Rutinosidase and other diglycosidases: Rising stars in biotechnology

Vladimir KREN [1], Katerina BRODSKY [1], Michal KOTIK [1], Pavla BOJAROVÁ [1]

[1] Institute of Microbiology of the Czech Academy of Sciences, Laboratory of Biotransformation, Prague, CZECH REPUBLIC;

kren@biomed.cas.cz

Diglycosidases are glycosidases catalyzing the cleavage of entire disaccharide moieties from the aglycone. Rutinosidases, main diglycosidase representatives, cleave rutinose (α-L-Rha-(1-6)-β-D-Glc) from rutin or other rutinosides (Fig. 1A). Some diglycosidases can be classified as monoglucosidases with extended substrate specificity. They also have distinct synthetic (transglycosylating) abilities. Rutinosidase from *A. niger*[1] and *A. oryzae* (GH5-23) can glycosylate various acceptors, including phenols, in a good yield using priceworthy rutin as a glycosyl donor. Surprisingly, they are able to glycosylate species such as inorganic azide to form β-rutinosyl azide [2] or carboxylic acids forming (anomeric) glycosyl esters [3], being a unique property of glycosidases. The variant of *A. niger* rutinosidase mutated at the catalytic nucleophile residue E319A is capable of generating α-rutinosyl azide [2]. It was found that rutinosidase is able to accept quercetin 3-β-glucopyranoside as a substrate and thus it is also able to transfer a β-glucosyl moiety [1]. This enzyme has a dual glycosylation activity, generating either rutinosides or glucopyranosides [4]. Its broad substrate specificity has also been demonstrated in the enzymatic cleavage of various 6''-acylated quercetin-3-*O*-β-glucopyranosides (Fig. 1B). Rhamnose-containing compounds (rutinose) are attracting attention due to their anti-cancer activity and as skin anti-aging agents [5]. Their easy availability through the action of rutinosidase opens a whole new avenue in cancer therapy, dermatology, and other fields.

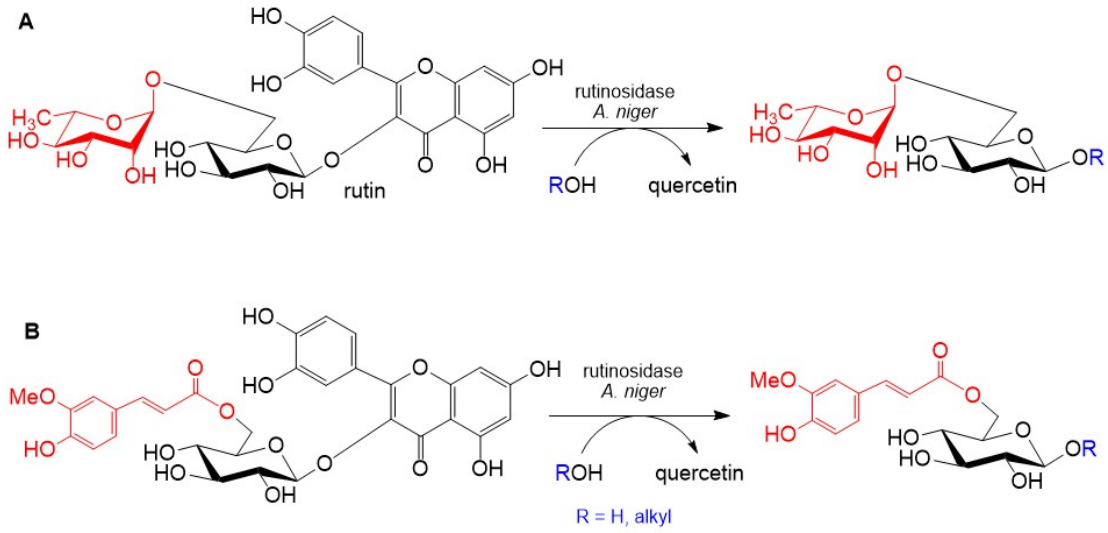

Fig.1 A Hydrolysis/transglycosylation by rutinosidase; B 6”-feruloyl quercetin 3-O-β-glucopyranoside

Acknowledgements

We acknowledge the support by the Czech Science Foundation project No. 22-00197K and by the COST Action CA18132.

Bibliographic references:

[1] P. Pachl, et al. (2020) FEBS J. (287), 3315-3327
[2] M. Kotik, et al. (2021), Cat. Commun. (149), 106193
[3] I. Bassanini, et al. (2019) Adv. Synth. Catal. (361), 2627–2637
[4] K. Brodsky, et al. (2020) Int. J. Mol. Sci. (21), 5671
[5] R. Novotná, et al. (2023) Molecules (28), 1728