Chapter-5

GENERAL MORPHOLOGY

The members of the tribe *Cymbidieae* show a great deal of diversity in their habit, vegetative and floral characters, which are briefly discussed below.

5.1 Vegetative Morphology:

**Habit and Habitat:**

The members of the tribe *Cymbidieae* are generally medium to large herbs. They are mostly autotrophic, capable of growing as epiphytes or terrestrial. Some of them have been found growing on moist, moss-covered rock surfaces as lithophytes or rupicolous (*Cymbidium tigrinum*). In addition, there are achlorophyllus forms capable of growing as mycoheterotrops (saprophytes) viz., *Cymbidiopsis macrorhiza*, *Eulophia zollingeri*, etc.

The members of the tribe are not host specific and can grow upon main trunks and branches of wide range of host plants. They need rough, moss covered, moist bark surface to grow. The size of plant ranges from few centimeters to more than a meter.

**Roots:**

The roots arise from the nodes of pseudobulbs or tubers. Most of the members of the tribe *Cymbidieae* possess fleshy, strong, slender to stout, tufted roots often with covered with white velamen tissue. Roots are generally confined to the base of the pseudobulbs. These roots provide anchorage to the plants by firmly attaching themselves to the substratum as well as absorb water and nutrients for the plant.

**Pseudobulbs and Tubers:**

The pseudobulbs or pseudostems are short to elongate, swollen, fleshy, globose or lens-shaped (*Cymbidium tigrinum*), bilaterally compressed and covered by overlapping leaf sheaths, leaf bases and cataphylls. Growth is usually sympodial i.e. new
pseudobulbs or tubers produce annually but members of section *Eburnea* of genus *Cymbidium* like *C. eburneum, C. whiteae, C. parishii, C. mastersii* do not produce pseudobulbs annually and each shoot grows indeterminately for 2-3 or more years.

In *Eulophia* and *Geodorum*, hypogeeal to epigeal tubers are produced, with 3-8 annular rings. These are variable in size and their shape ranges from ovoid to oblong-orbicular or irregularly cylindrical-globose. The tubers are annually produced and covered with membranous sheaths.

**Leaves:**

Like other orchids in tribe *Cymbidieae* the leaves are monocotyledon type, appear (if present) at the time or after the flowering. In *Cymbidiopsis macrorhizon*, true leaves are not found, these are reduced to small scales. Number and shape of leaves ranges with in the tribe it may be solitary (*Eulophia kamarupa, E. bicallosa*) to many, plicate to conduplicate, variable in size, generally linear, ovate-lanceolate, acute-acuminate, sessile or petiolate, linear, thick and coriaceous, obtuse to emarginated, unequally bilobed, whereas elliptic, petiolate type of leaves are found in the section *Bigibbarium*. Sometimes the leaves elongate at base forming a short, terete, unbranched, green stem-like structure. In the genus *Cymbidium* lamina is articulated to the leaf base by an abscission layer. In most orchids an abscission zone allows a dying leaf to separate from its persistent sheath. While making herbarium specimens, killing these abscission zone either by hot water treatment or by chemical treatment at the earliest is essential to keep the leaves attached.

**5.2 Reproductive morphology:**

**Inflorescence:**

The inflorescence in the tribe *Cymbidieae* arises laterally from the base of the pseudobulbs or tubers. It is erect to sub-erect or drooping, raceme or sometimes paniculate, solitary to many laxly to densely arranged flowers. In the genus *Geodorum*, the inflorescence is characteristically strongly recurved from apex and the peduncle is loosely sheathed.
Floral bracts:

The flowers in the tribe Cymbidieae are bracteate. The floral bracts are variable in size and shape. In the genus *Cymbidium*, the floral bracts are variable in size ranging from very minute, measuring few mm in length (sections *Cymbidium*, *Himantophyllum*, *Bigibbarium*, *Iridorchis*) to large or equaling the pedicel and ovary. In the section *Maxillarianthe*, the floral bracts are usually exceeding the pedicel and ovary, persistent, ovate-lanceolate, cymbiform, acute-acuminate to obtuse. In *Geodorum*, the floral bracts are larger than the pedicel and ovary but in the genus *Eulophia* they may be shorter to equaling or larger than the ovary.

Flowers:

Orchids are globally valued for their attractive floral beauty. Flowers in all species belonging to the tribe *Cymbidieae* are resupinate i.e. twisting of ovary to 180° around the axis of the plant and shows incredible range of variation. Most of the species are spreading but in some species of *Eulophia*, *Geodorum* the flowers do not fully open. The members of the section *Cyperorchis* of subgenus *Cyperorchis* in genus *Cymbidium* are characterized by campanulate flowers. The flowers in the genus *Eulophia* and *Cymbidium* are medium to very large in size, (few are small, inconspicuous) showy, very attractive, and some times fragrant, whereas the flowers in *Geodorum* are generally small, inconspicuous and not very attractive.

Sepals:

The flowers in the tribe have three sepals, one dorsal and remaining two lateral sepals. Sepal are generally narrowly oblong, lanceolate to obovate-lanceolate, ligulate, linear-oblong, oblanceolate, entire, acute-acuminate or apiculate-mucronate, spreading or conniving, glabrous and their shape, size and colour varies in different members of the tribe. Dorsal sepal differs from the lateral ones in size, shape, venation, texture, colour; lateral sepals are usually weakly falcate, spreading or porrect. In some species of genus *Eulophia*, the lateral sepals are fused to the column foot. The colour of sepals varies from white variously tinged with green to yellow, reddish-green, pink, pale-brown
Taxonomic studies on the tribe - Cymbidieae Pfitz. (Orchidaceae) in India

to red brown.

**Petals:**

There are three petals in the flowers of the tribe *Cymbidieae*, two lateral and the median one which is highly modified and called the lip or labellum. The lip varies in shape and size from species to species. The lateral petals are usually free but sometimes form a hood over the column along with dorsal sepal.

**Lip or Labellum:**

It is the modified petal of orchid flower, which plays a very significant role in pollination. Their attractive colour and shape attracts the insect pollinators. Due to resupination of ovary this inner petals takes the outermost position corresponding to the axis and perform as the landing platform for the visiting insects in search of nectar. The colour pattern, texture and shape is an important taxonomic character. Lip may be entire (*Geodorum, Eulophia bracteosa* and *E. ochreata*) or 3-lobed (*Cymbidium* and *Eulophia*). Sometimes the lip is extended at the base to form a distinct conical to cylindrical, obtuse to acute spur as in case of some species of *Eulophia*. Callus ridge are usually present on upper surface of lip. Callus is also an important character for identifying the species. In the genus *Cymbidium* and *Cymbidiopsis* two callus ridged united at apex to form a short tube like structure. (Plate: 1)

**Column:**

Column or gynostemium is formed by the fusion of stamen and pistil. Column varies from short to long, erect or curved, winged or not, sometimes base with short minute hairs. Anther cap terminal, entire, or 2-lobed, 2-4 chambered. The rostellum is a structure in the column which forms a barrier between the anther and stigma lobes to prevent self pollination. The clinandrium is a depression in the column where anther sets. (Plate: 2).

**Anther:**

There is only one fertile anther present at the top of the column. The anther is 2-
lobed and each lobe has generally 2 chambers but in the genus *Cymbidiopsis* and in subgenus *Jensoa* in *Cymbidium* the anther is 4 chambered. In some species of *Eulophia* viz., *E. andamanensis*, *E. epidendraea*, *E. graminea*, *E. mackinnonii*, *E. spectabilis*, *E. promensis*, *E. nicobarica* and *E. zollingeri*, 2 horn like process are present at the apex of anther.

**Pollinia:**

Pollinum is one of the characteristic features of orchids. It is the aggregation of pollen grains into a waxy mass or massulae (small masses). Pollinia in the tribe *Cymbidieae* are variable. In the genus *Eulophia*, *Geodorum*, the pollinia are 2 in number, which are deeply cleft and attached to a short and broad stipe. In the *Cymbidium*, the pollinia are 2, deeply cleft or 4 in two unequal pairs (subgenus *Jensoa*), whereas in *Cymbidiopsis* there are also four pollinia in two unequal pairs. *(Plate: 2)*

**Pedicel and ovary:**

The ovary in orchids is inferior. It is continuous with the pedicel or stalk of the flower and can be differentiated from the pedicel by its ridged surface. The pedicel varies from very small to long, glabrous or hairy.

**Fruits/Capsule:**

After fertilization, the ovary grows and develops into a fruit. Fruit is always a capsule (pod) which is a characteristic feature of Orchidaceae. Capsules are stalked, erect or pendulous, ovoid, oblong, ellipsoidal to obovate, glabrous, with a short beak at apex. In side the maturing capsule, the placenta develops into fibrous, cottony structures to which numerous, minute, microscopic seeds are attached. Placentation is parietal and the three placentas remains as three cottony ridges inside the capsule. Seeds are numerous, microscopic, non endospermic, elliptic, spindle shaped. The orchid seeds lack an appropriate mechanism (Glycosomes) to utilize their own lipidaceous food-reserve or those present in the substratum and they depend upon mycorrhizal endophytes for their requirements for sugar and possibly other nutrients in nature (Poole and Sheehan, 1982). Orchid seeds survive and regenerates well even after several years deep freezing.
Until the end of the 19th century, orchid seed germination remained a mystery. In 1889, Noël Bernard, a French biologist observed a fungus later identified as *Rhizoctonia*, living in tandem with their root structure, which helps in seed germination. The association between the orchids and fungus is called symbiotic relationship, where the orchid provides shelter to the fungus and the fungus provides nutrients to the germinating orchid seedling.