Short Communication

Production and refining of *Dacryodes edulis* “native pear” seeds oil

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Accepted 1 February, 2008

The suitability of native pear *Dacryodes edulis* seeds as a source of good quality vegetable oil was investigated. Oil was extracted from the dried seeds by simple solvent extraction process with hexane. Extracted oil was degummed using 0.2% Na₂CO₃ or H₃PO₄ solutions, and then bleached with activated carbon. Chemical (acid value (AV), saponification number (SN), peroxide value (PV), and iodine value (IV)) and physical (smoke point (SP), flash point (FP), melting point (MP) and freezing point) analyses were carried out on both the crude and refined oils. Results showed that the crude oil had AV of 9.6 mg KOH/g, SN of 72.8. Degumming (with 0.2%Na₂CO₃ and 0.2%H₃PO₄) and bleaching gave oils with lower AV (7.45 mgKOH/gfat) and higher acid value (9.4 mgKOH/gfat), respectively. Iodine value (48.78 ml/g) of the 0.2% Na₂CO₃ degummed oil was higher than that of the seed oil degummed with 0.2% H₃PO₄ (25.35 ml/g). Bleaching of 0.2% Na₂CO₃ degummed oil resulted in oil with peroxide value of 20 mgEq/Kg which was higher than that of 0.2% H₃PO₄ degummed and bleached (19.4 mgEq/Kg) oil.

Key words: Native pear, seeds, degumming, bleaching, deodorizing, extraction, vegetable oil.

INTRODUCTION

Oil extraction from oil bearing seeds and mesocarps can be done with the use of non-polar solvents such as hexane, diethyl ether and carbon tetra chloride. The expressed oils usually are composed of fatty acids (triglycerides), some mucilaginous, proteinaceous, pigments, resins and other fat oxidation substances which when left in oil will result in the production of off flavours, odours and colours and may reduce the shelf life of the oil. These substances are usually removed during refining processes (degumming, bleaching and deodorization).

Native pear, *Dacryodes edulis*, is consumed traditionally in Nigeria raw, roasted or boiled in hot water and is eaten alone, or used in garnishing fresh maize. It is widely found in many sub-Saharan countries including Nigeria, Liberia, Cameroons and Zaire (Boungou, et al., 1991). It may be available for up to 6 months of the year according to Eka (1977), Omoti and Okiy (1987) and Lam (1985). *D. edulis* can be a source of vegetable oil and the seeds of the fruit contain up to 18 - 70% oil (Gunstone and Norris, 1982). However, not much has been done in the characterization and refining of the oil. This study was done to investigate the possibility of producing good quality oil from the seeds of native pear (usually discarded after the consumption of the mesocarp). This will increase the economic value of the crop and add to the varieties of vegetable oils available to consumers.

MATERIALS AND METHOD

The ripe native pear fruits purchased from a local market in Abia state of Nigeria were cleaned and cut to remove the seeds, which were cut into small pieces and sun dried (during hammartan) for 48 h. The seeds were milled with a corona traditional corn mill REF 121 (100 µm mesh size). After milling the powder was packed in
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Table 1. Chemical and physical characteristics of
native pear seeds oil.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil content (%)</td>
<td>50.00±0.416</td>
</tr>
<tr>
<td>Iodine value (ml/g)</td>
<td>32.40±0.158</td>
</tr>
<tr>
<td>Acid value (mgKOH/g)</td>
<td>9.60±0.0 47</td>
</tr>
<tr>
<td>Saponification (mgKOH/g)</td>
<td>172.80±0.206</td>
</tr>
<tr>
<td>Peroxide value (meq/Kg)</td>
<td>6.00±0.047</td>
</tr>
<tr>
<td>Freezing point (0°C)</td>
<td>21.00±0.163</td>
</tr>
<tr>
<td>Melting point (0°C)</td>
<td>30.00±0.082</td>
</tr>
<tr>
<td>Smoke point (0°C)</td>
<td>198.00±0.047</td>
</tr>
<tr>
<td>Flash point (0°C)</td>
<td>270.00±0.094</td>
</tr>
</tbody>
</table>

Means of triplicate determinations.

cellophane bags and stored in a refrigerator for use. 70 g of the
milled seed sample was weighed into a 500 cm³ beaker and
thoroughly washed with 300 cm³ of hexane and filtered through filter
papers until every trace of oil was extracted from the sample. The
oil-hexane mixture (miscella) was separated by distillation using a
distillation apparatus. The oil was further heated over a Gallenkamp
distillation apparatus. The crude ‘native pear’ seed oil was degummed at 70
degree C with 10 cm³ of 0.2% phosphoric acid or sodium carbonate. 100 cm³
of the crude ‘native pear’ seed oil was degummed at 70°C with 10 cm³
of 0.2% H₃PO₄ or Na₂CO₃ solutions.

Aliquots of the degummed oil were bleached with 2% fuller’s
earth (activated carbon) at 110°C for 30 min (Jawad et al., 1983).

The crude ‘native pear’ seed oil was degummed at 70°C with 10 cm³
of 0.2% H₃PO₄ or Na₂CO₃ solutions.

Table 1 showed that all the treatments resulted in oils
of lower freezing point than the crude. This could have been as a result of the removal of
impurities in the crude. The crude ‘native pear’ seed oil was degummed at 70°C with 10 cm³
of 0.2% H₃PO₄ or Na₂CO₃ solutions.

The refining of extracted oil yielded better quality oil.
The characteristics of the crude ‘native pear’ seed oil is
presented in Table 1. The oil content of the ‘native pear’
seed was 50% as shown in the table. This makes the
seed to compare favourably with other oil bearing seeds
such as palm kernel (40%), peanuts (49%), cotton seed
(36%), and soybean (20%) (Abraham and Hron, 1992).

The crude oil analyses showed that the oil had IV of 32
ml/g, SN of 172.8 mgKOH/g, PV of 6 meq/Kg and AV of
9.6 mgKOH/g. The oil can be classified as a non drying
oil which the predominating fatty acid is oleic acid
because of its range of iodine value (Heiman, 1980). The
acid value of 9.6 mgKOH/g is within the range acceptable
for crude palm kernel oil in the processing industry. The
saponification number showed that the oil will be good for
the manufacture of soaps. The smoke point (198°C) and
flash point (270°C) meant that the oil will be good for
frying and will not dry out easily. The freezing point
(21°C) of the oil explains the fact that the oil is liquid at
room temperature.

Table 2 showed that degumming with Na₂CO₃ resulted
in oil with higher IV (48.78 ml/g) while H₂PO₄ degummed oil had 25.35 ml/g IV. Bleaching also increased the iodine
value of the degummed oil. The SN of the oil increased
dramatically both for the degumming and bleaching
processes. These increases in the iodine and saponification
number could have been as a result of the removal of
phosphatides, proteinaceous compounds, resins and
other impurities from the oil during the above mentioned
processes. Degumming increased the peroxide value of
the oil (14.20 meq/Kg for Na₂CO₃ degummed oil). The
increase in the peroxide value of the degummed oil could
have been due the addition of water which must have
resulted in acceleration of rate deterioration (rancidity) in
the oil. Degumming and bleaching however resulted in oil

RESULTS AND DISCUSSION

The characteristics of the crude ‘native pear’ seed oil is
presented in Table 1. The oil content of the ‘native pear’
seed was 50% as shown in the table. This makes the
seed to compare favourably with other oil bearing seeds
such as palm kernel (40%), peanuts (49%), cotton seed
(36%), and soybean (20%) (Abraham and Hron, 1992).

The refining of extracted oil yielded better quality oil.
Therefore, instead of discarding the seeds, as is
presently done, they can be processed into valuable
vegetable oil.

Conclusion

‘Native pear’ seeds contain high percentage of oil (50%).

The freezing point (21°C) of the oil explains the fact that the oil is liquid at
room temperature.
Table 2. Chemical characteristics of refined native pear seeds oil.

<table>
<thead>
<tr>
<th>Treatment (ml/g)</th>
<th>Iodine value (mgKOH/g)</th>
<th>Saponification Number (meq/Kg)</th>
<th>Peroxide value (mgKOH/g)</th>
<th>Acid value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na₂CO₃ degummed oil</td>
<td>48.78±0.039</td>
<td>292.36±0.014</td>
<td>14.20±0.025</td>
<td>7.45±0.047</td>
</tr>
<tr>
<td>H₃PO₄ degummed oil</td>
<td>25.35±0.141</td>
<td>238.40±0.163</td>
<td>16.00±0.480</td>
<td>9.40±0.163</td>
</tr>
<tr>
<td>Na₂CO₃ degummed and bleached oil</td>
<td>51.27±0.253</td>
<td>166.50±0.408</td>
<td>4.60±0.245</td>
<td>3.31±0.253</td>
</tr>
<tr>
<td>H₃PO₄ degummed and bleached oil</td>
<td>47.97±0.237</td>
<td>183.20±0.108</td>
<td>5.20±0.163</td>
<td>3.80±0.033</td>
</tr>
</tbody>
</table>

Table 3. Physical characteristics of refined native pear seeds oil.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Freezing point (°C)</th>
<th>Melting point (°C)</th>
<th>Smoke point (°C)</th>
<th>Flash point (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na₂CO₃ degummed oil</td>
<td>18±0.428</td>
<td>32±0.243</td>
<td>176±0.327</td>
<td>210±0.294</td>
</tr>
<tr>
<td>H₃PO₄ degummed oil</td>
<td>18±0.422</td>
<td>28±0.455</td>
<td>220±0.249</td>
<td>280±0.411</td>
</tr>
<tr>
<td>Na₂CO₃ degummed and bleached oil</td>
<td>18±0.450</td>
<td>20±0.330</td>
<td>176±0.340</td>
<td>280±0.166</td>
</tr>
<tr>
<td>H₃PO₄ degummed and bleached oil</td>
<td>19±0.205</td>
<td>22±0.374</td>
<td>220±0.083</td>
<td>290±0.163</td>
</tr>
</tbody>
</table>

REFERENCES


