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TOPIC(s) : Biocatalytic cascade reactions

Biotransformations of flavonoids with a methyl group or a chlorine atom in cultures of entomopathogenic filamentous fungi *Isaria fumosorosea* KCH J2

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PURPOSE OF THE ABSTRACT

Flavonoids are widespread in nature secondary metabolites of plants with numerous biological activities, including antimicrobial, anti-inflammatory, antiplatelet, and anti-cancer. Among the various structures of flavonoids, we can distinguish such subclasses as chalcones, flavanones, and flavones. Methylation at the ring position of flavonoid compounds leads to derivatives with increased metabolic stability due to insusceptibility to conjugate with glucuronic acid or sulfate [1]. On the other hand, the introduction of a chlorine atom into the structure of a flavonoid compound enhances its anti-inflammatory activity [2]. In addition, the introduction of a glucose unit into flavonoids leads to the formation of derivatives with improved water solubility and bioavailability [3].

To obtain such flavonoids with a methyl group or a chlorine atom and glucose unit with satisfactory yields, we combined chemical and biotechnological methods. In research of microbial glycosylation of flavonoids, our team obtained compounds with a methyl group at the same position of the flavonoid core, belonging to three subgroups of flavonoids (2'-hydroxy-5'-methylchalcone, 6-methylflavanone, and 6-methylflavone) and biotransformed them using the strain of entomopathogenic filamentous fungi *Isaria fumosorosea* KCH J2 [3,4]. In further research on the glycosylation of flavonoids, we obtained their counterparts with a chlorine atom (5'-chloro-2'-hydroxychalcone, 6-chloroflavanone, and 6-chloroflavone) and biotransformed them in cultures of the same strain. The resulting compounds were glycosylated at different positions of the flavonoid core. In the case of chalcones, we observed glycosylation of 5'-chloro-2'-hydroxychalcone at A ring (at C-2'), while glycosylation of 2'-hydroxy-5'-methylchalcone occurred at B ring (at C-3). Biotransformation of 6-chloroflavanone led to the formation of one main product glycosylated at B ring (at C-4') but microbial glycosylation of 6-methylflavanone led to the formation of 4 products and none of them was glycosylated at C-4'. Another biotransformation substrate – 6-chloroflavone was glycosylated at C-4' (similar to 6-chloroflavanone) and 6-methylflavone was also mainly glycosylated at the same position but with another product glycosylated at C-8.

The obtained results show that the regioselectivity of microbial glycosylation conducted by the strain of entomopathogenic filamentous fungi *Isaria fumosorosea* KCH J2 depends on both: type of substituent (methyl group or chlorine atom) and structure of the flavonoid core (chalcone, flavanone, and flavone), and leads to the formation of biotransformation products glycosylated at different positions. However, some similarities can be observed, such as glycosylation at C-4' in the case of 6-chloroflavanone, 6-chloroflavone, and 6-methylflavone. The used strain *Isaria fumosorosea* KCH J2 is able to perform glycosylation of all of the tested flavonoid aglycones and can be used as a valuable tool for microbial glycosylation of various flavonoids.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

fungal biotransformation | flavonoids | glycosylation | O-methylglucosides

BIBLIOGRAPHY