Efficient one-pot enzymatic synthesis of alpha-(1 -> 4)-glucosidic disaccharides through a coupled reaction catalysed by Lactobacillus acidophilus NCFM maltose phosphorylase

Lactobacillus acidophilus NCFM maltose phosphorylase (LaMalP) of glycoside hydrolase family 65 catalysed enzymatic synthesis of alpha-(1 -> 4)-glucosidic disaccharides from maltose and five monosaccharides in a coupled phosphorolysis/reverse phosphorolysis one-pot reaction. Thus phosphorolysis of maltose to 0-glucose 1-phosphate circumvented addition of costly 0-glucose 1-phosphate for reverse phosphorolysis with different monosaccharide acceptors, resulting in 91%, 89%, 88%, 86% and 84% yield of alpha-a-glucopyranosyl-(1 4)-N-acetyl-a-glucosamin inopyranose IN-acetyl-maltosamine I, alpha-b-glucopyranosyl(1 -> 4)-a-glucosaminopyranose I maltosaminej, a-a-glucopyranosyl(1 -> 4)-b-mannopyranose, alpha-n-glucopyranosyl(1 -> 4)-l-fucopyranose and alpha-b-glucopyranosyl(1 -> 4)-D-xylopyranose, respectively, from 0.1 M maltose, 0.5 M N-acetyl glucosamine, 0.1 M glucosamine, 0.1 M mannose, 1 M l-fucose and 0.5 M xylose in 0.2 M phosphate-citrate pH 6.2. These current yields of 0.27-0.34 g of disaccharide products from 10 mL reaction mixtures are easy to scale up and moreover the strategy can be applied to large-scale production of other oligosaccharides from low-cost disaccharides as catalysed by phosphorylases with different substrate specificities.