

cobalt(II), nickel(II), copper(II), zinc(II) and cadmium(II) complexes with  $H_2L$  which behaves as a pentadentate biprotic ligand and the sixth coordination position is occupied by the water molecule.

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1. Singh, B., Rukhayay, M. M. P. and Sinha, R. J., *J. Inorg. Nucl. Chem.*, 1977, **39**, 29; Dave, L. D. and Curiak, M. U., *J. Indian Chem. Soc.*, 1975, **51**, 383.
2. Gupta, B. K., Gupta, D. S., Dikshit, S. K. and Agrawal, U., *Indian J. Chem.*, 1977, **A15**, 624; Garg, A., Natrajan, K. and Agrawal, U., *Indian J. Chem.*, 1977, **A15**, 534.
3. Gakhar, H. K., Gupta, S. C. and Kumar, N., *Indian J. Chem.*, 1981, **B20**, 14.
4. Verma, J. K. and Verma, G. S. P., *Indian J. Chem.*, 1982, **A21**, 825.
5. Nakamoto, K., *Infrared spectra of inorganic and coordination compound*, John Wiley, New York, 1970, p. 167.
6. Verma, J. K., *Chim. Acta Turc.*, 1987 (in press).

## BIFLAVONES FROM THE LEAVES OF *RHUS ALATA* THUMB.

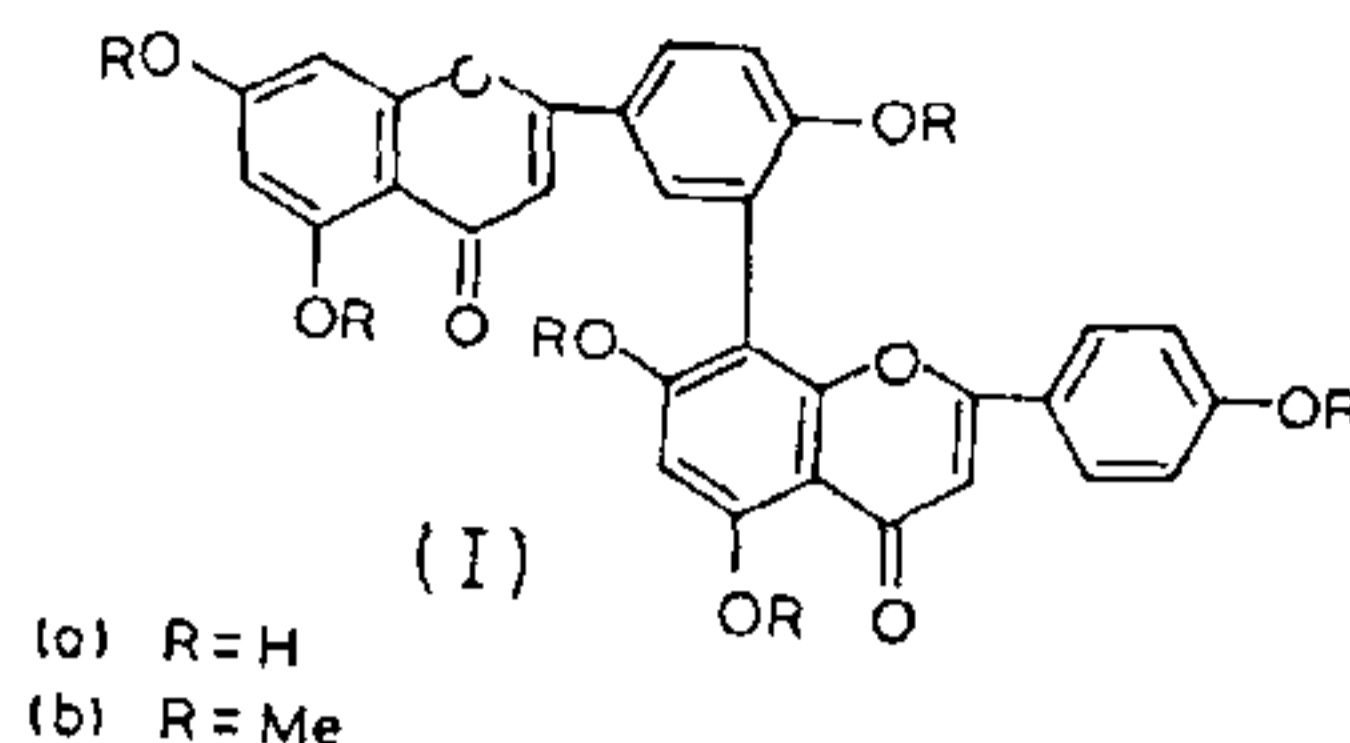
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The chemotaxonomic significance of biflavones in the genus *Rhus*, the cardiotoxic activity of the Chinese syrup "Shu Guang Tong" prepared from the extract of *R. Chinensis*<sup>1,2</sup> and the isolation of allergens from *R. toxicodendron*<sup>3</sup> prompted us to investigate *Rhus alata* (Syn. *Hippobromus alatus*) Thumb. which has not been reported so far. A number of biflavones have been reported from *R. succedanea*<sup>4-12</sup>, *R. toxicodendron*<sup>13</sup>, *R. punjabensis*<sup>14</sup> and *R. mysurensis*<sup>15</sup>. In the present communication, we report the occurrence of biflavones from the leaves of *R. alata*.

*R. alata* Thumb. was collected from the Pucchung University College, Aizaul, Mizoram and identified by Dr W. Husain, Department of Botany of this University. A voucher specimen was submitted to the University Herbarium, (Voucher Number, Husain-33701).

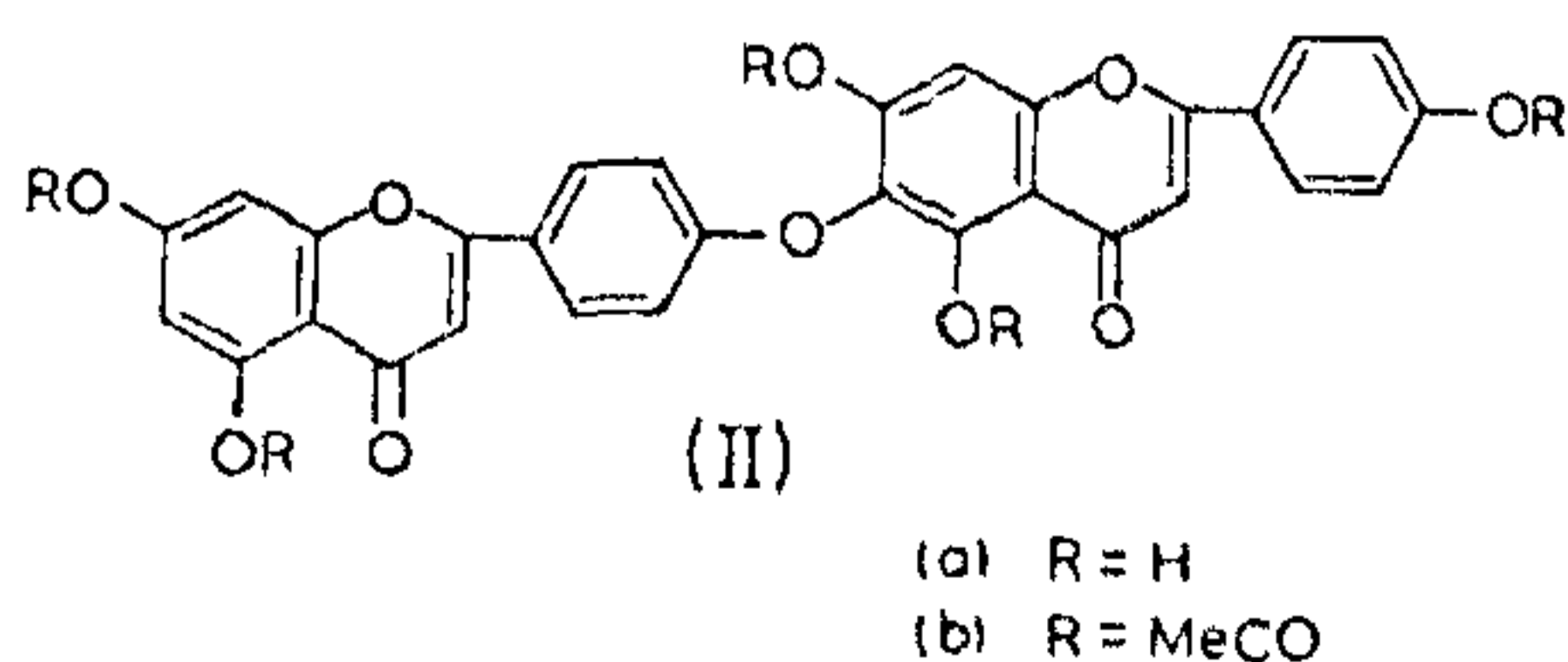
The dried and powdered leaf material of *R. alata* (1 kg), after being defatted with light petrol, was



extracted with EtOH. The EtOH extract was concentrated and the residue refluxed with light petrol and benzene; treated with boiling water and filtered. The yellow solid, undissolved residue (0.5 g) yielded the two chromatographically homogeneous fractions RA-I ( $R_f$  0.16) and RA-II ( $R_f$  0.34) after development on a silica gel column and subsequent preparative TLC [silica gel, benzene-pyridine-formic acid (BPF), 36:9:5].

RA-I; RA-I was comparable with amentoflavone on TLC (silica gel, BPF, 36:9:5). On methylation it gave a mixture of hexamethyl ethers of amentoflavone, agathisflavone and robustaflavone which were separated by preparative TLC (silica gel, BPF, 36:9:5). The minor constituents were tentatively characterized as hexamethyl ethers of agathisflavone and robustaflavone, based on their  $R_f$  values and characteristic shade in UV light with authentic sample<sup>16,17</sup>. Amentoflavone hexamethyl ether (Ib) was characterized by <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>,  $\delta$ -scale); 3.80 (s, 6H, OMe-4, 4''), 3.86 (s, 3H, OMe-7), 3.94 (s, 3H, OMe-7''), 3.96 (s, 3H, OMe-5), 4.10 (s, 3H, OMe-5''), 6.40 (d, 1H, J=3Hz, H-6), 6.54 (d, 1H, J=3Hz, H-8), 6.54 (s, 1H, H-6''), 6.56 (s, 2H, H-3, 3''), 7.18 (d, 1H, J=9Hz, H-3'', 5''), 7.18 (d, 1H, J=9Hz, H-5'), 7.44 (d, 2H, J=9Hz, H-2'', 6''), 7.90 (d, 1H, J=3Hz, H-2') and 8.04 (dd, 1H, J=9Hz & 3Hz, H-6'). Therefore, the major constituent in RA-I was characterized as amentoflavone (Ia)<sup>18</sup>.

RA-II; RA-II was comparable with hinokiflavone on TLC (silica gel, BPF, 36:9:5). On methylation by the method of Khan *et al*<sup>16</sup> it gave hinokiflavone pentamethyl ether. On acetylation using acetic



anhydride and pyridine, RA-II yielded hinokiflavone pentaacetate (IIb), which was characterized by <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, δ scale): 2.12 (s, 3H, OAc-7"), 2.24 (s, 3H, OAc-4"), 2.35 (s, 6H, OAc-7, 5), 2.45 (s, 3H, OAc-5"), 6.60, 6.66 (1H each, s, H-3, 3"), 6.86 (d, 1H, J=2.5 Hz, H-6), 7.05 (d, 2H, J=9 Hz, H-3', 5'), 7.34 (d, 2H, J=9Hz, H-3'', 5''), 7.35 (d, 1H, J=2.5 Hz, H-8), 7.47 (s, 1H, H-8"), 7.83 (d, 2H, J=9Hz, H-2', 6') and 7.91 (d, 2H, J=9Hz, H-2'', 6''). Therefore, RA-II was characterized as hinokiflavone (IIa)<sup>19</sup>.

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1. Chen, Y-Y., *Chung Ts'ao Yao*, 1981, **12**, 21.
2. Zheng, R. and Ji, L., *Yaouxue Tongbao*, 1982, **17**, 216.
3. Watson, E. S., Murphy, J. C. and Elsohly, M. A., *J. Invest. Dermatol.*, 1983, **80**, 149.
4. Chen, F-C., Lin, Y-M. and Lin, Y. C., *Heterocycles*, 1978, **9**, 663.
5. Chen, F-C. and Lin, Y-M., *J. Chem. Soc. Perkin Trans-I*, 1976, p. 986.
6. Lin, Y-M. and Chen, F-C., *Tetrahedron Lett.*, 1973, **48**, 4747.
7. Chen, F-C. and Lin, Y-M., *Phytochemistry*, 1975, **14**, 1644.
8. Chen, F-C. Lin, Y-M. and Wee, J. C., *Phytochemistry*, 1974, **13**, 1571.
9. Chen, F-C., *Taiwan K'o Hsueh*, 1973, **26**, 100.
10. Lin, Y-M. and Chen, F-C., *Hua Hsueh*, 1974, **1**, 14.
11. Chen, F-C., Lin, Y-M. and Liang, C. M., *Phytochemistry*, 1974, **13**, 276.
12. Lin, Y-M. and Chen, F-C., *Phytochemistry*, 1974, **13**, 1617.
13. Elsohly, M.A., Craig, J. C., Waller, C, W. and Turner, C. E., *Phytochemistry*, 1978, **17**, 2140.
14. Kamil, M., Iqbal, M. and Ilyas, M., *J. Indian Chem. Soc.*, 1984, **61**, 375.
15. Sarada, M. and Adinarayana, D., *J. Indian Chem. Soc.*, 1984, **61**, 649.
16. Khan, N. U., Ansari, W. H., Usmani, J. N., Ilyas, M. and Rahman, W., *Phytochemistry*, 1971, **10**, 2129.
17. Varshney, A. K., Rahman, W., Okigawa, M. and Kawano, N., *Experientia*, 1973, **29**, 784.
18. Pelter, A., *et al.*, *Experientia*, 1969, **25**, 350.

19. Naqvi, S.W.I., Parveen, N., Parveen, M. and Khan, N. U., *Curr. Sci.*, 1987, **56**, 480.

## DEPENDENCE OF CRYSTALLINITY OF NICKEL ON ELECTRODEPOSITION CONDITIONS

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THE report of Pol Duwez *et al*<sup>1,2</sup> on non-crystalline solids has led to new academic and technological research activity. The unique properties of these non-crystalline solids are attributed to their freedom from constraint of periodicity and requirements of stoichiometry. New metastable crystalline or amorphous solid phases were found to form in some simple binary eutectic alloy systems by rapid solidification from metallic melts. Non-crystalline solids may generally be obtained using electrodeposition, electroless deposition and vapour deposition on cold substrates in addition to the most popular method of fast quenching from melts. The preparation of amorphous alloys of nickel-phosphorous<sup>3</sup> and cobalt-phosphorous by chemical reduction process<sup>4</sup>, electrodeposition process and preparation of electroless nickel-boron amorphous alloy<sup>5</sup> have been reported earlier. Recently, preparation of non-crystalline zirconium-iron<sup>6,7</sup> and iron-boron<sup>8</sup> alloys by rapid solidification method and electro-chemical method respectively has been reported. The present authors have successfully prepared non-crystalline nickel-sulphur, partly crystalline and crystalline nickel-boron electrodeposits by carefully controlling the parameters, to examine their unusual properties.

The bath composition used to prepare the following deposits were: (i) nickel-sulphate, 52.9 g/l, sodium thiosulphate, 25 g/l, ammonium sulphate, 30 g/l, sodium citrate, 20 g/l, at 0.065 A/cm<sup>2</sup>, current density, for non-crystalline nickel sulphur deposit, (ii) nickel sulphate, 57.24 g/l, boric acid, 40 g/l, ammonium sulphate, 33.3 g/l, liquor ammonia, 200 ml/l, 2-mercaptoethanol, 20 ml/l, at 0.65 A/cm<sup>2</sup>, current density, for partly-crystalline nickel-boron deposit and (iii) nickel sulphate, 30 g/l, boric acid, 60 g/l, ammonium sulphate, 30 g/l, and borax 50 g/l, at 0.6 A/cm<sup>2</sup>, current density, for crystalline nickel-boron deposit. The samples so prepared were dried, powdered and subjected to X-ray diffractogram investigation using standard procedures.

X-ray examination of these deposits, prepared