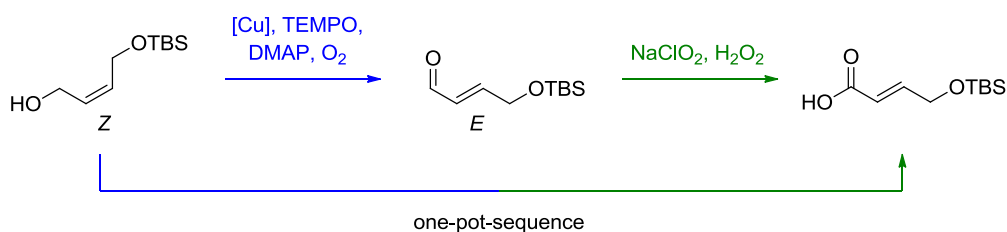


Abstract

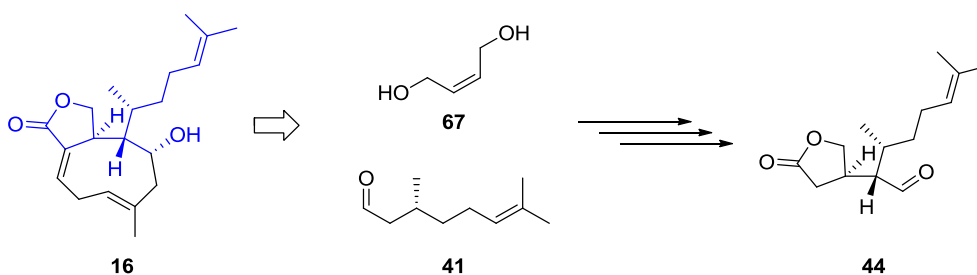
Xenicane-diterpenes represent a class of marine natural products with manifold interesting biological activity. Despite their promising cytotoxic and antibacterial properties, only few synthetic approaches to xenicane-diterpenes are known. One member of this class of natural products is the 4-hydroxydictyolactone (**16**), which could initially be isolated by Guella and Pietra in 1991 from the brown seaweed *Dictyota ciliolata*. Its first total synthesis was achieved by Williams *et al.* in 2009.

This work presents a diastereoselective approach to the northern fragment of the 4-hydroxydictyolactone (**16**). Key features include the use of renewable resources and sustainable synthetic methods. During the course of this campaign, a copper-catalyzed aerobic oxidation could be optimized and its applicability in diverse sequential one-pot oxidation/organocatalysis reactions could be demonstrated. A one-pot sequence consisting of oxidation and *Z/E*-isomerization was established to directly convert (*Z*)-allylic alcohols to (*E*)- α,β -unsaturated aldehydes. This system combines the desired oxidation and isomerization activity of reagents like pyridinium chlorochromate (PCC) while it avoids their toxic and environmentally pollutive properties and is consequently able to substitute these reagents completely.



The combination of alcohol oxidation, *Z/E*-isomerization and aldehyde oxidation to give a one-pot sequence allowed for the direct conversion of (*Z*)-allylic alcohols to (*E*)- α,β -unsaturated carboxylic acids. Purification of the isolated carboxylic acids was not necessary in most cases.

The key step in the diastereoselective formation of the chiral centers in **16** was a Mukaiyama-Michael addition. A titanium-mediated enamine Michael addition afforded aldehyde **44** in satisfying yield and high diastereoselectivity.



Starting from chiral-pool derived (*R*)-citronellal (**41**) and (*Z*)-2-butene-1,4-diol (**67**) the northern fragment of 4-hydroxydictyolactone was obtained en route to its total synthesis.