

DIE NATÜRLICHEN
PFLANZENFAMILIEN

BAND 17 a IV



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DIE NATÜRLICHEN PFLANZENFAMILIEN

NEBST IHREN GATTUNGEN UND WICHTIGSTEN ARTEN,
INSBESONDERE DEN NUTZPFLANZEN

UNTER MITWIRKUNG ZAHLREICHER HERVORRAGENDER FACHGELEHRTER
BEGRÜNDET VON

A. ENGLER UND K. PRANTL

ZWEITE STARK VERMEHRTE UND VERBESSERTE AUFLAGE

HERAUSGEGEBEN VON

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P. HIEPKO

BAND 17 a IV

ANGIOSPERMAE: **Ordnung Ranunculales**
Fam. Ranunculaceae



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PREFACE

The second volume of "Die Natürlichen Pflanzenfamilien" is presented now in the new format: the book is written mainly in English and it contains an extensive General Part including contributions of different authors. The first volume of this kind on the family *Loganiaceae* was published almost 15 years ago.

It is 19 years now that Prof. Michio TAMURA having then some 20 years of experience due to meticulous studies on different aspects of the *Ranunculaceae*, was asked to write a monograph of the family. The completion of this treatment was very time-consuming, especially due to the complicated infrageneric taxonomy in the larger genera of *Ranunculaceae*. Since it took so much time to complete the manuscript it was not possible to use in the text the new standard of "Authors of Plant Names" by R. K. BRUMMITT & C. E. POWELL (1992). In the Index of Plant Names – prepared by the editor as well as the notes on etymology of the generic names – this standard was followed although the citation of authors is therefore often different from that used in the text of the Systematic Part (in the General Part authors of plant names are not cited).

As editor of this volume I would like to thank all authors who made the publication of this book possible; special thanks are due to the main author, Prof. Michio TAMURA, and to the artist Masayoshi UMEBAYASHI for his excellent illustrations. I am particularly grateful to Dr. M. I. HAKKI, who was most helpful in revising the manuscripts.

Finally, I wish to thank the Verlag Duncker & Humblot for the patience in dealing with all problems and the careful and fine production of the volume.

Berlin, March 1995

P. HIEPKO

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INTRODUCTION

By M. TAMURA

The *Ranunculaceae* is a moderately large family with 59 genera and ca. 2500 species. Many species have beautiful flowers or substances with strong physiological activity. They are used as ornamental or medicinal plants. This family shows great diversity in both vegetative and reproductive structures as well as in ecology. It retains many primitive characters and is regarded as one of the most primitive angiospermous families, but on the other hand it often presents quite specialized or advanced features. Therefore the family has attracted attention of many botanists from various points of view, and its members have been studied not only taxonomically, but also morphologically, anatomically, embryologically, palynologically, cytologically, phytochemically, serologically, and so on. The *Ranunculaceae* are indeed an intensively studied family.

I have been studying the *Ranunculaceae* taxonomically for more than 40 years. When I started the study of the family in 1949, Prof. S. KITAMURA suggested to me that at the beginning I should read the treatment on the *Ranunculaceae* in "Die natürlichen Pflanzenfamilien". In 1975 at the XII International Botanical Congress in Leningrad (now St. Petersburg) I was asked to write the treatment of *Ranunculaceae* for the second edition of this famous work. Soon after the Congress, Prof. TH. ECKARDT, the former editor of the publication, passed away. Since then more than 19 years elapsed too quickly. Still I don't feel that my work has been completed. New papers, some of which are quite important, appear one after another. I considered only a few papers published very recently, because publication of this book is already overdue.

In the history of the taxonomic studies of the *Ranunculaceae*, there were three monumental works. The first is that of A. P. DE CANDOLLE. In the first volume of his "Systema Naturale" (1817) the family has been monographed at the species level for the first time. His work was excellent and gave a sound base to the taxonomy of the family and influenced the subsequent work for a long time. The second monograph at the generic level is that of K. PRANTL (1888) which appeared in "Die natürlichen Pflanzenfamilien". This author used anatomical and embryological characters, in addition to traditional morphological ones for the classification of the family, and tried to make a phylogenetic system. The third work is of O. F. I. LANGLET (1932) based on caryology. He noticed the importance of karyological features in the taxonomy of the *Ranunculaceae* and defined the phyletic groups mainly by such characters. His work is one of the most successful examples of cytotaxonomy established in those days. My classification presented here is an extension of the work of these three. Although my work is far from being com-

plete, I believe that it is still the most comprehensive and the most detailed one until now.

Throughout my studies of the *Ranunculaceae* I have felt the deficiency of the knowledge on the species of the southern hemisphere. The classifications of the family presented previously were mostly based on the northern species. The present classification is also insufficient in this point. In future more intensive studies on the southern species will be necessary.

Recently molecular phylogenetic studies have become more popular and common, and some reports on the *Ranunculaceae* have already been published. Their results are not included in this book, because the molecular methods cannot be considered to be fully established as reliable methods for the taxonomy at least in the *Ranunculaceae*. In future these methods will be important for a phylogenetic review of the family.

During preparation of the manuscript I have been helped by many botanists. Especially Prof. Dr. P. HIEPKO has given all facilities and advice for my studies; without his help and encouragement I would not have been able to finish this work. Dr. M. HAKKI has also given me valuable comments on the manuscript. I would like to express my cordial thanks to them. I also would like to thank the directors, curators and other staff members of the following herbaria for the research facilities: A, ABD, B, BK, BKF, BM, BO, BRI, CANB, CDBI, E, G, HBG, K, KANA, KUN, KYO, L, LAE, LE, MAK, MO, NOU, NSW, NY, P, PDA, PE, RYU, SAN, SAPA, SING, SUVA, TAI, TI, TNS, UC, W, WTU, WU, etc.

I. GENERAL PART

1. HISTORY OF THE FAMILY

By M. TAMURA

All ranunculaceous genera, except *Hydrastis*, were grouped into *Multisiliquae* by LINNAEUS (1764), though this group included some improper genera, such as *Dic-tamnus*, *Ruta* and *Peganum*. ADANSON (1763) also recognized that ranunculaceous genera formed a natural family, *Ranunculi*. But *Nigella* and *Garidella* were excluded from this family, and on the other hand, the improper genera, *Damaso-nium* (= *Limnocharis* L.), *Sagitta* (= *Sagittaria* L.) and *Alisma* were included in it. JUSSIEU (1789) greatly improved the delimitation of the family by including all ranunculaceous genera known at that time. The only improper genus included by him was *Podophyllum*, and he adopted the name *Ranunculaceae* for the group. DE CANDOLLE (1817) excluded *Podophyllum* and the *Ranunculaceae* defined by him had been believed for a long time to be one of the typical natural families, mainly owing to the similarity in the floral constitution of all members.

Ranunculaceae were first divided by DE CANDOLLE (1817) into 5 tribes, *Clemati-deae*, *Anemoneae*, *Ranunculeae*, *Helleboreae* and trib. *Paeoniaceae* including *Actaea*, *Xanthorhiza* and *Paeonia*. HOOKER & THOMSON (1855) improved this system in delimiting the *Paeonieae* as a monotypic tribe of *Paeonia*, and BENTHAM (1862) followed their treatment.

PRANTL (1887, 1888) recognized the peculiarities of *Paeonia*, *Glaucidium* and *Hydrastis* and classified them in the tribe *Paeonieae*. He characterized his *Paeonieae* by the feature that the outer integument is longer than the inner one, and considered that the *Paeonieae* were the direct offspring of the ancestor from which *Berberidaceae* and *Ranunculaceae* were derived and argued that the *Paeonieae* might be placed at the beginning of the *Berberidaceae*. Since then, the systematic positions of these genera have been often discussed. Also heterogeneity of the *Ranunculaceae* became a problem with the introduction of new characters from different fields of biology, e.g. morphology, cytology, embryology, phytochemistry and serology.

Among the genera of the classical *Ranunculaceae* defined by PRANTL (1887, 1888), *Paeonia* and *Glaucidium* were excluded from the family, and separate families were created *Paeoniaceae* (RUDOLPHI 1830, WORSDELL 1908a, 1908b, HEINTZE 1927, KUMAZAWA 1935, 1938b, EAMES 1961, TAMURA 1963a, CRONQUIST 1981) and *Glaucidiaeae* (TAMURA 1963a, 1972), respectively. *Circaeaster* had often been classified in the *Ranunculaceae*, but now the *Circaeasteraceae* (HUTCHINSON 1926, TAMURA 1963a), is generally accepted as a monotypic family.

Hydrastis has sometimes been considered to be the representative of a distinct family, *Hydrastidaceae* (LEMESLE 1948, 1955, EAMES 1961, TOBE & KEATING 1985).