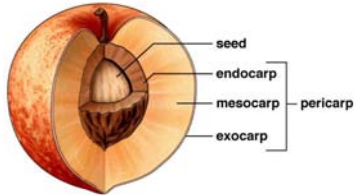


Lecture 27-28. Fruits

Regions of a Mature Fruit

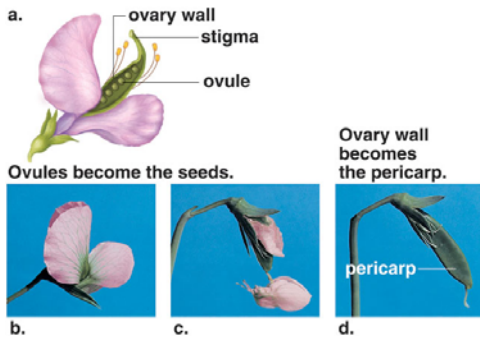


Topics

- Formation of fruits
- Basic Fruit Types

Formation of fruits

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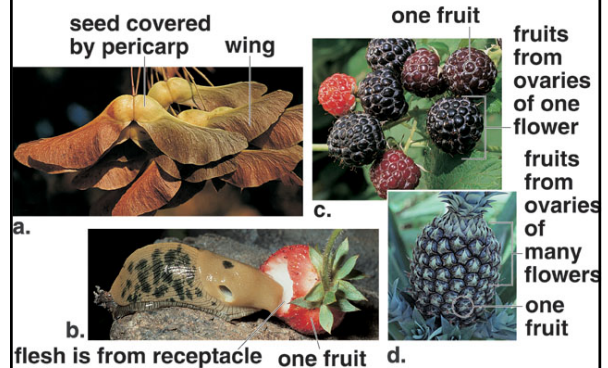
Basic Fruit Types

- The two principal Fruit Types are Fleshy & Dry
 - Caution: A Legume is a dry fruit. We eat unripe legumes like Snow Peas and Green Beans. We might classify the latter as fleshy fruits but they are dry at maturity!!
- Dry Fruits are either Dehiscent or Indehiscent.
 - Dehiscent Fruits open at maturity while indehiscent Fruits do not!
- Fruits may be Simple or Accessory.
 - Simple Fruits are Mature Carpels.
 - Accessory Fruits include the Carpels & other tissues.
 - The latter may be other Floral Organs or the Receptacle.
- Aggregate vs multiple fruits
 - Aggregate Fruits contain Many Simple Carpels from ONE FLOWER
 - Multiple Fruits contain the Fruits of MANY FLOWERS.

Fruit Types

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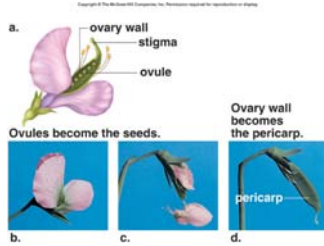
Table 28.1		
Kinds of Fruit		
Name	Description	Example
Simple Fruits Develop from a Flower with a Single Ovary		
Fleshy	Pericarp is usually fleshy.	
Drupe	From simple ovary with one seed (pit) and soft "skin"	Peach, plum, olive
Berry	From compound ovary (pistil) with many seeds	Grape, tomato
Pome	From compound ovary; flesh is from accessory of flower parts	Apple, pear
Dry	Pericarp is dry.	
Follicle	From simple ovary that splits open down one side	Milkweed, peony
Legume	From simple ovary that splits open on both sides	Pea, bean, lentil
Capsule	From compound ovary with capsules that split in various ways	Poppy
Achene	From simple ovary with one-seeded small fruit; pericarp easily removed	Sunflower, dandelion, strawberry
Nut	From simple ovary with one-seeded fruit; hard pericarp	Acorn, hickory nut, chestnut
Grain	From simple ovary with one-seeded small fruit; pericarp completely united with seed coat	Rice, oat, barley
Compound Fruits Develop from a Group of Individual Ovaries		
Aggregate fruits	Ovaries are from a single flower.	Blackberry, raspberry
Multiple fruits	Ovaries are from separate flowers clustered together.	Pineapple



Fruit Types: simple fruits

Simple Fruits

- Simple fruits are derived from single or several united carpels.
- Legumes are fruits that split along two sides when mature.
 - Dehiscent - Split open
 - Indehiscent - Fail to split open



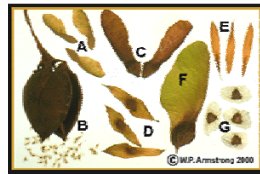
Simple Fruits

- Fleshy
 - Drupe: peach
 - Berry: grape
 - Pome: apple
- Dry
 - Dehiscent
 - Follicle: peony
 - Legume: bean
 - Capsule: poppy
 - Indehiscent
 - Achene: sunflower
 - Nut: hazelnut
 - Grain: rice

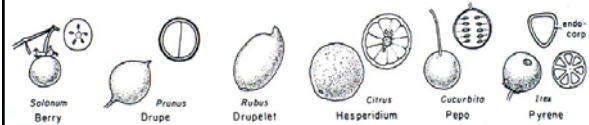


Simple Fruits

- Dispersal
 - Many seeds are dispersed by wind.
 - Woolly hairs, plumes, wings
- Fleshy fruits - Attract animals and provide them with food.
 - Peaches, cherries, tomatoes
- Accessory fruit - Bulk of fruit is not from ovary, but from receptacle.
 - Apples



FLESHY FRUIT TYPES



- **Berry.** Fleshy fruit, with succulent pericarp, as in *Vitis*.
- **Drupe.** A fleshy fruit with a stony endocarp, as in *Prunus*.
- **Drupelet.** A small drupe, as in *Rubus*.

Berry – from compound ovary with many seeds

- have a fleshy or leathery Exocarp, Mesocarp and Endocarp.

Grapes (*Vitis*)

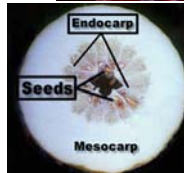


Tomato



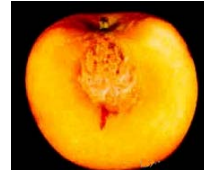
Citron

These have leathery Pericarps. The "Juice Sacs" are trichome-like structures produced by the Endocarp.



Drupe – from simple ovary with one seed and soft "skin"

- like Berries but they have Stony Endocarps and are thus known as "Stone Fruits".
- Section through a Drupe showing the Sclerenchymatous nature of the Endocarp and Inner Mesocarp: Note the Seed with its Embryo.



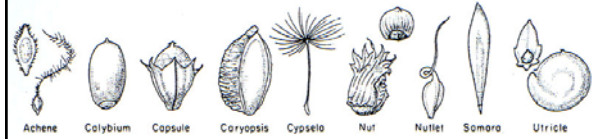
Drupe – from simple ovary with one seed and soft “skin”



Longitudinal Section through a Mango Ovary: Note the solitary Ovule which develops into the Seed. The inner portion of the Pericarp forms the sclerotic layer that surrounds the seed.

FRUIT TYPES

DRY INDEHISCENT FRUIT TYPES



- **Achene.** A one-seeded, dry, indehiscent fruit with seed attached to fruit wall at one point only, derived from a one-loculed superior ovary.
- **Capsule, Indehiscent.** Dry fruit derived from a two- or more loculed ovary, as in *Peplis*.
- **Caryopsis or Grain.** A one-seeded dry, indehiscent fruit with the seed coat adnate to the fruit wall, derived from a one-loculed superior ovary.
- **Nut.** A one-seeded, dry, indehiscent fruit with a hard pericarp, usually derived from a one-loculed ovary.
- **Nutlet.** A small nut.

Dry Indehiscent Fruits - Achene

- **Achene**
 - from simple ovary with one-seeded small fruits
 - pericarp easily removed.
- **Achenes are One Seeded Dry Indehiscent Fruits with a closely fitted Pericarp that is, however, separate from the Seed Coat. The fruits of Composites like Sunflower can be classified as Achenes.**

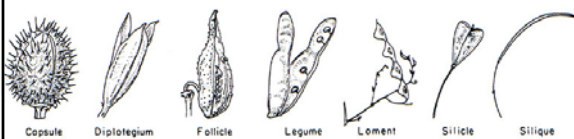


Dry Indehiscent Fruits-Nuts

- **Nut**
 - essentially large Achenes with very hard Pericarps
 - from simple ovary with one-seeded fruit
 - hard pericarp



DRY DEHISCENT FRUIT TYPES



- **Capsule.** Dry, dehiscent fruit derived from a compound ovary of 2 or more carpels.
- **Follicle.** A dry, dehiscent fruit derived from one carpel that splits along one suture.
- **Legume.** A usually dry, dehiscent fruit derived from one carpel that splits along two sutures.

Dry Dehiscent Fruits - Follicle

- **Follicle**
 - Dry Dehiscent Fruit which splits along one Suture
 - From simple ovary that splits open down one side

Ranunculus



Magnolia



Dry Dehiscent Fruits - Legume

- Legume

- Dry Dehiscent Fruit that Splits along two sutures
- From simple ovary that splits open on both sides
- The Fabaceae which is one of the largest families of flowering plants, was once called the Leguminosae due the fruit which is characteristic of this taxon.

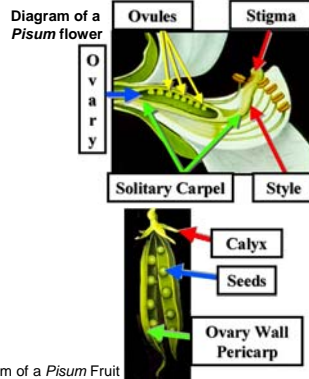
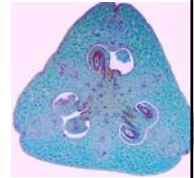


Diagram of a *Pisum* Fruit

Dry Dehiscent Fruits - Capsule

- Dry Dehiscent Syncarpous Fruit that has more than one locus of Dehiscence.
- From compound ovary with capsules that split in various ways

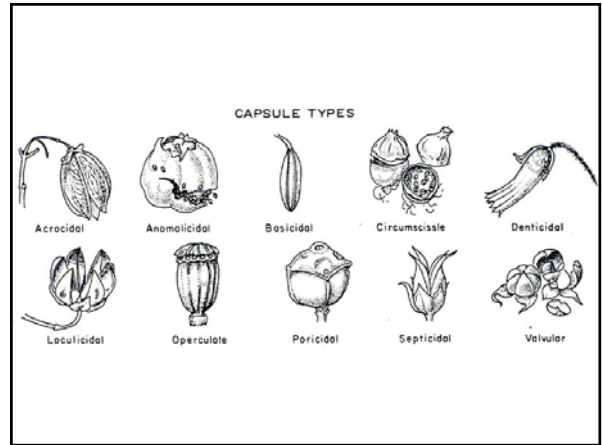


The *Lilium* Ovary contains 3 Carpels. It produces a fruit that is a borderline Capsule because the Valves may separate at maturity and act as individual fruits.



Dry Dehiscent Fruits - Capsule

- Immature Cotton (*Gossypium*) Fruit
- Mature Cotton Fruits



Aggregate vs Multiple Fruits

- One Flower & Many Free Carpels = Aggregate Fruit
- Many Flowers = Multiple Fruit



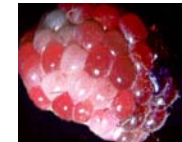
Each Flower produces a Fruit!



The Mature Fruit has shed its flower parts but it still represents Many Fruits!

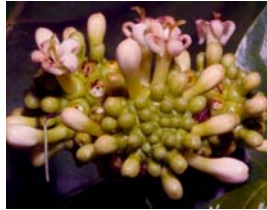
Aggregate Fruit – Ovaries are from a single flower

- appear to be one fruit but they are actually composed of many tiny fruits which develop from the Many Carpels of One Flower with an Apocarpous Gynoecium.
- The Gynoecium of a *Rubus* flower is composed of many Simple Carpels. Each becomes a fleshy fruit (Drupelet).
- The Fruit of Blackberry (*Rubus*) is composed of many tiny Drupelets. Each "Fruitlet" is the product of one Carpel. Consequently, this is an Aggregate Fruit.



Multiple Fruit – Ovaries are from separate flowers clustered together

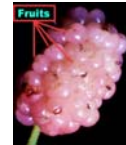
- look like one fruit but they represent the combined Fruits of Many Flowers.
- The fruit of Noni (*Morinda citrifolia*) is actually the fruit of Many Flowers. It is thus a Multiple Fruit!



Noni Flowers are tightly spaced.

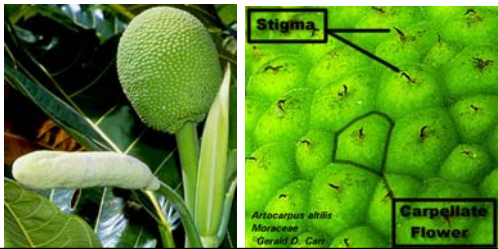
Multiple Fruit

- Many members of the Moraceae (Mulberry Family) have Multiple Fruits.
- Carpellate Inflorescences of *Morus Alba*: Note the tight Clusters of the individual Incomplete, Imperfect Flowers.
- Multiple Fruit of Mulberry: Each Fruit is derived from a separate Carpellate Flower.

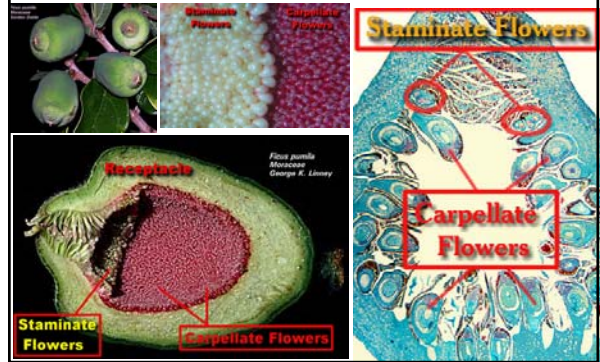


Multiple Fruit

- Breadfruit Male (Elongate) and Female (Round) Inflorescences: Each of these contains many Imperfect, Incomplete Flowers.
- Carpellate Flowers – each of which produces a fruit



Multiple Fruits - Ficus



Multiple Fruits - Pineapple

- Pineapple (*Ananas*) belongs to the Bromeliaceae (Bromeliad) family.
- SEM photo of a Pineapple Flower Apex: Each flower has a subtending Bract. Most of these have been removed to show the Flower Primordia. FAM = Flowering Apical Meristem
- Pineapple with Showy Bracts & Corollas which correspond to individual Flowers
- Longitudinal section of a Mature Fruit showing its components: F = Fruit



Compound Fruits

- Compound fruits develop from several individual ovaries.
 - Aggregate Fruits - Ovaries are from a single flower.
 - Blackberry
 - Multiple Fruits - Ovaries are from separate flowers clustered together.



Good Website

- Tree Identification:
<http://www.coopext.colostate.edu/arapahoe/horti/TreeID/fruit/fruitytype.html>