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Short Communication

Characterization of avocado pear (*Persea americana*) and African pear (*Dacryodes edulis*) extracts

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The oil from edible avocado pear *(Persea americana*) and African pear (*Dacryodes edulis*) were extracted with chloroform. The oil were characterized for melting point, refractive index, relative viscosity, free fatty acids, saponification value, iodine value, acid value and percentage unsaponifable matter. The percent oil content in the fruit pulp was determined. The oil content of avocado pear was 9.1% while that of African pear was 23.2%.The physico- chemical characteristics and fatty acid composition of these oils, suggest some industrial potentials.

Key words: Avocado pear, African pear, Oil, Fatty acid, Characteristics.

INTRODUCTION

African pear (Dacryodes eduls) and the avocado pear (*Persea americana*) are well known plants in West Africa. The fruits are edible and the bark, leaves, stem and roots are used as local medicine against diseases (Neuwinger, 2000; Jirovetz et al., 2003; Annabelle1 et al., 2004). In Nigeria, their fruits are gathered for household use or for sale in local markets.

Previous studies have shown that the seeds from these fruits contain oil which have considerable nutritional value. They could provide a useful supplement to animal feed (Obasi and Okoli, 1993; Ajiwe et al., 1997; Leaky, 1999) and the fruits are rich in lipid (Kinkela and Bezard, 1993; Mbofung et al 2002).

In this study, the oil from the pulp of the fruits was extracted, characterized and fatty acid composition determined to establish its industrial potentials.

MATERIALS AND METHODS

Extraction of the oil

50 g of the flesh was mashed in a mortar and pestle and dissolved in 100 ml of water. 300 ml of Chloroform was added to the sample solution, shaken thoroughly in a separatory funnel and allowed to stand for 1 h. The extraction process was repeated five times. The extract was collected in a round bottom flask and desolventized at 450oC. The percent yield of the oil was calculated.

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Physico-chemical characteristics

The olfactory evaluation of both oils was carried out. The capillary method of melting point determination was adopted. The refractive index was determined by a refractor-meter. Relative viscosity was determined by the use of Oswald U- tube viscometer. The free fatty acids, sponification, acid and iodine values were determined using the official method of analysis (A.O.A.C, 1995). The unsaponifiable matter was determined using the separation method.

Fatty acid determination

The fatty acid composition of the oil samples was determined using JCL 6000 for windows 2.0 Chromatography Data system. The retention times of the components were compared with the time of standards. The % fatty acid was obtained using the relationship in the equation:

$$\%\text{Fatty acid} = \frac{\text{Retention time of component X 100}}{\text{Retention time of sample}}$$

RESULTS AND DISCUSSION

Avocado pear (*P. americana*) and African pear (*D. edulis*) extracts were liquid at room temperature. This meant that they could be classified as oils. The percentage oil yield

Table 1. Physico-chemical characteristics of the oil samples.

Characteristics	Avocado pear	African pear
Physical		
Average melting Point	10.50^{o}C	80^{o}C
Refractive Index	1.462	1.456
Viscosity	0.357 poise	0.33 poise
Chemical		
Free fatty Acids (F.F.A.)	0.367%	1.100%
Saponification Values (S.V.)	246.840	143.760s
Iodine Value (A.V.)	42.664	44.079
Acid Value (A.V.)	5.200	15.280
Ester Value (E.V.)	241.640	128.480
Unsaponifiable Matter	15.250%	53.920%

Table 2. Fatty acid composition of the oil samples.

Component	Africa pear (% fatty acid)	Avocado pear (% fatty acid)
Lauric	-	-
Myristic	-	3.99
Palmitic	9.06	7.22
Stearic	15.46	12.86
Stearic Isomer	18.00	-
Oleic	26.63	22.00
Linoleic	30.85	24.79
Linolenic	-	29.14

for avocado pear was 9.1% and that of African pear 23.2%. The oil yield of the African pear was high in comparison with that of avocado pear. The lower yield of the avocado pear oil can be attributed to genetic factors and the solvents used for extraction. It has been established that the oil content of an avocado pear varies from species to species (Mason, 1981).

The melting point was 10.50^{o}C for avocado pear oil and 80^{o}C for African pear oil (Table 1). The variation could be due to difference in fatty acid composition. Melting point is dependent on the degree of unsaturation of the fatty acid present and also on the chain of fatty acid. The low melting point of the oils can also be attributed to their unsaturation (Gavin, 1981). Avocado pear oil can be used as salad oil in mayonnaise because of its low mel-ting point.

Relative viscosity depends on many factors such as the method of extraction, age, storage, degree of saturation and extent of oxidation of the oil being analyzed. The avocado pear oil had a higher viscosity than the African pear oil. This is probably due to its lower unsaturation when compared to the African pear oil. Increasing unsaturation decreases viscosity. Avocado pear could be used in the production of body cream as the low viscosity prevents the dryness of the skin when used as body cream (Berdick, 1972).

The refractive index is temperature dependent. It increases with increasing amount of saturation. Impurities (fatty acids, mono and diglyceride oxidation products, conjugated olefinic bonds) cause positive deviation. Refractive index is used to check purity and to follow and control hydrogenation and isomerisation process (Coenen, 1976). The avocado pear oil had a slightly higher refractive index (1.462), probably due to its lower unsaturation as compared to African pear oil (1.456).

The iodine value gives an indication of the degree of unsaturation of the oils. Higher iodine value is attributed to high unsaturation. The higher iodine value of the African pear oil is therefore due to its slightly higher unsaturated fatty acids content. Although it has been established that avocado pear oil was similar to olive oil, the iodine value of the avocado pear oil obtained in the study (42.664) was lower than that of olive oil (89.7). This could be the result of high oxygen uptake (oxidation) and isomerisation processes which usually lead to loss of unsaturation. The low iodine value when compared with other oils like cocoa butter, coconut oil, and palm oil, means that the oil can be used as plasticizers and lubricants.

Most of the fatty acids in oils are esterified with glycerol to form glycerides. Where abuse of the raw materials has occurred, considerable (>5%) free fatty acids is found. Hydrolysis occurs in the presence of moisture. This reaction is catalysed by some enzymes, acids, bases and heat. In this study, African pear oil had a higher free fatty acids value (1.1%) as a result of hydrolysis. Accordingly, the lower value of avocado pear. (0.37%) could be due to reduced hydrolytic activities. The free fatty acid is important in determining the suitability of oil as edible oil. The lower the free acid content, the more appealing the oil is (Coenen, 1976). The low free fatty acids of the oils (<5%) makes them suitable as edible oils.

Sponification value is inversely proportional to the mean molecular weight of the glycerides in the oil. The avocado pear oil had a much higher value (246.84) than that of the African pear oil (143.76). Both oils could be good for soap making but that of avocado pear oil will give a much better and harder soap because of its lower unsaturation.

The unsaponificable matter (sterols, phospholipids, waxes, terpanes etc) of avocado pear oil (15.25%) was low while that of the African pear oil (53.92%) was high. This implies that the African pear oil is less saponifiable than the avocado pear oil. This high percentage unsaponifiable matter can yield sterols. These sterols can be used in the production of drugs in pharmaceutical (Dibungi et al., 2002). The phospholipids extract also can be used in the production of lecithin, used in the manufacture of margarine, confectionery, shortenings, etc (Mason, 1981).

Table 2 shows the fatty acid composition of the oils. Myristic and linolenic acid were found in avocado pear but absent in African pear. An isomer of stearic acid was also identified in African pear, but absent in avocados pear. Linoleic acid which is one of the most important polyunsaturated fatty acids in human food because of its prevention of distinct heart vascular diseases (Boelhouwer, 1983) is found in both oils. Both oils are rich in oleic acid. Oils rich in oleic as in avocado pear and African pear oils display greater oxidative stability than those containing more unsaturated acids and therefore could be widely used as frying oils. This oxidative stability can prevent skin irritation caused by oxidation of the oil when used as body cream. In general, the composition of saturated and unsaturated fatty acids in Afican pear and avocado pear was 42.5 and 57.5%, respectively, while that of avocado pear was 24.1 and 75.1%, respectively. The fatty acid composition of both oils compares favourably with those of some conventional oils seeds like soybean, sunflower, palm oil etc (Akintayo, 2004). Utilization of these oil seeds will reduce our dependence on the popular vegetable oils like groundnut, palm and coconut oils for domestic and industrial purposes.

Conclusion

This study shows that African pear (*D. edulis*) and avocado pear (*P. Americana*) can both be used as an alternative resource base for fats and oils The physico-chemical characteristics and fatty acid composition of these oil suggest that they have some industrial potentials.

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