Pak. J. Agri. Sci.
25(4)255, 1988

EXTRACTION AND CHARACTERIZATION OF BAUHINIA VERIGATA (KACHNAR) SEED OIL

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A brownish yellow oil (16.2% yield) was extracted from 'Kachnar' seeds. The oil showed specific gravity 0.84, refractive index 1.4654, viscosity 0.43 poise, melting point 16.5°C, saponification value 166, iodine value 79, acid value 1.66 and unsaponifiable matter 1.12 %. Gas chromatographic analysis showed the presence of linoleic (38.26%), oleic (26.14%), palmitic (19.52%) and stearic acid (16.95%) in the oil. Crude fiber, protein, ash, NFE, reducing sugars, calcium and phosphorus contents of the oil cake were 6.27, 40.83, 9.22, 43.6, 1.25, 0.32 and 0.0125% respectively. The oil was recommended as a potential source of raw material for oil based industries.

INTRODUCTION

Fats and oils have been essential constituents of human food since prehistoric time. The primitive man used fats not only as food but also as source of heat and light. Today we know that a gram of fat provides 9.3 Kcal of heat as compared to proteins and carbohydrates which supply only 4.1 Kcal/gram. Certain vitamins and essential fatty acids are also provided through fats and oils.

Nearly 67% of world's demand for fats and oils is met from vegetable sources, 31% derived from animals and only 2% from fish (Kirk and Othmer, 1980). In Pakistan, like other developing countries, the gap between production and demand

of vegetable oil is increasing day by day with increasing population and establishment of new oil based idustries. Pakistan is producing 0.454 million tonnes of vegetable oil against the demand of 1.151 million tonnes per annum, for which she has to import 0.796 million tonnes spending 7176.98 million rupees per annum to cater the national need (Anonymous, 1987-88). It is therefore imperative to increase the oil production either by employing extensive agricultural practices or by exploiting some non-conventional sources of oils. The seeds of Bauhinia verigata grown in India have been reported to contain 16% oil (Zaka et al., 1983). The work presented in this paper describes the extraction and characterization of the oil of seeds of Bauhinia verigata grown in Punjab, Pakistan.

MATERIALS AND METHODS

Fully mature seeds of Bauhinia verigata (Kachnar) were collected from the plants during April 1987 by opening the pods along the ventral suture. The seeds were air dried, ground to a uniform powder and then dried to a constant weight. A known weight of the dried sample was extracted in a Soxhlet extractor for six hours using n-hexane as a solvent, after which the solvent was distilled and the oil was heated under vacuum at 60°C to remove the last traces of solvent and stored at 4°C in a glass bottle till analysed further.

For physico-chemical characterization of the oil and 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 (DEGS) on chromosorb (80-100 mesh). The flow rates of nitrogen, hydrogen and air were 25, 40, 500 ml/min. respectively. Injector, column and detector temperatures were kept at 200, 100 and 250°C respectively.

RESULTS AND DISCUSSION

For better evaluation, each characteristic of Bauhinia verigata seed oil has been discussed below separately (Tables 1 and 2).

i) **Percentage of oil in seed:** It has been found that the seed contained 16.2% oil which is very close to the value reported by Zaka et al. (1983) for Kachnar seeds of Indian origin. The oil content of Bauhinia malabarica seeds has also been reported to be nearly the same by the same workers. In this regard the Kachnar seed may be compared with soybeans and peanuts which contain 17.2% and 19.2% oil respectively (F.A.O., 1972).

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

Oil in seed (%)	16.2
Specific gravity	0.84
Refractive index	1.4654
Viscosity	0.43 (poise)
Melting point	16.5 C
Saponification value	166.0
Iodine value	79.0
Acid value	1.66
Unsaponifiable matter (%)	1.12

ii) **Physical characteristics:** The values for physical characteristics like melting point (16.5°C), specific gravity (0.84), refractive index (1.4654) and viscosity (0.43 poise) as determined for the isolated Kachnar seed oil fell in the usual range of respective values for common vegetable oils (Kirk and Othmer, 1980).

iii) **Saponification value:** Saponification value of an oil gives an idea about the size, i.e. molecular weight of the fat molecule. For Kachnar seed oil, this value has been found to be 166 as compared to the value 189-198, 188-194 and of 189-195 for cotton seed, sunflower and soybean oils respectively (F.A.O., 1972).

Table 2. *Percentage fatty acid composition of Kachnar seed oil*

	Local variety	Indian variety	
		(Zaka et al., 1983)	Badami and Shanbhag (1973)
Linoleic acid	38.26	36.84	35.5
Oleic acid	26.14	26.14	12.5
Palmitic acid	19.52	19.52	20.5
Stearic acid	16.95	16.95	12.0
Linolenic acid	0.48	0.55	---

iv) **Iodine value:** Iodine value is an index of unsaturation of fatty acids contained in a fat molecule. Kachnar seed oil has iodine value as low as 79 which is indicative of its low unsaturated fatty acid content. In this respect, Kachnar seed oil resembles margarine, olive oil and hazal oil with respective iodine values as 72, 85 and 86 (F.A.O., 1972).

v) **Acid value:** It indicates the free fatty acid content of an oil and determines the refining losses. The acid value of Kachnar oil as found in this study is 1.66.

Table 3. *Percentage composition of Kachnar seed oil cake*

Crude fiber	6.27
Protein	40.83
Ash	9.22
NFE	43.6
Calcium	0.32
Phosphorus	0.0125
Reducing sugar	1.25

vi) **Fatty acid composition:** In order to evaluate an oil or fat, it is essential to determine its fatty acid composition. Fatty acid composition of Kachnar seed oil has been given in Table 2 alongwith the corresponding values as reported by Badami and Shanbhag (1973) and Zaka et al. (1983) for oil of Kachnar seeds of Indian origin. Minor differences in the percentage composition of individual acids as determined for local Kachnar seed oil and the reported values may be due to differences in variety, climate, soil, etc. From the data given in Table 2, it is evident that the major fatty acid present in Kachnar oil is linoleic (38.26%) followed by oleic (26.14%), palmitic (19.52%) and stearic (16.95%).

vii) **Composition of oil cake:** The percentages of major components of the oil cake have been presented in Table 3. It is evident from this table that the Kachnar seed oil cake is highly rich in protein (40.83%) with high NFE (43.6%) and ash content (9.22%); the latter value is indicative of its good mineral source. Protein content of Indian variety of Bauhinia verigata seed oil cake has been reported to be 41% by Zaka et al. (1983).

Based upon the reported physico-chemical characteristics of the indigenous Bauhinia verigata (Kachnar) seed oil and its cake it is suggested that this oil if exploited commercially could be an additional raw material for soap making and other oil based industries. However, feeding trials are required to be carried out for looking into its suitability as an edible oil. Moreover, the oil cake could be used as protein source in cattle and poultry feed. Amino acid composition of the oil cake protein needs to be determined for its better evaluation and commercial exploitation.

REFERENCES

Anonymous. 1987-88. Economic Survey. Economic Advisor's Wing, Ministry of Finance, Government of Pakistan, Islamabad.

A.O.A.C. 1984. Official Methods of Analysis. Association of Official Analytical Chemists, Washington-DC, U.S.A.

Badami, R.C. and M.R. Shanbhag. 1973. Component acids of six seed oils J. Oil Technol. Assoc., India, 5(4):68-70.

F.A.O. 1972. Food Composition Tables for use in East Asia. F.A.O. Food Policy and Nutrition Division, 00100, Rome, Italy.

Kirk, R.E. and D.F. Othmer. 1980. Encyclopedia of Chemical Technology, Vol.9. pp. 408. John Wiley and Sons, New York, U.S.A.

Tasneem, S., R. Ahmad and S. Ahmad. 1988. Extraction and characterization of iple-iple (Leucaena leucocephala) seed oil. Pak. J. Agri. Sci. 25(1):1-4.

Zaka, S., M. Saleem, V. Shakir and S.A. Khan. 1983. Fatty acid composition of Bauhinia verigata and Bauhinia malabarica seed oil: Comparison of their physico-chemical properties. Fette Seifen Austrichemittee, 85(14):169-170.