Isolation of Strigolactones from Root Cultures

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Striga hermonthica (Del.) Benth. is an important root parasitic weed of cereal crops in Sub-Saharan Africa. Vulnerable crops include sorghum, maize, millet and rice. To germinate, a Striga seed requires after-ripening pretreatment (conditioning) in a moist warm environment for 10 to 14 days and subsequent exposure to an exogenous stimulant. Germination stimulants so far reported are thought to be sesquiterpene lactones based on their structures, and are collectively named strigolactones.

Preliminary screening of plant tissue cultures in our laboratory revealed that root cultures of Menispermum dauricum, a broad-leaved herbaceous plant, and Lotus japonicus, a leguminous plant, were highly potent in inducing germination of conditioned S. hermonthica seeds. M. dauricum root culture filtrate was subjected to solvent partitioning and high activity was detected in an EtOAc fraction. Then stimulant in the EtOAc fraction was purified by Sephadex LH-20 column chromatography and HPLC. The purified stimulant was identified as (+)-strigol (1) by direct comparison of its chromatographic behaviour, $^1$H-NMR, UV and mass spectra with those of authentic (±)-strigol, and on the basis of its CD spectrum (1). L. japonicus root culture filtrate was subjected to solvent partitioning. Activities were recovered in hexane and EtOAc fractions. Active substances in the hexane fraction were purified as mentioned above. The most active stimulant was isolated and subjected to mass spectrometry in the ESI mode and EI mode. Chromatographic behavior and mass spectrum of the stimulant were identical to those of authentic (±)-5-deoxystrigol (2). Incorporation of possible biosynthetic precursors into (+)-strigol in M. dauricum root culture will also be presented.

1. $R=\text{OH}$
2. $R=\text{H}$