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SYNTHESIS OF 5-(3-HYDROXYPROPYL)-2-(3′,4′-METHYLENEDIOXYPHENYL) BENZOFURAN AND RELATED STYRAX EXTRACTIVES

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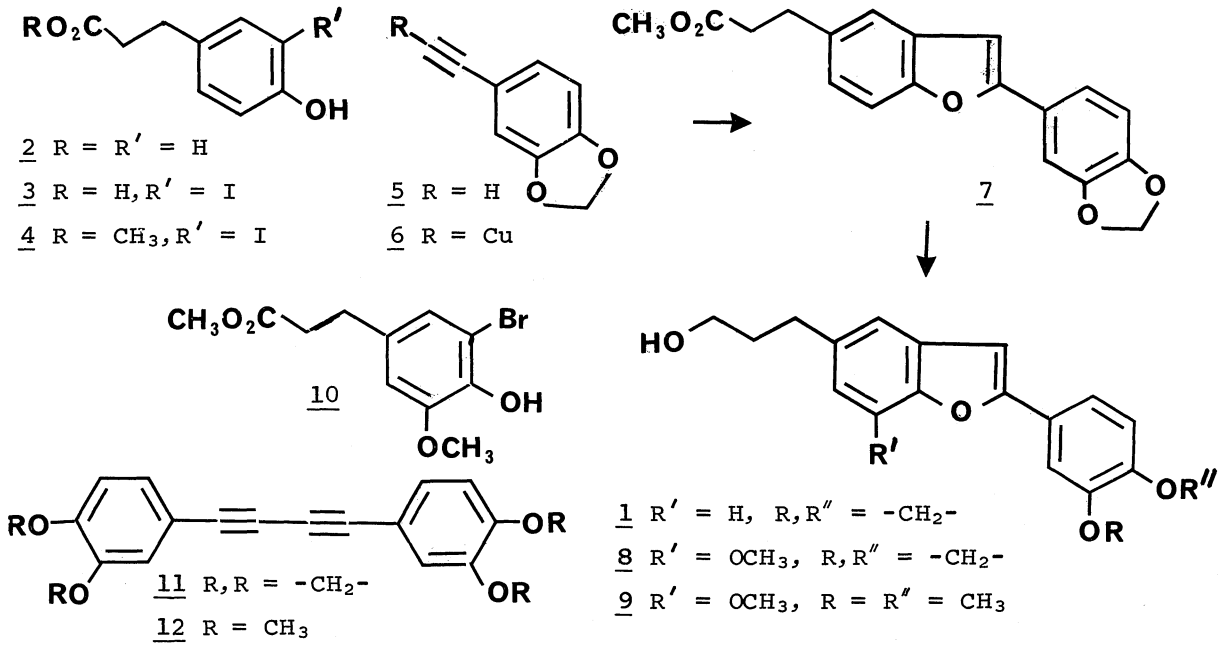
Short procedures for the synthesis of the lignans (egonol, homoegonol and the title compound) which are constituents of various Styrax species are reported.

The isolation and structure elucidation of 5-(3-hydroxypropyl)-2-(3′,4′-methylenedioxyphenyl)benzofuran (1) from Styrax obassia Sieb. et Zucc. was recently reported in this Journal.[1] In the course of our studies of lignans, we have synthesized this product by a simple procedure, in the key step of which a benzofuran ring is formed by reaction of an o-halophenol with a cuprous arylacetylide.[2]



The commercially available phloretic acid (2) was converted to the 3′-iodo acid (3) by treatment with KI-I_2 in NH_4OH solution,[3] and then to the methyl ester

(4). 3,4-Methylenedioxyphenylacetylene (5), which is readily obtained[4] from 3,4-methylenedioxyacetophenone, yielded the cuprous salt (6) by standard treatment[2] with $CuSO_4$-NH_4OH-$H_2NOH \cdot HCl$. Addition of 4 to a suspension of 6 in pyridine, followed by heating under reflux for 22 hr. gave methyl 3-[2-(3′,4′-methylenedioxyphenyl)-5-benzofuranyl]-propanoate, (7, $C_{19}H_{16}O_5$, m.p. 125-128°) in > 90% yield. Reduction of the ester (7) with lithium aluminium hydride in tetrahydrofuran solution gave 5-(3-hydroxypropyl)-2-(3′,4′-methylenedioxyphenyl)benzofuran (1) in 80% yield, m.p. 124-125° (lit.[1] m.p. 118-119°) with NMR spectrum in close agreement with that reported and UV spectrum, λ^{EtOH} 214 (35,200), 317 (32,300) and 331 nm (ε 26,200).[5]

We have also used this general pathway to synthesize egonol (8), which was first isolated in 1915[6] and for which two different syntheses have been reported,[7,8] and the veratryl analogue (9), isolated from Styrax officinalis L.,[9] and recently named homoegonol.[10] In these cases, the halophenol employed was methyl 3-(3′-bromo-4′-hydroxy-5′-methoxyphenyl)propanoate (10) and in addition to the desired benzofuran, there was obtained in each case the respective diacetylenes (11) and (12) as minor bye-products.

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