Master Thesis in Biochemical Engineering (TBC)

Isolation, structure elucidation, and antimicrobial evaluation of novel glycolipids from cultures of *Dacryopinax spathularia*

Abstract

The addition of preservatives has become crucial to avoid food spoilage in industry. A promising class of natural preservatives are antimicrobial glycolipids (GLs) produced by the basidiomycete *Dacryopinax sp.* The GLs examined in this thesis consist of a polyhydroxylated fatty acid, glycosidically bound to a trisaccharide, which can be acylated with small organic acids. The chemical nature and the structure-activity relationships (SARs) of GLs have been characterised in this thesis in order to ultimately take advantage of their antimicrobial properties.

The aims were as follows: (1) The preparative isolation of unknown components from GL mixtures. (2) The structural elucidation using LC-MS^n and NMR spectroscopy. (3) The evaluation of the antimicrobial potential of GL mixtures and single pure compounds.

An analytical LC-MS method was established for the rapid identification and dereplication of GL components. In total, eight components were isolated from GL mixtures by preparative LC. Along with nine already purified compounds, they were structurally elucidated. LC-MS^n allowed for determination of molecular weight, substitution pattern, and polarity relative to the other XLs. NMR spectroscopy revealed eighteen structures from the seventeen GL compounds examined, indicating that not all samples were pure. Among these, nine new structures were discovered, while nine were found to be literature-known compounds. Furthermore, a novel substituent was identified besides the known ones.

Minimum inhibitory concentration (MIC) experiments examined the antimicrobial activity of GL mixtures against common organisms responsible for food spoilage. It was found to be much more active than commercial references. Thus, GLs are promising new preservatives. In addition, SARs have been deducted from MIC experiments with single GLs. It was concluded that GLs substituted with specific sets of substituents are the most potent antimicrobials. Medium activity was observed for GLs containing no or only one substituent. Furthermore, it was found that the newly discovered substituent significantly reduces the antimicrobial activity compared to the same structures without this moiety, regardless of other acyl groups present.

Author: *Kevin Becker*
Supervision: *Prof Dr Veronika Hellwig*
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