Send Orders for Reprints to reprints@benthamscience.ae

REVIEW ARTICLE

Exploring Coumarin and Chalcone Analogues as Potential Antimycobacterial Agents

Shefali Shukla, Pragya Gahlot, Ameya Khandekar, Arush Agrawal and Sharda Pasricha*

Department of Chemistry, S V College, University of Delhi, India

ARTICLE HISTORY

Review: June 07, 2017
Research: October 18, 2017
Accepted: November 14, 2017

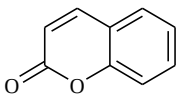
DOI:
10.2174/2211352515666171120142559

Abstract: TB is one of the major infectious diseases caused by *Mycobacterium tuberculosis* (M.TB) with millions of people dying every year. Emergence of new cases, increased incidence of multi drug resistant strains of M.TB and the adverse effects of first and second line antitubercular drugs have led to renewed interest in natural products with the hope of discovering new antitubercular leads. Coumarins and chalcones are plant derived secondary metabolites with potentially exploitable activities against M.TB. To pave way for future antitubercular research, there is an urgent need to collect latest information on these promising moieties. The objective of this review is to focus on the newer and important coumarin and chalcone derivatives having potent antitubercular activity. General scheme of synthesis of coumarins and chalcones is presented. This review enlightens the landscape of the discovery and development of chalcones and coumarin based antitubercular drugs with an emphasis on structure- activity relationship (SAR) and inhibition of some their specific molecular targets. We hope that this review paper would provide new opportunities for researchers to design future generation novel and potent coumarin and chalcone based antitubercular drugs with higher activity and lesser toxicity.

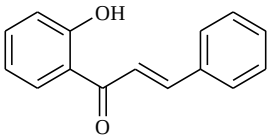
Keywords: Antitubercular activity, Mycobacterium tuberculosis, QSAR Studies, Molecular targets, Chalcones, Coumarins.

1. INTRODUCTION

TB is an infectious disease caused by M.TB which primarily affects the human respiratory tract. As per the World Health Organization (WHO), approximately 2 million people die of TB and ten million fresh cases are reported every year. Multidrug resistant strains of M.TB, adverse effects of first and second line drugs {e.g. isoniazid (INH), ethambutol (EMB), rifampicin (RIF), pyrazinamide-first line drugs and ethionamide (ETH), thiolactomycin (TLM)-second line drugs)}, the increased incidence of tuberculosis associated with HIV and the emergence of new cases have led to the revival of research in the field of natural products like coumarins and chalcones [1-4]. Development of new agents that reduce the duration, cost and complexity of the current therapeutic regimen as well as effectively treat MDR and XDR TB would have a major impact on public health. Coumarins (1) are a class of phenolic compounds found widely in the plants, fungi and bacteria. Chalcones (2), on the other hand, belong to the family of plant derived compounds, called flavonoids, which are widely distributed in fruits, vegetables, tea, and spices. Preparations containing coumarins and chalcones as prime physiologically active components have been used, for centuries, to cure human diseases. Clinical trials of these compounds have shown that they are welltolerated and could reach moderate plasma concentration. Such observations pave way for researchers to look for better understanding of these compounds. Many research groups have isolated and identified the structural derivatives of these two compounds possessing antifungal, antiviral, antitumor and antibacterial (esp. antitubercular) activity [5-11]. However, further exploration of the pharmacological potential of these compounds is still underway. In this paper, recent reports on antitubercular activities of coumarins and chalcones have been reviewed. The article focuses on the *in- silico* and *in-vitro* studies of naturally occurring as well as synthetic and semi - synthetic compounds having moderate to good activity ($\leq$ 20 μg/mL) and low toxicity.



(1) Coumarin



(2) 2'-Hydroxychalcone

2. CHEMISTRY

Coumarins (2H-1-benzopyran-2-one) (1) consist of fused benzene and α-pyrone rings. Classically, the synthesis of coumarins has been carried out by the Pechmann reaction (Scheme **1**), i.e. by the condensation of β-ketoesters with phenols in an acidic medium [12].

*Address correspondence to this author at the Sharda Pasricha, Department of Chemistry, S V College, University of Delhi, India; Tel: +919971099180; E-mail: shardap@gmail.com

2211-3525/17 $58.00+.00