RAMA UNIVERSITY

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FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

INTRODUCTORY BIOLOGY UGR-121

LECTURE- 07

FRUIT

- **Fruit** is a matured ovary developed after fertilization.
- After fertilization, ovary forms fruits and ovules form the seeds.
- **Pomology** is the study of fruits.
- The seeds are protected inside fruit. But in some fruits, seeds are not found in grapes, banana and such type of fruits are called **parthenocarpic** or **seedless fruit**.
- After ripening, the ovary 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 :
    - **Epicarp** : It is the outermost layer. It is thin and is either hard or soft. It forms outermost layer of fruit which is also called rind.
    - **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.
    - **Endocarp** : It forms the innermost layer. It may be thin membrane (eg. orange, date palm) or thick and hard. (eg. Mango, coconut).

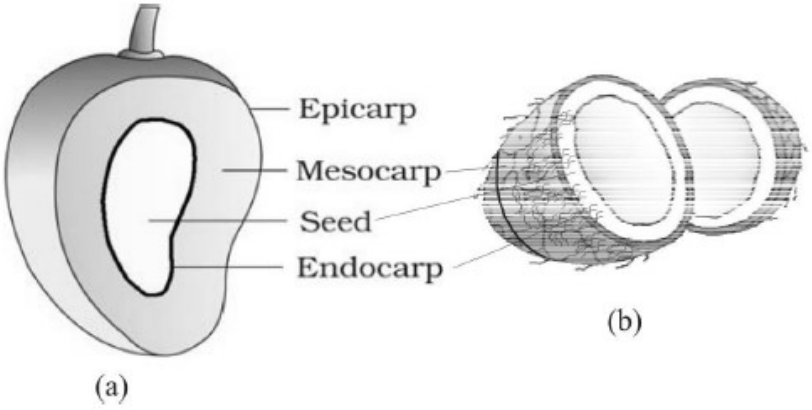

Fig. : Parts of a fruit : (a) Mango (b) Coconut

- When the fruit is developed only from the ovary, the fruit is called as true fruit. E.g., Mango, Coconut, Zizyphus.
- In some fruits, in place of ovary, some other parts of flower like thalamus, inflorescence, calyx are modified to form a part of fruit. These types of fruit are called false fruits or pseudocarp. E.g., Apple, Strawberry.

CLASSIFICATION OF FRUITS

- On the basis of presence of carpels in gynoecium, (whether free or infused) or role of one or more flowers in formation, fruits are divided into : **simple**, **aggregate** and **composite**.

  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 : **fleshy fruit** and **dry fruit**.

- **Fleshy fruit**

- In fleshy fruit, fruit wall is differentiated into epicarp, mesocarp and endocarp.
- These fruits 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.
- Drupe is a fleshy fruit

- **Drupe fruit** : These fruit develop from mono or multicarpellary, syncarpous, superior ovary. In these fruits, endocarp is hard and stony, so these fruits are also called stony fruits. E.g., Mango, coconut, almond, peach, walnut, plum. In mango, the outermost cover or rind is called epicarp. 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 protected in it. The sweet water and edible part of coconut are liquid and solid endosperm.

SEED

- Seed is a fertilized or ripened ovule.
- Seed is characteristic of gymnosperms and angiosperms.
- Seed is a dormant structure containing protective coverings (**seed coats**), **reserve food** and **embryo** (2n).
- Seed coat develops from integuments of ovule. The outer seed coat is called testa while the inner one is called **tegmen**. Seed coat is membranous, generally fused with fruit wall.
- The seed is attached to the fruit wall or pericarp by means of stalk called **funicle**. The point of attachment of the funicle to the body of mature seed is called **hilum**.
- The surface of seed possess a fine pore at one end called micropyle. The micropyle permits the entry of water needed at the time of germination.
- Seeds are of two types -

- **Albuminous (endospermic) seeds** : In these seeds, food is stored in the endosperm. E.g., corn, wheat, onion etc.
- **Exalbuminous (non-endospermic) seeds** : They usually store reserve food material in cotyledons. In these seeds, the endosperm is used up and not present in mature seeds. E.g., bean, gram and pea.

- **STRUCTURE OF DICOTYLEDONOUS SEEDS**

- A dicotyledonous seed contains seed coats, two cotyledons and an embryonal axis.
- The embryonal axis is attached to the cotyledons for absorbing nutrition from them.
- The embryonal axis consists of two ends - radicle and plumule.
- Radicle gives rise to root system and plumule gives rise to shoot system.

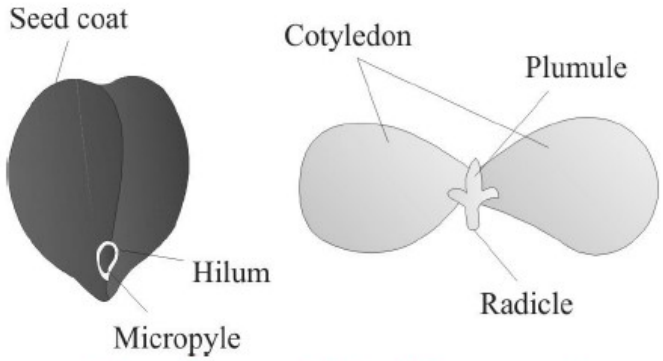

Fig. : Structure of dicotyledonous seed

- The portion of the embryonal axis between the radicle and the point of attachment of the cotyledons is called **hypocotyl** whereas the portion between the plumule and cotyledons is called **epicotyl**.
- Most of the dicotyledonous seeds are exalbuminous. A few dicotyledons like castor, bean have albuminous seeds. Their cotyledons are thin and papery.

- **STRUCTURE OF MONOCOTYLEDONOUS SEEDS**

- Monocotyledonous seeds are endospermic but some (as orchids) are non-endospermic.
- Maize grain shows structure of a typical monocotyledonous seed. In maize grain, the seed coat is fused with the pericarp.
- Major part of the grain is occupied by a large endosperm which is rich in starch
- The endosperm has one to three layered peripheral protein layer (called aleurone layer) which separates the embryo from endosperm.

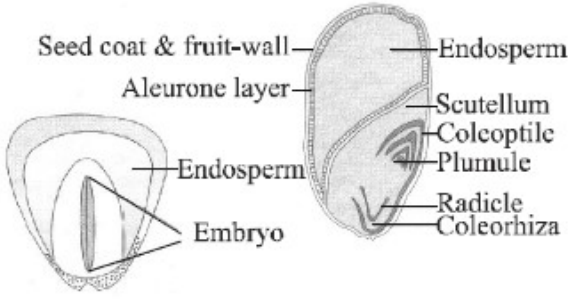

Fig. : Structure of a monocotylendous seed

- The embryo consists of a cotyledon and an embryonal axis.
- The cotyledon is also called **scutellum** in cereals.
- The lower end of the axis is called the radicle which has a protective sheath termed **coleorhiza**. The upper part of the axis is called the **plumule** which is covered by coleoptile.

DISPERSAL OF FRUITS, AND SEEDS

- Most of the plants do not move from one place to another. They grow, produce flowers and fruits while remaining fixed at one and the same place. The seeds falling directly under the mother plant have to germinate and develop under limited food supply and space. To overcome this problem, the fruits and seeds have developed several special devices for wide dispersal.
- Dispersal is essential to avoid struggle for existence for colonization of new areas and production of mixed population.
- The natural agents like wind, water and animals and even mechanism of dehiscence in some fruits, help the seeds and fruits to disperse from one place to another, and to long distances from the parent plant.

WIND

- In the species, where the seeds are light in weight or have some accessory part to help dissemination, are dispersed by the air current (called anemochory).
- The seeds of drumstick and Cinchona and (fruits of yam, maple) aridisol tree, are provided with one or more appendages in the form of thin, flat and membranous wings, which help them to float in the air and be carried away to long distances.
- In the members of Asteraceae, the calyx is modified into hair like structures called pappus. They persist in fruit and open out like umbrella, helping the seeds to float in the air.
- In poppy and prickly poppy (Argemone), the fruit dehisces and seeds are thrown out to distances away from the parent plant. The seeds of Calotropis, Alstonia and cotton are provided with hair and cover sufficient distances along with the wind.
- The seeds of orchids and some grasses are very small and light in weight and may be easily carried away by the wind to far off places.

WATER

- Hydrochory is the mode of dispersal of fruits and seeds by water.
- The fruits and seeds with specialised devices which may be in the form of spongy and fibrous outer walls as in coconut and spongy thalamus as in lotus, and small seeds with airy aril as in water lily, float very easily in water, and are carried away to long distances with the water current.

ANIMALS

- The fruits and seeds with hooks, spines, bristles, stiff hair, etc., get attached to the body of hairy and woolly animals and are carried away by them to distant places.
- For instance, fruits of Xanthium and Urena bear curved hooks, spear grass has a bunch of stiff hair, Tribulus has sharp and rigid spines, Boerhaavia has sticky hair which help in dispersal by animals.
- The edible fruits like guava, grapes, figs and plums are dispersed by birds and even human beings, either by feeding on them and passing out undigested seeds with faeces or by carrying them to other places for later feeding.

Seed germination is defined as the emergence of the radicle through the **seed** coat. Common garden **seeds germinate** if given just water and reasonably warm temperatures. ... If a species has evolved a very thick **seed** coat, it may require scarification of that **seed** coat before water can enter the **seed** and initiate **germination**

The Seed Germination Process

1. **Step** 1: Imbibition: water fills the **seed**.
2. **Step** 2: The water activates enzymes that begin the plant's **growth**.
3. **Step** 3: The **seed** grows a root to access water underground.
4. **Step** 4: The **seed** grows shoots that grow towards the sun.
5. **Step** 5: The shoots grow leaves and begin photmorphogenesis