Glycolipid biosurfactants in food industry: their biological activity on the gut microbiome and against (food) pathogens

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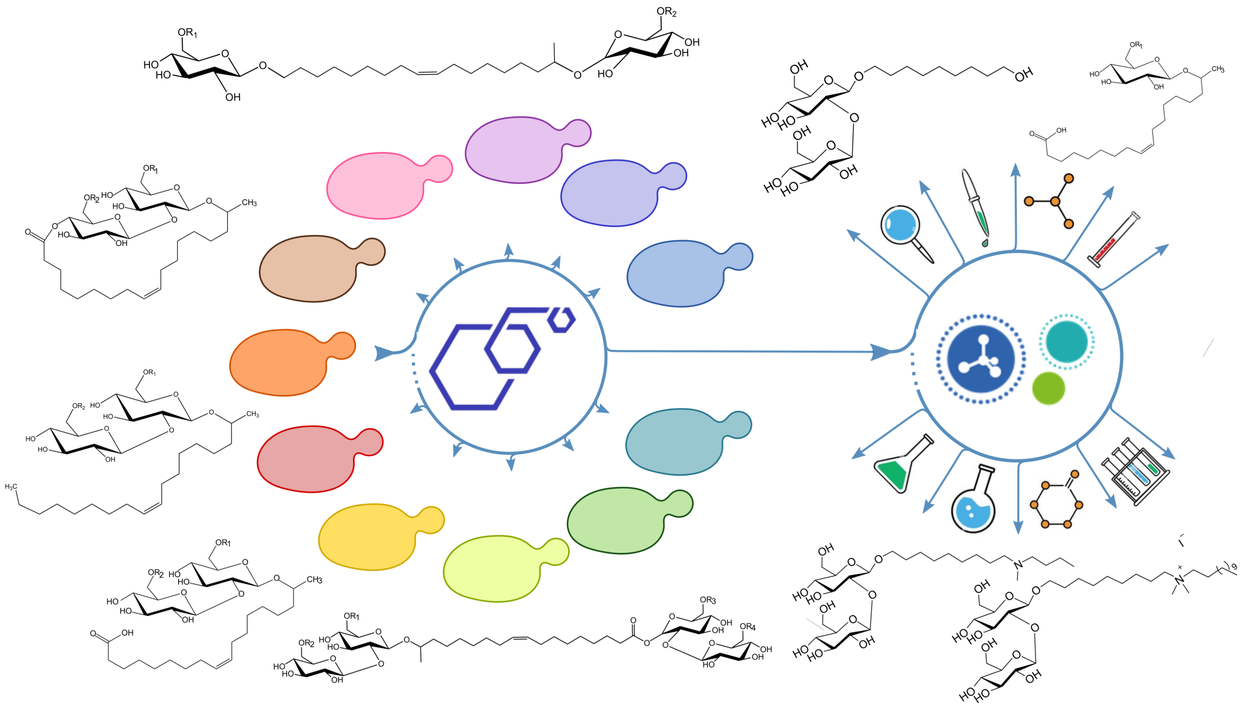
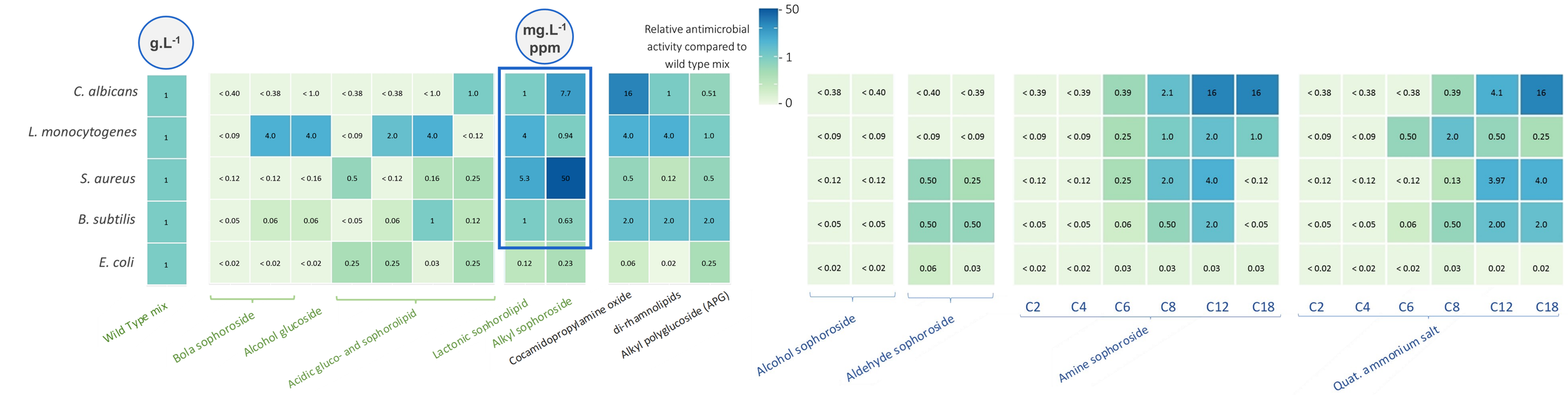
Introduction

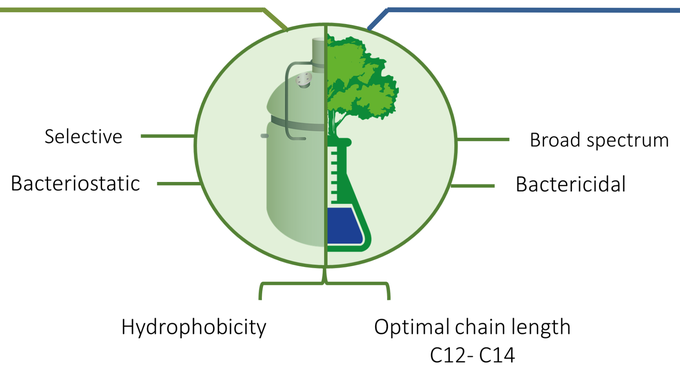
Glycolipid biosurfactants (sophorolipids and sophorosides) and their **chemical derivatives** are sustainable and environmentally friendly alternatives to petroleum derived or oleochemical surfactants. To meet the requirements regarding compound variability, **InBio.be** invested significant efforts to develop a battery of new ***Starmerella bombicola* strains** producing **new-to-nature glycolipid biosurfactants (BS)**. **SynBioC** was able to increase the compound variability by means of **chemical derivatization**. As currently more of these novel compounds are produced on a larger scale, time has come to map their properties and associated **application potential**. The **food industry** is one of those sectors in which surfactants play an important role. Also here, high-end green alternatives with improved and plural functionalities are warmly welcomed. This study investigates **the biological properties** of these biosurfactants against **pathogens** as well as their influence on the **gut microbiome**.



Results

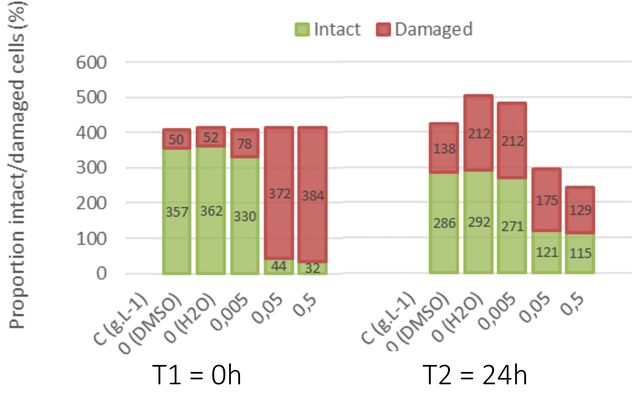


Microscopic image (100x 10x) of ***Starmerella bombicola***, a non-conventional yeast and natural producer of wild type biosurfactants. New-to-nature sophorolipids and sophorosides were fermentatively produced by a battery of novel strains in order to **widen the glycolipid property spectrum** and to **increase the application potential** .

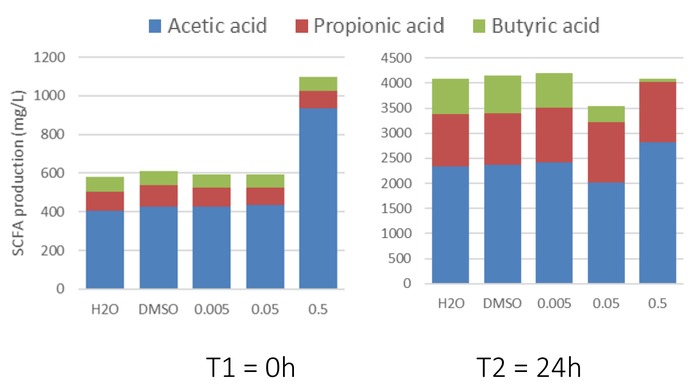


An in vitro antimicrobial assay, supported by a colorometric **resazurin**-based analytical method[1], showed that inhibition of **food spoiling and pathogenic** microorganisms was possible for both fermentatively produced (10) and chemically derived (16) glycolipids. This figure shows relative **minimal inhibitory concentrations** (g.L^{-1}) for every combination of glycolipid and micro-organism. This figure includes comparison to benchmark surfactants (3).

Influence of acetylated lacton sophorolipids on intact/damaged gut microorganisms



Influence of acetylated lacton sophorolipids on SCFA production profile by gut microorganisms



investigation of **the direct influence of lacton sophorolipids**, a wild type sophorolipid species, on the **viability of the gut microbiome and its production of short chain fatty acids** (SCFA). At concentrations of 0,05 g.L^{-1} and 0,5 g.L^{-1} an immediate (t = 0h) and prolonged (t = 48h) **effect in intact/damaged cell ratio** and **total cell count** was observed, as well as a **decrease in butyric acid production** by the gut microbiome. No significant changes were observed for the lowest tested concentration (0,005 g.L^{-1}) compared to the controls (preliminary results). Further investigation regarding BS digestibility, interaction with foodstuffs and desired BS concentration is required.

References

1. Elshikh *et al*. Resazurin-based 96-well plate microdilution method for the determination of minimum inhibitory concentration of biosurfactants. Biotechnol Lett. 2016 Jun;38(6):1015-9.

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