# Pyrrolizidine Alkaloids from *Echium rauwolfii* and *Echium horridum* (Boraginaceae)

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Echimidine was isolated from *Echium rauwolfii* and *Echium horridum* and identified by MS, $^{1}$H- and $^{13}$C NMR as a major alkaloid. In addition, structures of 12 minor alkaloids were inferred from GLC and GLC-MS analyses: 7-angeloylretronecine, 7-tigloylretronecine, lycopsamine, 7-acetyllycopsamine, uplandicine, 7-angeloyllycopsamine, 7-tigloyllycopsamine, tigloyl isomer of echimidine, 7-angeloyl-9-(2-methylbutyryl)retronecine, 7-tigloyl-9-(2-methylbutyryl)retronecine, 7-angeloyl-9-(2,3-dihydroxybutyryl)retronecine, and 7-tigloyl-9-(2,3-dihydroxybutyryl)retronecine. Both species had similar alkaloid profiles. Alkaloid extracts exhibited antibacterial effects with a MIC of 1.7 mg/ml in *E. coli*. Microscopic examination of *E. coli* treated with different subtoxic alkaloid concentrations (13–52 μg/ml) revealed extensive filamentation.

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