

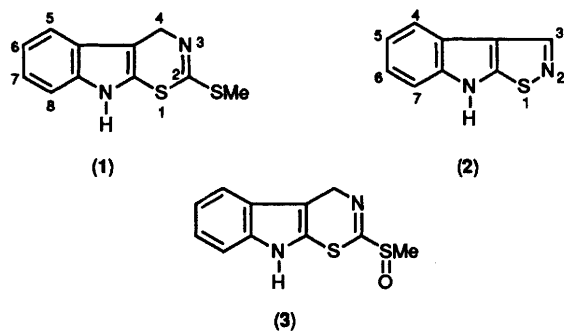
Oxidative Ring Contraction of the Phytoalexin Cyclobrassinin: a Way to Brassilexin

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Periodate-induced degradation of cyclobrassinin gives brassilexin in 30% yield.

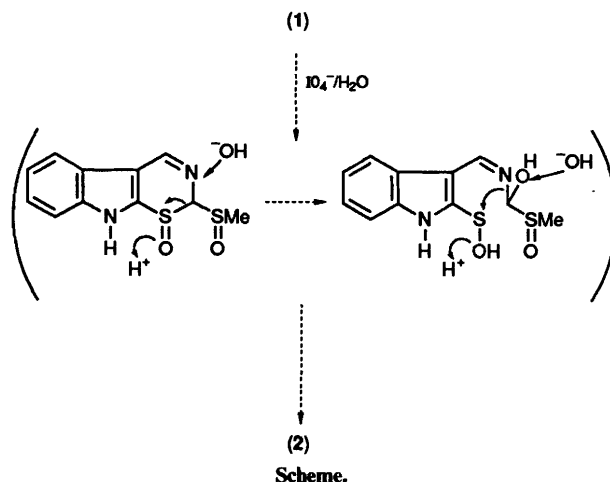
The oxidative ring contraction of benzothiazines to benzisothiazoles has recently been described.^{1,2} We report here a similar process in which cyclobrassinin (1) gives brassilexin (2), both compounds being phytoalexins previously isolated from plants of the family Cruciferae.³⁻⁶ Cyclobrassinin (1) was oxidized by NaIO₄ and brassilexin (2) was isolated pure by repeated TLC (SiO₂) followed by crystallization (30% yield). The isolated brassilexin (2) was identical with both the natural⁶ and synthetic⁷ product (m.p., R_F, MS, high resolution MS, UV, ¹H NMR). This ring contraction probably occurs by oxidation of cyclobrassinin (1) to the corresponding sulphoxide followed by a double-bond migration to form the conjugated imine. Cyclobrassinin monosulphoxide (3) was previously reported⁸



from a natural origin. The double bond migration with one H transfer was advanced⁹ for compounds of the benzothiazine family. The mechanism that we propose for such a rearrangement is summarized in the Scheme.

Experimental

In a typical experiment, cyclobrassinin (1) (23 mg, 0.1 mmol) was dissolved in methanol (2 ml) at 50 °C and a solution of sodium metaperiodate [400 mg in water (2 ml) at 50 °C] was added dropwise until the formation of a precipitate (*ca.* 1 ml, 1 mmol). After *ca.* 30 min at 50 °C, the reaction mixture was kept for 24 h at room temperature. The pH of the solution was brought to 8 by adding sodium hydrogen carbonate (1M). The mixture was diluted with water and extracted with ethyl acetate (10 ml × 2), and the combined organic phases were washed with water, dried (Na₂SO₄), and evaporated to give a residue (16 mg). Brassilexin (2) was isolated from this residue by preparative TLC [SiO₂, pentane-ethyl acetate (7:3), R_F 0.60,



UV observation at 254 nm]. An oily product (12 mg) was recovered by extraction of the SiO₂ by ethyl acetate. A second TLC carried out in CH₂Cl₂ gave solid brassilexin (R_F 0.30; 10 mg). The pure product (2) was obtained by filtration of a solution in pentane-ethyl acetate (7:3) through a small column of Al₂O₃; yield 8 mg. The latter was washed with a little cold pentane and crystallized from ethyl acetate-pentane to give 2.4 mg of product [yield of crude (2) 30%, after crystallization 16%]. Physicochemical data: colourless microcrystals m.p. and mixed m.p. 164–168 °C, (lit.,⁶ 164–167 °C); λ_{max}(MeOH) 218 (ε 5 × 10⁴), 245 (1.4 × 10⁴), and 264 nm (1.2 × 10⁴); m/z (EI) 174 (M⁺, 100%); δ(Bruker 400 MHz, CDCl₃/TMS) 7.88 (dd, 1 H, 4-H, J_{4,5} 8 Hz, J_{4,6} 2 Hz), 7.45 (dd, 1 H, 4-H, J_{7,6} 8 Hz, J_{7,5} 2 Hz), 7.35 (dt, 1 H, 5-H, J_{5,4} 8 Hz, J_{5,6} 2 Hz), 7.26 (dt, 1 H, 6-H, J_{6,5} 8 Hz, J_{6,4} 2 Hz) and 8.70 (s, 2 H, NH and 3-H);⁶ m/z (HRMS) 174.0247 (Calc. for C₉H₆N₂S: 174.02517).

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