

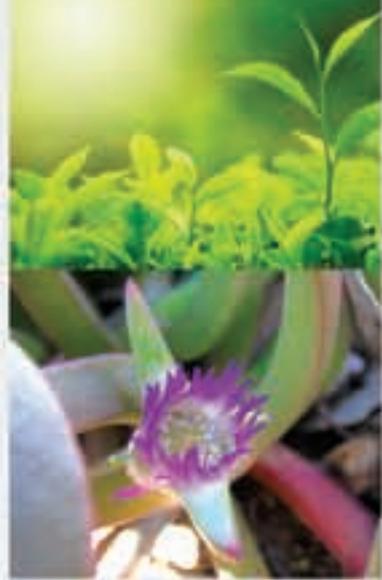
# PLANT TAXONOMY

PAST, PRESENT, AND FUTURE

Dr Prithipalsingh Festschrift

Editor

**Rajni Gupta**



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The Energy and Resources Institute

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# Foreword

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Taxonomy is considered “dead” by some so-called “reformists of botany syllabi”. If this thinking predominates, students of botany would not be able to identify even common plants such as *Tagetes*. This would be a sad day for botany in general.

Taxonomy, directly or indirectly, is a part of all branches of botany; hence it cannot die. The majority of botanists, unfortunately, consider people knowing only the names of plants as taxonomists. In fact, the names of plants represent phyletic, phylogenetic, and phytogeographic features, and also (directly or indirectly) have many other important implications. Like other sciences, taxonomy is based on principles and has many characteristic theories. Therefore, if taxonomy is to be understood in its entirety, each botany department should have a teacher like Dr Prithipalsingh (to whom this book is dedicated) on its faculty. I am sure the readers of this volume shall be able to appreciate the scope of taxonomy in its entirety.



**Professor (Retd) K M M Dakshini**

Department of Botany

University of Delhi



# Message

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It is a great pleasure to write about Dr Prithipalsingh, an affable, intelligent, and diligent student and equally hardworking and painstaking teacher. He has interacted with several generations of young minds in the pursuit of knowledge and truth. In fact, Dr Prithipalsingh is a brilliant taxonomist. His doctoral thesis was based on the study of the genus *Blumea* (Family: Asteraceae) under the supervision of the well-known taxonomist, Professor K M M Dakshini, my colleague in the Department of Botany, University of Delhi.

Now, I would like to develop a theme within the domain of Dr Prithipalsingh's interest, which is plant taxonomy. In doing so, I will largely draw upon my own research works. During my PhD programme at the Department of Botany, University of Delhi, I was given material of *Adonis flammea* fixed in FAA in 1961. Dr B M Johri provided this to me for investigations in the family Ranunculaceae (he had obtained the material thanks to Dr van der Heel from Leiden). When I investigated the embryology of this plant I found many unique features, some of which I would like to describe below.

There are numerous carpels in the flower and each carpel has many ovules, one of which is fertile while the rest are sterile. Uniquely, the development of the embryo sac is similar in the sterile ovules as well as the fertile ovule. At the stage of megaspore, the mother cell cuts off a cell which starts dividing multiple times to produce a large number cells resulting in a "parietal tissue". One of these cells is placed on top of the megaspore mother cell, simulating a megaspore. But, this soon starts dividing and contributes to the parietal tissue. The megaspore mother cell divides and results in two megaspores. The nuclei in each of the two cells further divide, resulting in the formation of two binucleate megaspores. Subsequently, the upper megaspore degenerates and the lower one gives rise to a binucleate embryo sac.

At the insistence and direction of my teacher and guru, Professor Panchanan Maheshwari, I went to the interiors of Shimla in search of a rare species of the genus, *Adonis aestivalis*. Needless to say, it was a Herculean task going deep into the woods all alone, with no one to share my thoughts and difficulties in finding the rare species. After

about five days of rigorous labour and frustration, I finally found a single plant. After Professor Maheshwari confirmed the identity of the plant, satisfaction dawned on me, and I relaxed because my pursuit had ended. After more searching, I found a patch of plants in flowering stage. It was an ideal spot. In addition, I also received fixed material of *Adonis chrysocyanthus* collected by Dr C P Malik and Dr G L Dhar from Kashmir.

Fixing research material for embryological studies of this species (*A. aestivalis*) helped me confirm whether this species also showed bisporic development. So I carried out detailed embryological research, which showed that this species as well as *A. chrysocyanthus* had bisporic embryo sac development. I concluded that, probably, all the species of *Adonis* have bisporic embryo sac development. It was therefore suggested that a new taxonomic unit be created within the family Ranunculaceae.

This reminded me of the statement of Sir J D Hooker who, in the *Introductory Essay to Flora indica* in 1855, remarked: "A knowledge of the relative importance of characters can only be acquired by long study...". In this context, the importance of embryological characters in plant taxonomy could be understood because of the extensive studies carried out by Professor Maheshwari and his students. Interestingly, Professor Maheshwari interpreted embryology in a very broad sense to include all events, taking into account the sequence from ovule and anther formation to fertilization as well as embryo and endosperm development. The observations on the development of the embryo sac in *Adonis* formed the basis of the suggestion about the taxonomic position of the genus. It gives me great satisfaction to emphasize that Armen Takhtajan (*Diversity and Classification of Flowering Plants*, 1997) has recognized Adonaideae as a distinct taxonomic unit in the family Ranunculaceae.

The importance of careful observation of minute details and the correct interpretation of the information has always been of great significance in plant taxonomy. Embryological characters have provided many interesting examples of their utility in plant taxonomy.

It is a matter of great joy that we are able to dedicate this volume to Dr Prithipalsingh. I wish him the very best in his life and hope that his work can inspire a new generation of taxonomists to enter this deeply enriching and widely interesting field of research.

**Professor (Retd) N N Bhandari**

Department of Botany

University of Delhi

# Preface

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Plant taxonomy is a fundamental science. It is recognized as the “focal point of biology” based on the fact that it is related to morphology, anatomy, embryology, cytology, chemistry, and evolution, as well as the classification of plants. In order to understand the developments of this science, the present volume attempts to provide a full scenario of plant taxonomy. Thus, topics related to nomenclature, species and evolutionary aspects, methods of identification, anatomical features, palynology, and molecular systematics have been discussed.

Dr Prithipalsingh has devoted his life to academic pursuits. Ever since he joined the Department of Botany, University of Delhi, he has been engaged in the study of different aspects of plant taxonomy. He has been teaching the subject for almost 40 years. This Festschrift commemorates his long span as a teacher who inspired generations of students by his depth of knowledge and the easy manner in which he explained the fundamental aspects of plant taxonomy. I have had the good fortune of interacting with Dr Prithipalsingh for more than 10 years and learning many concepts of angiosperm taxonomy from him.

In compiling this volume, it has been my endeavour to focus on different aspects of plant taxonomy. Nomenclature is a significant aspect of plant taxonomy. Different aspects of this science of naming plants have been developed in some of the contributions. It is also an established fact that “species is a fundamental unit in biology”. The species concept and the process of speciation have been elaborately discussed. The importance of proper identification of the species has been recognized and modern tools and techniques used for this purpose have been elaborated. The wisdom of traditional knowledge and “folklore taxonomy” as well as the importance of protecting this ancient science needs elaborate legal knowledge and has been described in detail. The significance of plant taxonomy for managing “genetic resources” has been analysed in depth. The use of evidence from anatomy, cytology, chemistry, and palynology for taxonomic purposes leads to a better understanding of taxonomic relationships. These have been evaluated in great detail in this volume.

Since understanding phylogeny and phylogenetic relationships has always been a challenge to students of plant taxonomy, these have been

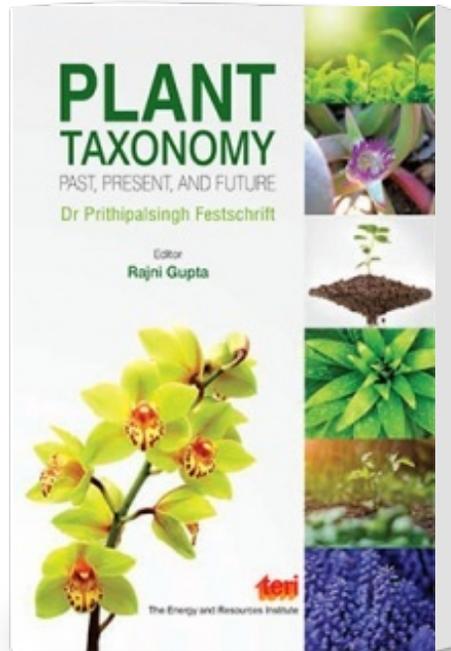
explained in simple terms. The importance of herbaria and data storage systems, as well as the floristics of the future, have been elaborately described. Thus, this volume shall serve as a useful source of information for graduate and postgraduate students in plant science courses.

I am highly obliged to all the contributors for their cooperation. In spite of such short notice, they prepared their manuscripts and generously accepted the suggestions made by the reviewers. Without their support and cooperation, the task of editing the volume would have been impossible. The citation of references in most of the contributions follows a basic pattern, but in the case of one contribution (*Indigenous Knowledge of Plants and Biopiracy in India*) a different pattern has been adopted. This was necessary in view of the legal aspects covered in this contribution.

It is an honour to have the foreword written by Professor K M M Dakshini, a teacher who has been the source of inspiration for generations of students. Due to indifferent health, he was unable to provide a complete article for inclusion in this Festschrift. Special thanks are also extended to Professor N N Bhandari for a very useful message on the importance of observations in plant taxonomy. He has provided some interesting facts about the embryology of the family Ranunculaceae and the taxonomic significance of these observations.

I thank all the contributors and my colleagues in the Department of Botany, Kirori Mal College, for their valuable cooperation and encouragement, which helped me complete the task. Last, but not the least, I remain grateful to my family members for their valuable support.

# Plant Taxonomy : Past Present And Future



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