The “Early-Diverging” Flowering Plants

The Flower – 4 Basic Whorls

Calyx [CA]: the green sepals (#3)
Corolla [CO]: the showy petals (#4)
Androecium [A]: the stamens or male structures (#6-8)
Gynoecium [G]: the carpels or pistils or female structures that contain an ovary (#9-12)

Variation in flowers – immense and what makes them successful!
- number of parts
- symmetry
- fusion of like parts
- fusion of unlike parts
- placentation
- position of ovary
- inflorescence type

will use floral formulas as shorthand

Magnoliophyta - Flowering Plants

Early Diverging Angiosperms

We will begin our survey of Great Lakes’ flowering plants by examining the “early diverging angiosperms”
The Flower

Early diverging angiosperms tend to have floral parts not fused.

Connation: fusion of floral parts from same whorl

Adnation: fusion of floral parts from different whorls

Magnoliaceae - magnolia family

Not found in Wisconsin, but part of the Alleghenian flora. Sub-tropical and warm temperate trees.

P ∞  A ∞  G ∞

Tepals, laminar stamens, apocarpic

Fruit = "cone" of follicles

Dehiscent fruit with one suture, derived from one carpel

Derivation of the follicle fruit

1 floral "leaf" or carpel with ovules

Folded carpel

1 carpel with 2 rows of seeds; the fruit opens along the 1 line of suture
Magnoliaceae - magnolia family
Tulip tree (*Liriodendron*) is also not native, but commonly planted. Pollinated by beetles.

Aristolochiaceae - birthwort family
8-10 genera and about 600 species worldwide; 1 species in Wisconsin. Mostly vines in the tropical regions, but herbs in temperate regions.

*Asarum canadense* - wild ginger
Used by eastern native Americans as a contraceptive, thick rhizome root can be cut up, boiled, and cooked in heavy sugar syrup to make candied ginger.

*Asarum* - wild ginger
Rare pipevine swallowtail in WI – does shift from host pipevine (*Aristolochia*) to wild ginger (*Asarum*)
Aristolochiaceae - birthwort family

*Asarum canadense* - wild ginger

Fly or beetle pollinated.

CA 3  CO 0  A 12  G (6)

Inferior ovary with 3 sepals and the stamens arising from top.

The petals are almost absent.

Seeds are dispersed by ants; these seeds possess an aril-like structure.

Nymphaeaceae - water lily family

These are aquatic herbs and have an obvious ecological niche - they inhabit still waters

Many of their characteristics reflect adaptations to this habitat.

- Floating or submersed leaves
- Air cavities in tissue
- Mucilaginous coverings
- Lack of vessels

Nymphaeaceae - water lily family

*Birge Hall lobby “Aquatic Plants” display!*

For extra credit on first exam, find one of two aquatic invasive genera in Great Lakes Region that have leaves just like *Nymphaea* – one is an Eudicot and the other is a Monocot:

N________ and H_________
Nymphaeaceae - water lily family

Nuphar variegata - yellow pond lily
Petaloid sepals & reduced petals
Leaf-like stamens grading from petals to pistils

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Nymphaeaceae - water lily family

Nuphar variegata - yellow pond lily
Superior pistil of many carpels
Beetle pollination

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Cabombaceae - water shield family

Brasenia shreberi - water shield
Small clonal floating aquatic
Peltate leaves
Wind pollinated

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Ceratophyllaceae – coon’s-tail family

Ceratophyllum demersum - hornwort, coon’s-tail
Submersed aquatic recognized by whorled leaves
dichotomously forked
Reduced! and Unisexual flowers on same plant = monoecious

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The Primitive Eudicots

Ranunculaceae - buttercup family

- Largest family of the ranunculid lineage which is the first diverging group of true dicots = eudicots

- Worldwide but is centered in temperate and cold regions of the northern and southern hemispheres. 13 native genera, 53 species in WI, 20 of these in Ranunculus

- Important family of our Wisconsin "Spring Flora" – you will see these species!

Frank Cook – UK botanist

Ranunculaceae - buttercup family

- Herbs, sometimes woody or herbaceous climbers or low shrubs - often poisonous
Ranunculaceae - buttercup family

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Golden-seal

Black cohosh

Monk's-hood

Ranunculaceae - buttercup family

- Nigella sativa (& N. damascena)
- Black seed tea (e.g., Egyptian tea)
- Condiments, Black seed bread
- Middle Eastern, Bengali cuisine
- Flavor wines and snuff

Nigella
Love-in-a-mist
Black seed
Black cumin
Fennel flower
Roman coriander

Other uses for Nigella

- Black cumin
- Black seed tea
- Condiments, Middle Eastern, Bengali cuisine
- Flavor wines and snuff

Egyptian tea

Roman coriander
Ranunculaceae - buttercup family

- Flowers very variable: except many stamens and many free carpels (apocarpic)

\[ \text{CA} 3+ \quad \text{CO (0)} 5+ \quad A \approx G 3+ \]

Ranunculaceae - buttercup family

- Herbs, sometimes woody or herbaceous climbers or low shrubs - often poisonous
- Leaves, alternate, usually basal and cauline, often divided or compound, or palmately lobed.
- No stipules.

Follicles = \( \infty \) seeded dehiscent fruit
Berries = \( \infty \) seeded fleshy fruit

Caltha - marsh marigold
Actaea - baneberry
Ranunculaceae - buttercup family

Anemone - thimbleweed with wind dispersed achenes

Achenes = 1 seeded indehiscent, dry fruit

Ranunculus – buttercup with animal dispersed achenes

Great Lakes – western North American disjunct pattern

Actaea rubra - red baneberry

Actaea alba - white baneberry

Anemone patens - pasque flower

Anemone canadensis - Canada anemone
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Photo: John Zaborsky

EXTRA CREDIT – digital image of pasque flower

Ranunculaceae - buttercup family

Anemone quinquefolia - wood anemone

Anemone acutiloba (Hepatica acutiloba) - sharp-lobed liverleaf

Ranunculaceae - buttercup family

Aquilegia canadensis - American columbine

Ranunculaceae - buttercup family

Caltha palustris - marsh marigold

No petals – only sepals
Follicle fruits
Ranunculaceae - buttercup family

Enemion biternatum [Isopyrum biternatum] - false rue anemone
One of most abundant spring ephemerals forming large colonies
No petals; 3-5 follicle fruits

Ranunculaceae - buttercup family

Thalictrum dioicum - early meadow-rue
Large herbs of more open habitats; wind pollinated
Dioecious; with separate male and female plants

Ranunculaceae - buttercup family

Ranunculus abortivus - cursed crowfoot

Ranunculus acris - tall buttercup

Ranunculus hispidus - bristly buttercup

Ranunculaceae - buttercup family

Anemonella thalictroides - rue anemone
Original name after Thalictrum because the leaves were so similar, although showy, insect-pollinated flowers
Now called Thalictrum thalictroides . . . and so it is "the thalictrum with the thalictrum-like leaves"!
Good example of the re-evolution of insect pollination within a wind pollinated group