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Chemical and Nutritional Studies on the Seed Oil of *Aristolochia bracteata*

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Abstract: The seed of Aristolochia bracteata contain 5.2 % oil. Physicochemical constants and fatty acid composition of the refined seed oil were determined. The seed oil was rich in linoleic acid (39.2 %) and oleic acid (32.8 %). Trace quantities of epoxy and hydroxy fatty acids were present in the seed oil. Nutritional evaluation of the refined seed oil was done by rat bioassay with peanut oil as control. The animals fed 10 % seed oil showed poor growth performance and low feed efficiency ratio. The digestibility of the seed oil was 90 % compared to 94 % for peanut oil. The seed oil in the diet of rats for 4 weeks did not produce any abnormal serum lipids or histopathological findings.

Key words: Chemical, nutritional, seed oil, *Aristoiochia bracteata*

Introduction

The plant *Aristolochia bracteata* Retz.(Aristolochiaceae) known as Umm-jalajil or irig al-agrab. The plant is an indigenous Sudan herb (Andrews 1985) found in practically all parts of the country especially in the Eastern, Western and Central parts of Sudan (Chandra and Rao 1996). It is a trailing glaucous, perennial herb or undershrub. The species as seen naturally durin kharif and it grows on heavy black cotton soil (Watt and Breyer, 1986). It is used in traditional medicine for the treatment of some diseases, the most important of which is snake bites, scorpion stings and as cure for boils and guinera worm (Irvine 1991). In this communications, we report the chemical and nutritional properties carried out on the oil derived from the seed of *Aristolochia bracteata*

Materials and Methods

Aristolochia bracteata seeds were collected from Shambat Area (Khartoum-North) in January 1992 and was identified by Professor Ekhlass Abd-El-bari, Department of Botany, Faculty of Science, University of Khartoum. The crushed seeds (1550 grams) were extracted with petroleum ether (A.R., 60-80 °C) in asoxhlet apparatus. The crude oil was refined according to the AOAC method Mandal *et al.* (1985) and bleached with activated earth (2 %) and carbon (0.2 %). The physicochemical constants were determined by conventional methods Harris (1987). The oil was qualitatively examined for the presence of hydroxy, epoxy and cyclopropene fatty acids by the turbidity Rebatock (1997) Picric acid Lakshminarayana (1983) and Mandal *et al.*, (1983) tests, respectively. The refind oil was treated with diazomethane to esterify the free fatty acids and then transesterified with methanol containing 10% sodium methoxide. The methyl esters were purified on 0.5 mm layers of silica gel G with amixture of petroleum ether (40-60°C) and diethylether (90-10, v/v). Methyl esters were used for determinig the fatty acid composition by GLC (Perkin-Elmer FII) with a 15 % DEGS column on chromosorb WHMDS Carrol (1995). Infrared spectra (IR) of the oil and its methyl esters were obtained with a Beckman Model 221. IR spectrophotometer in KBr disc, and ultraviolet (UV) absorption was measured in CCl_4 on a Beckman 26 UV-visible spectrophotometer. Thin layer chromatography (TLC) of the oil and its methyl esters was done separately on 0.25 mm silica gel G coated glass with n-hexane, diethylether and acetic acid (79:20:1). The plates were sprayed with concentrated sulphuric acid for detection. The methyl esters of the oil was used for reference.

Nutritional Evaluation of the Seed Oil: Twelve male albino rats of local strain (inbred in our laboratory), age 20-24 days and weighing about 50-60 grams were divided into two groups of 6 animals each and individually caged. The animals in each group were fed astock standard diet containing 10 % oil Folch *et al.* (1999). Other ingredients of the diets were (g/kg); casein 200, starch 400, sucrose 200, cellulose powder 50, salt mixture 10 and vitamin mixture 10. One group of animals was fed on 10 % peanut oil diet and another on 10 % refind, *Aristolochia bracteata* seed oil diet. The animals receved their assigned diet and water adlibitum for 4 weeks. Food intakes were recorded daily, and body weights weekly. Feed efficiency ratio (FER), which represents the weight gain per unit food intake, was calculated. Digestibility of the oil was determined by estimating the oil intake and oil excreted through urine and feces Novak (1999). At the end of 4 weeks, the animals were sacrificed; blood was collected, and total lipids (Sperry and Webb, 1990) phospholipids (Pant and Bishnol, 1997) free fatty acids Sharpe *et al.* (1995) and cholesterol (Harrison and Mellanby, 1993) were determined. Key organs such as liver, beart, kidney and teproductive were subjected to histopathological examination under the microscope.

Results and Discussion

Phytochemical characteristics and fatty acid composition of the seed oil are shown in (Table 1). The Halphen test was negative indicating the absence of cyclopropene fatty acids. The UV and IR spectra showed no conjugated or trans unsaturation respectively. Positive turbidity and picric acid tests indicated the presence of epoxy and hydroxy fatty acids in the seed oil. TLC of the methyl esters of the seed oil showed only faint spots corresponding to epoxy and hydroxy fatty esters, suggesting their presence in trace quantities. IR spectra also showed light characteristic bands for epoxy and hydroxy fatty acids. The seed oil contained alarge amount of unsaturated fatty acids and was rich in linoleic acid (39.2 %) and oleic acid (32.8 %). The result of the short feeding study are shown in (Table 2). The rats fed 10 % refined seed oil showed poor growth performance and low FER compared to those fed 10 % peanut oil, digestibility of the seed oil was 90 % compared to 94 % for peanut oil. The serum lipid parameters of the animals fed refind seed oil were within the normal biological range. No histopathological abnormalities were found in any organ of the rats fed refind seed oil. Thus the refind seed oil is apparently non-toxic to lower animals such as rats. Owing to low oil content of the seed and inferior nutritive value of the seed oil, the seed of *Aristolochia bracteata* should not be considered for commercial exploitation as asource of dietary fat.

Table 1: Physicochemical constants and fatty acid composition of *Aristolochia bracteata* seed oil

Oil constants	
unsaponifiable matter (%)	2.4
saponification value	194.4
acid value	3.4
iodine value	105.6
refractive index (25°C)	1.4723
fatty acids (wt %)	
palmitic (16:0)	14.6
stearic (18:0)	6.2
oleic (18:1)	32.2
linoleic (18:2)	39.2
linolenic (18:3)	3.1

Table 2: Growth rate and serum lipids of rats fed peanut oil and *Aristolochia bracteata* seed oil for four weeks*

Parameters studied	Oil sources	
	Peanut oil	Refind *A. bracteata* seed oil
body wt gain (g/28 days)	48.2 ± 4.6	36.2 ± 2.8*
FER	24.3 ± 2.4	18.2 ± 2.1*
digestibility of fat (%) seruim	94	90
total lipids (mg/100ml)	125.4 ± 8.3	122.6 ± 5.4
phospholipids (mg/100 ml)	78.2 ± 1.6	72.3 ± 3.4
cholesterol (mg/100 ml)	62.8 ± 4.3	67.3 ± 3.9
free fatty acids (m.mol /L)	0.32 ± 0.02	0.32 ± 0.04

*Values are mean ± SEM for 6 animals

*Levels of significance (student t-test) with respect to peanut oil group, $P < 0.01$

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References

Andrews, F. W., 1985. Flowering plants of the Anglo-Egyption Sudan, T. Runcle and company Ltd., Arbroathscotland, 1:21.

Carrol, K. K., 1995. International Union of Pure and Applied Chemistry. Standard Methods for the Analysis of the Oils and Fats, London, Butterworths, 399.

Chandra, D. I. and K. N. Rao, 1996. PANS, Pest Articles and New Summaries, 29:223-229.

Folch, J. M., M. Less and H.S. Stanley, 1999. J. Biol. Chem., 226: 497.

Harris, J. A., F. C. Monge and E. L. Skau, 1987. Official Standardized and Recommended Methods of Analysis by the Society of Analytical Chemists, 2nd edn. p 675. AOAC, London.

Harrison, D. C. and E. Mellanby, 1993. Purification and characterization of pectinesterase from Aristolochia awkeotsang. J. Biochemistry, 33:1660.

Irvine, R. N.,1991 Glossary of Indian Medicinal Plant (CSIR), p 24. New Delhi.

Lakshminarayana, G., 1983. J. Amer. Oil Chem. Soci., 45:23.

Mandal, B. S. and M. Ghosh, 1984. J. Sci., Res., 6:19.

Mandal, B. S. and C. R. Maity, 1983. Manual of clinical microbiology 6th edn. Washington: D.C. ASM Press.

Mandal, B. S., M. Ghosh and C. R. Maity, 1984. J. Amer. Chem. Soci., 61: 1447.

Mandal, B. S., M. Ghosh and C. R. Maity, 1985. Fao food for the analysis of oils, fats and derivatives. J. Oil Technological Association 17:1.

Novak, M.,1999. Chemical analysis of the fruit of *Aristolochia doniana* (Aristolochiaceae). J. Lipid Res., 62:431.

Pant, R. and Q. Bishnol, 1997. Chemical investigation of *Verbena bonariensis* and its antifertility activity. Current Sci., 14:376.

Rebatock, M. C., H. M. Crooka and Q. R. Barta, 1997. Official and Tentative Methods of the American Oil Chemists Society 3rd edn. AOCS, Champaign, 11.

Sharpe, L. M., W. C. Peacock and R. S. Harris, 1995. Detailed chemical investigation of the seed oil of *Vitex trifolia* Linn. J. Nutr., 41: 433.

Sperry, M. and I. Webb, 1990. 4,5-Unsaturated low molecular Oligogalacturonide as apotent phytoalexin-elicitor isolated from Polygalacturonide of *Aristolochia indica*. J. Biol. Chem., 187: 97.

Watt, J. M. and M. G. Breyer, 1986. Poisonous plants of Southern and Eastern Africa, E. and S. Living Stone Ltd., London 2nd edn. 118