Synthesis of (±)-Tanegool and (±)-Pinoresinol

Significance: Lignin natural products offer a multitude of structural variety. Despite their diverse complexity, the biosynthesis is proposed to feature a common oxidative coupling of two propenyl phenols, resulting in a bis-para-quinone methide, such as D or G. In this communication, Albertson and Lumb elegantly accessed such an intermediate through the opening of a cyclobutane. Indeed, bis-para-quinone methides D and G underwent 5-exo-trig cyclizations to result in the lignin natural products tanegool and pinoresinol.

Comment: Ferulic acid A was first converted into cyclobutane C. For the synthesis of tanegool, reduction led to key intermediate D. Then, radical-induced cyclobutane opening with iron trichloride gave the natural product in 59% yield together with 15% of its C7 ‘epimer. The same strategy was used to synthesize pinoresinol by first epimerizing the α-position of diester B. After reduction and deprotection of E, radical ring opening resulted in intermediate G, which cyclized to pinoresinol as a single diastereomer in 48% yield.