL

S/no	Properties	Cashew nut oil	Palm kernel oil
1.	Colour(5 1/4)cell	24.6Y,4.7R, 0.7B	21.0Y, 5.0R,
2.	Specific gravity	0.96	0.91
3.	Moisture Contents (%)	0.00	0.55
4.	Melting point (%)	32	26

TABLE II. CHEMICAL PROPERTIES OF THE EXTRACTED OIL

S/no	Properties	Cashew nut oil	Palm kernel oil
1.	Acid value	10.70	10.71
2.	Peroxide value (meg peroxide/kg)	7.95	4.36
3.	Saponification value (mgKOH/g oil)	137	249.9
4.	Iodine value (mg iodine/100g)	41.30	20.70
5.	Free fatty acid	5.4	5.9

Tables 1 and 2 present the physicochemical properties of oil extracted from cashew nut and palm kernel using straight run gasoline as the solvent. The specific gravities are 0.96 and 0.91 for cashew nut oil and palm kernel oil respectively. This implies that both oils are less dense than water. The colour of the oils were 24.6Y, 4.7R, 0.7B and 21.0Y, 5.0R, 1.4B using 5¼ cell in a lovid bond by matching the colour of light transmitted through the specific dept of liquid oil. The result of the melting point shows that cashew nut and palm kernel oil melts at 32^0C and 26^0C respectively. The melting point shows the temperature at which a fat or oil starts to melt as each oil has its own melting point which is dictated by its chemical composition. The moisture content was 0.0% for cashew nut oil and 0.55 for palm kernel oil. The moisture content of food gives an indication of its shelf life and nutritive value, hence low moisture content is a requirement for long storage life (10).

Free fatty acid is the percentage by weight of a specified fatty acid (11). High concentrations of free fatty acids are undesirable in crude oils because they result in large losses of the neutral oil during refining. Hence, the free fatty acids obtained from this work were 5.4 and 0.7 for cashew nut oil and palm kernel oil. The results of the iodine value were 41.3 and 20.6mg iodine 100g. The iodine value is a measure of the unsaturation of fats and oils and it is an indicator of double bindings in the molecular structure in terms of classification of fats and oils (12). Both oils are non-drying with an iodine value lower than 100. The peroxide value is an index of rancidity, thus indicates a poor resistance of the oils to per oxidation during storage (13). The peroxide values of cashew nut oil and palm kernel oil were 7.95 and 4.36 meg peroxide/kg which are below the maximum acceptable value of 10 meg peroxide/kg (14).

The saponification values were 137 and 249 mg KOH/g oil and compared favorably and within the range for edible oils reported by (15,16)

IV. CONCLUSION

The result of this study indicated that straight run gasoline can be a better alternative to n-hexane.

The physicochemical properties indicated that cashew nut and palm kernel oil are non-dry and may not be suitable for oil paint, various and surface coatings due to its non-drying attribute. The analysis of both oils indicated high quality with low moisture content.

REFERENCES

[1] Murphy, D.J (1994): Designer oil crops. VCH Press, Weinhein

[2] Dari, L (2009). Effect of Different solvent on the extraction of soya bean oil, M.Sc Thesis. University of Science and technology. Ghana.

[3] Adebayo, S. E. Orhevba, B. A. Adeoge, P.A and Musa, J.J (2012): Solvent extraction and characterization of oil from African star Apple, Academic Research International Vol.3.No.2 pp178-183.

[4] Akintayo, E.T (2004): Characteristics and composition of parkia Biaglabba and Jatropha Curcas oil and seed, Bioresour Technol, 92, 307-310.

[5] Akinhanmi, T. F. Atasie, V.N and Akintokun, P.O. (2008): Chemical composition and physicochemical properties of cashew nut oil and cashew nut oil shell liquid. Vol.2, Issue 1 pp1-10.

[6] Akpanabiatu, M. I. Ekpa, A and Razzo, R (2001): Nutrient composition of Nigeria palm kernel from the dura and terner varieties of the oil palm. J. Fovel Chem. 72:173-177.

[7] NIOSA, (2007): NIOSA Pocket guide to chemical hazards.National Institute for occupational Safety and Health. www.cdc.gov/niosn/npg.pdfs/2005-149.pdf.

[8] Prevention of Food Adulteration Act (PFA) Act No 37 of 1934: part III, Rule No. 5 Appendix B Definition and Standard till date http://www.lawbookshop.com

[9] AOAC, (2000): Official Methods of Analysis. 14th Edition, Association of official analytical chemists, Washington DC, USA

[10] Aurand, L.W. Wood, A.E. Wells, M.R (1987): Food composition and analysis. Van nostrand Reinhold, New York, pp20-33, 181-220.

[17]

[11] Nieson, S.S (1994): Introduction to the Chemical Analysis of foods. Chapman and Hall, New York, pp 93-207.

[12] Pomeranz, Y. Meloan, E.C (1987): Food analysis: theory and practices 2nd ed. Van Nostrand Reinhold company, New York. Pp581-765.

[13] Mohammed, M.I and Hamza, Z.U (2008): Physicochemical properties of oil extracts from Sesamum indicum seeds Grown in Jigawa State.-Nigeria. Journal of Applied Science and Environmental management.

[14] Abaye, O.J. Aina, E.A and Okounghae, C.O (1998): Oil content and oil quality characteristics of some Nigeria oils seeds science forum. Journal of plant and Applied sciences. 1(1):17-23.

[15] Eromosele, I.C. Eromosele, C.O. Akintoge, A.O and Komolafe, T.O (1994): Characterization of oils and chemical analysis of the sees of wild plants. Plant food for Human nutrition, 46, 361-365

[16] Abitogun, A.S and Borokini, F. B (2009): Physicochemical Parameters and Fatty composition of Cashew nut oil. Journal of Research in National Development. Volume 7 No 2. Dec. 2009.