CANARIUM SHWELFURTHLL (PERSLEY) A SOURCE OF VEGETABLE OIL

E. J. ETERIGHO

Abstract

Indirect leaching was used to extract oil from Canarium shwelfurthll (commonly called Persley fruit). The leaching was carried out in three stages at different particle sizes and time. From the analysis, particle size 0.250mm gave the highest yield, which are 31.50%, 37.80%, 42.30% and 42.38% at various time for the three stages respectively. The extracted persley oil was characterized. The saponification value was 191.44, while the acid was 0.622, peroxide 10.42, iodine 86.04 and free fatty acid 1.41 respectively. The specific gravity and refractive index was 0.912 and 1.466 respectively.

Introduction

Since ancient times, fats and oils have been used by man as source of food and energy. The world population is increasing everyday and the production of vegetable oils and fats is not enough to meet the demand of the people due to increasing soap manufacturing, industrial and domestic uses (Lee, 1988). Persley fruit (*Canarium schweinfurthll)* is the fruit of a perennial tree. It is mostly found in the savanna region of West, Central and East Africa. It can be found in almost all parts of Nigeria. Keay *et al* (1964) identified three species of *Canarium*. These are *Canarium scheweinfurthll, Canarium zeglarium betz and Canarium authriabitum. Canarium* or Persley fruits contain a high percentage of oil usually about 40-45% (Davan, 1995). The oil finds a wide range of application, for example in cooking, soap making and in Australia, it is used for the manufacturing of vetenary medicine or vaccine, pharmaceuticals, baking and confectioneries. Like all vegetable oils, it contains mainly saturated and unsaturated fatty acids. Its proteins content is between 18-24%, carbohydrate (16.3%), total ash (3.26%) calcium (1.34%), phosphorus (0.8%) and water (18-26%) (Brown, 1979). The fruit in major languages in Nigeria is called Ukpoko (Ibo), Rigbo (Yoruba) and Atile (Hausa). The aim of this study is to produce vegetable oil from (*Canarium* schweinfurthl) persley fruit. It is hope that this will increase the source of vegetable oil.

Experimentals

Treatment of the persley fruit

The fruits were collected and washed to remove contaminants. Thereafter, they were boiled for 10 minutes to soften the tissues. The seeds were then removed using mortar and pestle. The pulp obtained was dried in an oven at temperature of 80 – 150°C for 6h and weighed until a constant weight was obtained. This was followed by particle size reduction (Fig. 1). Indirect leaching was used to extract the oil from the persley or *Canarium* pulp using normal hexane as the solvent at various times, (Brown, 1979).

E.J. Eterigho is with the Department of Chemical Engineering, Federal University of Technology Minna, Nigeria.

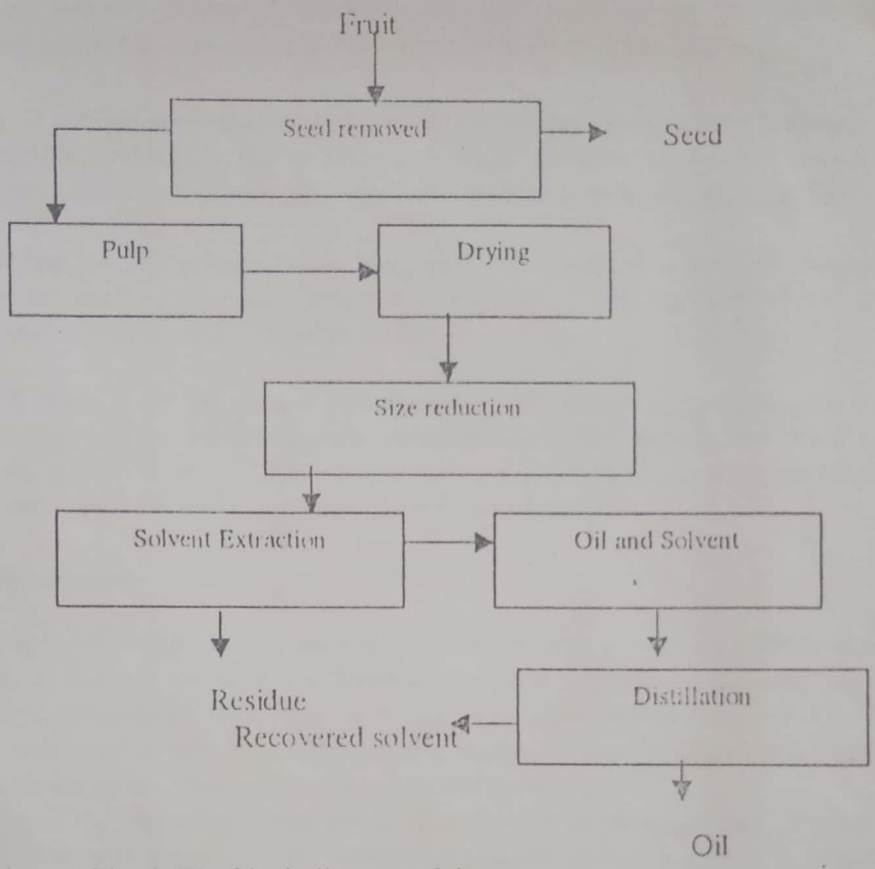

Fig. 1. The block diagram of the process

Chemical and physical characterization of Canarium oil

Saponification value: Few drops of the oil were put in conical flask and 25ml of ethanol potassium hydroxide was added. The flask was attached to a reflux condenser and heated for 60 mins in boiling water under constant shaking. 1ml of phenolphthalein was added to the mixture and titrated with 0.5m hydrochloric acid to an end point. The whole procedure was repeated with a blank solution i.e. without the oil (Lee, 1988).

Iodine value: Five millilitres of the oil sample was mixed with 20ml of chloroform and 25ml of Dam's reagent was added. The mixture was subjected to vigorous mixing and left in the dark for 90mins. Then 20ml of potassium iodide and 150ml of water were added. The mixture was titrated with 0.1mole of sodium thiosulphate solution. Few drops of prepared starch were added and titration continued (Lee, 1988).

Peroxide value: 5ml of the oil was mixed with 10ml of chloroform and stirred immediately. 1.5ml of acetic acid was added followed by the addition of 1ml of freshly prepared potassium hydroxide. 75ml of water was added and shaken vigorously. Few drops of starch solution were used as indicator. The resulting solution was titrated with 0.01mole of sodium thiosulphate solution, (Lee, 1988).

Free fatty acid value: 25ml of diethyl ether was mixed with 25ml of ethanol in a beaker containing 20ml of the oil sample. Phenolphthalein was used as the indicator. The mixture was titrated against 0.1mole of sodium hydroxide with constant shaking.

Acid value: 25ml of diethyl ether was mixed with 25ml alcohol; using phenolphthalein it was carefully neutralized with 0.1ml of sodium hydroxide. 10ml of the oil was added to the neutralized solvent and titrated with aqueous 0.1ml sodium hydroxide, (Lee, 1988).

Specific gravity: The specific gravity bottle was filled with distilled water and weighed. Equal volume of oil sample was also weighed using the specific gravity bottle and maintained in the water bath at 20°C (Warren, 1985).

Moisture content: 10ml of the oil sample was spread evenly across the evaporating dish and weighed as quickly as possible to minimize moisture loss. The sample was dried in a hot air oven for 4h at 80 - 150 C. The sample was cooled in a desiccator for 1h and reweighed. This was repeated until a constant weight was obtained.

Results and Discussion

The results (Tables 1 – 4) show the percentages of oil extracted at various particle sizes. The results indicate that the smaller the particle size, the higher the amount of oil extracted which is in accordance with the report of Coulson and Richardson (1991). The percentage of oil extracted is time dependant until a particular reaction time, when there is no significant increase in the amount of oil extracted (Davan, 1995).

Table 5 shows the various percentages of oil extracted at various times of particle size, 0.250mm. The results show that the maximum particle size is 0.250 at a reaction time of 2h, which gives the optimum yield. Though the particle sizes of 1.00mm, 0.850mm and 0.500mm gave various percentages of oil at increasing reaction time but that of 0.250 gave higher at 2. It is therefore not necessary to increase the reaction time beyond 2h (Warren, 1985).

The physiochemical properties of the extracted oil are; saponification value 191.61, iodine value 86.04, peroxide value 10.4,acid value 0.62 and free fatty acid value 1.41 respectively. The saponification value is the amount of alkaline required to saponify the oil. The iodine value is the amount of unsaturated fatty acid, which determines how reactive the oil is. The acid value is to determine if the oil is edible or not. The analysis shows that the extracted oil is good for soap industry, very reactive with oxygen to form gum and a good edible vegetable oil, since these values fall within the acceptable range reported by Kilglour (1987) and Norman (1995).

Conclusion

Canarium shwelfurthll (persley fruits), an agricultural product, is used as an alternative source in the production of edible oil. The oil was extracted and characterized with various particle sizes and the particle size of 0.250mm gave the optimum amount of oil (42.30%) at a reaction time of 2h. The saponification value shows the oil can be used in soap industry. The iodine value is high and shows that it is very reactive with oxygen on

exposure to form gum. The acid value is very low, thus the oil is a good edible vegetable oil. The colour is bright yellow, which means there is no need for bleaching.

Table 1. Various percentages of oil extracted at stage 1 (0.5h)

Weight of Sample (g)	Particle size (mm)	Average amount (ml)	Percentage of oil extracted
10	1.00	1.87	18.7
10	0.85	2.14	21.4
10	0.50	2.53	25.3
10	0.25	3.15	31.5

Table 2. Various percentages of oil extracted at stage 2 (1h)

Weight of Sample (g)	Particle size (mm)	Average amount (ml)	Percentage of oil extracted
10	1.00	2.41	24.1
10	0.85	2.62	26.2
10	0.50	2.99	29.9
10	0.25	3.78	37.8

Table 3. Various percentages of oil extracted at stage 3 (2h)

Weight of Sample (g)	Particle size (mm)	Average amount (ml)	Percentage of oil extracted
10	1.00	2.78	27.8
10	0.85	2.93	29.3
10	0.50	3.67	36.7
10	0.25	4.23	42.3

Table 4. Various percentages of oil extracted at stage 4 (3h)

Weight of Sample (g)	Particle size (mm)	Average amount (ml)	Percentage of oil extracted
10	1.00	2.84	28.1
10	0.85	2.95	29.5
10	0.50	3.69	36.9
10	0.25	4.33	43.3

Table 5. Summary of percentages of oil extracted using 0.250 (mm) particle

Stages	Particle size (mm)	Percentages of oil extracted	Time (hour)
1	0.25	31.5	0.5
2	0.25	37.8	1
3	0.25	42.3	2
4	0.25	42.4	3

References

Brown, S. (1959). *Food Science – A Chemical Approach*, 4th edition, Holder and Stroughton Limited, London, Pp. 112 – 114.

Coulson, J. F. and Richardson, J. M. (1991). *Size Reduction* 3rd Edition, Butterworth Heinemann Publishers, Oxford. pp. 48 – 49.

Davan, S.A. (1995). *Extraction of Oils from Non-Conventional Oil Seeds.* Edward Arnold Publisher, London. pp. 54 – 58.

Keay, R.W., Stand, F.B.P. and Onochie, O.F.O. (1964). *Nigerian Trees* Vol. II. Department of Forest Research, Ibadan, pp. 265-266.

Kilglour, D.F. G. (1987). *Mastering Nutrition,* 3rd Edition. AVI Publishers, London, pp. 208 – 210.

Lee, T. (1988). *Laboratory Hand Book on Methods of Food Ananlysis.* Leonard Hill Press, London, pp. 5 – 7.

Norman, M.J.T. (1995). *Tropical Food Crops in their Environment* 2nd Edition, Cambridge University Press Cambridge, pp. 562.

Warren, L. and McCabe, J.S.(1985) *Unit Operations of Chemical Engineering,* 3rd Edition, Mc Graw – Hill, Inc., London, pp. 616 – 703.