

Introduction to Botany. Lecture 37

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Outline

1 Monday test

2 Rosidae, or rosids (Part II)

- Rosaceae—rose family
- Leguminosae, or Fabaceae—legume family
- Cruciferae, or Brassicaceae—cabbage family

Outline

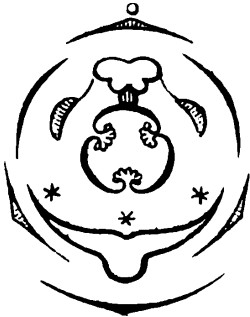
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- 2 Rosidae, or rosids (Part II)
 - Rosaceae—rose family
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Monday test (5 points)

- 1 Name one difference between Cyperaceae (sedge family) and Gramineae (grass family)

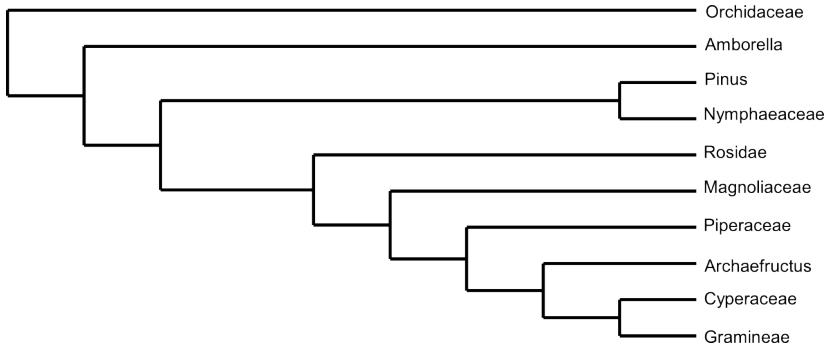
Monday test (5 points)

2 Which family this diagram belongs to?



Monday test (5 points)

3 What is wrong with this picture?



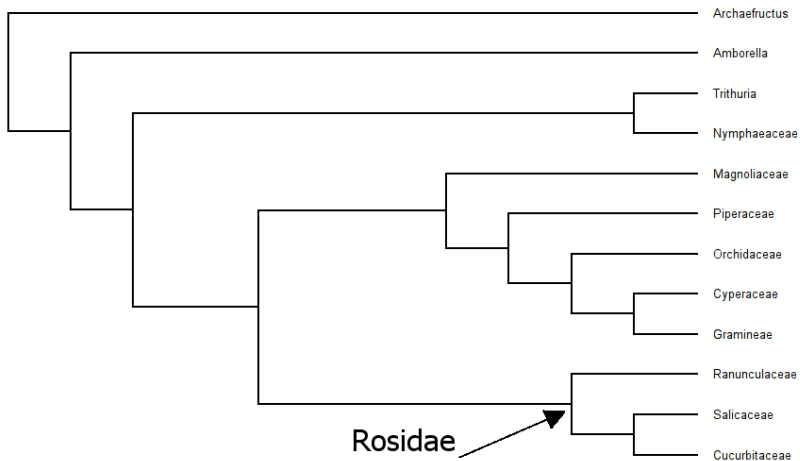
Monday test (5 points)

4 What is united Rosidae (rosids)? (≥ 1 character)

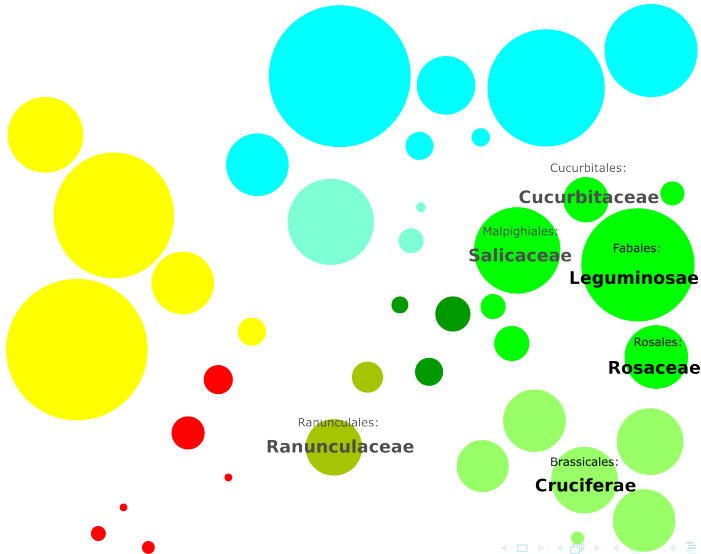
Monday test (5 points)

5 Name one economically important representative of Cucurbitaceae.

Phylogeny of angiosperms so far



Overview of rosid families



General features of Rosaceae

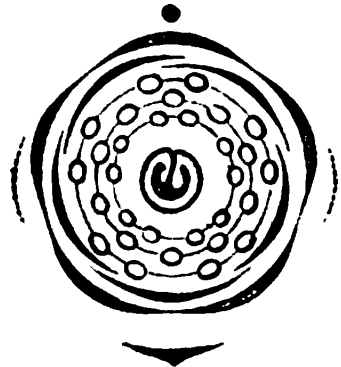
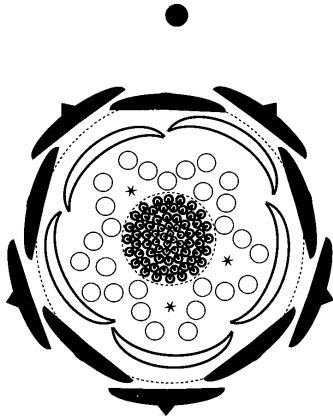
Rosaceae—rose family

- $\approx 3,000$ species
- Nearly cosmopolitan, but more common to temperate and subtropical regions of Northern Hemisphere
- Forest and meadow plants, do not prefer dry places

Morphology of Rosaceae

- Trees, shrubs and herbs
- Often accumulate cyanogenic compounds (contains $\text{—C} \equiv \text{N}$ group); some Rosaceae have nitrogen-fixing bacteria as symbionts
- Alternate, simple or dissected leaves with stipules
- Flowers with hypanthium; in Maloideae hypanthium fuses with pistils and produces inferior ovary
- Calyx with connected sepals, corolla with distinct petals
- Stamens numerous, typically in sets of 5 (or 10)
- Fruits diverse: multiple nuts/drupes in Rosoideae, multiple follicles or single drupes in Spiraeoideae, pomes in Maloideae
- Mature seeds without endosperm

Rosaceae flower: Rosoideae and Spiraeoideae



* $K_5C_5A_{5-10-\infty}G_{\underline{1-5-\infty}}$ or $G_{(3-5)}$ (Maloideae)

Representatives of Rosaceae

Several subfamilies, each with economically important members:

- Rosoideae (multiple one-seeded fruits)
 - *Rosa*—rose
 - *Fragaria*—strawberry and close genus *Potentilla*—cinquefoil
 - *Rubus*—blackberry, raspberry
- Spiraeoideae (fruits—follicles of solitary drupes)
 - *Prunus*—cherry, peach, apricot, plum
 - *Spiraea*—meadowsweet, important component of prairies
- Maloideae (now often inculed in Spiraeoideae; have inferior ovary, fruits are pomes)
 - *Pyrus*—apple, pear
 - *Crataegus* (hawthorn), *Sorbus* (mountain ash),
Amelanchier (serviceberry), *Aronia* (chokeberry) and others

Spiraea tomentosa, prairie plant



Aronia × *mitchurinii*



Spontaneous hybrid between American chokeberry and
European *Sorbus aria*

Potentilla fruticosa, shrubby cinquefoil



General features of Leguminosae

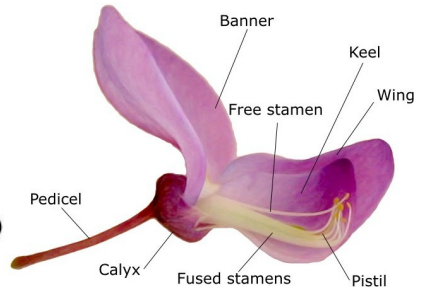
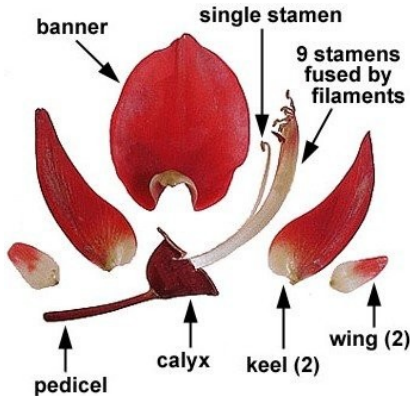
Leguminosae, or Fabaceae—legume family

- Up to 17,000 species, third largest angiosperm family after Compositae (aster family) and Orchidaceae
- Widely distributed throughout the world but preferably in tropics
- Three subfamilies (Caesalpinioideae, Mimosoideae, Papilionoideae) often treated as separate families

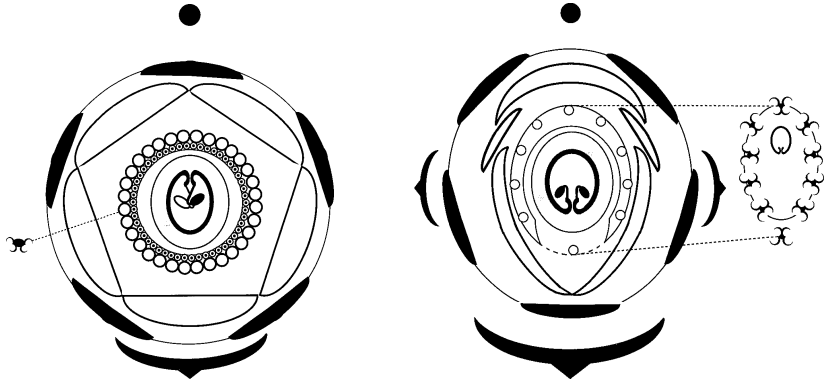
Morphology of Leguminosae

- Have root nodules with nitrogen-fixing bacteria
- Leaves alternate, pinnately compound (once or twice), with stipules
- Sepals 5, united; petals 5, in Papilionoideae they are free, unequal and have special names (banner, keel and wing), in Mimosoideae they fuse and form tube
- Stamens often 10 with 9 fused and one free stamen; in Mimosoideae, stamens are numerous
- Single pistil with single carpel
- Fruit is a legume: dehiscent with one camera
- Mature seeds without endosperm

Flower of Papilionoideae



Leguminosae flower: Mimosoideae and Papilionoideae



$*K_{(5)}C_{(5)}A_{5-\infty}G_{\underline{1}}$ or $\uparrow K_{(5)}C_{1,2,2}A_{1,[4+5]}G_{\underline{1}}$

Representatives of Leguminosae

- **Mimosoideae**: stamens numerous, petals connected
 - *Acacia*—dominant tree of African and Australian savannas, often with phyllodes
 - *Mimosa*—sensitive plant
- **Papilionoideae**: stamens 9+1, petals free; this subfamily contains many extremely important food plants with high protein value
 - *Glycine*—soybean
 - *Arachis*—peanut with self-buried fruits
 - *Phaseolus*—bean
 - *Pisum*—pea

Phyllodes of Australian *Acacia glaucoptera*



Mimosa pudica before touch



Mimosa pudica after touch



Glycine max, soybean



Arachis hypogaea, peanut



General features of Cruciferae

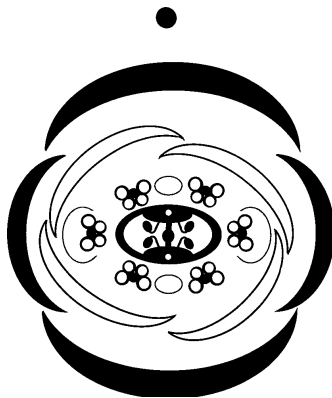
Cruciferae, or Brassicaceae—cabbage family

- $\approx 3,000$ species
- Found mostly in temperate regions, especially in dry climates
- Morphologically and ecologically uniform family

Morphology of Cruciferae

- Herbs, often hairy, contain mustard oils
- Leaves simple, often dissected, alternate, without stipules
- Flowers dimerous, in racemes
- 4 sepals, 4 petals, ancestrally also 4 stamens but inner stamens split each in two = 6 stamens in total
- Pistil has two carpels
- Fruit is a siliqua: dehiscent, with two cameras and replum bearing seeds
- Mature seeds with small amount of endosperm

Cruciferae flower



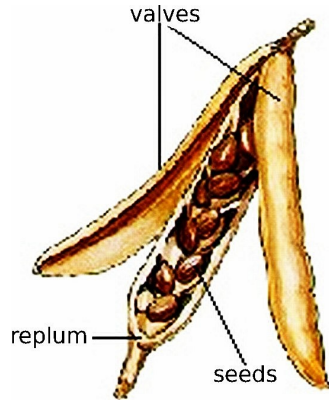
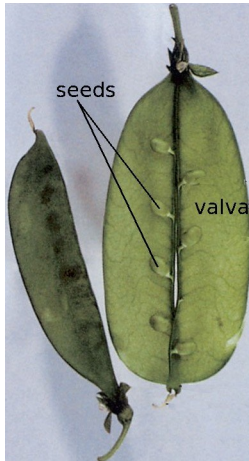
$$*K_4C_4A_{2+2,2}\underline{G_{(2)}}$$

Representatives of Cruciferae

Important vegetables and spices, e.g.

- *Brassica oleracea*—broccoli, cabbage, cauliflowers
- *Brassica nigra*—black mustard
- *Brassica rapa*—turnip
- *Raphanus*—radish
- *Armoracia*—horseradish
and
- *Arabidopsis thaliana*—famous model plant

Legume and siliqua



Arabidopsis thaliana



Summary

- Among three listed families, Rosaceae and Leguminosae are closer relatives (representatives of “nitrogen-fixing alliance”, these two families also close to Cucurbirtaceae
- Cruciferae is a representative of “mustard-oil containing families”, the other alliance

For Further Reading



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
Chapter 25.