

Fig. 6.16 Forms of Gamopetalous corolla. A - Tubular in *Helianthus annuus*. B - Campanulate in *Cucurbita* sp. C - Infundibulum in *Ipomoea* sp. D - Hypocrateriform in *Catharanthus roseus*. E - Rotate in *Nyctanthes* sp. F - Urceolate in *Bryophyllum* sp. G - Ligulate in ray florets of a compositae flower (*Tagetes patula*). H - Bilabiate in *Leucas* sp. I - Personate in *Antirrhinum* sp.

(b) **PERSONATE OR MASKED** is a kind of bilabiate in which the throat of corolla is closed by a projection of the lower lip, known as *palate*. Examples are met within species of *Antirrhinum*, *Lindenbergia* (Scrophulariaceae), etc.

(c) **LIGULATE OR STRAP-SHAPED** corolla is met with in the marginal or ray-florets of the capitulum of Compositae ; here 5 petals are connate to form strap or tongue-shaped structure.

● **6.11 Aestivation** : Aestivation is the mode of arrangement of the accessory members i.e. sepals and petals or perianth with respect to one another in a flower bud. There are five types (Fig. 6.17), such as :

(a) **Valvate**—In this type, either the margins of sepals or petals simply touch each other but they do not overlap; valvate sepals are found in Malvaceae e.g. *Hibiscus rosa-sinensis*; valvate petals are also found in *Calotropis* sp. and plants of the family Mimosaceae.

(b) **Twisted or Contorted**—In this type, the sepals or the petals are arranged in such a way that one margin overlaps the margin of the next one and the other margin is overlapped by the margin of another, e.g. *Hibiscus rosa-sinensis*, *Gossypium* sp. of Malvaceae, species of *Nerium* sp., *Thevetia* sp., etc. of Apocynaceae.

(c) **Imbricate**—In imbricate, one of the petals or sepals overlaps the margins of the two adjoining members and the two margins of another member are overlapped, while the remaining three behave as twisted fashion. Examples—species of *Brassica* (Cruciferae), *Capparis* (Capparidaceae), *Delonix*, *Cassia*, *Caesalpinia* (Caesalpinaceae), etc.

(d) *Quincuncial*—In this, the margins of sepals or petals (usually in an imbricate aestivation) are arranged in such a way that out of the five members two are outer, two are inner and the odd fifth posterior being overlapped along its one margin, the other margin overlapping i.e. one remain external like twisted. Examples—calyx of most plants of Asclepiadaceae (*Calotropis* sp.), Myrtaceae (*Psidium guajava*), etc.

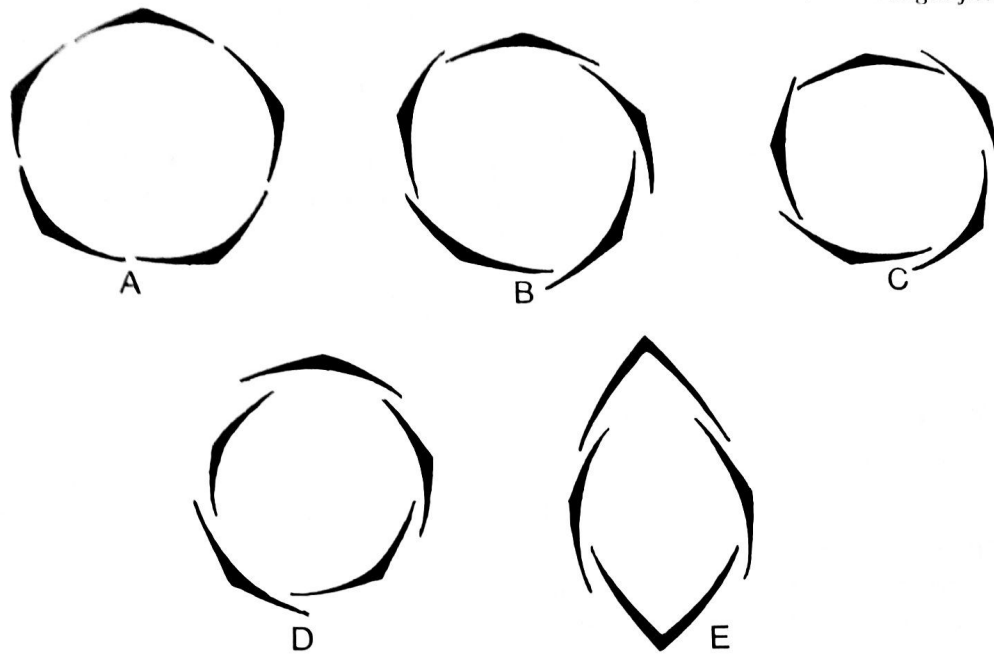


Fig. 6.17 Types of aestivation. A - Valvate, B - Twisted or Contorted, C - Imbricate, D - Quincuncial, E - Vexillary.

(e) *Vexillary*—It is no doubt a type of imbricate aestivation, here out of the five petals the odd fifth posterior (known as *standard* or *vexillum*) one is the largest and the outermost, it overlaps the two lateral petals (known as *wings* or *alae*) and the lateral petals again in turn partly overlap the two smallest and innermost petals known as *keel*. Examples—corolla of all flower of plants belonging to the family Papilionaceae.

But according to Michael Hickey and Clive King, 1985 aestivations are of eight types as follows :

1) *Open*—This type of aestivation is found in polysepalous calyx, polypetalous corolla and polyphyllous perianth. Here sepals, petals or perianth in a whorl do not touch one another at the margin but remain free. Open type is found in sepals of *Magnolia champaca* (Magnoliaceae), perianth of *Ricinus communis* (Euphorbiaceae), etc.

2) *Valvate*—In this type, floral leaves (sepals, petals, etc.) are united with each other and just touch one another at the margin. Examples as mentioned in *valvate* (a), page 104 .

3) *Contorted or Twisted*—as mentioned earlier in point no (b), page 104.

4) *Convolute*—This type of aestivation is noted in case of only gamopetalous corolla. Here petals are arranged spirally in bud condition. Example—*Ipomoea purpurea*, *Evolvulus nummularis*, etc. of Convolvulaceae.

5) *Quincuncial*—same as described in item No. (d), page 105.

6) *Imbricate*—same as described in item no. (c), page 104.

7) *Descending imbricate* or *Vexillary*—same as described in item no. (e), page 105.

8) *Ascending imbricate*—This type of aestivation is found only in corolla members. Out of the 5 petals, the odd 5th petal is posterior, small and innermost, other 4 petals are almost equal. Examples—*Cassia sophera*, *Bauhinia purpurea* of S. F. Caesalpinioideae of Family Leguminosae.

Aestivation is very important from taxonomic point of view i.e. it helps in identifying families and genera.

gynoecium individual ovary possesses respective chamber. But in syncarpous gynoecium though ovaries are combined together forming apparently one ovary still cavities for respective ovaries of carpels are there, forming several chambers. The number of chambers in the ovary may be one or as many as the number of carpels. Sometimes as a result of the dissolution of partition walls of respective ovary chambers in *syncarpous gynoecium*, the number of chamber is reduced to one, e.g. *Caricaceae*, *Passifloraceae*, etc. Sometimes due to the formation of *false* partition walls ovary chambers are increased from two to four (*Solanaceae*).

### ● 6.17 Placenta and Placentation :

◆ A. PLACENTA is the term applied to a zone of marked protuberance of the carpellary leaf in the ovary to which ovule or ovules are attached.

Placentas may develop either at the base or apex of the carpel, or along the fused margins of carpel or carpels known as *ventral sutures*.

◆ B. PLACENTATION is the type of arrangement of placentas bearing ovule or ovules in the ovary chamber.

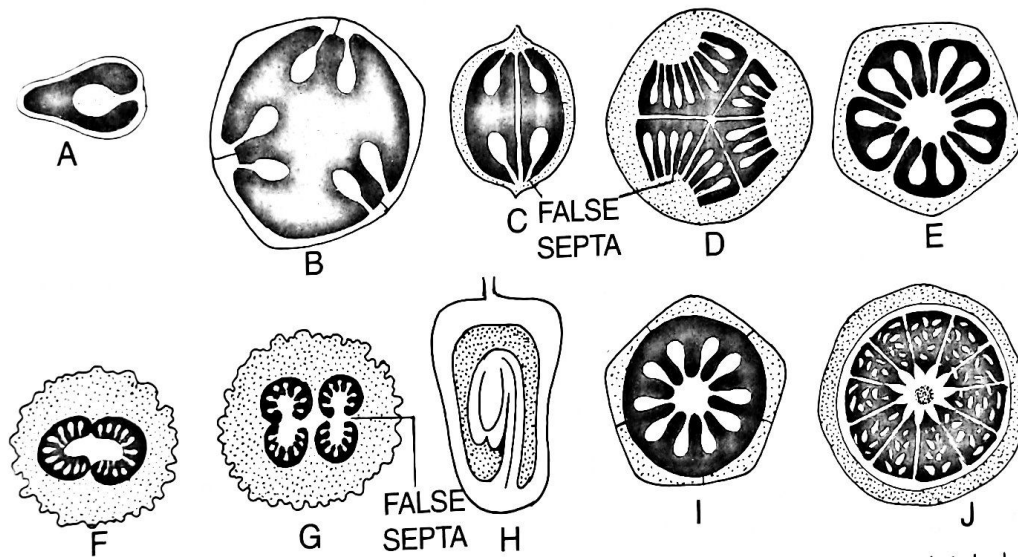


Fig. 6.31 Different types of placentation. A - Marginal ; B-D - Different forms of parietal placentation ; E - Typical axile placentation found in *Hibiscus* sp. F-G - Axile placentation in members of *Solanaceae* (F, in bilocular ovary ; G, in tetralocular ovary) ; H - Basal in *Compositae* (in L.S.) ; I - Free Central ; J - Superficial.

The following types of placentation are noted—

1. *Marginal*—When placenta develops along the fused margins of the carpel in the ovary i.e. along the ventral suture and ovules are borne in a double row along this suture, it is termed marginal. Here ovary is one-chambered. This type is found in the members of the family *Leguminosae*.

2. *Parietal*—In this type the ovary is one-chambered though two or more carpels unite along the ventral suture—placentas develop on the ventral sutures of their carpellary leaf and placenta bearing ovules remain attached at the confluent margins of the respective carpels in the ovary—this is seen in families *Violaceae*, *Moringaceae*, *Caricaceae* (*Carica papaya*), *Cruciferae*, etc.

3. *Axile*—When the pistil is formed of several united carpels, the ventral sutures of respective carpels meet at the centre. The placenta bearing ovules ultimately arise from the central axis or from the inner angle where the respective ventral sutures of carpels meet, this placentation is known as axile. Axile placentation is common in *Malvaceae*, *Solanaceae*, *Rutaceae*, *Liliaceae*, *Amaryllidaceae*, etc. e.g. species of *Asparagus*, *Allium*, *Polyanthes*, etc.

4. *Free central* or *Central*—This type arises from axile placenta in the initial stage of development. At maturity in the ovary the partition walls are broken and disappear, the placenta bearing ovules appear to be situated at the central axis arising from the remnants of ventral sutures of carpels free from the ovary wall, the

ovary apparently becomes one-chambered. This type is found in the members of families Caryophyllaceae, *Portulacca* sp. of Portulaccaceae, etc.

Free central placentation may also occur by peg-like protrusion of the thalamus inside the unilocular ovary. Placenta bearing ovules develop on it, e.g., *Primula* sp. (Primulaceae). According to some botanists organographically this type of placentation is the *true central placentation*.

5. *Basal*—In *Helianthus annuus*, *Tagetes patula* (Compositae) the placentation is basal. In this type placenta bearing single ovule, sometimes a few, arises on the thalamus at the base of the one-chambered ovary.

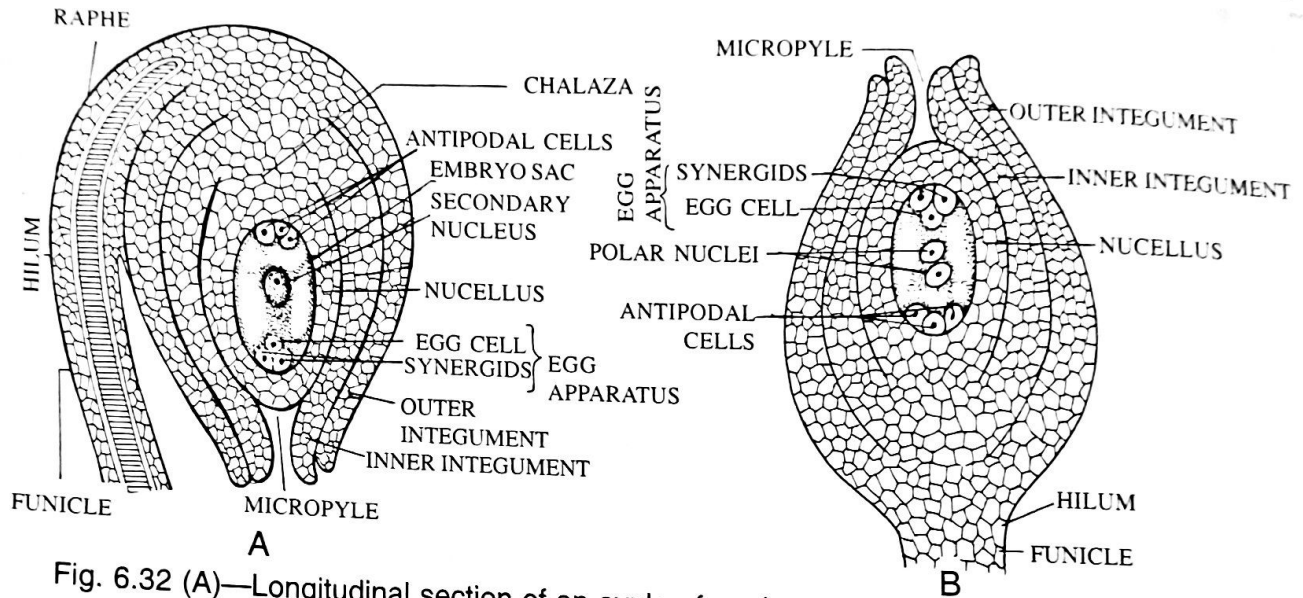


Fig. 6.32 (A)—Longitudinal section of an ovule of angiosperm; A - Anatropous ovule, B - Orthotropous ovule.

6. *Superficial or Laminal*—In *Nymphaea* sp. (Nymphaeaceae) ovary is many-chambered and carpels are many, placenta bearing ovules are situated throughout the whole inner surface of the ovary; the placentas are not restricted to localised spot as in axile or parietal.

### ● 6.18 The Ovule :

◆ A. The ovule may be defined as an immature seed or an unripened integumented megasporangium. It may also be designated simply as “the egg containing organ within ovary.”

After fertilization the ovule develops into seed. In angiosperms, ovules are protected by megasporophyll which forms a closed structure (ovary), that is why seeds remain enclosed. In gymnosperms, ovules are not protected but exposed on megasporophyll i.e. carpel resulting into the formation of naked seeds.

### ◆ B. STRUCTURE OF AN OVULE

- (1) The stalk with which the ovule remains attached to the placenta is called *funicle* or *funiculus*.
- (2) The point of attachment of the funicle to the body of the ovule is called *hilum*.
- (3) The basal part of the ovule from where the integument or integuments arise is known as *chalaza*.
- (4) The extension of the funicle beyond the hilum alongside the body of the ovule is known as *raphe*. A raphe may be ventral or dorsal in an ovule, and may extend up to the base i.e. chalaza of the ovule.
- (5) The main body of the ovule consists of a central mass of tissue—the *nucellus* which is surrounded by one or two envelopes called *integuments*; the integuments enclose the nucellus except at the apex, where a small opening is left called *micropyle*.
- (6) Near the micropylar end, a sac-like structure known as *embryo sac*<sup>1</sup> (female gametophyte), lies

<sup>1</sup>Embryo sac is the megaspore and its derivatives.