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The Aroma Volatiles of Cannabis – How Terpene Synthases Create Chemical Diversity

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Abstract: Terpenes are responsible for the characteristic aroma of different cannabis chemovars. The first committed step in the biosynthesis of these volatiles is catalyzed by terpene synthases. Plant genomes often contain large families of genes that code for terpene synthases and, for the development of varietal improvement strategies, it is thus essential to determine or predict the function(s) of these genes. Interestingly, while some terpene synthases are highly specific, accepting only one precursor (a C10 prenyl diphosphate for monoterpene synthases or a C15 prenyl diphosphate for sesquiterpene synthases) and generating mostly one signature product, others are promiscuous and catalyze the formation of multiple products. We have been using both experimental and computational modeling approaches to better understand catalytic specificity in terpene synthases. These efforts have demonstrated how the interactions between active site residues of the enzyme and reaction intermediates affect product outcome. This presentation will provide a mechanistic introduction to terpene synthases, accessible to non-specialists but also with novel insights for experts, and will discuss the implications for aroma characteristics of cannabis cultivars.