The R_f values and colour observed with the spray reagent are given in Table I.

TABLE I

R_f values and colour observed with the spray reagent

Name of compound	R_f	Colour observed with the reagent
2-hydroxy-1 : 4-naphthaquinone	0·84	RP
Anthraquinone	0·02	..
1,8-dihydroxy-3-methylanthraquinone	0·76	Br
1,6,8-trihydroxy-3-methylanthraquinone	0·64	Br
1,8-dihydroxy-3-methyl-6-methoxyanthraquinone	0·94	LBr
8-hydroxy-3-methyl-1,6-dimethoxyanthraquinone	0 11	V
7-hydroxyflavone	0 00	..
5,7-dihydroxyflavone	0·67	LY
5,7-d hydroxyflavonone	0 57	LY
5,7-d hydroxy-4′-methoxyflavone	0 50	Y
5-hydroxy-3′,4′-dimethoxyflavone	0·43	Y
5-hydroxy-7,3′- 4′-trimethoxyflavone	0·38	Y
5,3′-dihydroxy-7,4′-dimethoxyflavone	0·52	Y
3,5,7,4′-tetrahydroxyflavonol	0·85	Y
3,5,3′,4′-tetrahydroxy-7-methoxyflavonol	0·80	Y
3,5,7 3′,4′-pentahydroxyflavonol	0·78	Y
3,5,7,3′ 4′-pentahydroxyflavanone	0·84	LBr
3′,5,7-trihydroxy flavone	0 91	Y
5,7,4′-trihydroxy-3,6,3′-trimethoxyflavonol	0 61	Y
3,5,7,2′,4′-pentahydroxyflavonol	0 86	LY
3,5,7,3′,4′-pentamethoxyflavonol	0·70	—
3-hydroxy-3′,4′,5,7-tetramethoxyflavonol	0 88	..
3,5,3′,4′-tetrahydroxyflavonone-7-O-galactoside	0·73	Y
5,7,3′,4′-tetrahydroxyflavonol-3-O-rhamnoside	0 82	Y
5,7,3′,4′-tetrahydroxyflavonol 3-O-rutinoside	0·56	Y

RP = reddish pink; Br = brown; LBr = light brown; V = violet; LY = light yellow, Y = yellow,

The authors are grateful to Prof. R. D. Tiwari, Dr. Jagdamba Singh (University of Allahabad), Prof. T. J. Mabry and Dr. P. Neuman (The University of Texas at Austin) for the gift samples of some of the compounds reported in this paper.

Department of Chemistry,
University of Allahabad,
Allahabad, India.
February 6, 1979.

M. MASOOD,
ASHOK PANDEY,
K. P. TIWARI.

1. Kohli, J. C., *Ann. Chim.*, 1975, **10**, 323.
2. Harborne, J. B., Mabry, T. J. and Mabry, H., *The Flavonoids*, Chapman and Hall, London, 1st ed., 1975, p. 24.
3. Geissman, T. A., *Modern Methods of Plant Analysis*, edited by Paech, K. and Tracey, M. V., Springer–Verlag, Berlin, 1955, **3**, 450.
4. Kohli, J. C. and Arora, A. K., *Ann. Chim.*, 1972, **2**, 21.
5. Tiwari, K. P., Masood, M. and Choudhury, R. N., *Curr. Sci.*, 1978, **47**, 678.

CHEMICAL EXAMINATION OF THE FRUITS OF *GARCINIA XANTHOCHYMUS*

G. xanthochymus (N.O. Guttiferae) is reputed for its medicinal importance[1]. Konoshima *et al.*[2], have examined the wood and fresh leaves of the plant and isolated (±) fukugetin, fukugiside, Volkensiflavone, xanthochymuside alongwith GB–1*a*, GB–2 and GB–2*a*. Venkataraman *et al.*[3], isolated xanthochymol and isoxanthochymol from the fruits. The present communication describes the isolation and identification of some additional constituents not reported before in the fruits.

Air dried fruits were extracted successively with benzene and petroleum ether (60–80°). The brownish-black semi-solid obtained by concentrating the benzene extract was treated in cold with light petroleum (40–60°). The pale yellow insoluble solid on crystallisation with hot petroleum ether (60–80°) yielded compound A. The petroleum ether soluble portion was examined on TLC over silica gel in different solvent systems. It was chromatographed on a silica column in methanol-chloroform (3 : 17) and eluted by the same solvent. The compounds, B, C, D, E and F were isolated and identified. Compounds E and F were separated from the mixture by preparative TLC in acetic acid-chloroform (8 : 92) on silica gel.

A semi-solid obtained by concentrating the petroleum extract of the extracted fruits, was also separated on silica column. Some of the eluted fractions were found identical on TLC to the compounds isolated from benzene extract. Three more compounds G, H and I were separated by preparative TLC using

methanol-chloroform (3 : 17). All the compounds were identified by co-TLC, IR, UV, NMR and ms spectral data and preparation of derivatives.

Compound A, $C_{38}H_{50}O_6$, Yellow needles, m.p. 122–24°, $[\alpha]_D^{26}$ + 130°. Rf 0·4 (benzene-methanol, 1 : 1), M^+ 602. It was identified as xanthochymol.

Compound B, $C_{38}H_{50}O_6$, pale yellow needles, m.p. 218–20°, Rf 0·88 (methanol-chloroform, 3 : 17) was identified as isoxanthochymol.

Compound C, $C_{30}H_{20}O_{10}$, yellow crystals, m.p. 250°, Rf 0·82 (methanol-chloroform, 3 : 17), hexa methyl ether, m.p. 258–60°, Rf. 0·5 (Benzene-pyridine-formic acid, 36 : 9 : 5). It was identified as Volkensiflavone.

Compound D, $C_{30}H_{20}O_{11}$, yellow granules, m.p. 301–2°, $[\alpha]_D^{26}$ 0°, Rf 0·71 (methanol-chloroform, 3 : 17), acetate, m.p. 210–2°, methyl ether, m.p. 210°, Rf. 0·94 (benzene-pyridine-formic acid, 36 : 9 : 5), identified as morelloflavone.

Compound E, $C_{13}H_8O_4$, yellow solid, m.p. 266–68°, Rf 0·80 (ethyl acetate chloroform, 1 : 9) and was identified as 1,5-dihydroxyxanthone.

Compound F, $C_{30}H_{22}O_{10}$, yellow crystals, m.p. 210°, $[\alpha]_D^{26}$ -9° 16′, Rf 0·63 (methanol-chloroform, 3 : 17), hexa methyl ether, m.p. 132–3°. It was identified as GB–1*a*.

Compound G, $C_{13}H_{10}O_6$, yellow needles, m.p. 220–22°, Rf 0·66 (benzene-ethyl acetate, 14 : 6), methyl derivative, yellow crystals, m.p. 164–5°. The compound was identified as maclurin.

Compound H, $C_{13}H_8O_4$, yellow solid, m.p. 237–40°, Rf 0·68 (ethyl acetate-toluene, 15 : 85) and was identified as 1,7-dihydroxyxanthone.

Compound I, $C_{30}H_{22}O_{11}$, amorphous powder, m.p. 202–4°, Rf 0·50 (methanol-chloroform, 3 : 17), hepta methyl ether, m.p. 126–7°. It was identified as GB–1.

The presence of 1,5-dihydroxyxanthone; 1,7-dihydroxyxanthone, maclurin and GB–1 reported for the first time in this species.

We are indebted to Dr. S. L. Kapoor, N.B.G., Lucknow, for identification of the plant; Prof. H. Wagner, Director, Inst. fur Pharmazeutische Arzneimittellehre, Munchen and Prof. Eiichi Fujita, Kyoto University, Kyoto (Japan) for IR, UV, NMR and ms measurements. Thanks are also due to U.G.C. (New Delhi), for the sanction of research Project to RKB under which work could be possible.

Chemistry Department,
Raza Govt. P.G. College
(Rohilkhand University),
Rampur 244 901, U.P.,
April 19, 1979.

R. K. Baslas.
Pradip Kumar.

1. Chopra, R. N., Nayar, S. L. and Chopra, I. C., *Glossary of Indian Medicinal Plants*, CSIR, New Delhi, 1956, p. 123.
2. Konoshima, M., IKeshiro, Y. and Miyahara, S., *Tetrahedron Lett.*, 1970, 48, 4203.
3. Karanjgaokar, C. G., Rama Rao, A. V., Venkataraman, K., Yemul, S. S. and Palmer, K. J., *Tetrahedron Lett.*, 1973, 50, 4977.

SPECTROPHOTOMETRIC METHOD FOR THE DIRECT DETERMINATION OF CYSTEINE IN THE PRESENCE OF OTHER NATURALLY OCCURRING AMINO ACIDS

Sulphur containing amino acids are of great importance in biochemical processes of animals. A number of spectrophotometric procedures have been developed for the determination of cysteine and none of them are specific. We have observed that cysteine out of more than 20 other amino acids tested found to form red coloured ternary complex at pH 3·5 (λ_{max} : 510 nm). The maximum intensity of the colour is developed in about 160 minutes and is stable for several hours. The concentration of the product formed is directly proportional to cysteine initially taken. Based on this, a simple and specific method is developed for the determination of cysteine and cystine.

Experimental

Procedure for cysteine : To amounts of cysteine varying from 0·001 to 0·0075 millimoles in 4 ml solution, 15 ml of potassium biphthalate-hydrochloric acid buffer (pH 3·3), 2 ml of 0·2% metol solution and 3 ml of 0·01 M potassium dichromate solution were added successively. It was diluted to 25 ml with distilled water in a calibrated volumetric flask and the absorbance was measured at 510 nm after 160 minutes against a corresponding reagent blank prepared in the same manner. The cysteine content was computed from an appropriate calibration curve.

Procedure for cystine : 10 ml of cystine solution containing between 0·00065 and 0·0075 millimoles of cystine per ml was treated with requisite quantity of 1·0 N potassium hydroxide to maintain the pH 9·20. After adding 10 ml of 2% sodium borohydride solution, the resulting mixture was warmed on a water-bath which was preheated to 50° for 30 minutes. Then the excess sodium borohydride was destroyed by dropwise addition of 10 ml of 10% acetic acid. Finally, the solution was diluted to 50 ml after the pH of the solution was brought to 5·0. 4 ml of this solution were taken and completed the determination as given for cysteine.

Procedure for groundnut protein: 1 g of groundnut protein was hydrolysed as reported earlier[1] by refluxing with 15 ml of 16% hydrochloric acid for 24 h.