N_b-METHYLATED TRYPTAMINES AND OTHER CONSTITUENTS OF *ACACIA CONFUSA* MERR. OF HONG KONG*

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Acacia confusa Merr., known as *hai hung tou* (the red bean from the sea) and *hai yuk* (sea medicine), is used widely in Chinese medicine.[1] It is said to be poisonous, and has been introduced into Hong Kong where it finds use as a muscle relaxant and for the treatment of blood disorders. Earlier studies have been made of the seed oil[2,3] and bark tannins.[4,5]

Alkaloids, obtained from stems but not from leaves of *A. confusa*, have been shown to consist of a mixture of N_b-methyltryptamine and N_bN_b-dimethyltryptamine in the approximate ratio of 4 : 1. Both of these alkaloids have previously been isolated from *Acacia maideni* F. Muell. by Fitzgerald and Sioumis,[6] who cited references to their occurrence in other plants. More recently N_b-methyltryptamine (dipterine) has been isolated from *Hammada leptoclada*[7] and N_bN_b-dimethyltryptamine from *Desmodium pulchellum*.[8]

Two triterpene alcohols from the leaves of *A. confusa* have been identified as lupeol and taraxerol, and a third, not obtained pure, appeared to be the steroid stigmasterol. β-Sitosterol was obtained from the stems. The sitosterol, m.p. 137°, and the sterol, m.p. 158–160°, described by Kafuku and Hata[3] probably correspond to our sitosterol and incompletely purified sterol (stigmasterol?) respectively. A long-chain ketone and a long-chain alcohol were also obtained, and resemble those reported from *Quercus* spp.[9]

Experimental

Analyses were made by the Microanalytical Laboratory, University of Singapore. Optical rotations were measured in chloroform solution, and i.r. spectra were measured on Nujol mulls.

(*a*) *Extraction of* A. confusa *Leaves*

Air-dried leaves (8·7 kg) were milled and extracted at room temperature with light petroleum and ethanol successively. The light petroleum extract was concentrated to 500 ml and then chromatographed on alumina (700 g). Elution with light petroleum gave waxy constituents and

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then colourless needles (2·3 g), m.p. 74°, $[\alpha]_D$ +15·5° (*c*, 0·42), ν_{max} 1720 cm^{-1} (C=O), which were identified as the ketonic compound described previously.[9] Elution with light petroleum/benzene mixture (9 : 1) gave a product which on crystallization from methanol yielded lupeol (2·4 g), m.p. 208–212°, $[\alpha]_D$ +24·6° (*c*, 0·63), ν_{max} 3310 cm^{-1} (OH) (Found: C, 84·4; H, 11·8. Calc. for $C_{30}H_{50}O$: C, 84·4; H, 11·8%). Acetylation gave lupeyl acetate, m.p. 214–215° (Found: C, 82·4; H, 10·7. Calc. for $C_{32}H_{52}O_2$: C, 82·0; H, 11·2%). The identification was confirmed by comparison with authentic lupeol.

Later fractions, eluted by benzene/light petroleum mixture, on crystallization from benzene/methanol, yielded taraxerol (1·2 g), m.p. 286°, $[\alpha]_D$ −1·0° (*c*, 0·87) (Found: C, 84·4; H, 11·9%). Acetylation gave taraxeryl acetate, m.p. 299–300° (Found: C, 82·0; H, 11·3. Calc. for $C_{32}H_{52}O_2$: C, 82·0; H, 11·2%). The identification of taraxerol and its acetate were confirmed by direct comparison with authentic reference samples.

Continued elution with benzene/light petroleum (3 : 2) gave a mixture (0·5 g), which on crystallization from methanol had m.p. 155–156° and an i.r. spectrum close to that of stigmasterol. Acetylation yielded an impure acetate, m.p. 135–140°, which did not show a melting point depression when mixed with stigmasteryl acetate.

The alcohol extracts of the leaves yielded an unidentified triterpene acid, but no alkaloids. Concentrated extracts were negative in the Mayer test.

(*b*) *Extraction of* A. confusa *Stems*

Dried stems (8·8 kg) were extracted in the same manner as the leaves. The concentrated light petroleum extract was chromatographed on alumina (400 g), and elution with light petroleum yielded waxy material, followed by a product (1·5 g) which on crystallization from acetone gave the previously described long-chain alcohol,[9] m.p. 78–81°, ν_{max} 3310 cm^{-1} (OH). Elution with benzene/light petroleum (7 : 3) gave fractions which on crystallization from ethanol yielded β-sitosterol, m.p. 137–138°, $[\alpha]_D$ −37·3° (*c*, 0·65). This identification was confirmed by comparison with authentic β-sitosterol.

The ethanol extract was concentrated under reduced pressure, and the resulting brown syrup was brought to pH 8 by addition of sodium carbonate solution, and then extracted with chloroform. The chloroform solution was extracted with 2N hydrochloric acid. From the chloroform solution the long-chain ketone[9] and β-sitosterol were separated as described above. The acid extract was basified by addition of sodium hydroxide and the solution was extracted repeatedly with chloroform. A crude alkaloid fraction (13·6 g), obtained by evaporation of the chloroform extracts, was purified by re-extraction into acid from chloroform solution, and afforded 6·5 g of alkaloids. The alkaloids were shown by chromatographic methods[6] to consist of a mixture of N_b-methyltryptamine and N_bN_b-dimethyltryptamine. Examination of the alkaloids by paper chromatography also indicated the presence of two constituents having R_F 0·21 and 0·61 when methanol was used as the developing solvent, and R_F 0·00 and 0·94 in chloroform. Authentic N_b-methyltryptamine and N_bN_b-dimethyltryptamine had R_F values of 0·22, 0·62, and 0·00, 0·92 respectively in these solvent systems.

N_b-Methyltryptamine was the major constituent (approx. 80%), and an acetone solution of the alkaloids containing hydrochloric acid deposited crystalline N_b-methyltryptamine hydrochloride (3·1 g), which after crystallization from acetone/methanol melted at 180–182° (Found: C, 63·1; H, 7·5; Cl, 17·1; N, 13·5. Calc. for $C_{11}H_{14}N_2$,HCl: C, 62·9; H, 7·2; Cl, 16·9; N, 13·3%). N_b-Methyltryptamine, regenerated from the hydrochloride, melted at 88° after crystallization from light petroleum (Found: C, 75·6; H, 8·2; N, 16·0. Calc. for $C_{11}H_{14}N_2$: C, 75·8; H, 8·1; N, 16·1%). The identification of the alkaloid as N_b-methyltryptamine was confirmed by spectroscopic (i.r., n.m.r.) comparison with authentic reference material, and by its mass spectrum (molecular ion peak at *m/e* 174).

N_bN_b-Dimethyltryptamine was isolated from the alkaloids recovered after precipitation of the hydrochloride of N_b-methyltryptamine. Reaction of the recovered alkaloids with acetic anhydride converted the remaining N_b-methyltryptamine into an *N*-acetyl derivative, which is non-basic and therefore readily separable from N_bN_b-dimethyltryptamine by partitioning between

chloroform and dilute hydrochloric acid solution. The recovered basic fraction from this procedure was chromatographed on alumina and gave crystalline fractions (*c.* 1·3 g) consisting of N_bN_b-dimethyltryptamine. Crystallization from hexane gave N_bN_b-dimethyltryptamine, m.p. 53·5–57·5°, which was identified (mixed m.p., i.r. spectrum) by comparison with an authentic specimen of N_bN_b-dimethyltryptamine.

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