

## Plant Anatomy Lab 2: Flowers, Fruits and Seeds

Objectives of the Lab:

- 1) Explore the structure and function of flowering plant reproductive organs from flower development through fruit maturation.
- 2) Examine the relative placement of the four flower whorls (sepals, petals, carpels, stamens) in different flowers and their influence on fruit development .
- 3) Distinguish between simple, compound, aggregate fruits, and false or accessory fruits.
- 4) Examine in detail fruits of cultivated members of the rose family. Identify the embryo, endosperm, seed coat, endocarp, mesocarp, epicarp in the mature fruit.
- 5) Recognize fruits that are generally called vegetables.

Dissect the flowers provided and identify the sepals, petals, stamens and pistils. Divide the stamens into filaments and anthers. Divide the pistils into stigma, style and carpel. Fill out the following table for three flowers. What are likely to be the pollinator rewards on these flowers?

|                               | Flower #1: | Flower #2: | Flower #3: |
|-------------------------------|------------|------------|------------|
| Number of Petals              |            |            |            |
| Number of Sepals              |            |            |            |
| Number of Stamens             |            |            |            |
| Number of Carpels             |            |            |            |
| Carpels fused or free?        |            |            |            |
| Bilateral or radial symmetry? |            |            |            |
| Ovary position                |            |            |            |
| Petals showy?                 |            |            |            |
| Sepals showy?                 |            |            |            |
| Placentation type             |            |            |            |
| # ovules/ovary                |            |            |            |

Daisy: an inflorescence masquerading as a flower (cf. the fig, which is like a rolled up daisy)

Iris: a flower masquerading as an inflorescence

The mathematics of flowers and fruits

Calyx = all the sepals, the sepal whorl

Corolla = all the petals, the petal whorl

Gynoecium = all the pistils, the whorl of female organs

Androecium = all the stamens, the whorl of male organs

Perianth = calyx + corolla

Pistil = carpel + style + stigma

Stamen = filament + anther  
 Pericarp = endocarp + mesocarp + epicarp  
 Seed = embryo + endosperm + seed coat

The development of flowers and fruits  
 Seed coat → testa  
 Ovule → (fertilization) → seed  
 Carpel wall → pericarp or fruit tissue in the strict sense

Structure, morphology, terminology

Dehiscent fruit: fruit splits open to release seeds as fruit matures  
 Indehiscent fruit: seed remains within the carpel wall as the fruit matures  
 Berry: an indehiscent fruit in which the testa is woody and the pericarp is hairy/fleshy (grape)  
 Hesperidium: a particular type of berry in which the endocarp is made of succulent hairs (e.g. oranges, lemons, limes)  
 Achene: indehiscent, dry fruit (e.g. sunflower "seed")  
 Karyopsis: indehiscent, dry fruit in which the testa and pericarp are fused (e.g. all grains)  
 Nut: indehiscent, dry fruit with a woody endocarp (e.g. walnut)  
 Drupe: indehiscent fruit with a woody endocarp but a fleshy epicarp and mesocarp (e.g. plum)  
 Pome: indehiscent fruit with a woody testa and a fleshy receptacle (e.g. apple, a false fruit)  
 Pepo: indehiscent fruit with a tough outer rind made up of the receptacle+exocarp; endocarp, mesocarp fleshy (e.g. melons)

|  | Fruit #1: | Fruit #2: | Fruit #3: |
|--|-----------|-----------|-----------|
| # of carpels                                       |           |           |           |
| # of seeds   |           |           |           |
| What is the fleshy tissue?                         |           |           |           |
| What are the attractive structures for dispersers? |           |           |           |

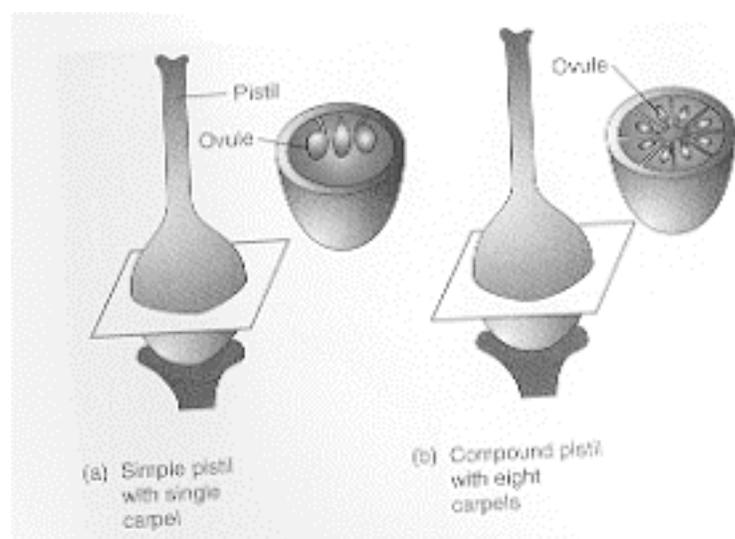
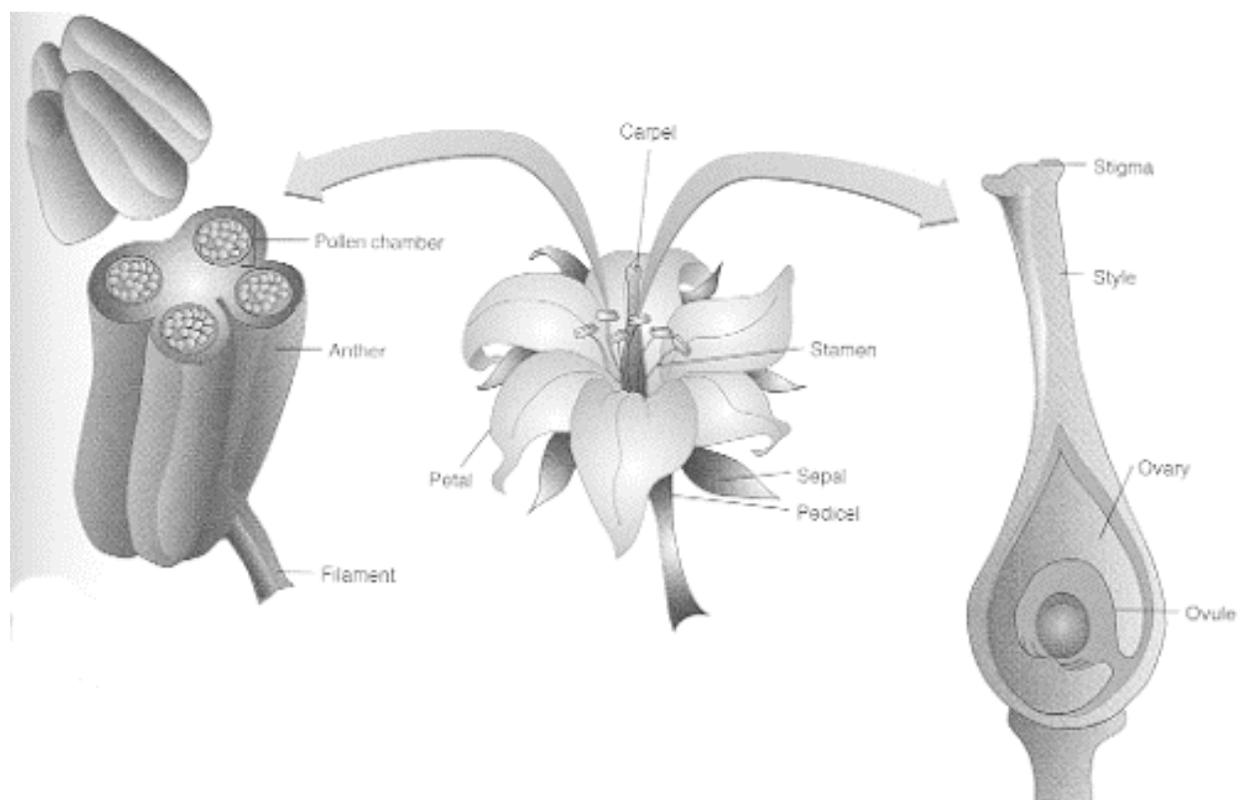
Cultivated fruit in detail: the rose family (we have examples of fruits in bold in the lab)  
**Apple, pear, almond, plum**, apricot, **peach**, nectarine, **strawberry**, raspberries, blackberries, **quince**, cherries, rosehip

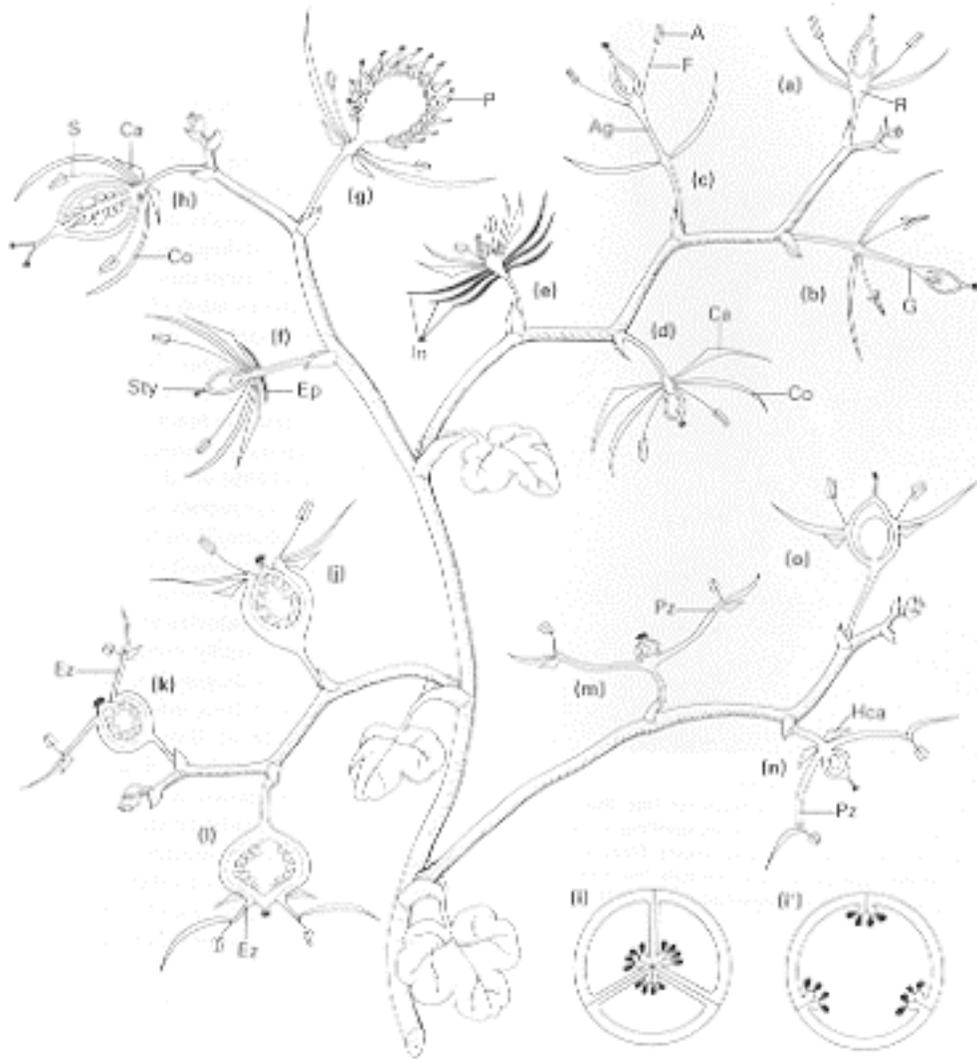
Fruits formerly known as vegetables  
 Tomatoes, peppers, squashes, cucumbers, eggplants, avocados, beans

There are three families that have fruits commonly thought of as vegetables.  
 Cucurbitaceae: the cucumber family. We basically only use the flowers (e.g. squash blossom soup) and fruits of this family. Some of these fruits (e.g. melons, cantelope) are recognized as such while others (e.g. squash, chayote, zucchini, cucumber) are not. The luffa “sponge” is derived from the fibrous tissue in the fruit of a squash.  
 Fabaceae: the bean family. We eat only the seeds and fruits of this family. Commonly eaten members of the family include beans, lentils, chickpeas, peanuts, and peas. Tamarind is made from the fruit wall of a legume pod.

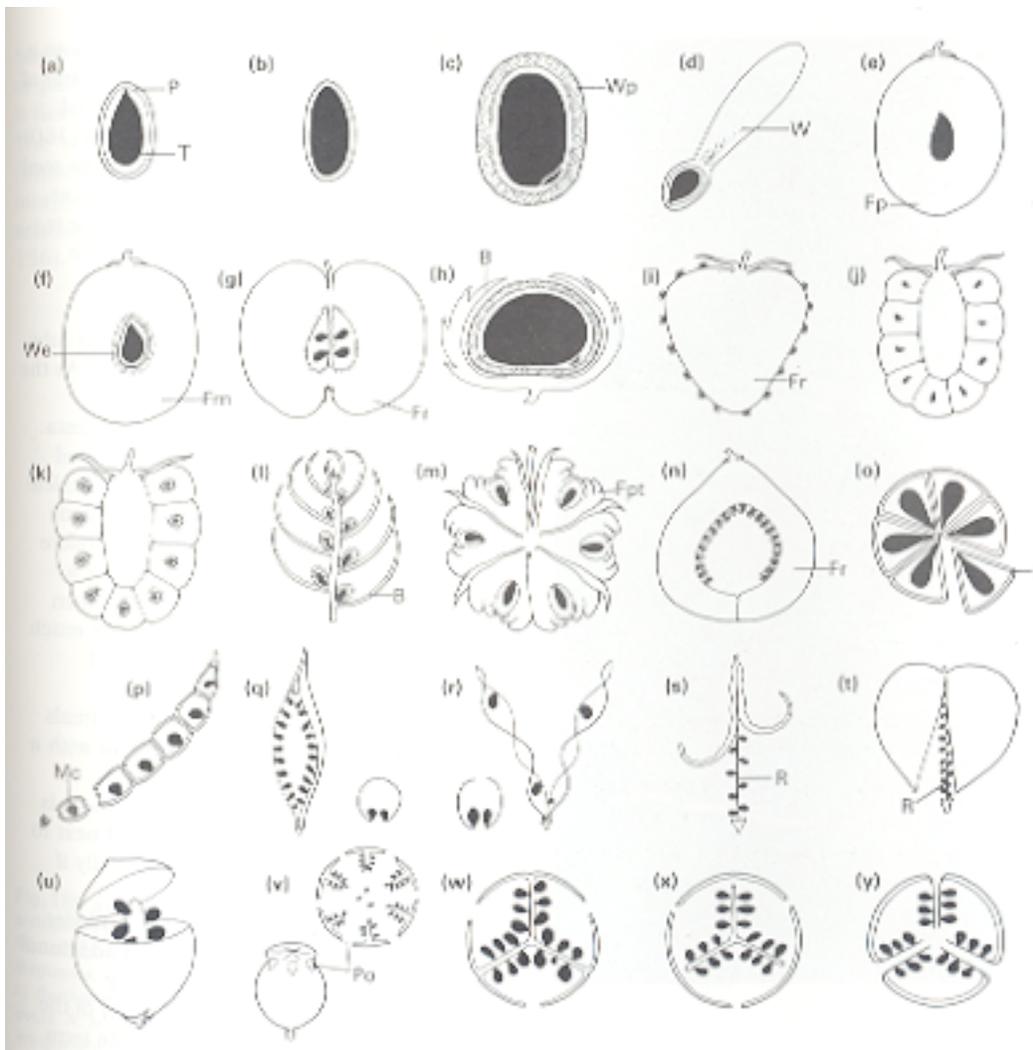
Solanaceae: the potato family. We eat the fruits of this family (tomatoes, eggplants, peppers) but also the stem tubers (potatoes). We also smoke the leaves (tobacco). In 1893, the US Supreme Court ruled that the tomato was a vegetable, not a fruit (another case in which the Supreme Court was clearly wrong).

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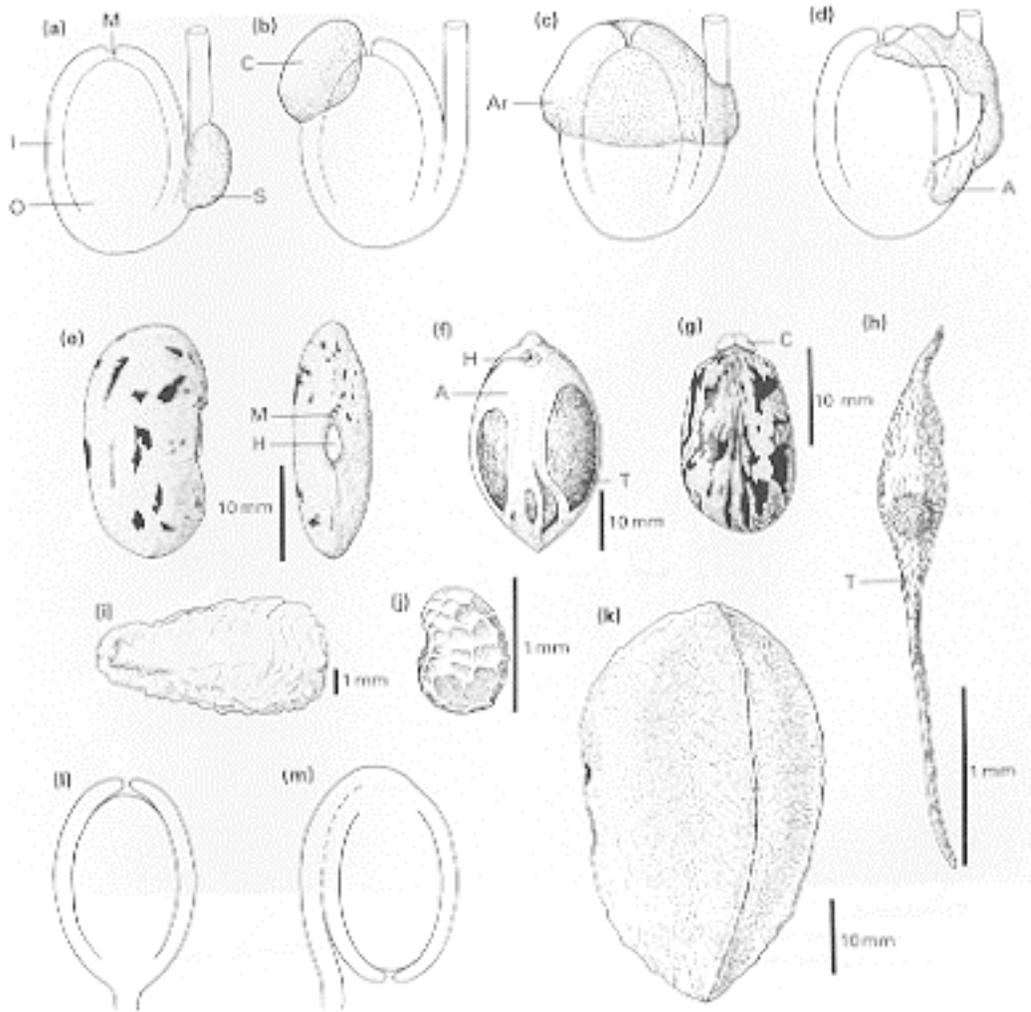


a-h superior ovary or hypogynous (g = carpels separate, h = carpels fused); i = transverse section through an ovary made up of three fused carpels divided by septa; i' = transverse section through an ovary made up of three fused carpels not divided by septa; j-n = inferior ovary or epigynous; o = epigynous



Different kinds of fruits.

B = bract (leaf-like structure); Fm = fleshy mesocarp; Fp = fleshy pericarp. Fpt = fleshy perianth; Fr = fleshy receptacle; Mc = mericarp; P = pericarp; Po = pore; R = replum; T = testa; W = wing; We = woody endocarp; Wp = woody pericarp



Diagrams of seeds showing seeds and seed structures.

- A = aril
- Ar = arillode
- C = caruncle
- F = funicle
- H = hilum
- I = integument
- M = micropyle
- O = ovule
- S = strophiole
- T = testa

