




Lilioids - petaloid monocots

4 main groups:

- Acorales - sister to all monocots
- Alismatids
 - inc. Aroids - jack in the pulpit
- Lilioids (lilies, orchids, yams)
 - grade, non-monophyletic
 - petaloid
- Commelinids
 - Arecales - palms
 - Commelinales - spiderwort
 - Zingiberales - banana
 - Poales
 - pineapple
 - grasses & sedges

Monocot Phylogeny
APG III 2009

Lilioids - petaloid monocots




The lilioid monocots represent five orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids

Majority are defined by 6 features:

1. Terrestrial/epiphytes: plants typically not aquatic

Lilioids - petaloid monocots



The lilioid monocots represent five orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids

Majority are defined by 6 features:

2. Geophytes: herbaceous above ground with below ground modified perennial stems: bulbs, corms, rhizomes, tubers

Lilioids - petaloid monocots



... thus common in two biomes

- temperate forest understory (low light, over-winter)
- Mediterranean (arid summer, cool wet winter)

Lilioids - petaloid monocots



The lilioid monocots represent five orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids

Majority are defined by 6 features:

3. Leaves without petiole: leaf blade typically broader and attached directly to stem without petiole

Lilioids - petaloid monocots

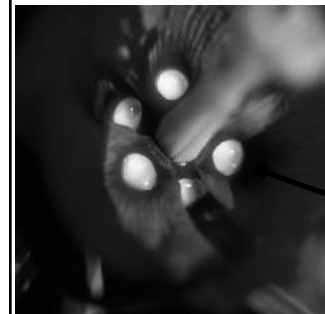


The lilioid monocots represent five orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids

Majority are defined by 6 features:

4. Tepals: showy perianth in 2 series of 3 each; usually all petaloid, or outer series not green and sepal-like & with no bracts

Lilioids - petaloid monocots



The lilioid monocots represent five orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids

Majority are defined by 6 features:

5. Nectaries: usually well-developed nectar tissue at the base of ovary or stamens; insect or bird-pollinated

Lilioids - petaloid monocots



The lilioid monocots represent five orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids

Majority are defined by 6 features:

6. Capsule/berry: fruit a 3-parted capsule or berry



Lilioids - petaloid monocots

Systematic issues with this group:

Exceptions abound! - most people have classified Pontederiaceae with lilioids (tepals, nectar)



Pontederia cordata - Pickerel weed [Commelinid]



Lilioids - petaloid monocots

Systematic issues with this group:

Will the real "Liliaceae" please stand up!

CA 3 CO 3 A 6 G (3)

The floral pattern in "Liliaceae" is plesiomorphic (primitive) for the entire group of petaloid monocots



Lilium - lily (Liliaceae)

Lilioids - petaloid monocots

Systematic issues with this group:

Will the real "Liliaceae" please stand up!

. . . and anything deviating from the generalized form has been placed in separate families



Trillium - trillium

e.g., Trilliaceae for flowers with 3 green sepals

Lilioids - petaloid monocots

Systematic issues with this group:

Will the real "Liliaceae" please stand up!

... and anything deviating from the generalized form has been placed in separate families

e.g., Amaryllidaceae for flowers with inferior ovary



Eucharis

Lilioids - petaloid monocots

Systematic issues with this group:

Will the real "Liliaceae" please stand up!

... and anything deviating from the generalized form has been placed in separate families

e.g., Smilacaceae for viney plants with petioled leaves



Smilax - catbriar

Lilioids - petaloid monocots

Systematic issues with this group:

Will the real "Liliaceae" please stand up!

... and anything deviating from the generalized form has been placed in separate families

e.g., many families that are "woody"



Dracaena - dragon tree

Lilioids - petaloid monocots

Systematic issues with this group:

Will the real "Liliaceae" please stand up!

Liliaceae thus included a lot of unrelated taxa that are now placed in at least three orders

warning: Gleason&Cronquist & UW Herbarium website still use Liliaceae sensu lato (in the broad sense)

warning: the new Michigan Flora and Wisconsin Flora use lilioid families incorrectly!

Lilioids - petaloid monocots

See last page of lab handouts for correct placement of genera into families:

Lilioid monocot genera in Wisconsin and their new family placements relative to various keying sources (exclusive of the Dioscoreaceae, Iridaceae, Orchidaceae, and Smilacaceae)

Genus	APG family - and Sudek's/Herbarium	WI Flora book	Winters online	MI Flora	Gleason/Grimquist
Alisma	Narthecyasaceae	Liliaceae	Liliaceae	Melanthiaceae	Liliaceae
Allium	Amurillidaceae	Liliaceae	Liliaceae	Liliaceae	Liliaceae
Arctostaphylos	(as Sigillariaceae)	(as Sigillariaceae)	(as Sigillariaceae)	Melanthiaceae	(as Sigillariaceae)
Asparagus	Asparagaceae	Liliaceae	Liliaceae	Asparagaceae	Liliaceae
Cimicifuga	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
Clintonia	Liliaceae	Liliaceae	Liliaceae	Cornaceae	Liliaceae
Crocodylus	Asparagaceae	Liliaceae	Liliaceae	Cornaceae	Liliaceae
Erythronium	Liliaceae	Liliaceae	Liliaceae	Liliaceae	Liliaceae
Hemerocallis	Xanthorrhoeaceae	Liliaceae	Liliaceae	Hemerocallidaceae	Liliaceae
Hyacinth	Hyacinthaceae	Hyacinthaceae	Liliaceae	Hyacinthaceae	Liliaceae
Lilium	Liliaceae	Liliaceae	Liliaceae	Liliaceae	Liliaceae
Muscicula	Asparagaceae	Liliaceae	Liliaceae	Cornaceae	Liliaceae
Muscaria	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
Narcissus	Amurillidaceae	Liliaceae	Liliaceae	Amurillidaceae	Liliaceae
Ornithogalum	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
Polygonatum	Asparagaceae	Liliaceae	Liliaceae	Cornaceae	Liliaceae
Scilla	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
Smilax	(as Melanthiaceae)	(as Melanthiaceae)	(as Melanthiaceae)	(as Melanthiaceae)	Liliaceae
Streptopus	Liliaceae	Liliaceae	Liliaceae	Cornaceae	Liliaceae
Triplicata	(as Tristelia)	(as Tristelia)	(as Tristelia)	(as Tristelia)	Liliaceae
Trillium	Melanthiaceae	Liliaceae	Liliaceae	Melanthiaceae	Liliaceae
Trillium	Melanthiaceae	Liliaceae	Liliaceae	Trillidaceae	Liliaceae
Trillium	Melanthiaceae	Liliaceae	Liliaceae	Cornaceae	Liliaceae
Pulsatilla	Asparagaceae	Liliaceae	Liliaceae	Asparagaceae	Asparagaceae
Zigadenus	Melanthiaceae	Liliaceae	Liliaceae	(as Anemone)	Liliaceae

Lilioids - petaloid monocots

Five orders - highlight 3 families:

Liliales: *Liliaceae s.s. (lilies)

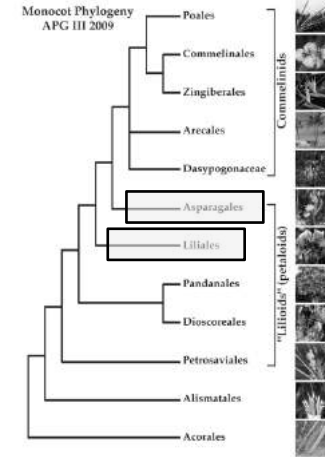
Asparagales: *Iridaceae (iris)

Asparagales: *Orchidaceae (orchids)

Briefly examine:

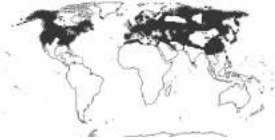
- other "Liliaceae" families of these two order

- yams and screw pines of Dioscoreales and Pandanales



Liliales: *Liliaceae s.s. - lilies

CA 3 CO 3 A 6 G (3)



North temperate family of 16 genera and 700 species



- bulbed or rhizomatous perennials
- leaves without petioles, stemmed or basal
- "Liliaceae" flower (tepals) but often spotted
- capsule or berry

Lilium - lily (Liliaceae)

Liliales: *Liliaceae s.s. - lilies



Medeola virginica - Indian cucumber root

Liliales: *Liliaceae s.s. - lilies



Clintonia borealis - Yellow blue-bead lily

Liliales: *Liliaceae s.s. - lilies



Erythronium americanum
- yellow trout lily

Tulipa sp. - tulip



Liliales: Smilacaceae - catbriars



Small family, mainly of South Hemisphere, climbers via tendrils (modified stipules), starchy tubers, large, net-veined leaves and definite petiole



Smilax herbacea - bristly greenbrier

Liliales: Smilacaceae - catbriars

Flowers unisexual, dioecious plants; carrion flowers are foetid



Male umbel

Female umbel

Fruit an umbel of black berries (red berries are from jack-in-the pulpit)



Liliales: Melanthiaceae



Trillium grandiflorum
- large flowered trillium



Trillium recurvatum
- prairie trillium

Liliales: Melanthiaceae



Xerophyllum
beargrass

Zigadenus
death camas

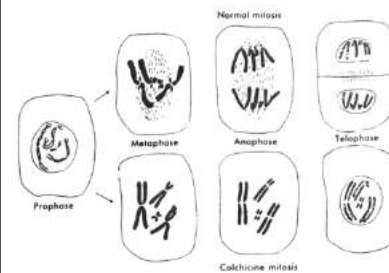


Liliales: Colchicaceae



Uvularia grandiflora - bellwort

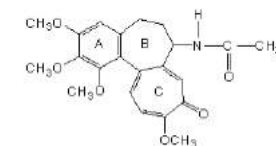
Liliales: Colchicaceae



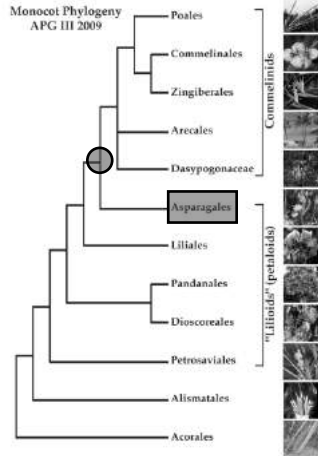
Disrupts spindle mechanism
in mitosis



Colchicum autumnale -
meadow saffron



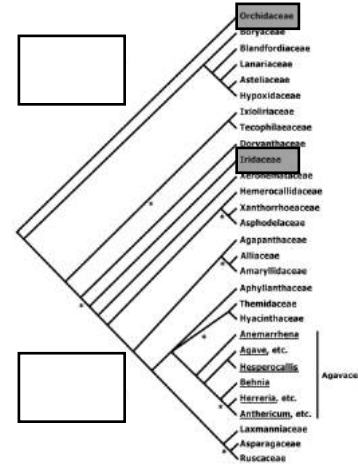
Asparagales: sister to the Commelinids



- in the Lilioid grade, Asparagales is sister to the Commelinids
- characterized by phytomelan in seed coats and arum-type mycorrhizal connection (vs. Paris-type in Liliales)



Asparagales: sister to the Commelinids



- much of the order Asparagales had been included in "Liliaceae"

- Orchidaceae is sister to the rest of the order

- Iridaceae (iris family) is the other large family



Asparagales: Asparagaceae



Asparagus officinalis - asparagus



Asparagales: Asparagaceae (Ruscaceae)



Maianthemum canadense - wild lily of the valley



Asparagales: Asparagaceae (Ruscaceae)



Asparagales: Asparagaceae (Ruscaceae)

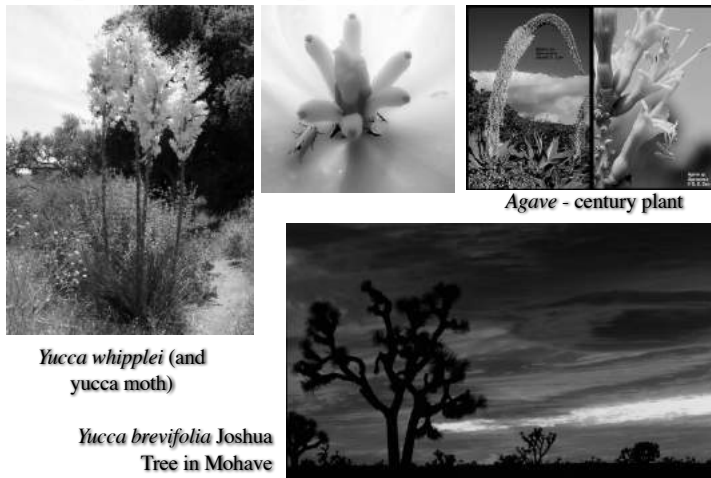


Dracaena drago -
dragon tree of
Canary Islands

Dracaena marginata
- houseplant from
Madagascar

Sansevieria -
mother-in-law
tongue

Asparagales: Asparagaceae (Agavaceae)



Yucca whipplei (and
yucca moth)

Yucca brevifolia Joshua
Tree in Mohave

Asparagales: Asparagaceae (Hyacinthaceae)



Scilla sibirica - English bluebell

Asparagales: Amaryllidaceae



Narcissus sp. - daffodil

- inferior ovary
- corona (staminal)



Asparagales: Amaryllidaceae



Hymenocallis - spider lily



Eucharis - Amazon lily

Asparagales: Amaryllidaceae (Alliaceae)



Allium tricoccum -
Wild leek (umbels and S compounds)

Asparagales: Xanthorrhoeaceae



Hemerocallis fulva - day lily
[Hemerocallidaceae]



Grass Trees [Xanthorrhoeaceae]

Asparagales: Xanthorrhoeaceae



Haworthia [Asphodelaceae]



Aloe dichotoma
[Asphodelaceae]



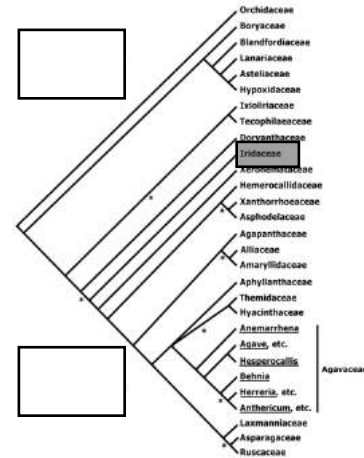
Asparagales: *Iridaceae - iris

A family primarily of Mediterranean climate geophytes.
Leaves are basal and equitant - folded and overlapping.



Iris virginica - Blue flag, iris

Asparagales: *Iridaceae - iris



Iridaceae always recognized
as distinctive family of
lilioids



Asparagales: *Iridaceae - iris

CA 3 CO 3 A 3 \bar{G} (3)

Tepals 6, the 3 inner (petals)
forming the “flags or
standards”

The 3 outer (sepals) forming
the “falls” with nectar guides

The 3 stamens are positioned
under the 3 petal-like styles

The gynoecium is inferior and
forms a 3-parted capsule



Iris virginica - Blue flag, iris

Asparagales: *Iridaceae - iris

CA3 CO3 A3 G(3)



Fleur-de-Lis



Iris virginica - Blue flag, iris

Asparagales: *Iridaceae - iris



Iris versicolor - Blue flag



Iris pseudacorus - Yellow flag
Introduced and potentially invasive

Asparagales: *Iridaceae - iris



Endangered species
restricted to fringe areas
of northern Great
Lakes; clonal growth

Iris lacustris
Dwarf lake iris

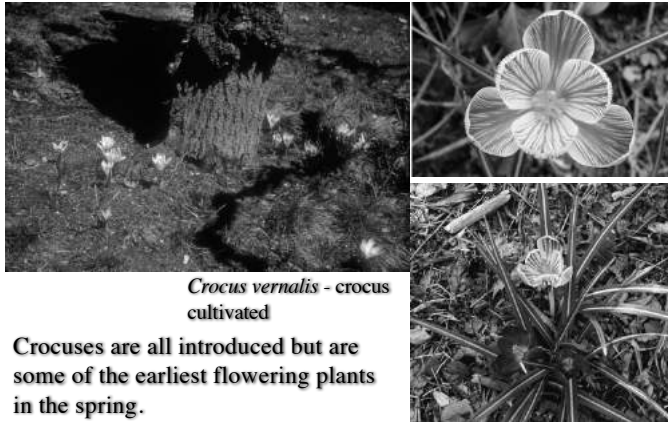


Asparagales: *Iridaceae - iris



Sisyrinchium campestre - blue-eyed grass

Asparagales: *Iridaceae - iris



Crocus vernalis - crocus cultivated

Crocuses are all introduced but are some of the earliest flowering plants in the spring.

Asparagales: *Iridaceae - iris



The dried styles of *C. sativus* yields the expensive saffron.



Asparagales: *Iridaceae - iris



Geissorhiza South Africa

Large radiations occur in several genera in Mediterranean climate regions of South Africa



Moraea - peacock lily

Asparagales: Hypoxidaceae - star grass



Hypoxis hirsuta - Yellow star grass

CA3 CO3 A3+3 G(3)

Family has been placed in Liliaceae or Amaryllidaceae but is now known to be near Iridaceae