SUPPLEMENTAL MATERIAL

Supplementary Table 1 Percentage (%) of each oligosaccharide in products (45 U).

Oligosaccharide composition	Percentage (%)
$(LA\text{-}G)_1$	40.77
$(LA\text{-}G)_1Me$	6.27
$(LA\text{-}G)_2$	29.22
$(LA\text{-}G)_2Me_1$	4.35
$(LA\text{-}G)_2Me_2$	4.23
$(LA\text{-}G)_3$	11.57
$(LA\text{-}G)_3Me_1$	2.12
$(LA\text{-}G)_3Me_2$	1.08
$(LA\text{-}G)_3Me_3$	0.39

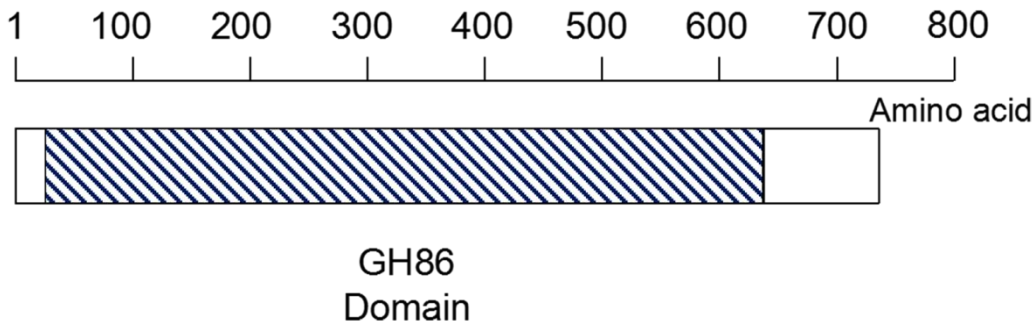

Fig. S1 A schematic of the modular arrangement of Aga86A_Wa. The GH86 family glycoside hydrolase catalytic domain (26-637 amino acids) was identified by the dbCAN.

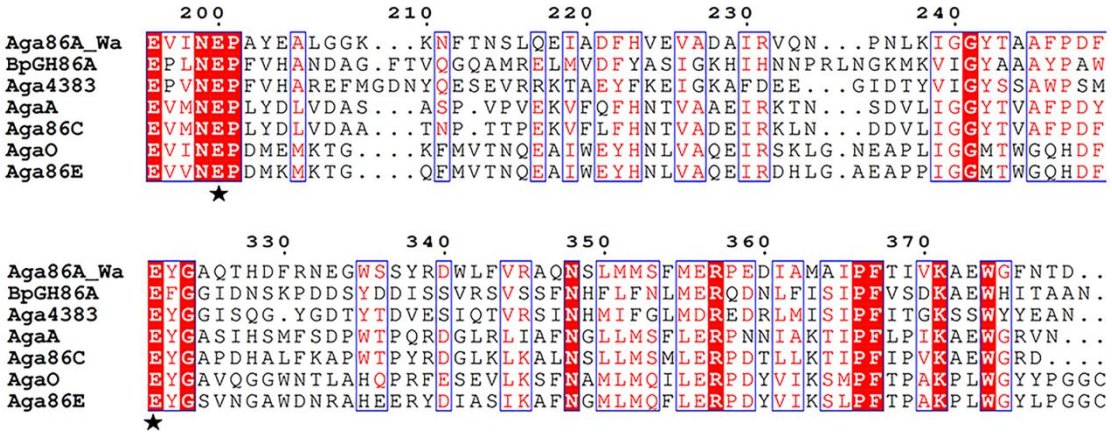

Fig. S2 Amino acid sequence alignment of Aga86A_Wa with characterized GH86 family enzymes. Critical catalytic residues were marked by stars.

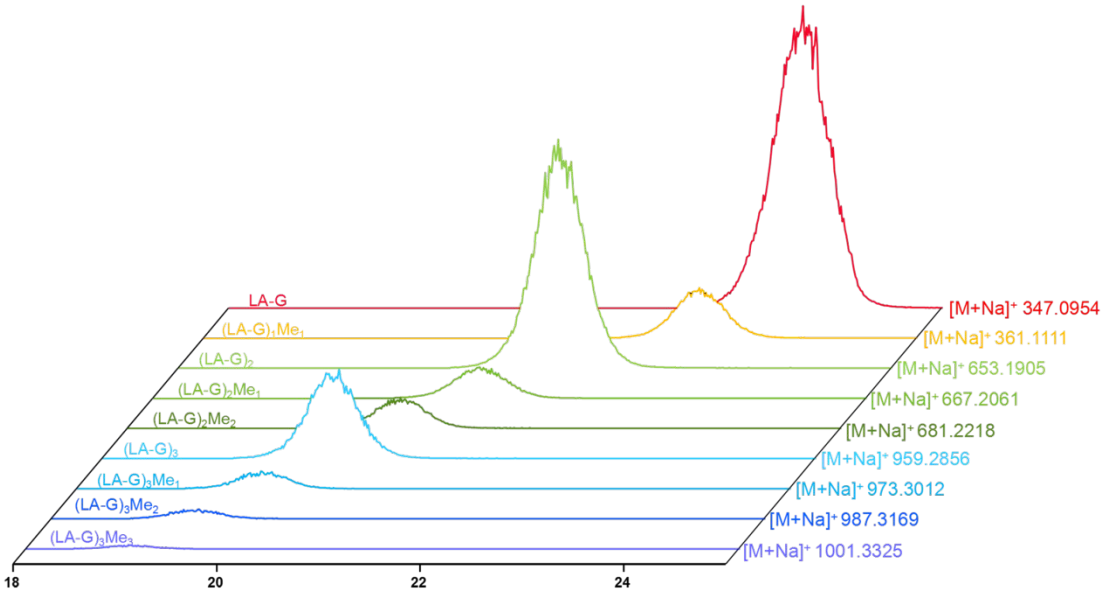

Fig. S3 Extracted ion chromatograms of oligosaccharides in product obtained with 45U enzyme (Fig, 5). The m/z and composition of oligosaccharides were annotated to the corresponding curve.

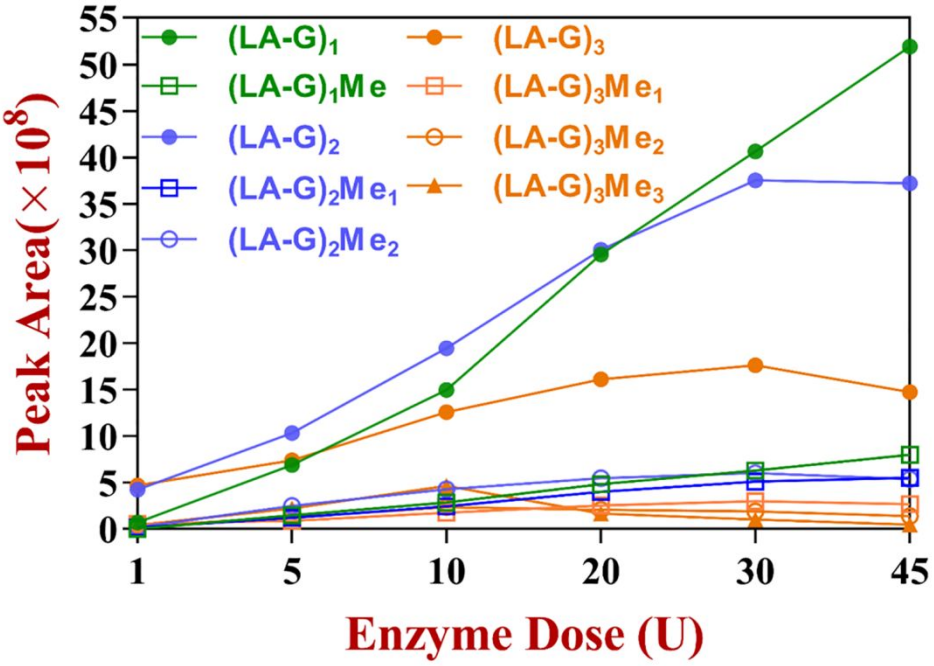

Fig. S4 Products prepared by 100 mg substrate incubated with different enzyme doses of Aga86A_Wa at 24 h.

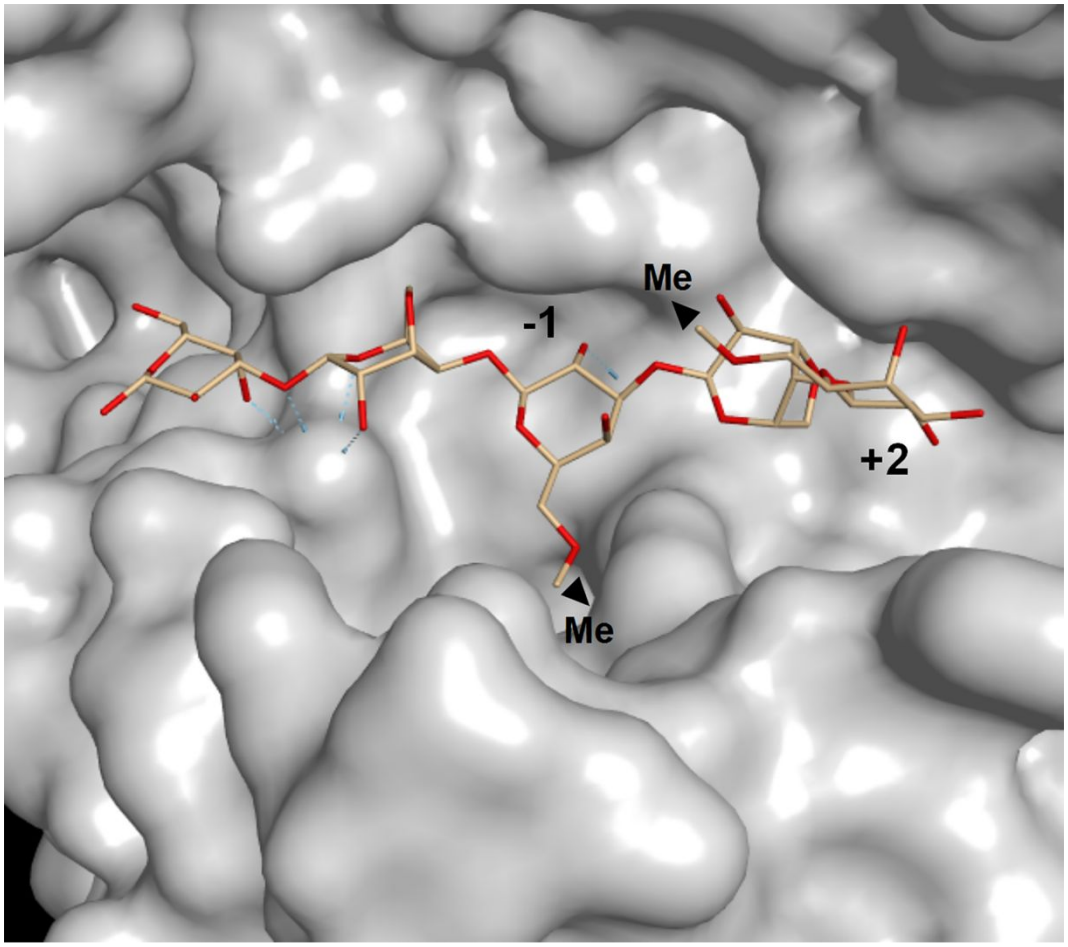

Fig. S5 Predicted tertiary structure of Aga86A_Wa superimposed with the ligand in BuGH86 (5TA0). The O-6 positions of G residues at -1 and +2 subsites were modified with methyl groups.