Abstract

Secondary metabolites play a major role in the adaptation of plants to their environment, but also represent an important source of valuable compounds. The commercial applications of cannabinoids and jasmonates are well defined, but the current issues with their production demands the development of alternative sources.

The recent advances in synthetic biology and metabolic engineering have enabled tailored production of natural compounds in microorganisms. In an attempt to create a new source of production, we have developed a microbial platform for the production of cannabinoids and jasmonates. By the introduction of selected enzymes from *Cannabis sativa* and modification of the cytosolic fatty acid synthase (FAS), we have designed *Saccharomyces cerevisiae* for the biosynthesis of cannabinoids intermediate olivetolic acid, from glucose. We also demonstrated the *in vivo* bioconversion of cannabigerolic acid (CBGA) to Δ^9-tetrahydrocannabinolic acid (THCA) and cannabidiolic acid (CBDA). Additionally, we modified *S. cerevisiae* for the production of α-linolenic acid, the polyunsaturated fatty acids precursor of jasmonates by the introduction of specific fatty acid desaturases.

The construction of a microbial platform for the production of cannabinoids, will support the design of novel cannabinoids with enhanced properties and help to characterize the enzymes responsible for the production of less abundant cannabinoids. Microbial biosynthesis of α-linolenic acid, constitute an initial step for the creation of an alternative and more sustainable source of jasmonates for the perfume industry that currently relies on chemical synthesis. Therefore, the work developed in this thesis constitute an important contribution to support and increase the potential value of cannabinoids and jasmonates.