

Taxonomy in Relation to Embryology



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Introduction

- ❑ Modern taxonomists consider that the gross morphological characters are not always sufficient to provide means of differentiation in determining the genetically and evolutionary relationship between taxa.
- ❑ To achieve this the taxonomical evidences from anatomy, embryology, palynology, cytology, palaeobotany, ecology, biochemistry etc. are discussed.
- ❑ Dr. V. Puri has said “One of the most significant modern trends in plant taxonomy is towards a synthesis between the older methods, outlook and more recent developments in our knowledge of plants”.

Plant Taxonomy : Embryology

- ❑ Embryology is the study of micro and megasporogenesis, gametophyte development, fertilization, and development of endosperm, embryo and seed coats.
- ❑ Embryological evidences have been used in solving the taxonomical problems at almost all levels. However the role of embryology in solving taxonomic problems was first brought into prominence by a German embryologist, Schnarf in 1931.
- ❑ According to Jones and Luchsinger the embryological characters have proved to be of significant help in determining relationships within families, genera and species. And have proved to be less useful at the rank of order, subclass or class.

Plant Taxonomy : Embryology – Basic Embryological Evidentiary Characters

- According to Maheshwari, Bhojwani and Bhatnagar and Radford some basic embryological characteristics which have proved to be of special importance in taxonomic considerations include-
 - presence and type of anther tapetum
 - number and arrangement of anther loculi
 - type of anther androthecium
 - quadripartition of microspore mother cell
 - mature pollen grains

Plant Taxonomy : Embryology – Basic Embryological Evidentiary Characters

- Development, structure, position, vasculature and orientation of ovule and Origin of sporogenous tissue in ovule
- Megasporogenesis and development of embryo sac
- Presence of aril
- Form of embryo sac
- Fertilization
- Type of embryo
- Type of embryogeny
- Endosperm formation
- Type of haustorium formation
- Seed coat & Cotyledons

Plant Taxonomy : Anatomy - Stomata

- ❑ Morphology and development of different stomatal types is important in assigning taxa of uncertain affinities to proper position.
- ❑ Morphology and ontogeny, number and arrangement of subsidiary cells and their relationship with other epidermal cells are characters of taxonomic significance.
- ❑ Significance of stomata has been confirmed in the taxonomy of Graminaeae, Epacridaceae, Combretaceae, Rubiaceae, Acanthaceae, Umbelliferae, Papilionaceae, Araliaceaea, Myrtaceae, Cyperaceae

Plant Taxonomy : Role of Embryology

- ❑ **Dicots and monocots:** Angiosperms are universally divided into dicotyledons and monocotyledons. This primary classification of angiosperms is based on the major embryological character, i.e. number of cotyledons.
- ❑ **Caryophyllales:** Embryological characters, such as trinucleate pollen, bitegmic crassinucellate ovules which are campylotropous or amphitropous, seed with peripheral embryo and perisperm with little or no endosperm, are the characters which are found only in Caryophyllales, more widely known as centrospermae (Cronquist, 1968).

Plant Taxonomy : Role of Embryology

- ❑ **Helobiae:** This monocotyledonous order, treated as a subclass in some recent systems of classification, is characterized by the presence of helobial type of endosperm.
- ❑ **Orchidales:** The distinguishing embryological character of the members of this order is the presence of undifferentiated embryo and very little or no endosperm.
- ❑ **Podostemaceae:** Members of this family are recognized because of the formation of pseudoembryo sac which is formed by the disintegration of nucellar cells below the embryo sac.

Plant Taxonomy : Role of Embryology

- ❑ **Onagraceae:** The family is recognized by the presence of Onagrad type of embryo sac.
- ❑ **Cyperaceae:** In flowering plants, four functional microspores develop from each microspore mother cell.
- ❑ **Lemnaceae:** Phylogenetic study indicates that Lemnaceae have been derived from either from the Helobiales or from the araceae.
- ❑ **Crassulaceae:** Embryological studies of Crassulaceae suggest that it should be placed in the order Rosales close to the family Saxifragaceae.
- ❑ **Parnassia:** It is generally treated as a member of the family Saxifragaceae. But the total dissimilarity of its embryological details with the other genera of Saxifragaceae.