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SHORT COMMUNICATION

# *TAXUS* HEARTWOOD CONSTITUENTS

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**Abstract**—The heartwood of several *Taxus* species has been investigated. All contain a series of six lignans also occurring in *Fitzroya cupressoides*. The neutral constituents, however, are different from those of *Fitzroya*.

DURING an investigation of the heartwood constituents of the South American conifer, *Fitzroya cupressoides* (Molina) Johnston (Cupressaceae), four lignans were isolated, namely secoisolariciresinol, isolariciresinol, isotaxiresinol (main product) and isotaxiresinol-6-methyl ether. Neutral constituents were "sitosterol" ($\beta$-sitosterol + campesterol) and a trace of a high-melting compound.[1]

When isolating isotaxiresinol, first isolated from *Taxus baccata*,[3] from the heartwood of the Japanese yew *T. cuspidata* Sieb. et Zucc.,[2] we were surprised to find that this species also contains lariciresinol as well as secoisolariciresinol, isolariciresinol and isotaxiresinol-6-methyl ether. The neutral fraction contained "sitosterol" and a complex mixture of compounds[4] of similar type, one of which was easily isolated and found to be taxusin. M.p. 129–131°, $[\alpha]_D + 120°$ (*c*, 1·24 in $CHCl_3$). (Lit.[5] m.p. 129–131°, $[\alpha]_D + 118·6°$, *c* 1·325 in $CHCl_3$.) The i.r. spectra were identical and there was no depression of the mixed m.p.

We have made a brief comparative examination of several *Taxus* woods. The results (Tables 1 and 2) indicate that they are chemically almost indistinguishable.

## EXPERIMENTAL

The heartwoods were exhaustively extracted (MeOH) and the extracts were mixed with celite, dried and extracted with ether. The residue obtained on evaporation of the ether was partitioned between methanol and petroleum ether. The epiphase, after extraction with 2 N NaOH, gave a petroleum ether soluble "neutral fraction". The hypophase was concentrated, dissolved in ether and shaken with 10% $Na_2CO_3$ and with 2 N NaOH. Acidification of the latter extract and extraction with ether gave a "phenolic fraction". The neutral and phenolic fractions were examined by TLC ($SiO_2$, phosphomolybdic acid spray). The results are given in Tables 1 and 2.

[1] H. ERDTMAN and K. TSUNO, to be published.
[2] M. HASEGAWA, T. SHIRATA and H. NAKAMURA, *3rd Annual meeting of Japan Wood Research Society*, p. 265 (1953).
[3] F. E. KING, L. JURD and T. J. KING, *J. Chem. Soc.* 17 (1952).
[4] W. R. CHAN, T. G. HALSALL, G. M. HORNBY, A. W. OXFORD, W. SABEL, K. BJÅMER, G. FERGUSON and J. M. ROBERTSON, *Chem. Commun.* 923 (1966).
[5] M. MIYAZAKI, K. SHIMIZU, H. MISHIMA and M. KURABAYASHI, *Chem. Pharm. Bull., Japan* **16**, 546 (1968).

TABLE 1. PHENOLIC FRACTIONS OF *Taxus* SPECIES

| *Taxus* species | Solvent system, $CHCl_3$:MeOH=9:1 Constituents* A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| *T. floridana* Chapm. (Florida sample) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. brevifolia* Nutt (Oregon) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. baccata* L. (English) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. baccata* (Swedish) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. cuspidata* Sieb. et Zucc. (Japanese) | (+) | (+) | + | + | + | + |

* In order of decreasing $R_f$. A=Lariciresinol (violet spot). B=Unknown (reddish violet). C=Secoisolariciresinol (blue). D=Isolariciresinol (reddish violet). E=Isotaxiresinol-6-methyl ether (dark violet). F=Isotaxiresinol (dark violet). (+)=TLC spot. (−)=No spot. +=Isolated.

TABLE 2. NEUTRAL FRACTIONS OF *Taxus* SPECIES

| *Taxus* species | Solvent system $CHCl_3$:MeOH=99:1 Constituents* A | B | C | D | Solvent system $CHCl_3$:MeOH=95:5 Constituents E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *T. floridana* | (+) | (+) | (+) | (+) | (−) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. brevifolia* | (+) | (+) | (+) | (+) | (−) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. baccata* (English) | (+) | (+) | (+) | (+) | (−) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. baccata* (Swedish) | (+) | (+) | (+) | (+) | (−) | (−) | (+) | (+) | (+) | (+) | (+) |
| *T. cuspidata* | (+) | + | (+) | (+) | (+) | (+) | (+) | (+) | (+) | (+) | (+) |

* In order of decreasing $R_f$ value. A–D follow the front in the second solvent system. A, C, E–I and K=unknown. B=Taxusin, D="Sitosterol", J=Deacetyl taxusin (compared with deacetylated taxusin). All spots: bluish.

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