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As secondary metabolites of plants, flavonoids exhibit a series of biological properties, e.g. they play a role in plant growth and development, have antioxidant and antimicrobial properties. They also show positive effects on the human organism due to their, e.g. anti-inflammatory, anticancer, cardio- and neuroprotective properties; thus, consumption of plant products containing these compounds or additional supplementation should be considered when planning daily meals. Flavonoid compounds are always present in plants in a complex of several compounds, mainly in the form of glycosides, whose biological activity can be additionally enhanced or suppressed.

De novo chemical synthesis of flavones, both glucopyranosylflavones and their aglycones are generally expensive and commonly require expensive catalysts and the maintenance of harsh reaction conditions. In contrast, when extracting individual compounds from plants, the process is usually not economically viable, mainly due to the low concentrations of these polyphenols in the plant, per gram of dry mass, and the high cost of separating mixtures often composed of dozens of compounds.

The aim of this work was to synthesize new flavonoid compounds and those which occur in small amounts in medicinal plants, mainly containing methoxy substituent, and to determine the catalytic ability of selected microorganisms, unconventional yeast strains and entomopathogenic filamentous fungi for biotransformation of these compounds.

Most living organisms are able to hydrogenate the double bond. Yeasts have specific enzymes that enable hydrogenation of the double bond between the C2 and C3 carbon atom of chalcones. I used eight microorganisms in chalcone biotransformations: *Yarrowia lipolytica* KCh 71, *Rhodotorula rubra* KCh 4, *R. marina* KCh 77, *R. rubra* KCh 82, *R. glutinis* KCh 242, *Saccharomyces cerevisiae* KCh 464, *Candida viswanathii* KCh 120, and *C. parapsilosis* KCh 909. Each exhibited the ability to reduce the double bond in selected chalcones and convert them into the expected products, but the efficiency of the described process differed significantly between the strains.

One of eight strains of unconventional yeast used in the study was a microorganism from the species *Yarrowia lipolytica*, which can also be used as a dietary supplement/supplement due to its GRAS (Generally Recognized As Safe) status. The use of yeast was to hydrogenate the double bond between the C2 and C3 carbon of the chalcone backbone and produce compounds with a potentially sweet taste having biological properties similar to chalcones. Both the chalcones and the biotransformed dihydrochalcones were submitted for biological tests to determine their activity.

Additionally, based on previous studies in entomopathogenic filamentous fungal cultures in which the ability to unique 4-*O*-methylglycosylation of hydroxyflavones was demonstrated, I selected nine entomopathogenic filamentous fungal strains.

They belonged to 4 species (*Beauveria bassiana*, *B. caledonica*, *Isaria farinosa*, and *I. fumosorosea*) and were tested for their catalytic ability to convert methoxyflavones to obtain their more soluble/absorbable derivatives. The use of these catalysts yielded hydroxy- and glucopyranosylflavones.

In this dissertation, I presented the biotransformations of 18 substrates. Ten chalcones were biotransformed in cultures of unconventional yeast strains to obtain seven dihydrochalcones (compounds **1a-7a**). Eight methoxyflavones were biotransformed in cultures of entomopathogenic filamentous fungi strains to obtain a total of 21 methoxyflavone derivatives - eight with an attached hydroxyl group and thirteen 4-*O*-methylglucopyranosyl derivatives. The aim of the work was to obtain derivatives with interesting biological properties, better bioavailability and solubility in relation to the substrates used, which is attributed to glycosidic derivatives of flavonoids.