Regio- and Stereoselective β-Arabinofuranosylation Using a Boron-Mediated Aglycon Delivery Method

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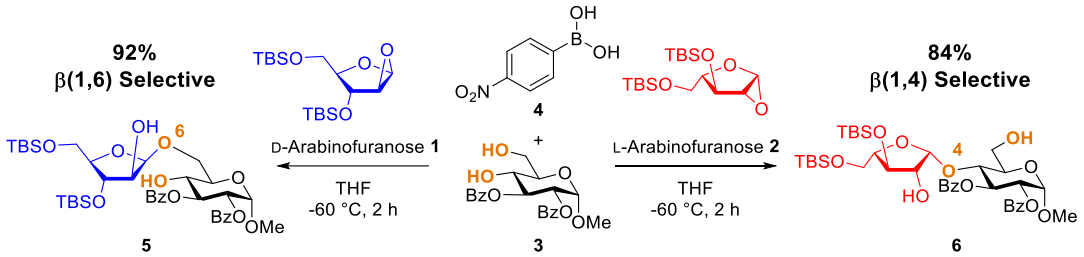
β-Arabinofuranoside (β-Arb*f*)-containing glycans have attracted much attention in many research fields due to their interesting biological activities. However, stereoselective construction of β-Arb*f* linkages has remained challenging owing to the non-availability of neighboring-group participation, the unfavorable anomeric effect, and steric hindrance of the substituent at the C2 position. In addition, furanose is favored by the S$_N$1 pathway due to its structural and electronic properties compared to pyranose, resulting in the blunted stereoselectivity.[1] In this context, we focused on our boron-mediated aglycon delivery (BMAD), which can construct 1,2-*cis* pyranosides with high regio- and stereoselectivities and we investigated the application of this method for regio- and stereoselective β-arabinofranosylation.

Initially, the glycosylation of 4,6-diol acceptor **3** with 1,2-anhydro-D-arabinofuranose **1** using a boronic acid catalyst **4** was found to proceed smoothly to give β(1,6)-D-Arb*f* **5** in high yield with high regio- and complete β-stereoselectivities. In addition, it was confirmed that when 1,2-anhydro-L-arabinofuranose **2** was used, the regioselectivity was reversed and β(1,4)-L-Arb*f* **6** was obtained in high yield,[2] indicating the regioselectivity was completely reversed depending on the optical isomerism of the donor used and was predictable a priori.[3] In addition, it was also successfully reversed the regioselectivity for the *cis*-3,4-diol acceptors in the glycosylations using donors **1** and **2**. Mechanistic studies using DFT calculations revealed that the present glycosylation undergoes via S$_N$i-type mechanism. Furthermore, the usefulness of this present method was demonstrated by the chemical synthesis of a fragment of arabinogalactan derived from timothy glass.



1) A. B. Mayfield, J. B. Mettemich, A. H. Trotta, E. N. Jacobsen, *J. Am. Chem. Soc.* **2020**, *142*, 4061. 2) M. Tanaka, A. Nakagawa, N. Nishi, K. Iijima, R. Sawa, D. Takahashi, K. Toshima, *J. Am. Chem. Soc.* **2018**, *140*, 3644. 3) M. Tanaka, K. Sato, R. Yoshida, N. Nishi, R. Oyamada, K. Inaba, D. Takahashi, K. Toshima, *Nat. Commun.* **2020**, *11*, 2431.