

Taxonomy in Relation to Palynology



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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 : Palynology

- ❑ Pollen character
- ❑ Palynology is the science of pollen and spores and its applications. It is derived from the Greek word **palynein** meaning to scatter.
- ❑ The significance of pollen attributes in taxonomy has been realized during the last three decade **Erdtman**, 1952; **Wagenitz**, 1995; **Stix**, 1960; **Raj**, 1961; **Chanda**, 1972; **Nair**, 1974.

Plant Taxonomy : Palynology – Number of Pollen Nuclei

- ❑ The **number of nuclei** in the pollen at the time of dispersal has been used by taxonomists (Brewbaker, 1967).
- ❑ The angiosperm pollen is either **binucleate or trinucleate** according to the precocity of division of the generative nucleus.
- ❑ The **binucleate condition is considered as more primitive** than the trinucleate.
- ❑ In the Centrospermae, the pollen is uniformly trinucleate, the monocot (Liliaceae) is binucleate, the apetalous and polypetalous dicot are binucleate and gamopetalous members trinucleate.

Plant Taxonomy : Palynology – Shape & Symmetry

- ❑ The **shape and symmetry** of a pollen grain the architecture of its wall *exine stratification, sculpture and structure and type, number, position, shape and structure* of its aperture are some of the basic characters which prove useful at all taxonomic levels.
- ❑ Palynological characters have been used in solving several **taxonomic problems** including the *repositioning of several disputed taxa and interpretation of problems relating to the origin and evolution* of different groups.
- ❑ Cronquist (1981) and several other workers have made the exclusive use of pollen characters in providing classification of angiosperms.

Plant Taxonomy : Palynology – Shape & Symmetry

- **Erdman** used the pollen characters in discussing and solving the taxonomic problems of 105 families.
- **Heywood(1967)** has gone up to the extent of stating that exine details of pollen are such that they can be used in plant identifications much **in the way that fingerprints** are used for the identification of criminals.

Plant Taxonomy : Palynology – Monosulcate and Tricolpate Pollen

- ❑ Jones and Luchsinger (1987) mentioned that angiosperms contain two basic kinds of pollen grains: monosulcate and tricolpate.
- ❑ **Monosulcate** pollen grains are characteristic of primitive *Dicotyledones*, several *Monocotyledone*, *Pteridosperms* and *Cycades*.
- ❑ Such pollen grains are boat shaped in outline and possess **one long germinal furrow and germinal aperture**.
- ❑ Tricolpate pollen grains are characteristic of advanced dicotyledons. Such pollen grains have **three germinal apertures and are globose** in shape..

Plant Taxonomy : Palynology – Stenopalynous and Eurypalynous

- Such a taxon in which the type of the pollen is constant and characteristic is called **Stenopalymous or Unipalynous**.
- On the other hand such taxa in which pollen types vary in size, **aperture, exine stratification** etc. with grains of various aperture forms.

Plant Taxonomy : Palynology – NPC System

- ❑ The classification of pollen is based on the number position character analysis called NPC system.
- ❑ Palynological studies suggest that the taxa with the same general NPC formula be grouped together and those showing different NPC separately.
- ❑ NPC system helps in providing a three dimensional classification and also in the preparation of diagnostic keys below the family level.

Plant Taxonomy : Palynology – Role of Palynology

- ❑ Author investigated the pollen morphology of **16 Indian species of *Cyperus*** and prepared a key to differentiate all of them on the basis of pollen characters.
- ❑ On the basis of **apertureal morphoforms** of pollen.
- ❑ According to Meyer gymnosperms contain **alveolar or granular** ektexine and laminated endexine, whereas angiosperms contain **columnar or granular** ektexine and nonlaminated endexine.
- ❑ A **massive exine and thin intine** is present in angiosperm pollens.

Plant Taxonomy : Palynology – Role of Palynology

- ❑ Several angiospermic taxa have **distinctive** pollen types.
- ❑ The **exine pattern is useful** in recognizing different species of genus.
- ❑ **Phylogenetic relationship** are determined using pollen characters in several cases.
- ❑ Pollen grains are associated in **tetrads** in several families of dicots and monocots.