

Preface

The medicinal importance of plants was realised in India since ancient times. Charak and Susurata Samhita comprised of important aspects of Ayurvedic medical system and dealt with the plant drugs of ancient India in depth and details. It provided definite properties of crude drugs in use of various ailments including the specified symptoms of the diseases.

There are ample examples of plant drugs having immense value in the treatment of various disorders. The investigations have resulted in the isolation of pure active principles. For example, *Papaver somniferum* have furnished morphine and other antitussive agents. *Rauwolfia serpentina* afforded reserpine while *Ammi majus* gave 8-methoxypsoralen which is used in curing leucoderma. Besides these, many more crude drugs from plants, such as, *Withania somnifera* (Ashwagandha), *Commifera mukul* (Gugglu), *Glycyrrhiza glabra* (Liquorice) and *Cassia augustifolia* (Sena) etc. have acquired an important place in modern medicine. It is thus, that the plant kingdom is considered as a cornucopia of bioactive compounds with considerable potential for further investigations.

The introduction of modern analytical techniques for the purification of plant constituents and their structure elucidation have greatly stimulated the study of the natural
products. The phenomenal progress has been made by the introduction of efficient separation techniques and development of sensitive methods of instrumental analyses which have made it feasible to study the microquantities of natural substances and to determine their structures with high order of precision.

The systematic chemical investigations of herbs and shrubs frequently used in the indigenous system of medicine have been undertaken during the last four decades. These studies have been of immense help in understanding the pharmacological, pharmacognostical and clinical implications of traditional remedies.

India, with its climatic and geographical variations possesses extensive forest cover of different types of vegetation. Based on the information available from the indigenous materia medica in tune with the modern scientific standards, the native flora-fauna provides a wide field of study. The first few thorough and systematic phytochemical studies were initiated in the country at Hoffman Institute, Bombay; School of Tropical Medicine, Calcutta; Universities of Delhi, Calcutta and later at Central Drug Research Institute, Lucknow. A large number of research publications, books and monographs have also been published dealing with the diverse aspects of Indian medicinal plants.
As a part of the above programme and to take full advantage of our floral wealth including their vast ancient knowledge of herbal medical preparations, Central Drug Research Institute, Lucknow, has been carrying out the systematic phytochemical investigation for the last three decades. Under the programme, each collected plant is subjected to primary pharmacological screening for various bio-activities like, anticancer, antifertility, antiinflammatory, cardiotonic, spasmolytic and diuretic action. The plants with confirmed bioactivities are taken for detailed chemical examination.

Pueraria tuberosa and Verbena hybrida which showed confirmed antiimplantation activity in detailed pharmacological screening in female rodent models were chosen to isolate and characterise the active component(s).

The first chapter of the thesis consists of an overview of the sources, structures, pharmacological properties and the folklore importance associated with various Pueraria species distributed globally.

The second chapter covers the detailed chemical investigation of P. tuberosa (Leguminosae). Over a dozen natural constituents have been reported including new compounds of isoflavones, pterocarpene and lignan prototypes. The structure of these constituents were elucidated using modern physico-chemical techniques of high resolution mass spectrometry and Fourier Transform nuclear
magnetic resonance in addition to the chemical degradation studies.

The concept of biogenesis is the most important aspect of natural products chemistry and provides an insight into the ways the nature makes various molecules. It does not only help in solving the complex structural problems but also gives stimulus in searching the intermediate structures predicted by theory. Furthermore, the understanding of the phenomenon helps in designing new and novel synthetic routes to the complex natural products. Keeping in view of these directives, the semisynthetic chemical transformation studies on the isoflavonoid constituents of *P. tuberosa* were carried out and are described in the first section of the third chapter. The study provided an understanding of the biogenetic pathway. The second part of the third chapter covers the total synthesis of novel pterocarpene and isoflavone starting from the common intermediate to provide the larger quantities of the related natural products and to yield the precursors of other natural products of almost similar structures.

The fourth chapter describes the detailed chemical investigation on *Verbena hybridra* (Verbenaceae) which furnished different phytosterols, triterpenes and iridoid glucosides of biogenetically related structures.