

1

Succulents & Carnivores & Weeds

Eudicot Phylogeny
APG III 2009

The caryophyllid group is a strange mixture of plants including cacti, carnations, and some carnivorous families.

Specialists of deserts, salt environments, nutrient poor sites, and weedy areas – often with interesting physiological adaptations.

2

Caryophyllaceae - pink family

Huge family, widespread but characteristic of temperate and warm temperate regions of the Northern Hemisphere.

In Wisconsin we have 18 genera and 63 species

Caryophyllaceae includes the pinks, catchflies, and carnations of garden fame

Dianthus deltoides
Maiden pink

3

Caryophyllaceae - pink family

Many of the species are **introduced** (either by Native Americans or Europeans or later)

- either **naturalized** – well-established, often widespread plant that is not originally in our flora
- or **adventive** – only casually established, not persistent.

Gypsophila paniculata
Baby's-breath invasive on Lake Michigan dunes

4

Caryophyllaceae - pink family

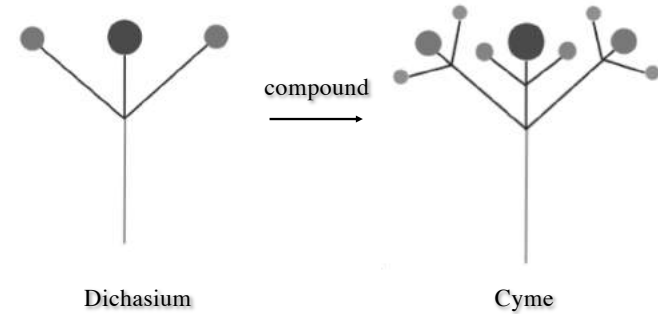
- Herbs, simple, opposite, entire leaves; nodes usually swollen
- Inflorescence a **dichasium** - determinate inflorescence - or **cyme** (compound dichasium)



Note 3 way split, middle branch is oldest flower

5

The dichasium inflorescence is terminated (i.e., determinate) by the oldest flower and flanked by two lateral younger flowers.



6

Caryophyllaceae - pink family



CA 5, (5) CO 5 A 5, 10 G (2-5)

- Some fused sepals, others not
- Petals often differentiate into a limb and claw, the apex is often notched

Free central placentation = free standing placental column in single locular pistil on which ovules are attached, or **axile**, or both at same time!

Capsule opens by valves or teeth



7



8

Caryophyllaceae - pink family



Minuartia michauxii
(= *Arenaria stricta*)
sand rockwort



9

Caryophyllaceae - pink family



Cerastium
mouse-ear chickweed
5- styles!

10

Caryophyllaceae - pink family



Stellaria longifolia
long leaved stitchwort



3 styles!



Stellaria media
common stitchwort

11

Caryophyllaceae - pink family



Silene latifolia - white campion



Silene vulgaris - bladder
campion with vespid wasp
pollinator



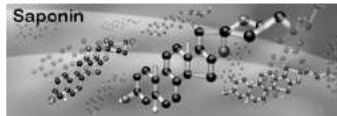
Silene – also called “catch-fly”

12

Caryophyllaceae - pink family



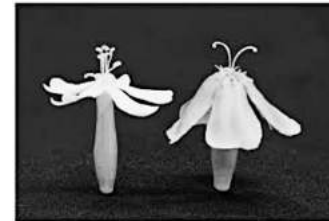
European species becoming invasive



Saponaria officinalis - bouncing bet, soapwort

13

Caryophyllaceae - pink family



(1) Male phase & (2) female phase

Dichogamy
Why does it change color?

PLANT SPECIES BIOLOGY

ORIGINAL ARTICLE | Open Access
Interaction between floral color change and gender transition in the protandrous weed *Saponaria officinalis*
SHARMA G, JAGGAR, SANDHU L, DASR, CHAVY, CARTER
First published 26 March 2012 | <https://doi.org/10.1111/j.1365-3113.2011.00552.x> | CiteSpace 3



Saponaria officinalis - bouncing bet, soapwort

14

Phytolaccaceae - pokeweed family



Phytolacca americana - pokeweed

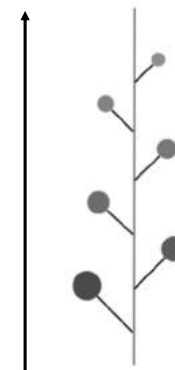
Family that is chiefly tropical and subtropical in distribution

In Wisconsin we have 2 species of *Phytolacca* - one native

Shrub with alternative simple leaves

Inflorescence typically an indeterminate **raceme**

15



Raceme

- simplest inflorescence type is indeterminate
- oldest flowers at the base
- younger flowers progressively closer to the apical meristem of the shoot

= a raceme

16

Phytolaccaceae - pokeweed family



Phytolacca americana - pokeweed

CA5 CO0 A10 G(∞)

- No petals
- 2x as many stamens as sepals
- fused carpels but only 1 ovule per carpel
- berry fruited, bird dispersed, and a source of dye



17

Phytolaccaceae - pokeweed family



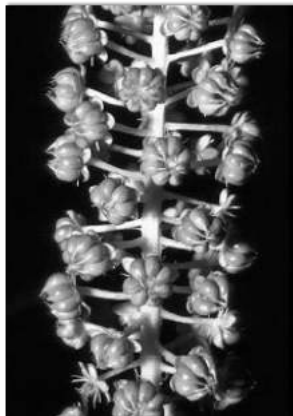
Alice Tanksley Brown's Poke Salet

Alice Tanksley Brown grew up in Mississippi, a state rich in pokeweed. She remembers Dr. Pruett telling her mother, "Widow, if you give your children a mess of poke in the spring and some sassafras tea, you'll save yourself doctor bills for a year." The good doc was probably referring to pokeweed's leaves purgative powers as they contain toxic alkaloids that should not be eaten in large amounts. Most recipes call for the green to be parboiled, at least once and sometimes twice, and for the water to be discarded.

The genus is poisonous, containing a dense array of chemicals used in a variety of medicinal treatments.

18

Phytolaccaceae - pokeweed family



Phytolacca acinosa – Indian pokeweed

CA5 CO0 A10 G∞

our non-native species – achenes!



19





Phytolacca acinosa – Indian pokeweed

20

Portulacaceae - purslane family

Family comprises small **succulent** herbs with small flowers except for cultivated species.







Portulaca oleracea
Common purslane

Portulaca grandiflora
Rock rose (Argentina)

21

Portulacaceae - purslane family

Portulaca oleracea – little hogweed, purslane

Prostrate herb, leaves succulent; has been cultivated as a salad ['oleracea' = edible]

Flowers are small, yellow, 5-merous

Capsule opens via a cap or lid

22





“herbal minute with Brigitte Mars” @ <http://www.youtube.com/watch?v=C9bFtKMSnXs>

23

Montiaceae – spring beauty family

CA 2 CO 5 A 5+ G (3)

- 2 sepals, 5 showy petals, 5 stamens
- 3 fused carpels (note the 3 stigma)
- **Basal** placentation
- Fruit is a capsule “with a lid”

24

Montiaceae – spring beauty family

Claytonia virginica - spring beauty
Claytonia caroliniana - spring beauty

25

Montiaceae – spring beauty family

Claytonia virginica - spring beauty
 Lower elevation E NAM
 S of Tension Zone Great Lakes

Claytonia caroliniana - spring beauty
 Higher elevation E NAM
 N of Tension Zone Great Lakes

26

Cactaceae - cactus family

A New World family; xeromorphic trees, **stem succulents** and sometimes epiphytic

In Wisconsin we have 1 genus, *Opuntia*, with 2 recognized species

Opuntia macrorhiza – plains prickly-pear
Opuntia fragilis – brittle prickly-pear

27

Cactaceae - cactus family

- **Tepals**
- Ovary is inferior and consist of 4 fused carpels with **parietal placentation**
- Fruit a **berry** (jam, wine!)

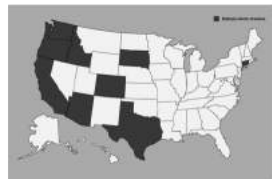
$P \infty \quad A \infty \quad G (4)$

Opuntia macrorhiza - plains prickly-pear

28

Amaranthaceae - amaranth family

- large family (now includes Chenopodiaceae)
- abundant in desert and semi-desert regions & weeds here!
- **halophytic** - salt-loving; tumbleweeds



Bassia scoparia - summer cypress

29

Amaranthaceae - amaranth family

- large family (now includes Chenopodiaceae)
- abundant in desert and semi-desert regions & weeds here!
- **halophytic** - salt-loving; tumbleweeds
- many species exhibit **xerophytic** adaptations (succulence, C4 or CAM photosynthesis)



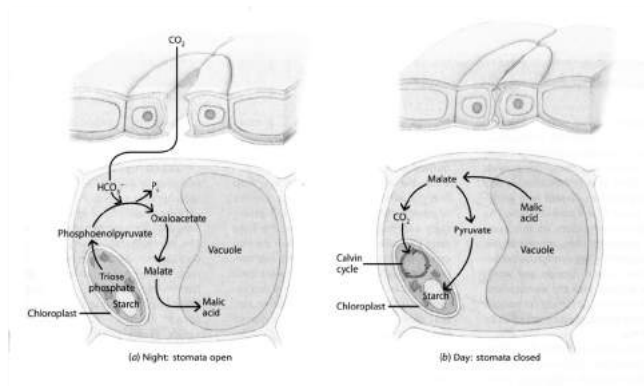
Salicornia virginica - glasswort



Chenopodium album - lamb's quarter

30

Amaranthaceae - amaranth family



C₄ and Crassulacean Acid Metabolism

31

Amaranthaceae - amaranth family

Flowers very small, greenish, **perfect or imperfect** (both monoecious and dioecious); congested inflorescences; wind pollinated

CA (2-5) CO 0 A 2-5 \overline{G} (2-3)

- Sepals only – persist in fruit
- Pistil with 1 locule and 1 ovule – **achene**



Chenopodium album - lamb's quarter



Spinacea oleracea
Chenopodiaceae

32

Amaranthaceae - amaranth family

Chenopodium – big & messy!

Welcome to the Online Virtual Flora of Wisconsin

Search for a species to view available images.

Dysphania ambrosioides (L.) Moench & Clements (deducted from: *Chenopodium ambrosioides* subsp. *ambrosioides*)

Family: Amaranthaceae

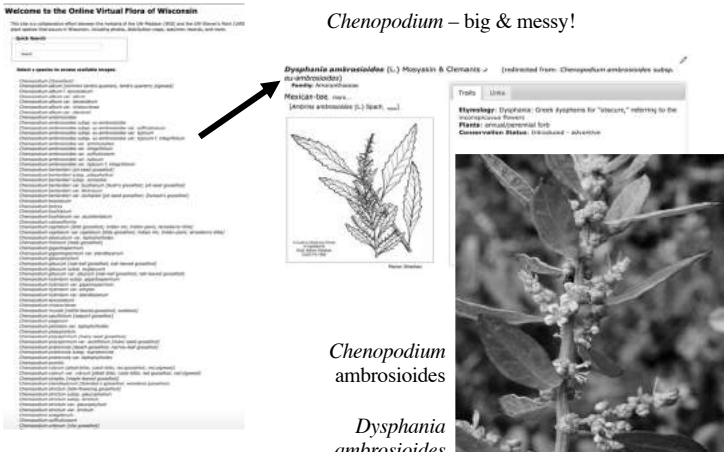
Mexican Ec. inv.

(Dysphania ambrosioides (L.) Moench, ...)

Etymology: *Dysphania*: Greek *Dysphania* for "bluish," referring to the *Amaranthus* flowers.

Flora: annual/short-lived herb

Conservation Status: Introduced - adventive






Chenopodium ambrosioides

Dysphania ambrosioides

33

Amaranthaceae - amaranth family

Froelichia floridana - cottonweed



Amaranthus retroflexus - rough amaranth, pigweed, redroot

34

Polygonaceae - smartweed family

Large, difficult family especially common in northern temperate regions – lots of generic changes!



In Wisconsin we have many *Persicaria* (smartweeds), *Fallopia* (bindweeds, giant knotweeds), *Polygonum* (knotweeds), *Rumex* (sorrels, docks)

Persicaria amphibia - water smartweed *Persicaria hydropiper* - water pepper

35

Polygonaceae - smartweed family

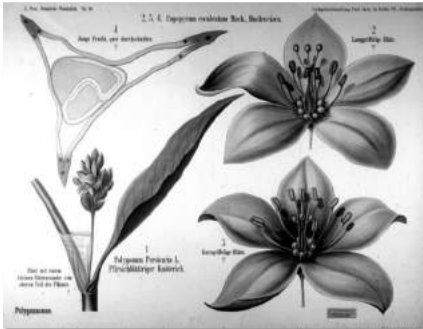
Herbs, shrubs with swollen nodes; leaves typically alternate and simple

Ocrea is a good character for the family – membranous sheath (connate stipule)

36

Polygonaceae - smartweed family

CA 5-6 CO 0 A 5-8 G (3)



- Flowers usually bisexual,
- Flowers are small often white to red
- 5 or 6 sepals (tepals) that often become large and membranous in fruit
- No petals
- Fruit is a triangular one-seeded **achene** (derivation of family name)

37

Polygonaceae - smartweed family



Rumex acetosella - sheep or red sorrel



Ubiquitous weed around the world, especially in pastures; distinctive leaf bases (**sagittate** or **hastate**); acetic acid taste (sour = 'sorrel')

38

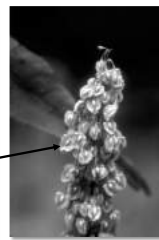
Polygonaceae - smartweed family



Rumex crispus
Curly dock



Rumex brittanica
(*R. orbicularis*)
Water dock



Polygonella articulata
jointweed



One-seeded fruits with 3 persistent sepals or wings

39

Polygonaceae - smartweed family




Rheum rhabarbarum
Garden rhubarb - locally adventive



40


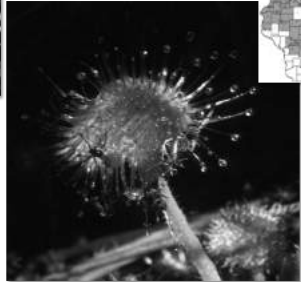
Droseraceae - sundew family



Drosera rotundifolia - round leaved sundew

The sticky **tentacles** are modified leaves with gland tipped hairs that capture the insects. Digestion and then absorption of amino acids follows.

Insectivorous family including snap traps (Venus fly trap) and sticky fly papers (sundews). In Wisconsin we have 4 species of *Drosera* (sundews) in nutrient poor soils or peat.



41



“sundew time lapse” @ <http://www.youtube.com/watch?v=frmyzIhD29Q>

42

Droseraceae - sundew family






Drosera intermedia - narrow-leaved sundew (threatened in WI)

Different species vary in leaf shape


Flowers are small in a terminal raceme

Drosera anglica - English sundew (threatened in WI)





43

Droseraceae - sundew family





D. rotundifolia



D. linearis

Unusual origin of *Drosera anglica*

- all *Drosera* are $2n = 20$
- *D. anglica* is $2n = 40$
- *D. anglica* is hybrid of *D. rotundifolia* and *D. linearis*
- *D. anglica* is allopolyploid (tetraploid)





X


44

Droseraceae - sundew family


Family shows divergence in insect capture



Drosera –
Sundews:
sticky flypaper



Dionaea–
Venus fly-trap: steel trap




Echtzeit / Real time


45

Droseraceae - sundew family


Family shows divergence in insect capture



Drosera –
Sundews:
sticky flypaper



Dionaea–
Venus fly-trap: steel trap




Nepenthes (Nepenthaceae) –
Asian pitcher plants: Pitfall trap


46

Droseraceae - sundew family

Family shows convergence in insect capture



Drosera –
Sundews:
sticky flypaper



Pinguicula (Lentibulariaceae) –
Butterwort: sticky flypaper

47