

Biotechnology for the Production of Flavor and Fragrance Terpenoids.

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Synthetic biology opens possibilities of developing cost-effective and sustainable manufacturing processes for molecules not easily available by organic chemistry or by extraction from natural resources. Because of the structural diversity and broad range of application the terpenoid biosynthetic pathway has been extensively studied in recent years and economically viable solution for biochemical production of this family of molecules are emerging.

In the flavor and fragrance industry, terpenoids represent a class of secondary metabolites of great economic importance, with unique olfactory properties, often difficult to replace with synthetic analogs. These molecules are mostly derived from plants and have thus the disadvantage of being subject to fluctuations in price and quality due to climatic or geo-politic factors and are sometimes available only in small concentration in the raw material or only from non-sustainable resources. In addition, given the structural complexity of terpene molecules, cost-effective chemical routes are not available for many terpene compounds important for the industry.

We have therefore investigated the biosynthesis of terpene molecules constituents of key perfume ingredient. The approaches used for the molecular characterization of new terpene biosynthetic pathways will be discussed and examples of successfully elucidated pathways leading to terpene molecules of high value for the perfumery industry will be presented. Finally, recent achievements in cost-effective industrial production of terpene compounds, such as Clearwood™, will be discussed.