Laboratory 14: Rosidae – Part 2

Today we will continue looking at the Rosid clade. The families in today's lab are all members of the Eurosid I clade; next time we will finish looking at Eurosid I as well as Eurosid II. This orders and families we are looking at today are: Oxalidales (Oxalidaceae); Malpighiales (Euphorbiaceae, Passifloraceae, Violaceae, Salicaceae); Fabales (Fabaceae, Polygalaceae); Rosales (Rosaceae, Urticaceae, Moraceae, Rhamnaceae, Ulmaceae). Many groups we will see today have a hypanthium, which is a putative synapomorphy for the Rosales clade.

Oxalidaceae – 6 genera, 880 spp., widespread, mostly tropical

Usually herbaceous; leaves alternate and **trifoliate** or pinnately lobed; stipules lacking; flowers perfect and regular; 5 free sepals; 5 petals, free or fused just at the base; **10 stamens arranged in two whorls, often of different heights**; ovary superior composed of five (generally connate) carpels; typically five styles, free from one another; fruit a capsule; **commonly contain oxalic acid (responsible for sour taste of some species)**; *Averrhoa carambola* is the edible "Star fruit" or "Carambola".

Oxalis

Euphorbiaceae – 320 genera, ~6100 spp., widespread, mostly tropical

Various growth forms (herbs, shrubs, vines, cactus-like succulents), leaves usually simple, generally alternate; stipules present; **paired extrafloral nectaries often present on leaves or petiole**; **milky latex** often present (commonly poisonous); **flowers unisexual** (monoecious or dioecious) and often reduced; some with a **cyathium** (a highly condensed inflorescence) as in the genus *Euphorbia*; sepals typically five [2-6] but may also be absent in some representatives; **petals absent in many representatives**; stamens variable in number (1-numerous); ovary superior, composed of **three fused carpels**; **typically three styles, each of which is usually forked**; nectar disk usually present; fruit generally a capsule.

Euphorbia
Ricinus

Passifloraceae – 18 genera, ~625 spp., mostly tropical and warm temperate

Vines; leaves alternate, simple to lobed, **tendrils (derived from sterile pedicels) present**; stipules deciduous; flowers bisexual, radial; hypanthium present with basal nectar disk; **sepals 5, petal-like**, distinct or fused at he base; petals 5 (sometimes 0), free or fused at the base; **stamens generally 5, often borne on a stalk with gynoecium**; flowers with an elaborately lobed **corona** located between the petals and the stamens; ovary superior composed of 3-5 fused carpels but ovary with only a single locule; **stigmas 3, often lobed**; fruit either a capsule or a berry.

Passiflora

Violaceae – 22 genera, 950 spp., mostly northern temperate

Herbs or shrubs (very few trees and vines); stipules present; leaves simple and generally alternate; flowers slightly bilateral or, in *Viola*, fully bilateral; bisexual; 5 distinct sepals; 5 distinct petals; **stamens generally 5, filaments short, fused (or appearing so) to form a ring around the gynoecium**; nectaries often present (as in a **spur**); ovary superior composed of three fused carpels; **style 1, curved, distally expanded**; ovary with a single locule containing numerous ovules; fruit type variable.

Viola

Salicaceae – 58 genera, ~1200 spp., mostly northern temperate

May be either trees or shrubs, deciduous; stipules present; leaves simple, alternate, **serrate to dentate with salicoid teeth (vein expands at tooth apex ending in a spherical gland)**; **flowers unisexual (dioecious), arranged in catkins that are subtended by bract(lets)** often not appearing at same time as leaves; **sepals 3-8, much redued**; **corolla typically lacking**; stamens 2-30; ovary superior, unilocular; composed of two fused carpels; style is typically divided; fruit is a capsule.

Salix

Fabaceae (Leguminosae) - ~625 genera, **~18,000 spp.**, worldwide distribution

Herbs, shrubs and trees; leaves typically alternate, pinnately compound (but there are many exceptions); stipules present but variable in structure, sometimes spiny; ovary superior, composed of a single carpel; flowers: may be regular or irregular, bisexual or unisexual (depends on the subfamily); sepals generally 5, ± fused; petals 5; in some members there is a banner, two wings and a keel (derived from two fused petals); stamens generally 10 but number varies, sometimes the filaments are partially fused; ovary superior, a single carpel; fruit a legume (a dry fruit that derived from a single carpel that opens along 2 longitudinal sutures). See p. 262-264 in Simpson for features of the three subfamilies.

Acacia
Lupinus
Cercis
Vicia
Calliandra
Clianthus
Indigo
Cassia

Rosaceae – 85 genera, ~3000 spp., worldwide distribution

Herbs, shrubs, or trees, deciduous or evergreen, **often with thorns or prickles**; leaves generally alternate, simple or compound; stipules generally present; flowers regular, bisexual, **often large and showy**; sepals 5, often with an **epicalyx**; petals 5 (rarely zero); **stamens many** (2x - 3x the basic number of petals); gynoecium composed of many free carpels, ovary position is variable but there is typically a **hypanthium**; fruit variable.

Rosa
Fragaria
Malus
Chaenomeles
Kageneckia

Urticaceae – 40 genera, ~900 spp., worldwide distribution

Mostly herbs or small shrubs, **sometimes with stinging hairs**; leaves simple, either alternate or opposite, stems commonly square; stipules usually present; flowers tiny, unisexual, monoecious or dioecious, inflorescences axillary; perianth reduced, composed of between three to five segments; stamens 4-5; ovary superior, composed of a single carpel; stigmas 1 or 2, extending along adaxial side of style; fruit an achene in a persistant perianth

Urtica

Moraceae – 53 genera, ~1500 spp., mostly tropical, but worldwide

Trees and shrubs, **milky sap or latex present in all tissue**; leaves simple, may be alternate or opposite; stipules present, leaving a circular scar on twig, **many with conical stipules covering apical bud**; inflorescence axillary, flowers densely packed on thickened axis; flowers tiny, unisexual, monoecious, radial; perianth composed of 4-5 tepals; stamens 1-5, opposite tepals, with explosive pollen release; ovary superior or inferior; 2 carpels, one ovule, 2 styles; fruit usually fleshy, drupelike achenes (**often aggregated into multiple fruits**).

Ficus
Morus

Rhamnaceae – 45 genera, ~850 spp, worldwide distribution

Woody trees and shrubs, often with thorns; leaves simple, leaf insertion is variable; tertiary leaf veins ladder-like, often strongly depressed into a ± convex leaf surface; stipules present (often spinose); flower: regular and usually bisexual, **typically small with a hypanthium**; sepals 4-5, fused at least at base; petals 4-5 (sometimes zero), **partly incurved as to cover the stamens**; stamens 4-5, **opposite the petals and adnate to the base of the petals**; ovary superior to inferior, 2-3 locules, single style may be divided; fruit drupe or nut.

Rhamnus
Ceanothus

Ulmaceae – 6 genera, 40 spp., mostly northern temperate

Trees; leaves simple, alternate, **simply or doubly serrate and usually with asymmetric bases**; stipules present; branches growing laterally then becoming erect; flowers bisexual or unisexual (dioecious or monoecious), reduced, but with hypanthium; perianth reduced to a series of tepals, 4-9 in number; stamens 4-9, explosive pollen release; ovary superior, **two fused carpels, two styles present with stigmas on adaxial side**; fruit a samara (winged) or a nut.

Ulmus

Polygalaceae – 17 genera, ~850 spp., temperate and tropical

Herbs, shrubs, trees, or vines, leaves alternate, simple, entire, venation pinnate; stipules lacking or spines present; inflorescence a panicle or raceme; **flowers bisexual and bilateral**; sepals 5, often with 2 fused, and two larger and petal-like; **petals usually 3 (5), adnate to staminal tube**; stamens typically 8, anthers usually opening by apical pores; **style often with one fertile and one sterile branch, the sterile one ending in a tuft of hairs**; fruit various.

Monnina

Lab 14 (1

OXALIDACEAE. OXALIS FAMILY

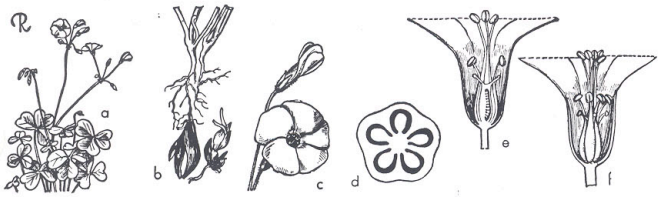

Fig. 168. OXALIDACEAE. *Oxalis Bowiei*: a, flowering plant, × ⅛; b, stems showing subterranean bulbs, × ¼; c, flower and bud, × ½; d, ovary, cross-section, × 10; e, flower, vertical section, × 2; f, flower, perianth removed, × 2. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

EUPHORBIACEAE.[122] SPURGE FAMILY

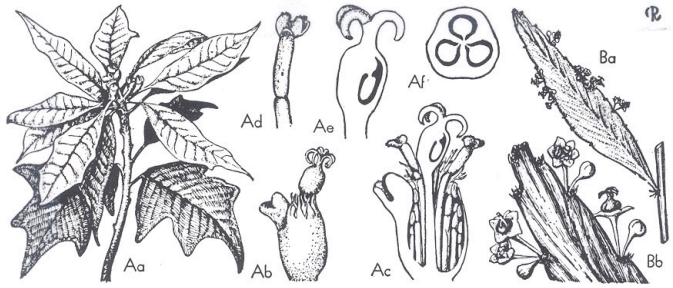

Fig. 181. EUPHORBIACEAE. A, *Euphorbia pulcherrima*: Aa, flowering branch, × ¼; Ab, cyathium, × 1; Ac, same, vertical section, × 2; Ad, staminate flower, × 6; Ae, pistillate flower, vertical section, × 3; Af, ovary, cross-section, × 5. B, *Xylophylla angustifolia*: Ba, stem bearing flowering phyllodium, × ½; Bb, phyllodium tip with inflorescences, × 2. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

PASSIFLORACEAE.[157] PASSION-FLOWER FAMILY

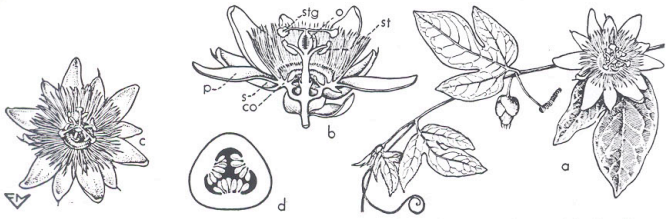

Fig. 225. PASSIFLORACEAE. *Passiflora caerulea*: a, flowering branch, × ⅙; b, flower, vertical section, × ⅓ (co corona, o ovary, p petal, s sepal, st stamen, stg stigma); c, flower, face view, × ¼; d, ovary, cross-section, × 2. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

VIOLACEAE.[154] VIOLET FAMILY

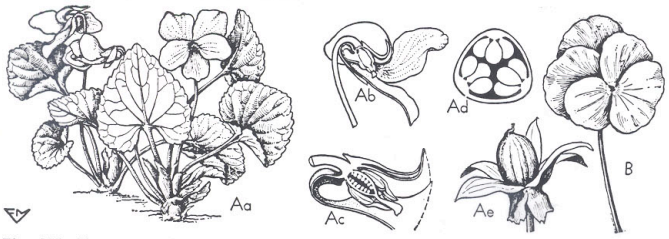

Fig. 221. VIOLACEAE. A, *Viola papilionacea*: Aa, flowering plant; Ab, flower, perianth partially removed, × 1; Ac, flower, vertical section, × 2; Ad, ovary, cross-section, × 4; e, capsule, × 1. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

from Lawrence's Taxonomy of Vascular Plants

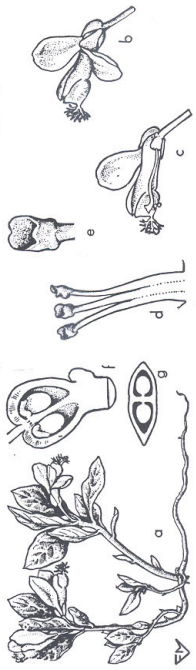

Fig. 180. POLYGALACEAE. *Polygala paucifolia*: a, flowering plant, × ½; b, flower, × 1; c, same, vertical section, × 1; d, stamens, × 5; e, anther, × 15; f, ovary, vertical section, × 5; g, same, cross-section, × 8. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

SALICACEAE. WILLOW FAMILY

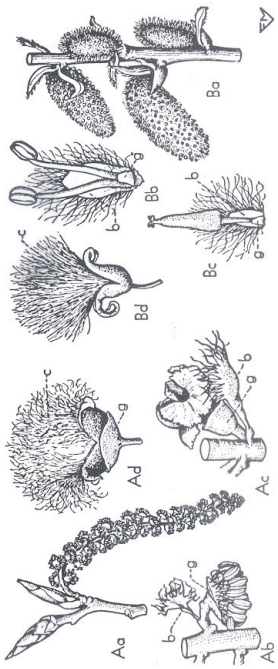

Fig. 103. SALICACEAE. A, *Populus balsamifera*: Aa, twig with staminate catkin, × ½; Ab, staminate catkin axis with flower, × 2; Ac, pistillate flower, × 4; Ad, capsule, × 2. B, *Salix fragilis*: Ba, staminate catkins, × 1 (catkins on left of twig at anthesis, others less mature); Bb, staminate flower, × 6; Bc, pistillate flower, × 6; Bd, capsule, × 2. (b bract, c seed coma, g gland.) (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

Fig. 167. LEGUMINOSAE. A, *Lathyrus latifolius*: Aa, flowering branch, × ½; Ab, perianth expanded, × ½; Ac, flower, less perianth, × 1; Ad, ovary, cross-section, × 8; Ae, fruit, × ½. B, *Trifolium pratense*: Ba, flowering branch, × ½; Bb, flower, × 3. C, *Amorpha fruticosa*: Ca, flowering branch, × ¼; Cb, flower, ×4; Cc, fruit with calyx, × 2. D, *Lupinus polyphyllus*: Da, flowering branch, × ¼; Db, flower, × 1. E, *Acacia decurrens*: Ea, flowering branch, × 1; Eb, inflorescence, × 4; Ec, flower, × 5; Ed, fruit, × ½. F, *Lotus corniculatus*: inflorescence, × 1. G, *Baptisia australis*: Ga, flowering branch, × ¼; Gb, flower, less perianth, × 1; Gc, fruit, × ½. H, *Bauhinia variegata*: Ha, flowering branches, × ¼; Hb, fruit (dehisced), × ¼. (k keel, s standard, w wing.) (From L. H. Bailey, *Manual of cultivated plants*, The Macmillan Company, 1949. Copyright 1924 and

Fig. 166. ROSACEAE. A, *Spiraea Vanhouttei*: Aa, flowering branch, × ½; Ab, flower, face view, × 1; Ac, flower, vertical section, × 2; Ad, pistil, vertical section, × 6; Ae, follicles, × 2. B, *Geum bulgaricum*: Ba, flower, × ½; Bb, same, vertical section, × 1; Bc, achene, × 2. C, *Fragaria chiloensis*: Ca, fruit and basal leaf, × ¼; Cb, fruit, vertical section, × ½; Cc, nutlet with persistent style, × 5. D, *Rubus roribaccus*: Da, flower, × nearly 1; Db, same, vertical section, × 1; Dc, fruit, vertical section, × 1. E, *Rubus occidentalis*: Ea, flower, × 1; Eb, flower, vertical section, × 1; Ec, fruit separated from torus, × 1. F, *Malus sylvestris*: Fa, flower, vertical section, corolla excised, × 1; Fb, fruit, vertical section, × ⅓. G, *Rosa canina*: Ga, flowering branch, × ½; Gb, flower, vertical section, × 1; Gc, hip, × ½. H, *Chaenomeles lagenaria*: Ha, flowering branch, × ½; Hb, flower, vertical section, × 1; Hc, ovary, cross-section, × 4. (From L. H. Bailey, *Manual of cultivated plants*, The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

URTICACEAE. NETTLE FAMILY

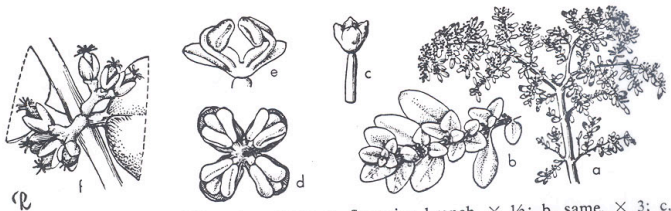

Fig. 113. URTICACEAE. *Pilea microphylla*: a, flowering branch, × ½; b, same, × 3; c, staminate flower-bud, × 5; d, staminate flower, face view, × 15; e, same, vertical section, × 15; f, pistillate flowers, × 5. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

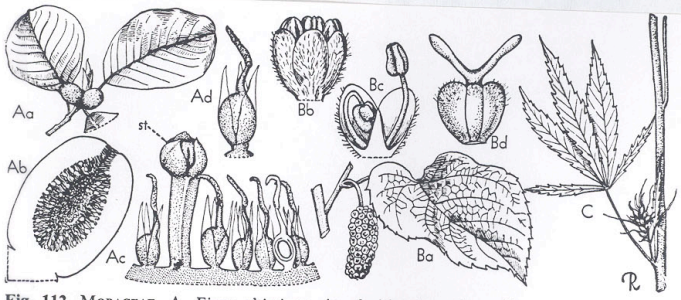

Fig. 112. MORACEAE. A, *Ficus altissima*: Aa, fruiting branch, × 1/10; Ab, flowering inflorescence, vertical section, × 1; Ac, section of "receptacle" bearing pistillate and staminate flowers, × 5; Ad, pistillate flower, × 6. B, *Morus alba*: Ba, fruit and leaf, × ½; Bb, staminate flower, × 6; Bc, same, vertical section, × 6; Bd, pistillate flower, × 12. C, *Cannabis sativa*: pistillate inflorescence and leaf, × ¼. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

RHAMNACEAE.[135] BUCKTHORN FAMILY

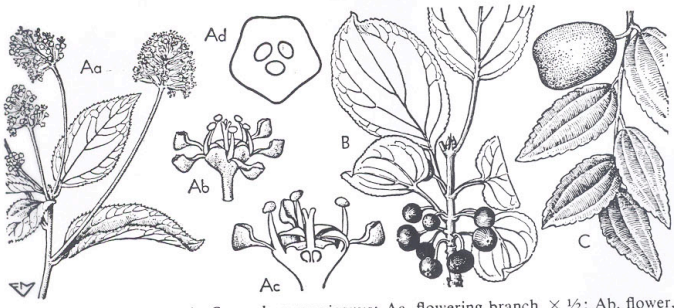

Fig. 200. RHAMNACEAE. A, *Ceanothus americanus*: Aa, flowering branch, × ½; Ab, flower, × 4; Ac, same, vertical section, × 5; Ad, ovary, cross-section, × 10. B, *Rhamnus cathartica*: fruiting branch, × ½. C, *Ziziphus Jujuba*: twig with fruit, × ½. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

ULMACEAE. ELM FAMILY

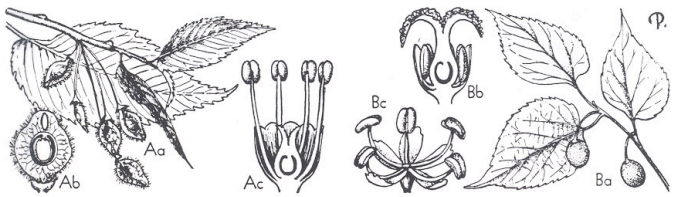

Fig. 111. ULMACEAE. A, *Ulmus americana*: Aa, fruiting branch, × ½; Ab, fruit, vertical section, × 1; Ac, flower, vertical section, × 4. B, *Celtis occidentalis*: Ba, fruiting branch, × ½; Bb, flower, vertical section, × 4; Bc, staminate flower, × 6. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)