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EXTRACTION AND CHARACTERIZATION OF IPLE-IPLE (*Leucaena leucocephela*) SEED OIL

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Using n-hexane as solvent, a greenish yellow oil was extracted (yield 5%) from iple-iple seeds. The oil with sp. gravity 0.8, refractive index 1.469, viscosity 0.475 poise, acid value 2.8, saponification value 154, iodine value 109.76, R. M. value 1 and unsaponifiable matter 3.07%, melted at 17°C. The oil contained C_{16} (14.8%), C_{18} (5.3%), C_{22} (1.4%) as major saturated and $C_{18:1}$ (16.2%), $C_{18:2}$ (55.0%), $C_{18:3}$ (2.4%) as main unsaturated fatty acids. Protein, crude fiber, nitrogen free extract, reducing sugars, calcium and phosphorous contents of the oil cake were found to be 43.75, 6.6, 35.00, 1.18, 0.68 and 0.01% respectively.

INTRODUCTION

Leucaena leucocephela locally known as iple-iple is a salt tolerant tree which has recently been introduced in Pakistan as a fast growing tree with its potential use as forage, fire-wood, timber, etc., (Brewbaker, 1975). In view of the fact that a large area of arable land in Pakistan is saline sodic, cultivation of such trees in these soils not only reclaims soils (Sandhu and Malik, 1975) but also provids huge amounts of biomass which may be converted to usable energy Besides various other plants screened for salt tolerance (Anonymous, 1982). extensive work is underway on iple-iple to test its potential for colonizing saline lands (Kausar *et al.*, 1985). In addition to its being a source of fire-wood, etc., iple-iple tree bears seeds containing appreciable amount of oil. It was therefore, planned to isolate and characterize the oil from the seeds of locally growing iple-iple tree.

MATERIALS AND METHODS

Authentic seeds of iple-iple (*Leucaena leucocephela*) were procured from Nuclear Institute of Agriculture and Biology, Faisalabad. The seeds were washed free of any extraneous materials, ground to uniform size and dried to

4% moisture level and extracted in a Soxhlet extractor for eight hours using n-hexane as a solvent. Rotary evaporator was used to remove the last traces of the solvent. The oil thus obtained was kept in air tight container at 4°C till analysed.

For physico-chemical characterization of the oil and the oil cake, standard methods as described in A. O. A. C. (1984) were followed. Fatty acid composition was determined on Perkin Elmer gas chromatograph model 3920 using flame ionization detector. Esterification of the oil was carried out by incubating it with a mixture of methanol sulphuric acid (4 : 1) at 80°C for 2 hours. The reaction mixture was diluted with water and extracted with n-hexane, which was removed by flushing with nitrogen. The resulting mixture of fatty acid esters was put on a column of 20% diethylene glycol succinate on chromosorb (80-100 mesh). The flow rates of nitrogen, hydrogen and air were 25, 40 and 500 ml/min. respectively. Injector, column and detector temperatures were kept at 200, 100 and 250°C respectively.

RESULTS AND DISCUSSION

Keeping in view the salt tolerant nature of iple-iple tree and the vast barren salt affected areas of Pakistan, where this tree could be grown successfully, its seed oil was extracted with n-hexane and characterized physico-chemically by recommended methods. Gas liquid chromatography and micro kjeldahl methods were respectively employed for determining the fatty acid composition of the oil and the protein content (6.24 x nitrogen content) of the oil cake. Other important constituents of the oil cake were also determined.

The examination of physico-chemical characteristics of oils is regarded important from the stand point of their edible as well as industrial use. Such characterics as determined for the oil isolated from iple-iple seeds have been presented in Table 1, while the approximate composition of the oil cake is given in Table 2.

The oil, greenish yellow in colour e melted at 17°C and possessed iodine value as 109.76 which showed the presence of a good extent of unsaturated fatty acids (75.3%) which mainly consisted of linoleic acid (55%) and oleic acid (16.2%). On the basis of its iodine value the oil may be termed as a semidrying oil. Among the saturated fatty acids contained in the iple-iple seed oil, major acid is palmitic (14.8%) followed by stearic acid (5.3%). The presence of palmitic,

stearic, behenic, lignoceric, oleic and linoleic acid has also been reported by Farooq and Siddiqui (1954) in the seed oil of iple-iple grown in India. However, the oil content of the seeds of Indian variety of iple-iple was higher (8.8%) as

Table 1. *Physico-chemical characteristics of iple-iple seed oil*

1.	Percentage of oil in seed	50
2.	Percentage of moisture in oil	0.485
3.	Melting point	17°C
4.	Specific gravity (30°C)	0.8
5.	Refractive index (30°C)	1.469
6.	Viscosity (30°C)	0.475 (poise)
7.	Iodine value	109.76
8.	Acid value	2.8
9.	Saponifiction value	154
10.	R. M. value	1.0
11.	Free fatty acids	1.82%
12.	Unsaponifiable matter	3.07%
13.	Fatty acids	
a)	*Saturated*	
i)	C_6 - C_{14}	1.73%
ii)	C_{16} (palmitic acid)	14.8%
iii)	C_{18} (stearic acid)	5.3%
iv)	C_{22}	1.4%
v)	C_{20} - C_{24}	2.9%
b)	*Unsaturated*	
i)	C_{18} : 1 (oleic acid)	16.2%
ii)	C_{18} : 2 (linoleic acid)	55.0%
iii)	C_{18} : 3 (linolenic acid)	2.4%
iv)	C_{12} : $_{1,2}$ + C_{14} : $_{1,2}$ + C_{16} : $_{1,2}$ + C_{22} : $_{1,2}$	1.7%

compared to that of local variety which had 5.0%. Other characteristics reported by Indian workers were : iodine value (110.11), refractive index (1.4674), saponification value (104.95) and unsaponifiable matter (4.7%). These values are, in

general, in close agreement with the corresponding values of the oil from the local variety. The difference in the saponification value and the unsaponifiable matter of the oils fromthe local and Indian varieties of iple-iple seeds could be due to the difference in variety, climate or soil.

Table 2. *Chemical composition of oil cake*

1. Protein (%)	43.75
2. Crude fiber (%)	6.60
3. N. F. E. (%)	35.00
4. Reducing sugars (%)	1.18
5. Calcium (%)	0.68
6. Phosphorous (%)	0.01

The crude oil with a disagreeable odour, when refined by usual methods gave a light yellow oil with no smell and could be used for soap, unsaturated fatty acids and candle manufacture and asa lubricant. However, toxicological and biological studies are to be carried out for determining its suitability as an edible oil. The oil cake containing 43.75% protein could serve as a promising source of protein for poultry and livestock feeds.

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