UNIT VIII
Fruit Morphology

Fruits types
After fertilisation the carpel(s) develop(s) into the fruit, and the ovules into seeds.
Classification

1. Simple fruits: each single flower → 1 fruit
   [Gynoecium 1 to n carpels, syncarpous, produce 1 fruit]
   
   1.1. Fleshy
   
   1.2. Dry
     
     1.2.1. Dehiscent
     1.2.2. Indehiscent

2. Aggregate fruits: each single flower → 1 fruit
   [Gynoecium 2 to n carpels, apocarpous, produce 2 to n “fruitlets” aggregated in a single fruit.]

3. Multiple fruits: ALL flowers of an inflorescence → 1 fruit
1. Simple fruits
G (1—n carpels), connate

1.1. **Fleshy**: wall of the fruit (pericarp) is fleshy

1.2. **Dry**: the wall of the fruit (pericarp) at maturity is dry
1.1. Simple Fleshy Fruits

BERRY

BERRY: Fruit wall is completely fleshy at maturity. The seeds are embedded in the fleshy tissue.
1.1. Simple Fleshy Fruits

PEPO: Like the berry, but the pepo is covered by a rind that is hard and thick. Below the rind, the rest of the ovary wall is soft and fleshy. This is the fruit of Cucurbitaceae: cucumber, pumpkin, watermelon, etc.
The “pepo gun?”; *Ecballium elaterium*  
(Squirting cucumber)

Before....  
After...
1.1. Simple Fleshy Fruits

DRUPE: Like the berry, but the inner part of the fruit wall becomes a hard and stony pit containing ONE seed.
1.1. Simple Fleshy Fruits

**POME**

POME – “special” fruit formed mainly from the receptacle of the flower; carpels produce only the cartilaginous core that encloses the seeds.
1.1. Simple Fleshy Fruits

HESPERIDIUM

HESPERIDIUM: is covered with a leathery rind and the partitions separating their carpels are tough and fibrous. E.g. Citrus spp. (orange, lemon and grapefruit, etc.)
1.2. Simple Dry Fruits

IF the open: 1.2.1. DEHISCENT
IF they don’t open: 1.2.2. INDEHISCENT

1.2.1. Simple Dry dehiscent Fruits

LEGUME (pod)

LEGUME: splits along two lines of dehiscence. The legume is derived from a gynoecium with one carpel, G1, with two rows of ovules. The fruit of Fabaceae (Leguminosae).
1.2.1. Simple Dry dehiscent Fruits

**FOLICLE**: resembles legume but splits along **one** line of dehiscence. The fruit of milkweeds (*Asclepias* spp.)
1.2.1. Simple Dry Dehiscent Fruits

**SILIQUE & SILICLE**

**THE SILIQUE** long fruit that splits in 2 valves along 4 dehiscence lines and originates from a G(2). Very characteristic is the septum that separates the fruit into 2 cavities and on which the seeds are attached. Together with the silicle, they are the fruit of Brassicaceae (cabbage family).

*Attention:* the silique superficially resembles the legume!
1.2.1. Simple Dry Dehiscent Fruits

SILICLE

The Silicle is essentially the same type of fruit as the silique. The only difference is in the ratio Length: Width. The silicle is maximum 3 times longer than wide. The silique is more than 3 times (usually many times) longer than wide.

Capsella bursa-pastoris

Thlaspi arvense
1.2.1. Simple Dry Dehiscent Fruits

CAPSULE - VALVICIDE

CAPSULE: originates from 2 or more fused carpels. The valvicide capsules like those of the lily (Lilium spp.) split length-wise into sections (valves) corresponding to the number of carpels.
1.2.1. Simple Dry Dehiscent Fruits

CAPSULE - PORICIDE

The poricide capsules like those of *Papaver* spp. (poppy) open and release their seeds through small pores.
EXPLOSIVE CAPSULES

Impatiens spp.; e.g. Impatiens capensis, Touch-me-not,

Before dehiscence

After...
Classification

1. Simple fruits: each single flower \( \Rightarrow \) 1 fruit

   [Gynoecium 1 to n carpels, syncarpous, produce 1 fruit]

   \[\begin{aligned}
   &1.1. \text{Fleshy} \\
   &1.2. \text{Dry} \\
   &\quad \begin{aligned}
   &1.2.1. \text{Dehiscent} \\
   &1.2.2 \text{Indehiscent}
   \end{aligned}
   \end{aligned}\]

2. Aggregate fruits: each single flower \( \Rightarrow \) 1 fruit

   [Gynoecium 2 to n carpels, apocarpous, produce 2 to n “fruitlets” aggregated in a single fruit.]

3. Multiple fruits: ALL flowers of an inflorescence \( \Rightarrow \) 1 fruit
ACHENE: Pericarp is free (doesn’t adhere) to the seed. One of the most common type of fruit. In Asteraceae, it is often accompanied by the “pappus” which is the persistent calyx.
1.2.2. Simple Dry Indehiscent Fruits

**NUT**: is an achene, but bigger; often not accepted as a distinct type of fruit and referred to as “achene. E.g. the acorns of Oak (*Quercus* or the “nuts” of chestnut tree (*Castanea* spp.).
1.2.2. Simple Dry Indehiscent Fruits

SAMARA is a winged achene. E.g. Ash (*Fraxinus* – left); Elm (*Ulmus* spp., right).
Disamara – *Acer* spp.
1.2.2. Simple Dry Indehiscent Fruits

CARYOPSIS - GRAIN

CARYOPSIS: Like the achene but the pericarp fuses intimately to the seed. The fruit of grasses (Poaceae).
Classification

1. Simple fruits: each single flower 1 fruit
   [Gynoecium 1 to n carpels, syncarpous, produce 1 fruit]
   \[\text{1.1. Fleshy} \quad \text{1.2. Dry}\]
   \[\begin{align*}
   &\quad \text{1.2.1. Dehiscent} \\
   &\quad \text{1.2.2 Indehiscent}
   \end{align*}\]

2. Aggregate fruits: each single flower 1 fruit
   [Gynoecium 2 to n carpels, apocarpous, produce 2 to n “fruitlets” aggregated in a single fruit.]

3. Multiple fruits: ALL flowers of an inflorescence 1 fruit
2. *Aggregate fruits:* Each single flower [Gynoecium 2 to n carpels, apocarpous, produce 2 to n “fruitlets” aggregated in a single fruit.]

- *Rubus spp.* Aggregate of drupes
- *Fragaria spp.* Aggregate of achenes
- Tulip tree (*Liriodendron tulipifera*), aggregate of samaras.
- *Magnolia spp.* Aggregate of follicles
3. Multiple fruits:
ALL flowers of an inflorescence → 1 fruit

The pineapple — *Ananas comosus*
3. Multiple fruits

Synconium of Fig (*Ficus carica*)
Multiple fruit of mulberry (*Morus* spp.)
Multiple fruit of jackfruit (*Arctocarpus incissa*).