PREFACE

Systematics can be used, as defined by Simpson (1961) as the scientific study of the kinds and diversity of organisms and if any and all relationships between them 1) Relationship of descent, 2) Relationships of similarity 3) Spatial or Geographic, and 4) Trophic relationship.

Most of the text books on the systematics emphasized the classificatory aspects of systematics and neglect to some extent the theoretical and evolutionary aspects of the field. Similarly most systematic books adequately cover the morphological and anatomical techniques used by the plant systematists but cover in much less detail the genetical, cytological, chemical and statistical approaches used in systematic work. The present text is to present the objectives of theoretical and technical aspects of evolution and proper understanding of evolution in detail. The book is designed to be used more of experimental aspects of the field of systematics, but also as a companion to any of the many fine plant taxonomy books being used in introductory courses.

Many systematists had been unhappy because existing classifications could not express all the relationships uncovered by systematics. They also felt that the accepted system of nomenclature did not allow a classification that expressed all that was known about the evolution of species.

Biosystematics is that part of systematics concerned with the **Variation** and **Evolution** of a species. It is often more concerned with the process of evolution than it is with the classification itself. Based mainly on the breeding systems several special classifications have been proposed.

Biosystematists have proposed a series of experimental classifications based on the genetic adaptation of the plant to

its environment, particularly soil and climate, and its ability to interbreed with other plants both in nature and under experimental conditions. Turesson (1922) first formulated the ecotype concept, his classification was later modified and put on a more precise genetic footing by Clausen, Keck & Hiesey and by Gregor etc. Transplant experiments and breeding experiments have been the tools used in the construction of these special, experimental classifications. Failure to interbreed was recognized as of great evolutionary importance, since such populations are prevented from any further gene exchange now at any time when they meet in the future. So, biosystematists have therefore devised various ways of describing continuous variation by graphical or mathematical means.

Biosystematics as defined by Camp and Gilly was consequently an attempt to produce a system of nomenclature by which more relationships could be explicitly expressed.

The rate of evolution appears to have been frequently speeded up by aridity. Stebbins (1952) points out that there are numerous structures which plants can evolve in adaptation to dry conditions. These include the annual habit, bulbs, corms etc., reduction in leaf surface, succulence and indumentum.

There are about 50,000 kinds of plants living on the face of the earth. It is therefore imperative that our energies be directed toward the discovery and formulation of basic principles and mechanisms that direct the functioning and evolution of organisms, rather than toward a general survey. Such a selective approach is already prevalent in the more analytical fields such as molecular biology and cell biology, but is less prevalent in fields such as physiology, anatomy or systematics. In this book the attitude has been taken that the purpose of science is to establish general principles expressible in rigorous terms. These principles have to be related, however, to the outside world in a direct, precise, and meaningful way and the reader should satisfy himself that this is so before accepting any generalization. A number of specific examples are presented in the text to illustrate principles. No systematic review of the plant kingdom or any part thereof has been attempted. The most examples referred in this book are Angiosperms. Whenever the choice existed

examples have been taken from the recent literatures. The purpose of this action is twofold, first to show the reader that systematics is a very active field and second to allow him to reach the original sources with the least effort.

Present day species are evolutionary products that have descended from preexisting species. Variation in organisms provides the raw genetic material that in concert with environmental variation, makes speciation possible. Variation in natural populations is limited by such factors as self fertilization, asexual reproduction, genetic fixation and stabilizing selection. Organic evolution involves the development of phyletic lines and the transmutation of form and structure within a line that gives rise to morphological species. The biological species represent the major continuity in ongoing evolution. Examples, therefore are not intended to give credit for the discovery of the principles they illustrate. As a matter of fact, no effort of any sort has been made to present the historical development of systematics except in the brief introduction.

Throughout the text book, the evolution theme " Genetic adaptation, or Organic evolution axiom is being continuously given an explanation in terms of organs such as phyllode, spine, sepal, petal, syngenesious anthers, petaloid anthers, their different orientation for promotion of cross pollination has been stressed.

Speciation is the development of freely interbreeding organisms adapted to their environment that are reproductively isolated from other such populations.

Finally the treatment of speciation includes the integral components of population breeding and asexual reproductive systems, isolating mechanisms and stabilization and selection along with a discussion of many types of species resulting from speciation. Plant populations are the source of potentially heritable genetic variation, which in concert with environmentally induced variation, leads to speciation.

Reproductive isolation comprises blocks to gene exchange between populations that stem from genotypically controlled differences in their reproductive organs, reproductive habits or fertility relationships.

The necessity or tendency for outbreeding may be reinforced by dioecism, self-compatibility, heterostyly, and other mechanisms. Out breeding is usually aided by the wind, insects or other pollinating agents. Out breeding generally maximize heterozygosity and variability are dioecism and monoecism, protandry and protogyny, heterostyly, self sterility and chasmogamy.

Introgression is a process of successive hybridization that cause the migration of genetic material from one species into another. Initial interspecific hybridization is usually followed by a series of back crosses to one of the parents.

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