Pak. j. sci. ind. res., vol. 35, no. 7-8, July-August 1992

CHEMICAL INVESTIGATION OF WHITE SEEDED VARIETY OF *ABRUS PRECATORIUS* LINN.

SAEEDAN BEGUM
Department of Chemistry, University of Karachi, Karachi-75270, Pakistan

(Received April 26, 1992)

The fatty acids of the oil of the white seeded variety of *Abrus precatorius* Linn. have been identified by GLC. They are palmitic (15.8%), stearic (4.9%), oleic (46.4%), linolenic (0.5%), arachidic (19.2%) and Behenic acid (13.4%). Gallic acid and Abrine were isolated and the sugars and amino acids were characterised by chromatographic studies.

Key words: Fatty acids, *Abrus precatorius* Linn.

Introduction

Abrus precatorius Linn. is a wildly growing shrub in the plains of India, Burma and other tropical countries. The seeds are physiologically active and find use in the treatment of a variety of ailments [1]. Three different varieties of the plant are known namely white, black and scarlet seeded varieties. Pharmacological and chemical studies have been carried out on the scarlet seeded variety and a number of workers have investigated terpenoids [2,3], steroids [4,5], alkaloids [6-10], glycosides [11,12], amino acids [13-17], anthocyanins [18], flavonoides [19], carbohydrates [20-24] and fatty acids [25-27] of this variety.

In view of the little work done on the white seeded variety and the importance attached in folklore to the white seeds as an antifertility agent [27], it was considered of interest to undertake a systematic study of the white abrus seeds and compare the results with the findings of earlier workers on scarlet seeds.

Experimental

1.2 Kilograms of the ground seeds (30 mesh) were exhaustively extracted with 1.5 litres of petroleum ether (40-60°) in a Soxhlet, till no fatty matter was obtained on evaporation of the solvent. After removal of the solvent under reduced pressure a golden yellow oil was obtained. 10 Milligrams of this oil was methylated in a tightly corked transmethylation tube with 5 ml of 20 % methanolic sulphuric acid at 80° for two hr. This was diluted with 3 ml of water and the fatty acids were extracted thrice with 4 ml of petroleum ether. The combined extracts were concentrated and analysed on a Varian GLC equipped with flame ionization detector. The glass column (5 ft.x 0.8 inches ID) was charged with 20% DEGS Chromosorb W. The column, detector and injection port were operated at 190, 230 and 170° respectively. Nitrogen and hydrogen were passed at a flow rate of 30 and 20 ml/min. The identification of the acids was made by chromatography of the fatty acid methyl esters with standard mixtures of fatty acids methyl esters provided by NIH, Bathasada, Maryland and also by plotting the log retention volume against carbon numbers. For the quantitative analysis the sample (10 mg) was methylated with 0.1mg of heptadecanoic acid. The petroleum ether extract was also used for the determination of density, specific rotation, tintometer number, acid value and saponification value etc. Sugars, amino acids and other components were extracted by a established procedure [28].

Results and Discussion

Table 1 shows that the oil belongs to the non drying class and is leavo-rotatory. The oil characteristics differ from those reported in the literature [25] because we are studying a different seeded variety and also following a different extraction procedure. The white seeded variety has a higher fatty acid content, lower saponification, iodine values and a higher precentage of unsaponifiable matter.

Table 2 represents results of our GLC studies. Analysis of chromatogram suggests the presence of four peaks corresponding to saturated fatty acids with 16, 18, 20 and 22 carbon atoms, a fifth peak with one double bond and 18 carbon atoms and a sixth one with three double bonds and 18 carbon atoms. Thus we identify these peaks as suggested in the Table. All these acids were also detected in the scarlet seeded variety. However, lignoceric and linoleic acid which were present in the scarlet seeded variety were found to be absent in the variety under study by us, besides the percentage of acids 1, 7 and 8 is significantly higher and that of 4 is lower in white seeded variety.

The sugars identified by paper chromatography (ethylacetate, acetic acid, formic acid, water (18;3:1:4) after total hydrolysis of the extract and comparison of the R_f values with the R_f values of the authentic samples were aldobiuronic acid, D-galactose, L- arabinose, D-Xylose and L-rhamnose. Similarly galactose, galacturonic acid, digalacturonic acid and an aldobiuronic acid- 2-0-α–D-, galactopyranosyluronic acid L-rhamnose which has been detected in many pectin samples [29] were identified, after partial hydrolysis, by paper chroma-

tography (ethylacetate, formic acid, water (18:3:1:4) and comparison of their R_f values with the values of authentic samples. Gallic acid and the alkaloid abrine were also isolated from the alcoholic extract. These were identified by infra-red spectroscopy and the comparison with the TLC's and m.p.s of the authentic samples.

TABLE 1.

	Mandiratta and Dutt	Present work
1. % of oil	2.5	2.0
2. d	0.918 (24°)	0.910 (28°)
3. n	1.47	1.74
4. Saponification value	187.5	172.4
5. Acid value	4.8	24.1
6. Iodine value	90.6	85.3
7. Hehner value	96.2	–
8. Acetyl value	7.2	–
9. Unsaponifiable matter	1.3	5.4
10. $[\alpha]_D^{20}$	–	3.8
11. Thiocynogen value	–	67.5
12. Tintometer number	–	1.0 (Yellow) 0.4 (red)

TABLE 2. PERCENTAGE OF TOTAL FATTY ACIDS.

Acids	Mandiratta and Dutt	Present work
1. Palmitic	1.07	15.6
2. Stearic	4.65	4.9
3. Oleic	46.02	46.4
4. Linolenic	18.49	0.50
5. Linoleic	12.64	N.D.
6. Lignoceric	2.54	N.D.
7. Arachidic	5.07	19.2
8. Behenic	4.42	13.4

N. D = not detected.

References

1. W. Dymock, C. J. H. Warden and D. Hooper, *A History of the Principle Drugs of Vegetable Origin* (Kegan, Paul, Trench, Trubner, London, 1893), Vol.I, pp. 430.
2. T. C. Chiang, H. M. Chang and T. C. W. Make, Planta Medica, **49,** 165 (1983).
3. M. S. Lefar, D. Firestone, E. C. Coleman, N. Brown and D. W. Shaw, J. Pharm. Sci., **A57,** 1442 (1968).
4. S. Siddiqui, B. Siddiqui and Z. Naeem, Pak. j. sci. ind. res., **21,** 158 (1978).
5. N. Ghatak and R. Kaul, J. Indian Chem. Soc., **9,** 383 (1932).
6. S. Ghosal and S. K. Dutta, Phytochemistry, **10,** 195 (1971).
7. M. S. Karawya, S. El-Gengaihi, G. Wassel and N. A. Ibrahim, Fitoterapia, **19,** 21 (1980).
8. W. J. Xiao, Y. Shen and L. T. Huang, Shengwu Huaxue Yu Shengwu Wuli Jinzhan, **4,** 59 (1987).
9. K. R. Markham, J. W. Wallace, Y. N. Babu, V. K. Murty, and M. G. Rao, Phytochemistry, **28,** 299 (1980).
10. Y. H. Choi, A. D. Kinghorn, X. Shi, H. Zhang and B. K. Teo, J. Chem. Soc. Chem. Commun., **13,** 887 (1989).
11. Y. H. Choi, R. A. Hussain, J. M. Pezzuto, A. D. Kinghorn and J. F. Morton, J. Nat. Prod., **52,** 1118 (1989).
12. M. Riaz and A. H. Khan, Pak. j. sci. ind. res., **16,** 99 (1964).
13. D. Sharma, D. S. Misra and B. K. Soni, J. Chinese Chem. Soc., **15,** 67 (1968).
14. Z. H. Zaidi, B. S. Siddiqui and Z. Naeem, Pak. j. sci. ind. res., **14,** 350 (1971).
15. F. O. Ambudo and B. L. Fetuga, Fd. Chemistry, **13,** 299 (1984).
16. D. Prakash and P. S. Mitra, Plant Fd. Hum. Nutr., **38,** 61 (1988).
17. M. S. Karawya, S. El-Gengaihi, G. Wassel and N. A. Ibrahim, Fitoterapia, **52,** 175 (1981).
18. S. El-Gengaihi, M. S. Karawya, G. Wassel and N. Ibrahim, Fitoterapia, **27,** 27 (1988).
19. A. Rodier and G. Orillard, Mem. Serv. Chim Etat (Paris), **35,** 61 (1950).
20. N. Akhtar, S. S. Hasan and Mehboob Uddin, Pak. j. sci. ind. res., **9,** 204 (1972).
21. Q. N. Haq, A. Awal and M. Karimuddin, Bengladesh J. Sci. Ind. Res., **8,** 47 (1973).
22. M. S. Karawya, S. El-Gengaihi, G. Wassel and N. A. Ibrahim, Fitoterapia, **52,** 179 (1981).
23. R. Agrawal and A. Sri Vastara, J. Indian Chem. Soc., **62,** 693 (1985).
24. N. Ghatak and R. Kaul, J. Indian Chem. Soc., **9,** 383 (1932).
25. M. R. Mandiratta and S. Dutt, Ind. Soap J., **14,** 195 (1949).
26. M. S. Lefar, D. Firestone, N. Brown, D. W. Shaw, J. Pharm. Sci., **57,** 1442 (1968).
27. R. V. Desai and E. N. Rupwala, Indian J. Pharm., **29,** 235 (1967).
28. Salimuzzaman Siddiqui, Personal Communication; S. Begum, M. Sc. Thesis, Studies in the Chemical Constituents of *Abrus precatorius* Linn.
29. G. O. Spinall, K. Hunt and I. M. Morison, J. Chem. Soc. (C), 1080 (1967).