The Surprising Story of Terpene Biosynthesis in Ginkgo biloba

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Abstract

The Ginkgo biloba tree produces, next to sitosterol, a set of unusual diterpenes, the ginkgolides and a structurally related C15-compound bilobalide, which display interesting pharmacological properties. We have studied their biosynthesis by application of precursors labeled with stable isotopes to Ginkgo biloba embryos grown on agar. Our results prove the coexistence of two well segregated and mechanistically independent pathways for the early steps of terpene biosynthesis in this plant. The origin of all the carbon atoms and most of the hydrogen atoms of ginkgolide A has been established. Together with the identification of two putative intermediates the experimental data can be integrated into a detailed biosynthetic scheme for the ginkgolides and for bilobalide.