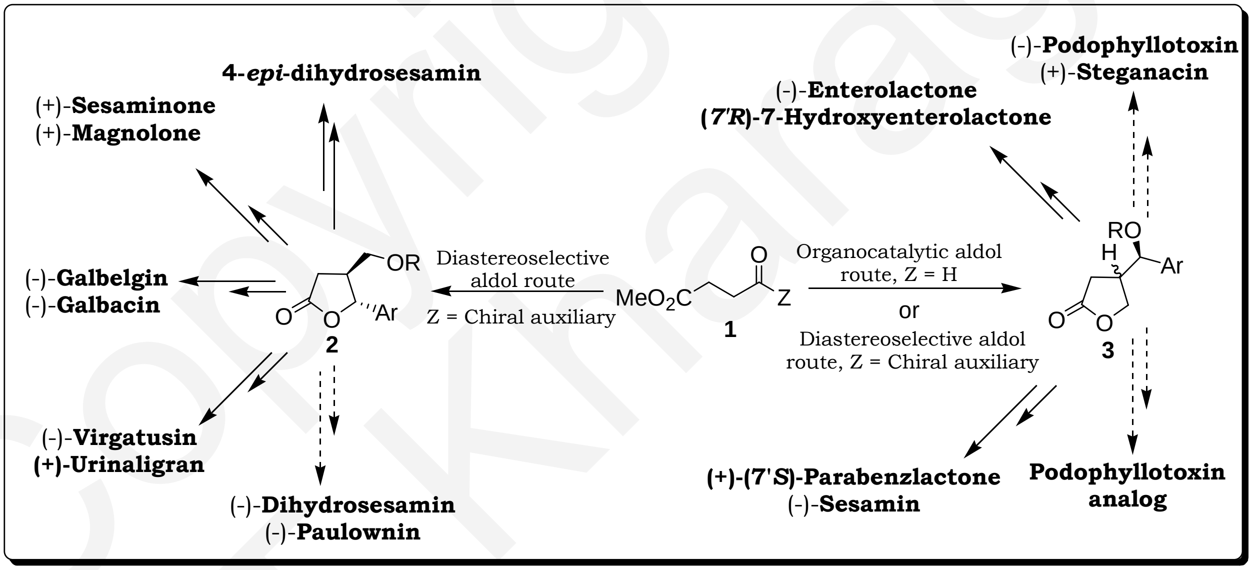
# Abstract

For the synthetic organic chemists one of the most challenging tasks is to find out synthetic tools that will give efficient access to biologically active natural products. *β*-Hydroxy carbonyl group itself and in suitably modified forms are important structural motifs present in various stereochemically complex natural and non-natural products. For this purpose, aldol reaction has been an obvious choice not only because it gives *β*- hydroxy carbonyl motif but also can generate up to two new adjacent stereocenters simultaneously. Lignans, characterized as being formed by the union of two C6-C3 units through *β*-*β′* linkage, have complex structural diversity and show wide range of biological activities. Hence asymmetric synthesis of lignans is important from chemical as well as pharmaceutical point of view.

The thesis entitled "**Asymmetric Synthesis of Lignans by Aldol Reactions**" describes studies on non-racemic synthesis of lignans by aldol reactions of a four carbon unit having a pendant ester group.



**Scheme 1**. Lignans or their advanced intermediates synthesized from **1** by asymmetric aldol reactions

Asymmetric aldol reactions (chiral auxiliary based aldol reaction and organocatalytic aldol reaction) of the four carbon substrate **1** (**Scheme 1**) were suitably utilized to give two chiral *γ*-butyrolactones **2** and **3**. These two were used as key precursors to the asymmetric synthesis of main classes of lignans such as (+)-4-*epi*-dihydrosesamin, (+)-sesaminone, (+)-magnolone, (–)-

virgatusin, (+)-urinaligran, (–)-galbelgin, (–)-galbacin, (+)-(7'*S*)-parabenzlactone, (–)-sesamin, (–)-enterolactone and (7′*R*)-7-hydroxyenterolactone. During the course of this study, asymmetric synthesis of advanced intermediates for (–)-dihydrosesamin, (–)-paulownin, (–)-podophyllotoxin and its analog and (+)-steganacin were also achieved.

Key words: Aldol reaction, *β*-hydroxy carbonyl group, asymmetric synthesis, chiral *γ*-butyrolactones, lignans.