

Systematic Botany. Asteridae. Equisetopsida

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Outline

Asteridae. Order Lamiales

Boraginaceae—borage family

Solanaceae—potato family

Oleaceae, olive family

Labiatae—mint family

Spore plants, Pteridophyta

Equisetopsida, horsetails



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Asteridae. Order Lamiales

Boraginaceae—borage family

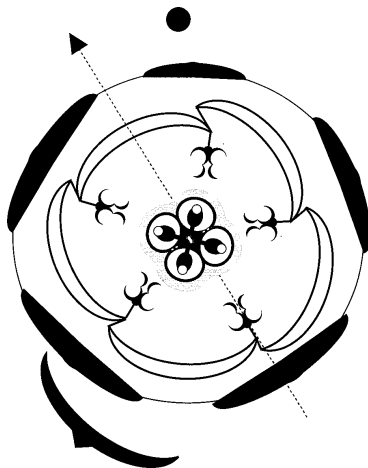


Description of Boraginaceae

- ▶ $\approx 2,000$ species, cosmopolitan
- ▶ Usually herbs, with roughly pubescent alternate leaves
- ▶ Flowers in cymes (cincinnia); bell or funnel-shaped, symmetric, 5-merous
- ▶ Pistil with two carpels which are secondary divided (similarity to Labiatae)
- ▶ Fruit schizocarp with 4 nutlets

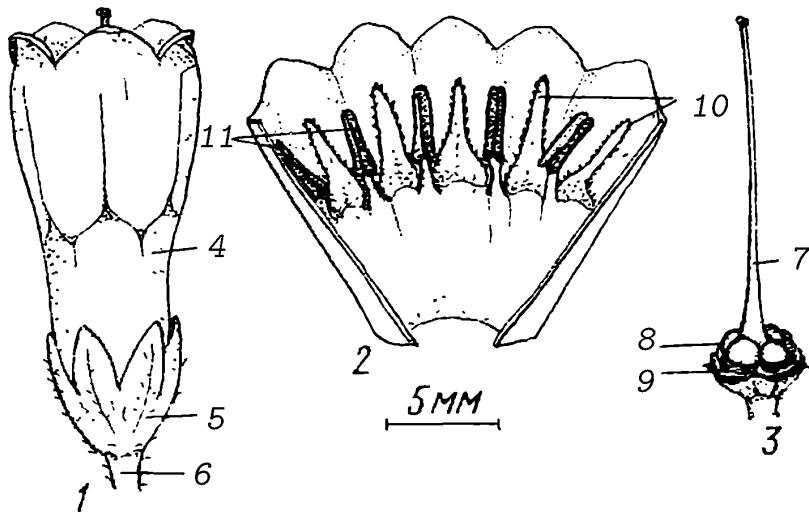


Boraginaceae flower



$$*K_{(5)}[C_{(5)}A_5]\underline{G_{(2 \times 2)}}$$

Flower of *Symphytum* (Boraginaceae)



Representatives of Boraginaceae

- ▶ *Lithospermum*—puccoon
- ▶ *Cynoglossum*—hound's tongue
- ▶ *Cryptantha*—cryptantha

Adjacent family Hydrophyllaceae (waterleaf family) also occurs in North Dakota.



Asteridae. Order Lamiales

Solanaceae—potato family



General features of Solanaceae

Solanaceae—potato family

- ▶ $\approx 2,300$ species, most of them belong to one genus, *Solanum*
- ▶ Cosmopolitan, with center of diversity in South America
- ▶ Prefer places with good water supply

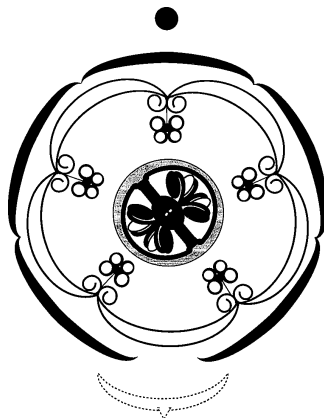


Morphology of Solanaceae

- ▶ Herbs, shrubs, vines, small trees; produce alkaloids, often poisonous
- ▶ Stems with bicollaterate vascular bundles
- ▶ Leaves alternate, without stipules, with pterodromous venation, simple or compound
- ▶ Flowers in cymes, actinomorphic (polysymmetric)
- ▶ Petals fused, stamens are attached to corolla
- ▶ Pistil has two carpels oriented obliquely to median plane of flower
- ▶ Fruit is mostly berry or capsule; seeds with well-developed endosperm



Solanaceae flower



$$\ast K_5[C_5A_5]\underline{G_{(2)}}$$

Representatives of Solanaceae

Mostly vegetables and spices

- ▶ *Solanum*—include potato (*Solanum tuberosum*), tomato (*Solanum lycopersicum*) and eggplant (*Solanum melongena*)
- ▶ *Capsicum*—red (Mexican) pepper
- ▶ *Nicotiana*—tobacco
- ▶ *Petunia*—important ornamental
- ▶ *Atropa*—belladonna, important medicine plant, source of atropin



Solanum tuberosum (potato) fruits



Solanum melongena (eggplant) flowers



Asteridae. Order Lamiales

Oleaceae, olive family

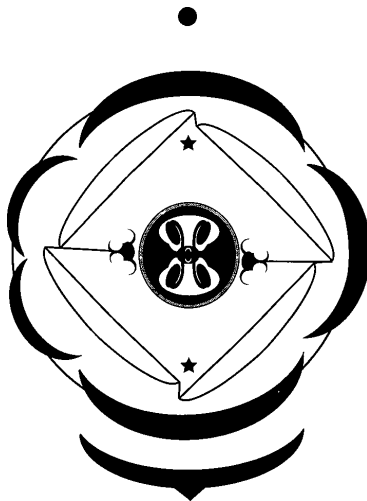


Description of Oleaceae

- ▶ \approx 600 species, mostly Eurasian
- ▶ Trees or shrubs, with opposite leaves without stipules
- ▶ Flowers in raceme-like inflorescences; 2-merous, symmetric; with two stamens; sometimes reduced (ashes)
- ▶ Pistil with two carpels
- ▶ Fruit capsule

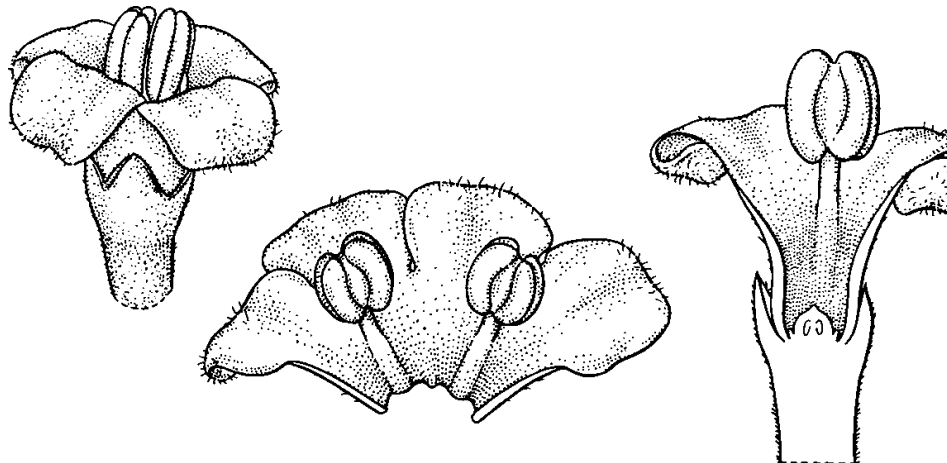


Oleaceae flower



$$*K_{(4\vee 5)}[C_{(4)}A_2]\underline{G}_{(2)}$$

Osmanthus (Oleaceae) flower



Ash (*Fraxinus*) flowers develop anthers with lots of pollen, and prominent stigmas to receive pollen from a wind. All other parts of ash flowers are reduced.



Representatives of Oleaceae

- ▶ *Syringa*—lilac
- ▶ *Ligustrum*—privet
- ▶ *Fraxinus*—ash, *F. penssylvanica* is the most common tree in prairie coolies



Asteridae. Order Lamiales

Labiatae—mint family



General features of Labiatae

Labiatae—mint family

- ▶ $\approx 8,200$ species
- ▶ Cosmopolitan, but occur mostly in Northern Hemisphere
- ▶ Prefer open spaces

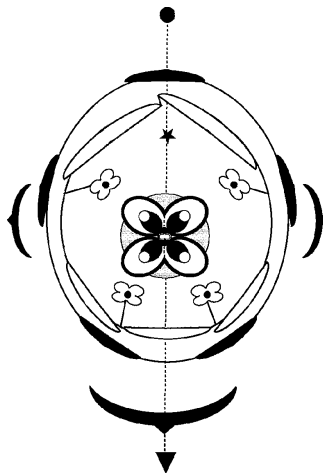


Morphology of Labiatae

- ▶ Herbs; contain iridoid compounds
- ▶ Often hairy, frequently aromatic, herbs or (rarely) shrubs
- ▶ Young stems are typically quadrangular or round; leaves opposite or alternate, without stipules, simple, with pterodromous venation
- ▶ Flowers in axillary or terminal inflorescences, zygomorphic (monosymmetric), but plantains (*Plantago*) have almost actinomorphic flower
- ▶ Calyx tubular, petals also fused, with two upper and one lower petals bigger than others, stamens frequently in two pairs, attached to corolla
- ▶ Pistil with two carpels, but each carpel could be secondary divided (like in Boraginaceae)
- ▶ Fruit is a capsule or schizocarp of four half-carpellary nutlets, seeds with little endosperm

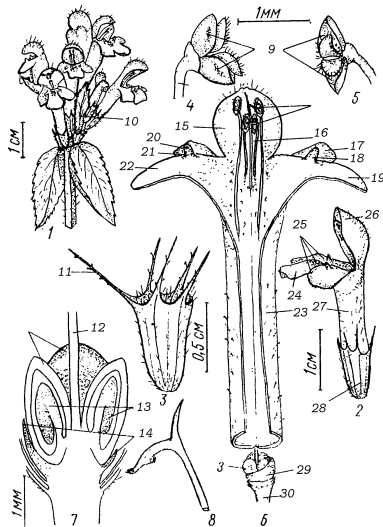


Labiatae flower



$$\uparrow K_{(5)} [C_{(2,3)} A_{2,2}] \underline{G_{(2 \times 2)}}$$

Galeopsis (hemp nettle) flower



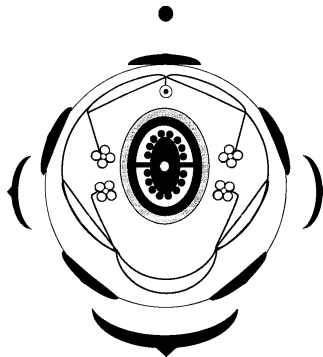
Mentha spicata (mint)



Thymus sp. (thyme)

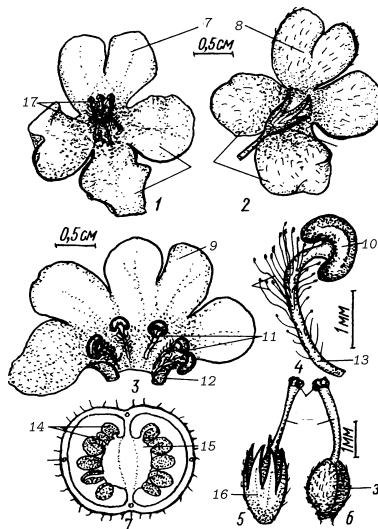


Flower of *Penstemon*

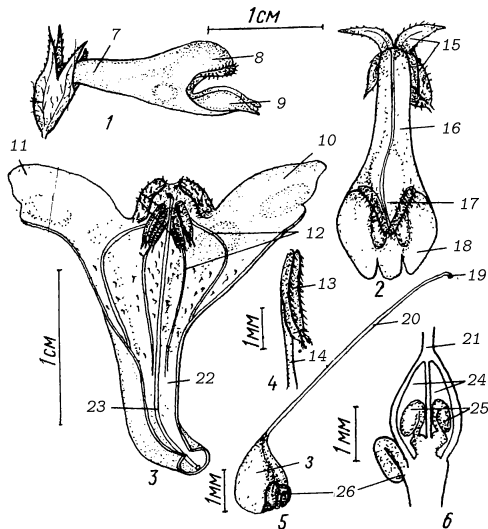


$$\uparrow K_{(5)} [C_{(2,3)} A_4] \underline{G_{(2)}}$$

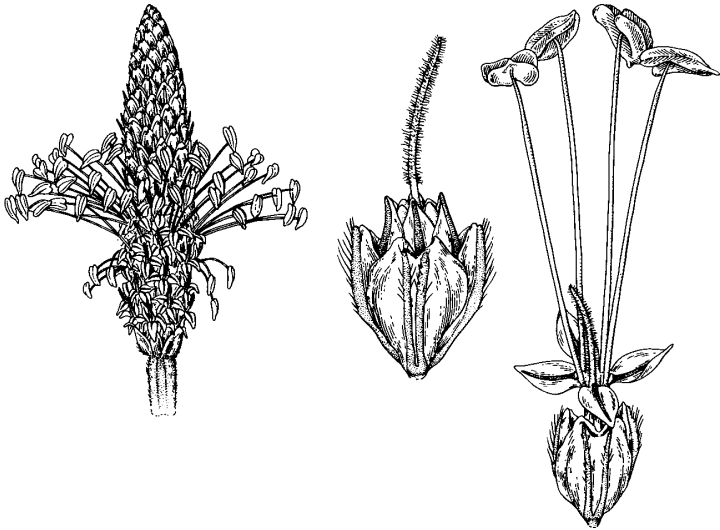
Verbascum (mullein) flower



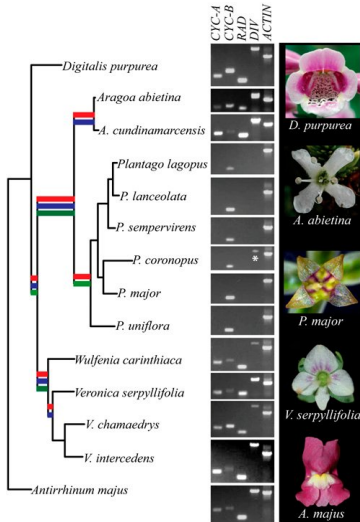
Melampyrum flower



Plantago (plantain) flowers



Origin of *Plantago* actinomorphic flowers (Preston, 2011)



Diversity of alliance

- ▶ *Scrophularia* group
 - ▶ *Verbascum*—mullein
- ▶ *Veronica/Plantago* group
 - ▶ *Veronica*—speedwell
 - ▶ *Plantago*—plantain
 - ▶ *Penstemon*—beardtongue
 - ▶ *Hippuris*—Mare's tail
 - ▶ *Callitriche*—water-starwort
- ▶ *Orobanche* group
 - ▶ *Castilleja*—painted cup
 - ▶ *Pedicularis*—lousewort
 - ▶ *Agalinis*—false foxglove
 - ▶ *Orobanche*—broomrape



Diversity of alliance (contd.)

- ▶ *Utricularia* group
- ▶ *Phryma* group
 - ▶ *Mimulus*—monkeyflower
 - ▶ *Phryma*—loopseed
- ▶ *Verbena* group
- ▶ *Lamium* group
 - ▶ *Lycopus*—hoarhound
 - ▶ *Physostegia*—obedient plant
 - ▶ *Monarda*—wild bergamot
 - ▶ *Mentha*—mint
 - ▶ *Thymus*—thyme



Spore plants, Pteridophyta

Equisetopsida, horsetails



Equisetopsida

- ▶ Small group of one genus, *Equisetum* with ≈ 30 species
- ▶ Leaves are reduced into scales, stems are segmented, photosynthetic. Have specific anatomy of stem (stele)—**artrostele** with specific central, **valecular** and **carinal** canals (similar to stele of some grasses)
- ▶ Sporangia associated with specialized leaves—sporangiophores. Spores have attached **elaters**. Gametophyte minute, usually dioecious but plants are homosporous
- ▶ One family, Equisetaceae, and one genus, *Equisetum*, with 6 species in North Dakota



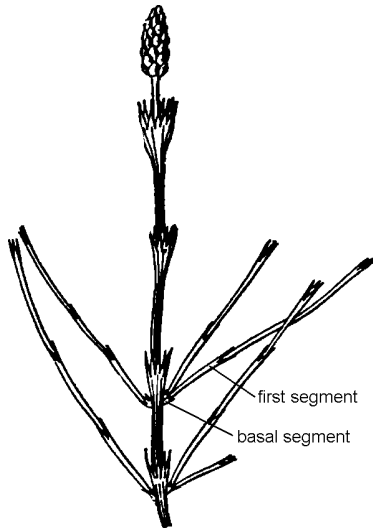
Strobili and sporangiophores of *Equisetum arvense*



Equisetum giganteum



Equisetum sp., basal and first segments



For Further Reading



A. Shipunov.

Shipunov, A. Plants of North Dakota. Manual.

2017—onwards.

Mode of access: http://ashipunov.info/shipunov/school/biol_448/nd_manual/nd_manual.pdf



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Shipunov, A. Flora of North Dakota: Checklist. Version 2. Ed.: Kartesz, J., and Nishino, M.

2017—onwards.

Mode of access: <http://ashipunov.info/shipunov/fnddb2>



Minot State University Herbarium (MSU)



Flora of Great Plains.

1986.

University Press of Kansas, Lawrence, KS.

