Loroglossol: An Orchid Phytoalexin

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ABSTRACT

Loroglossol, a dihydrophenanthrene first isolated from orchids (Loroglossum hircinum) after inoculation with fungi, was found to be active against spore germination of Monilinia fructicola and Phytophthora infestans (ED₅₀ approximately 5 × 10⁻³M). Previous reports that the compound is inactive presumable were due to its relatively low solubility.

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Loroglossol (Fig. 1, II) and the phytoalexin, hircinol (Fig. 1, III) were isolated by Hardegger et al. (7) and Urech et al. (9) from tubers of the orchid, Loroglossum hircinum, after inoculation with Rhizoctonia versicolor. The structures of the two compounds have been confirmed recently by Fisch et al (2) and both are very closely related to orchinol (Fig. 1, I), the phytoalexin from the orchid, Orchis militaris (4, 5, 6). Both orchinol and hircinol were reported to have appreciable antifungal activity, and to play a role in the defense of orchid tubers against fungal invasion. Loroglossol was described as inactive (2, 7). When a supply of this compound became available from a laboratory synthesis of orchinol (8), the opportunity was taken to re-examine its antifungal activity.

Loroglossol was assayed against spore germination of Monilinia fructicola (Wint.) Honey and Phytophthora infestans (Mont.) de Bary using the standard slide germination method (1) and other procedures as described in detail elsewhere (10). Loroglossol is sparingly soluble in water and it was made up initially as a 2.5 × 10⁻²M solution in ethanol. From this 0.2 ml were rapidly dispersed in 4.0 ml of water forming a fine and apparently stable suspension. After dilution with the spore suspension, this gave a concentration of 1 × 10⁻³M. Lower concentrations were obtained by serial dilution of the water suspension.

The results of these assays appeared to confirm previous reports that the compound was inactive. However, it was observed that at concentrations above 0.625 × 10⁻⁴M large numbers of crystals had separated out, indicating that loroglossol rapidly crystallized when transferred from ethanol solution to the water medium, and did not redissolve on subsequent dilution. To avoid this, a dilution series of loroglossol was prepared in ethanol and each dilution was added directly to a spore suspension to give the required concentrations. By this procedure, germination of P. infestans zoospores was almost completely inhibited down to 6 × 10⁻⁵M (Table 1). With M. fructicola, spore germination was not inhibited below 1.25 × 10⁻⁴M but, at concentrations down to 1.56 × 10⁻⁵M, germtubes were extremely stunted and greatly distorted, frequently rupturing at their tips. It is unlikely that the majority of such germ tubes were viable.

It appears, therefore, that loroglossol has antifungal activity at least of the same order as orchinol and hircinol [minimum inhibitory dose 10⁻⁴ - 10⁻³M, (3, 5)]. These observations justify the warning in the original description of the slide germination assay, that
phytoalexin in addition to hircinol in *Loroglossum hircinum*, and its role in the defense reaction of this plant should be reconsidered.

**LITERATURE CITED**


