SUMMARY

The research work embodied in this thesis entitled "**Transformative Reactions of Terpenoids and Studies on their Biological Activity**" was carried out in the Department of Chemistry, University of North Bengal, Darjeeling – 734 013, under the guidance and supervision of Dr. P. Ghosh, Department of Chemistry, University of North Bengal. The studies described in this thesis comprises the phytochemical investigation of *Croton bonplandianum*, development of new methodology using greener and cleaner technology to synthesize some suitable derivatives of pentacyclic triterpenoids and investigation of their manifold applications in biology. The thesis has been divided into four parts.

Part I is divided into two chapters, chapter I and chapter II. Chapter I is divided into three sections. Section A comprises the main morphological feature and classification of the genera croton. Section B describes the detail phytochemical study of methanolic extract of root of *C. bonplandianum* Bail, isolation of various active components *etc*. The study reports the isolation and structure elucidation (IR, ^{1}H NMR, ^{13}C NMR, 2D NMR, MS *etc*) of a new ursane type triterpenoid *viz*. 3α-hydroxy-urs-12,15-dien (**1**), along with two known triterpenoids, oleanolic acid (**2**) and ursolic acid (**3**) and most abundant β-sitosterol (**4**).

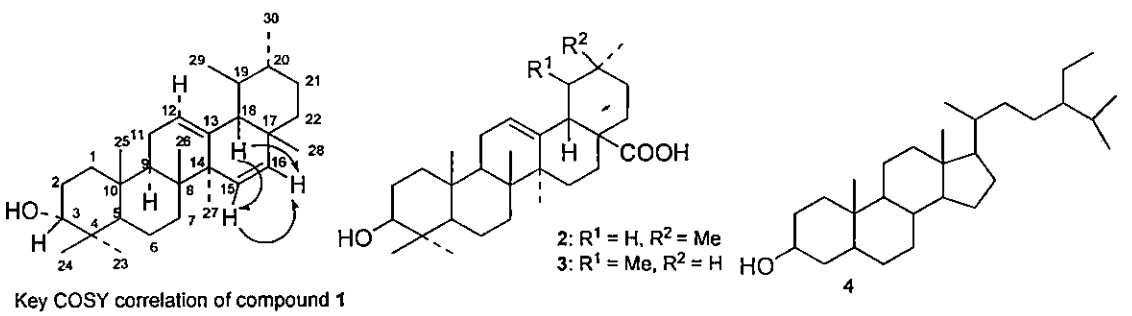


Figure 1 Isolated compounds from C. bonplandianum Bail.

Section C describes the results of the present investigation towards the antimicrobial activity of the isolated compounds against a series of fungal and bacterial pathogens. All the isolated compounds showed good antimicrobial activity and the determined MIC values are tabulated in table 3 and 4 respectively.

Chapter II describes the detail experimental procedures and a collection of important references used during the study.

Part II is divided into four chapters. Chapter I comprise a short review on pyrazine derivatives. Chapter II is divided in two sections. Section A is related to the development of a clean protocol for the synthesis of pyrazine derivatives of triterpenoids, the total optimization of the reaction condition and the details about the structure elucidation of the synthesized pyrazine derivatives.

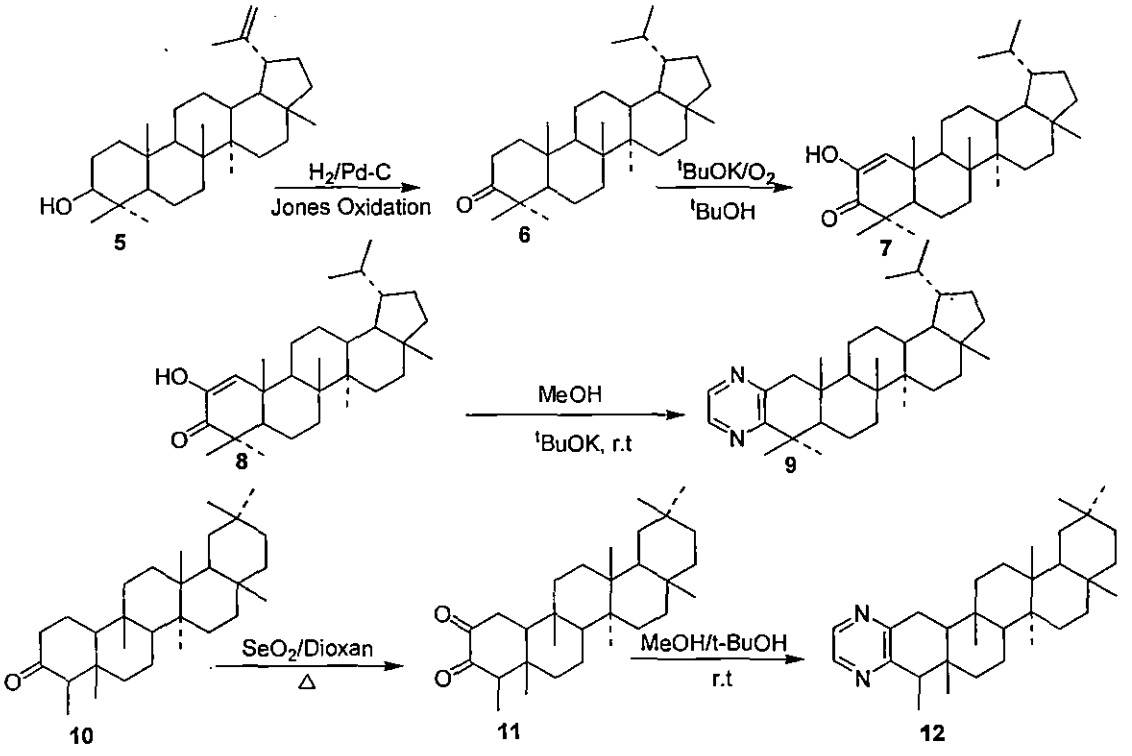


Figure 2 Synthesis of pyrazine derivatives of triterpenoids

Section B of this chapter describes the biological activity of the synthesized compounds. It represents the results of the antifungal activity and the antitopoisomerase activity with a through prediction of binding efficiency to the enzyme molecule by 3D docking studies. Chapter III is further classified into two different sections. Section A relates to the synthesis of benzopyrazine or quinoxaline derivative of pentacyclic triterenoid, friedelin by a novel protocol, standardization of the reaction condition, scope and application of the present protocol and a proposed mechanism of the developed method. Section B is related to the biological work. But because of the insolubility of the synthesized

quinoxaline derivative of friedelin in DMSO, the author was unable to carry out any biological work.

Chapter IV describes the detail experimental procedures and a list of references used during the study.

Part III of the present thesis is divided into three chapters. Chapter I comprises a short review of isolation and biological activity of triterpenoids having lupane skeleton.

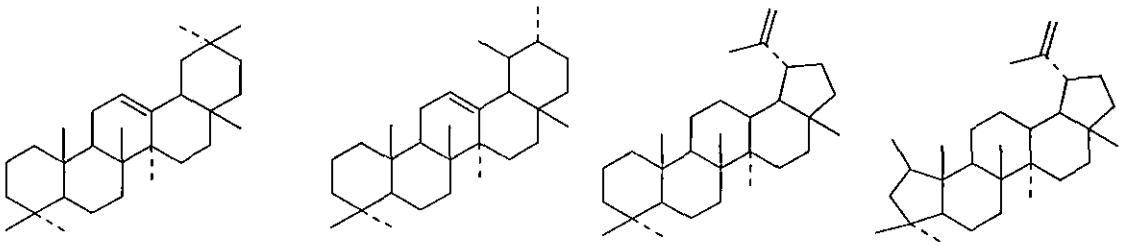
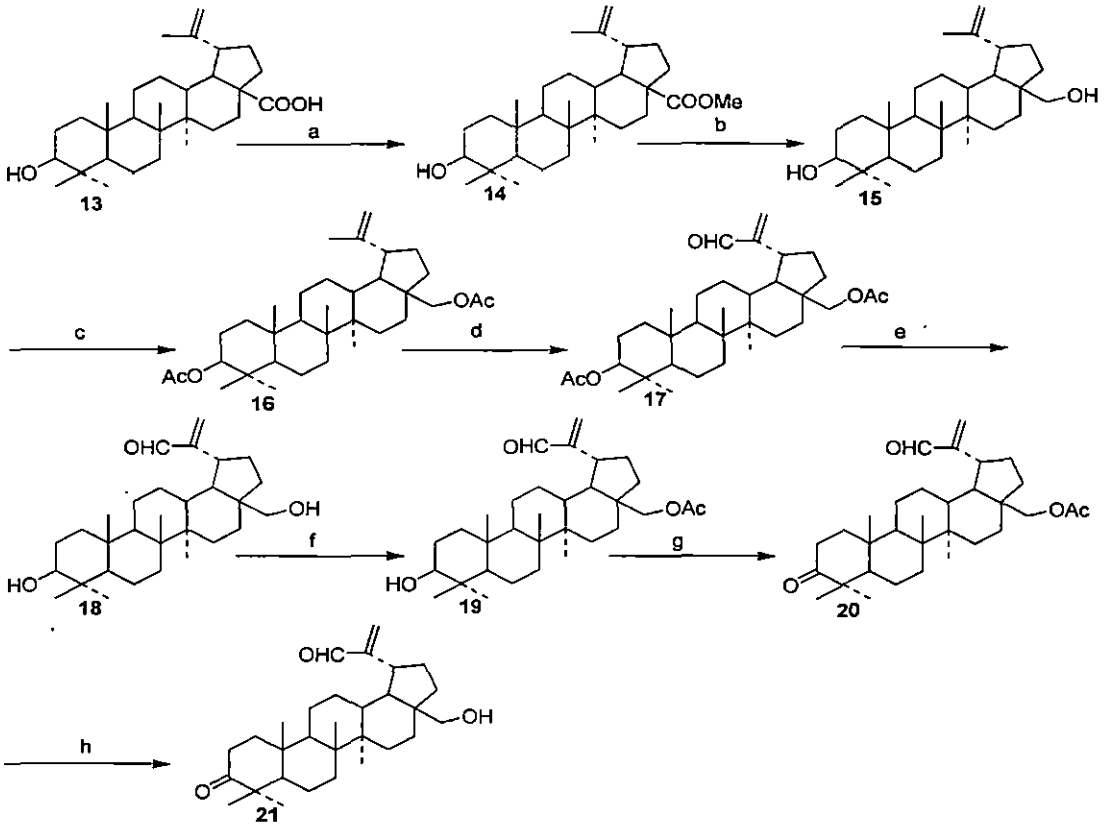


Figure 3 Structures of some important triterpene skeleton

Chapter II, Section A describes an efficient partial synthesis of 28-hydroxy-3-oxolup-20(29)-en-30-al from Betulinic acid. The structures of all the intermediates were elucidated by both chemical and spectral means.



Scheme 1. Partial synthesis of compound **21** from betulinic acid (**13**): Reagents and conditions: a, CH_2N_2, ether, over night, AcOH (gal.), Na_2SO_4; b, $LiAlH_4$, dry THF, 2 hrs., saturated Na_2SO_4 solution, ether, Na_2SO_4; c, C_5H_5N, Ac_2O, 6 hrs.(100°C) ice cold H_2O, ether, Na_2SO_4; d, SeO_2, aq. dioxan, 2 hrs., ice cold H_2O, ether, Na_2SO_4; e, 10% alcoholic KOH, THF, 4 hrs., ice cold H_2O, ether, Na_2SO_4; f, C_5H_5N, Ac_2O, (5-10°C), 8 hrs., ice cold H_2O, Na_2SO_4; g, C_5H_5N, dry CrO_3, overnight, ice cold H_2O, CH_2Cl_2, $MgSO_4$; h, 10% alcoholic KOH, THF, 4 hrs., ice cold H_2O, ether, Na_2SO_4.

Section B of this chapter describes the antileukemic activity of the compounds against three different cell lines *viz.* human K562 leukemia, murine WEHI3 leukemia and murine MEL erythroid progenitor.

Chapter III describes the detail experimental procedures and a collection of references used during the study.

Part IV is divided in three chapters. Chapter I deals with a short review of the transformative reactions of friedelan triterpenoids. Chapter II is further divided into two different sections, section A and section B. Section A describes the detail oxidative transformative reactions on friedelin and cerin, isolation and structure elucidation of the products.

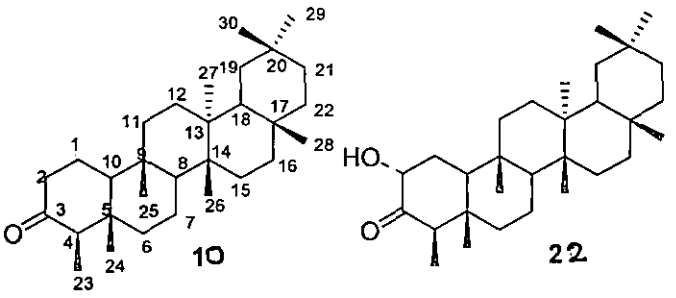


Figure 4 Chemical structures of triterpenoids from *Q. suber*

Section B of this chapter is related to the 3D molecular docking and the antitopoisomerase activity of all the compounds including the parent compounds isolated from natural sources. Both the theoretical docking results and the experimentally determined topoisomerase IIα inhibitory activities are represented.

Chapter III describes the detail experimental procedures and a collection of references used during the study.