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TOPIC(s) : Biocatalytic cascade reactions

Glucosylated mycosporines for innovative UV-filters: a strategy inspired by marine organisms.

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PURPOSE OF THE ABSTRACT
Preventing people from UV damages is a major concern and challenge of the 21st century. As living beings have evolved their own defense strategies, Nature could be a great source of inspiration for developing new UV-filters(1).
Some organisms accumulate small molecules with unique UV-absorption and antioxidant properties, the mycosporines and mycosporine-like amino acids (MAAs). Interestingly, metazoans such as fish accumulate MAAs especially in sensitive tissues or organs like the eyes, either in free or associated form(2). Having MAAs associated to a carbohydrate moiety com-pound is of relevant interest for photostability(3) and formulation purposes. Glycosylated MAAs exist in terrestrial cyanobacteria, but their synthesis pathways remain unknown4. In our work, we focused on the enzymatic glucosylation of the mycosporine-serinol MSer(OH) naturally found in a lichen from the medio-littoral zones of Western European coasts, and, to date, never described as glycosyl-ated. This reaction would allow the development of innovative anti-UV products such as biosourced and biodegradable sunscreens or ophthalmic products.
As such, we relied on enzymes called GH70 a-transglucosylases that use sucrose as cheap glucosyl donor to transfer it onto a large variety of hydroxylated acceptor moieties(5). After a first screen of our lab collection, a sole enzyme (GS-D) efficiently recognized MSer(OH) by adding one or two gluco-syl units (95% conversion). In order to elongate the glucidic head, an enzymatic cascade involving a second GH70 enzyme was then developed. Now, a vast array of glucidic chains were added, varying in term of linkage specificity and size (from 3 to 24,000 glucosyl units) depending on the second enzyme used. Once glucosylated, these compounds keep their strong absorbance and photostability as well as their interesting antioxidant properties. Moreover, the enzymatic cascade works equally whether it is starting from purified MSer(OH) or from a raw extract, paving the way for the devel-opment of biomedical applications with a refined compound having texturing, moisturizing, anti-UV and antioxidant properties(6).

FIGURES

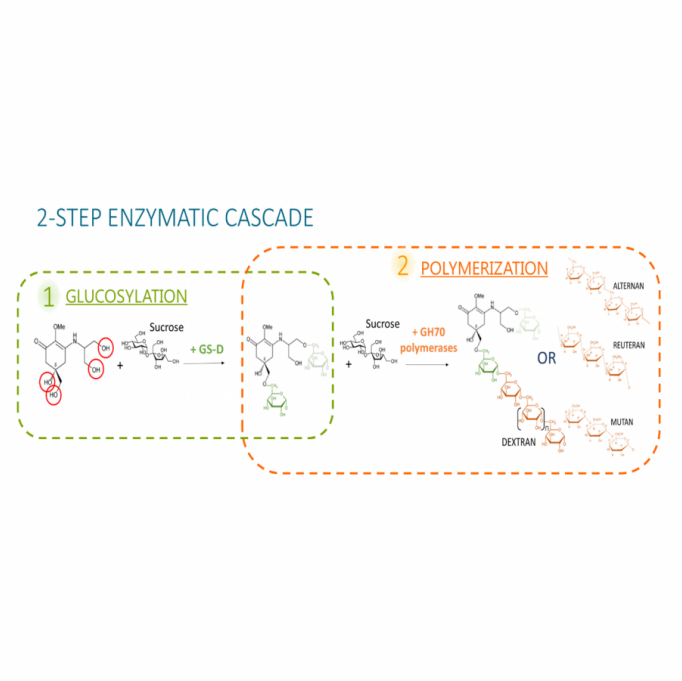

FIGURE 1

Figure 1 : Representation of the enzymatic cascade set up it this work.

FIGURE 2

KEYWORDS

Mycosporine-like Amino Acids | Transglucosylases | UV-Filter | Biomaterials

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