## COHESION OF CARPEL

If only one carpel is present in gynoecium this condition is called monocarpellary.

If more than one carpel is present in gynoecium this condition is called polycarpellary. If all the carpels in polycarpellary/multicarpellary condition are free, then condition is called apocarpous.

If all the carpels are fused together, then condition is called syncarpous.

In syncarpous gynoecium four types of cohesion are found:

(1) When many ovaries are fused, than they form syncarpous ovary. But in it, stigma and stigma and style are separated with each other, Eg. **Dianthus, Plumbago**

(2) In carpels ovary and style fused, but stigma are not fused. Eg. In Malvaceae family. **Hibiscus rosasinensis,** cotton.

(3) When stigma are fused but the ovary and style are free. Eg. **Calotropis, Casia fistula, Nerium.**

(4) Carpels are completely fused. This condition is found in max. flowers. eg. Mustard, **Raphanus sativus,** Lycopersicon.

In syncarpous gynoecium how many carpels are fused, can be detected through –

(1) No. of stigma (2) No. of style (3) No. of lobes of ovary (4) No. of placenta

**PLACENTATION:**

The ovules are attached on ovary walls on one or more cushion called placenta. The manner in which placenta are arranged on ovary wall is known as placentation. It is of following types :

(1) **Marginal:** This type of placentation is found in monocarpellary gynoecium the placenta develops along the junction of two fused margins. Eg. Pea and other leguminous plants.

(2) **Parietal:** This type of placentation is fond in unilocular syncarpous ovary. In it, the ovule is formed by the fusion of two or more carpels by their adjacent margins and two or more placenta forms. In this type of placentation, the no. of placenta is equal to no. of carples Eg. **Cucurbita, Argemone**, and Cruciferae family (Mustard)

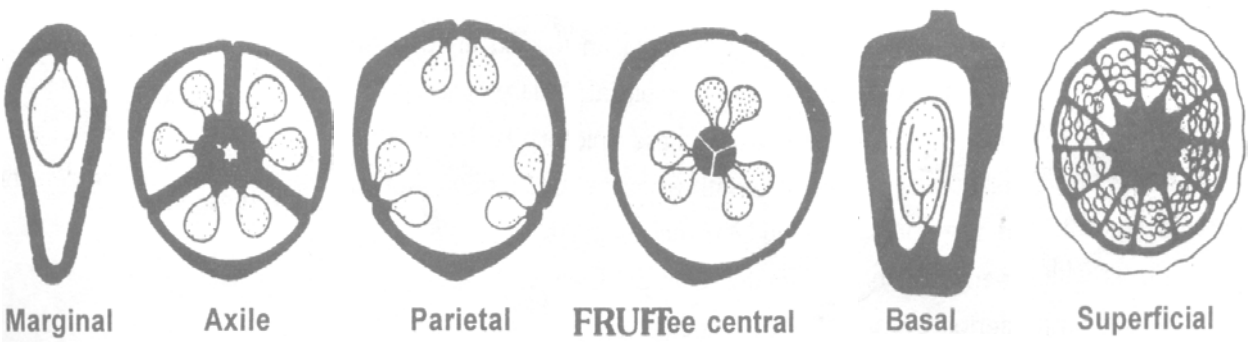
(3) **Axile:** It is found in multicarpellary syncarpous gynoecium. The fusing margin of carpels grows inward and meet in the centre of the ovary. Thus an axis forms in the centre of ovary, thus ovary becomes multichambered. The ovules are born on the central axis Number of these chambers are equal to the number of carpel. Eg. Potato, China rose, Onion. Lemon, Orange, Tomato.

(4) **Free central:** This type of placentation is found in syncarpous gynoecium. In it, the ovary is unilocular and the ovules are borne on the axis in the centre of the ovary.

Placentation is axile in beginning. After sometime walls of chamber destroy and only ovulated central axis left. eg. Primrose **Dianthus** (Caryophyllaceae)

(5) **Superficial –** This type of placentation is found in multicarpellary syncarpous gynoecium. The ovules are attached on the walls of loculii Eg. Nymphaea (Water lily)

(6) **Basal:** The ovary is unilocular and a single ovule is borne at the base of ovary. Eg. Marigold, Sunflower (Asteraceae family).



The seeds are protected inside fruit. But in some fruits, seeds are not found like in grapes, banana and such type of fruits are called parthenocarpic or seedless fruit.

**Pericarp :** After ripening, the ovarian wall changes into pericarp. This pericarp may be thick and fleshy or thick and hard or thin and soft.

**Pericarp is made up of 3 layers :-**

(a) Outermost layer = Epicarp
(b) Middle layer = Mesocarp
(c) Inner most layer = Endocarp

(a) **Epicarp –** It is the outermost layer it is thin and hard or soft part. It forms outermost layer of fruit which is also called rind

(2) **Mesocarp** : It is the middle layer which is thick and fleshy in mango, peach, date palm. In coconut, this layer is made up of fibres which is also called coir

(3) **Endocarp :** It forms the innermost layer it may be thin membrane (eg. Orange, datepalm) or thick and hard (eg. Mango, Coconut)

**TRUE FRUIT :**When the fruit is developed only from the ovary, the fruit is called as true fruit. Eg. Mango, Coconut, Zizyphus

**FALSE FRUIT OR PSEUDOCARP :** In some fruits, in place of ovary, some other parts of flower like thalamus, inflorescence, calyx are modified to from a part of fruit. These types of fruit are called false fruits. Eg. Apple, Strawberry.

**CLASSIFICATION OF FRUITS :**

(1) Carpels present in gynoecium are whether free or in fused state.
(2) One or more flower takes part in formation of fruit.

On the above two basis, fruits are divided into :

(1) Simple (2) Aggregate(3) Composite

**1**. **Simple fruit :** These fruit develop from monocarpellary ovary or multicarpellary syncarpous ovary and only one fruit is formed by the gynoecium. Simple fruits are of two types :

(a) Fleshy fruit (b) Dry fruit

**(a) Fleshy fruit :** In fleshy fruit, fruit wall is differentiated into epicard, Mesocarp and endocarp. These fruit develop from superior or inferior syncarpous gynoecium. These may be unilocular or multilocular, these fruits are indehiscent. Dispersal of fruit occurs after pericarp is destroyed. In this fruits pericarp is distinguished into Epicarp, Mesocarp and endocarp.

**Fleshy fruits are of following types :**

**(1) Drupe fruit :** These fruit develops from mono or multicarpellary, syncarpous, superior ovary. In these fruits endocarp is hard and stony so these fruits are also called stony fruits. Eg. Mango, coconut, almond, peach walnut, plum. In mango the outermost cover or rind is called epiccarp. Edible fleshy part is Mesocarp and the part where seed is protected is called as endocarp. In ber, Epicarp and Mesocarp both are edible part while endocarp is drupe.

The rind of Almond and walnut are endocarp and their edible part is seed. In coconut Epicarp is hard and thin while Mesocarp is thick and consists, of hard fibres. The endocarp is hard and seed is proteced in it. The sweet water and of coconut are liquid and solid endosperm.

**(2) Berry :** These fruits develop from mono or multicarpellary syncarpous ovary. Ovary may be superior or inferior. Placentation is axile or parietal. In these Epicarp is thin like membrane and seeds are embedded in fleshy part initially seeds are attached with placenta of fruit but after maturation these seeds are detached with placenta and are spread randomly in fleshy part.

(i) Plants with superior ovary = Tomato, Grapes, Brinjal.
(ii) Plants with inferior ovary = Guava, Banana

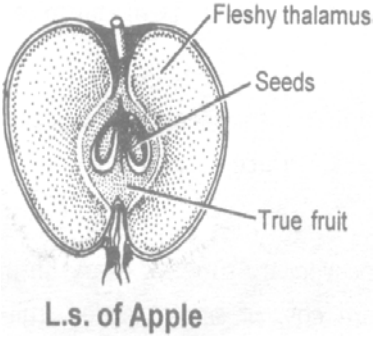
**Date palm** is one seeded berry. In it pericarp is divided into Epicarp, Mesocarp and endocarp. Epicarp

is thin and soft while Mesocarp is thick and fleshy and endocarp is thin like a membrane. Which is attached with seed.

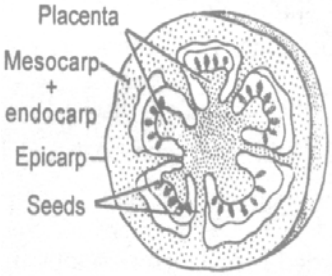
**Arecanut** is one seeded fibrous fruit. When its thick fibrous layer is removed then seed comes out which is hard.

**(3)** **Pepo:** These fruit develops from tricarpellary, syncarpous and inferior ovary. This fruit is unilocular and have parietal placentation. These fruits are fleshy and spongy. Eg. fruits of Cucurbitaceae family like cucumber, melon, **Cucurbita maxima,** bitter gourd, muskmelon.

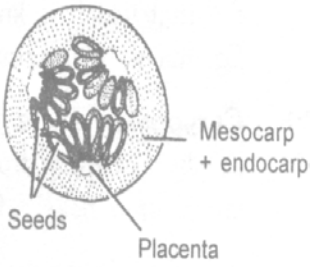
**(4)** **Pome :** This fruit develops from bi or multicarpellary syncarpous inferior ovary. The rind and sponge are made up of thalamus. The main part of ovary is like to cartilage. It means it is hard and dry remain inside the fruit seeds are present in it. Eg. Apple, Pear. These are false fruits. Fleshy swollen thalamus of these fruits is edible part.



L.s. of Apple



L.s. of Tomato



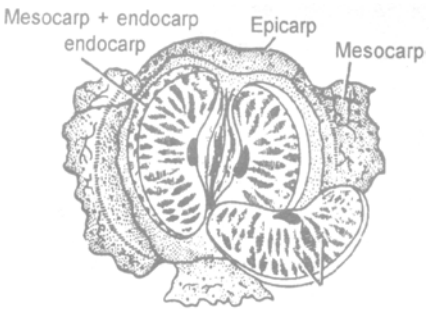
T.s. of Cucumber

**(5)** **Hesperidium :** This fruit develops from multicarpellary, syncarpous, superior ovary. This fruit is specialy found in plants of Rutaceae family. Eg. Orange, Lemon.

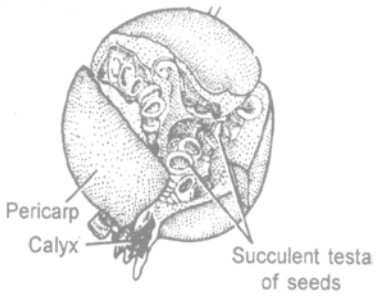
Epicarp of these is made up of thick rind which is leathery and many oil glands are found in it. Mesocarp is the white fibrous structure which is attached with epicarp. Membranous endocarp projects inward and formed many chambers. Many glandular hairs are present on the inner side of endocarp. These glandular hairs are only edible parts.

**(6)** **Balausta :** It is a multilocular multiseeds fruit, which develops from inferior ovary. It's pericarp is hard. Calyx is persistent which is arranged in the form of crown. If is persistent Carpels are arranged systematically. Seeds are irregularly arranged on placenta. Endocarp is hard. Testa is fleshy and Juiceous. This is the edible part of fruit. Eg. Pomegranate (**Punica granatum**).

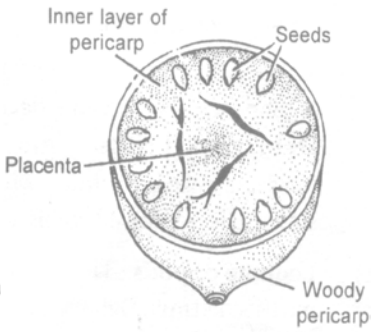
**(7)** **Amphisarca :** This fruit is multicarpellary and multichambered which develops from supericarp is hard and fleshy placenta is found in them. The inner part of pericarp and placenta is edible part of fruit. Eg. wood apple (**Aegle marmelos**)**, elephant apple.**



Hesperidium of orange



Balausta of pomegranate



Amphisarca of wood apple