4-Phenoxyflavan-3-ols

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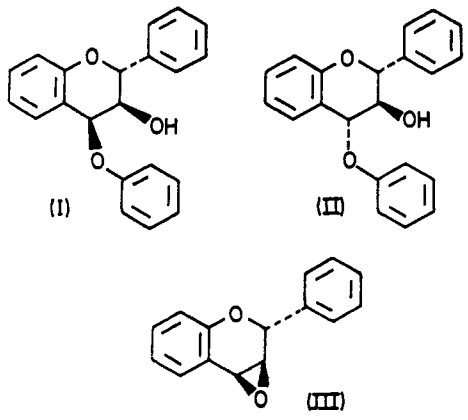
Summary 2,3-*trans*-Flav-3-ene epoxide reacts with phenol to give 2,3-*trans*-3,4-*cis*-4-phenoxyflavan-3-ol and with sodium phenoxide to give 2,3-*trans*-3,4-*trans*-4-phenoxyflavan-3-ol, both compounds being stereochemically pure and both resulting in good yield.

RECENTLY, by BF_3-catalysed reaction of phenols with flavan-4-ols in anhydrous solvents, we have established the first synthetic route to simple 4α-aryloxyflavans,[1] the basic structure suggested for the tannin from *Calluna vulgaris* Salisb. (ling).[2] However, reaction of phenols with flavan-3,4-diols in the presence of BF_3 has not proved successful as a route to 4-aryloxyflavan-3-ols (I and II) which would constitute better models for tannins of this type.



All the above compounds, described in the text, are racemic.

Epoxides are known[3] to be opened by phenols to give β-hydroxyalkyl aryl ethers and we have been successful in controlling the opening of 2,3-*trans*-flav-3-ene epoxide[4] (III) to give either 3,4-*cis*- or 3,4-*trans*-stereochemistry in the resulting 2,3-*trans*-4-phenoxyflavan-3-ols (I and II). 2,3-*trans*-3,4-*cis*-4-Phenoxyflavan-3-ol (I) (93%, stereochemically pure by n.m.r.), m.p. 105—106° after recrystallisation (77%) results when the epoxide (III) is heated at 100° for 30 min. in an excess of phenol. On the other hand, 2,3-*trans*-3,4-*trans*-4-phenoxyflavan-3-ol (II) (91%, stereochemically pure by n.m.r.), m.p. 145—147° after recrystallisation (73%) is produced by reaction of the epoxide with an excess of sodium phenate in dimethylformamide at 100° for 2 h. Both compounds react with thiophenol to give identical mixtures of the two corresponding thiophenyl derivatives which we have prepared individually by other means.

The production of 2,3-*trans*-3,4-*trans*-4-phenoxyflavan-3-ol (II) from the epoxide (III) and a phenoxide ion is clearly an S_N2 reaction. We have shown that this 4-aryloxyflavan-3-ol (II) is unchanged after treatment with phenol at 100° and hence the production of 2,3-*trans*-3,4-*cis*-4-phenoxyflavan-3-ol (I) from the epoxide and phenol is unlikely to be the result of thermodynamic control.

The structures of the compounds have been assigned from elemental analysis, i.r., n.m.r., and mass spectra.

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[2] M. J. Betts, B. R. Brown, P. E. Brown, and W. T. Pike, *Chem. Comm.*, 1967, 1110.
[3] E. Roithner, *Sitzungber. der Akad. der Wissenschaft.*, 1894, **103**, IIb, 549.
[4] B. J. Bolger, C. P. Lillya, K. G. Marathe, E. M. Philbin, and T. W. Wheeler, *Tetrahedron*, 1967, **23**, 341.