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**Berberidaceae
through
Fumariaceae
of
New York State**

**RICHARD S. MITCHELL
New York State Museum**

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BOTANICAL GARDEN**

**Contributions to a Flora of New York State V
Richard S. Mitchell, Editor**

1983

Bulletin No. 451

New York State Museum

**The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Albany, New York 12230**

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PREFACE

OUR GOAL in producing this series is to present a useful and authoritative account of the plants of New York State. These contributions are intended to reflect the knowledge and taxonomic opinions of specialists who prepare the manuscripts while following a generalized format for consistency. Inclusion of ecological, distributional, medical and economic information on each species is also one of our major aims. Habitat references, flowering times, pertinent synonymy, etc., apply specifically to New York plants rather than to the entire ranges. Complete illustration should facilitate identification of specimens for those who are not formally trained in botany. Descriptions are original, ordered and as complete as possible to provide sequential cross-referencing.

Distribution maps accompany species of seed plants, ferns, mosses, lichens and some groups of fungi. These are plotted by counties to eliminate pinpointing endangered habitats, while offering an accurate visual picture of past collecting. Maps are based on the master file at the New York State Museum, Albany, and supplemented by available data (specimens examined by the authors) from herbaria housing significant New York collections. Specific data or literature citations for any map may be obtained, on approval, from the Museum.

We hope that these bulletins will serve individuals with interest in the flora, as well as to provide information for state and federal agencies, conservation organizations, industry and the scientific community. With these works go our hopes for the preservation and wise use of a precious and lifegiving resource—our state's plantlife.

The New York State Flora Committee

The steering council of the New York State Flora Committee met for the first time on January 19, 1976, and established as its goals the promotion of study of the state's plant resources and the publication of this series of Museum Bulletins. These contributions will be continually updated after publication for possible incorporation into larger volumes at a later date.

Members of the council at the time of this publication are:

Richard S. Mitchell, Chairman, State Botanist, N.Y. State Museum, Albany (Vascular Plants)

Charles J. Sheviak, Curator of Botany, N.Y. State Museum, Albany (Vascular Plants)

Edwin H. Ketchledge, College of Environmental Science and Forestry, Syracuse (Bryophytes)

Clark T. Rogerson, New York Botanical Garden, New York (Fungi)

George J. Schumacher, Biology Department, SUNY, Binghamton (Algae)

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ACKNOWLEDGMENTS

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IMPORTANT NOTE

All economic uses, folklore, medical and pharmaceutical notes, uses as foodstuffs, etc., are compiled from the literature and do not represent an endorsement by the authors or the New York State Museum. Some of the uses may, indeed, be dangerous if incorrectly employed. Some are not effective and are presented for historical interest only.

LEGEND

FOR ALL MAPS IN THIS PUBLICATION THE FOLLOWING SYMBOLS APPLY:

- Solid dot—specimen seen by author; data on file at the State Herbarium (NYS)
Circle—Field observation with location data and observer's name on file (NYS)
Hollow triangle—Literature citation on file (NYS)

FOR ALL ILLUSTRATIONS IN THIS PUBLICATION THE FOLLOWING LETTER-DESIGNATIONS APPLY:

- | | |
|---------------------------|-----------------------------|
| A. Habit sketch | F. Flower |
| B. Silhouette | G. Inflorescence |
| C. Fruit or fruit cluster | H. Flower parts (breakdown) |
| D. Seed | K. Rhizome |
| E. Bud | M. Root |

Berberidaceae (Barberry Family)

The Berberidaceae: a family of shrubs and primitive herbs comprising 10 (or more) genera and up to 600 species worldwide. Most of its taxa are species of *Berberis* (Barberry) including the compound-leaved segregate genus, *Mahonia* (Grape Holly). Distribution of the family centers in Asia, with lesser representation in Europe, north Africa and the Western Hemisphere. The Pacific Coast of North America has as native genera: *Vancouveria*, *Achlys* and *Berberis* (*Mahonia*). In eastern North America *Diphylleia cymosa* and *Berberis canadensis* are primarily southern-Appalachian, and are known only from cultivation in New York State. Our native genera (*Podophyllum*; *Caulophyllum*; *Jeffersonia*) are herbaceous relicts of the ancient Arctotertiary Forest, each with one species in North America and an east-Asian counterpart. Two species of *Berberis* escape cultivation in the state. Members of this family are important in horticulture, the pharmaceutical trade and as alternate hosts to diseases of cereal-grain crops. Some are also poisonous.

FAMILY DESCRIPTION

Mostly shrubs or perennial herbs from perennial rootstocks, rhizomes or tubers. Leaves are alternate, fascicled or sub-opposite, and may be simple or pinnately compound (or reduced to spines), sometimes basally articulated, entire to variously toothed or lobed or with marginal spines, estipulate or stipuled, some genera with swollen petiole bases. Flowers are solitary or borne in racemes, cymes or panicles, usually bracteate. Flowers are radially symmetrical, bisexual; the perianth is of two to several series of free parts which may be somewhat similar or clearly differentiated into calyx and corolla, 3 to 5-merous; petals (4) 6–9; sepals (4) 6 to many, often petaloid. Stamens may be equal to the petals in number or more numerous (4–18); the outer whorl is often opposite the petals and is sometimes associated with petaloid nectaries. Anther sacs dehisce by valves (slits in *Podophyllum*). The ovary is superior, 1 per flower with (1) 2 to several ovules on a sub-basal to parietal placenta. Fruits are few-seeded berries or capsules. Seeds are often drupe-like with fleshy to horny endosperm, sometimes with an aril.

KEY TO GENERA

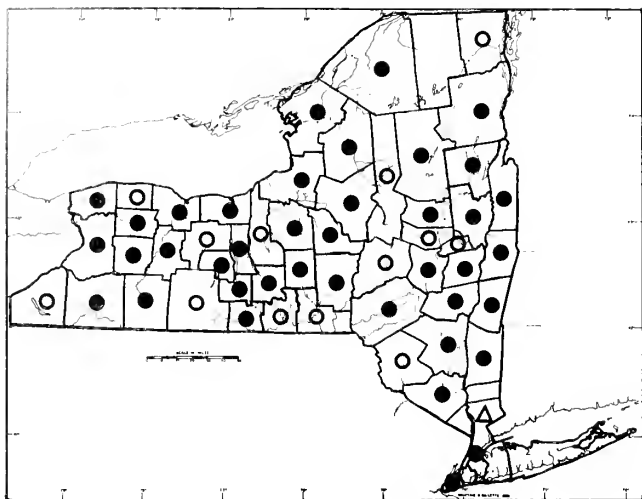
1. Plants woody, much-branched shrubs, usually with sharp spines4. *Berberis* (p. 6)
1. Plants herbaceous, without spines(2)
 2. Flowers borne in panicles, greenish-yellow to purple, less than 1 cm wide; seeds borne naked, with the appearance of glaucous, blue berries3. *Caulophyllum* (p. 4)
 2. Flowers solitary, white to creamy, over 1 cm wide; seeds borne within a berry or capsule(3)
3. Leaves only basal, long-petioled with 2 terminal leaflets; fruit a capsule, scapose2. *Jeffersonia* (p. 3)
3. Leaves mostly cauline, often peltate with several lobes; fruit a berry, peduncled1. *Podophyllum* (p. 1)

1. PODOPHYLLUM

Common Names: May-apple, Mandrake

Authority: Linnaeus, *Species Pl.*, p. 505, 1753

This is a genus of primitive plants of uncertain relationships, sometimes put in their own family, Podophyllaceae. One species is native to eastern North America, and one or more are known from Asia. Our common, forest species, *P. peltatum* L., is sometimes grown as an ornamental or transplanted to woodlots where it thrives. The seeds and foliage are poisonous, but the pulpy flesh of the fully ripe fruit is reportedly edible.



1. *Podophyllum peltatum* L.

Common Names: May-apple, Wild Mandrake, Wild Jalap, Indian-apple, Ground-lemon, Hog-apple, Puck's-foot

Type Description: Linnaeus, Species Pl., p. 505, 1753

Origin: Arctotertiary Forest

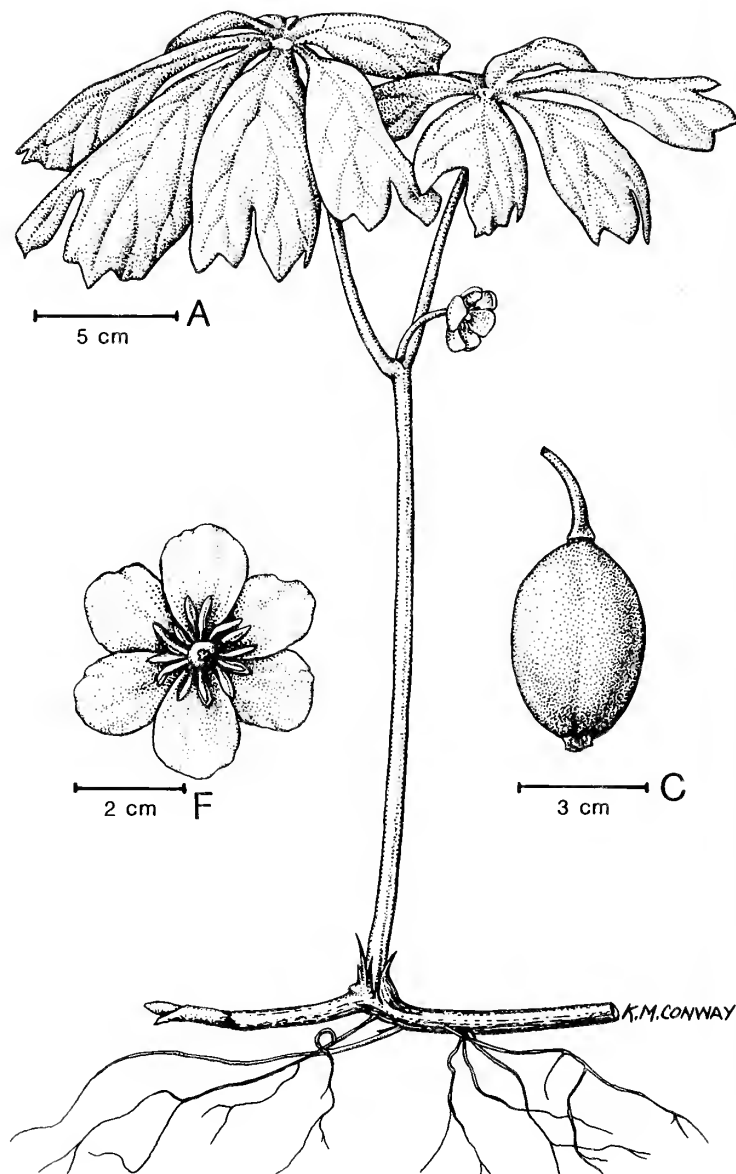
Habitats: Rich, moist woodlands and borders, usually in partial shade

Habit: Erect, perennial herbs

Flowering: May

Fruiting: (July) August

General Distribution: Western Quebec and New England to Minnesota, south to Texas, Louisiana and the southern Appalachians (n. Florida)



Description: Plants with bisexual flowers; stigma (2) 4–8 lobed, capitate, convoluted, fleshy, 2–5 mm broad, 2–3 mm high, persistent in fruit; style lacking; ovary 1 per flower (rarely 2–8 carpels), superior, fusiform to subspherical, 8–12 mm long, 5–8 mm wide, many-ovuled, smooth, becoming a fleshy, ovoid berry in fruit, 3.5–5.8 cm long, ca 2–4 cm wide at maturity, somewhat spindle-shaped with obtuse, tapered ends, pale yellow to deep yellow often tinged with pink (uncommonly orangish to deep red), smooth, the pulpy placenta surrounding the numerous seeds; seeds elliptic, 3–4 mm long, almost totally enclosed in their pulpy arils; stamens usually 12–20 or more (rarely 6, opposite the petals), 8–10 mm long; anther sacs 4–6 mm long, dehiscing along longitudinal slits (not valved) with a broad, fleshy connective; filaments stout, 3–6 mm long, broader near the bases; petals 6 or 9, free, in 2–3 series (sometimes with smaller petals interspersed), greenish-white to creamy-pink (rarely orange to reddish), obovate to obspatulate with rounded tips, mostly 1–3 cm long, 1–2.5 cm broad; sepals 6, in 2 series, greenish-white, early-deciduous, cucullate, enclosing the 9–18 mm bud; sepal-like bractlets associated with the base of the bud early-deciduous, 2–3 in number, greenish, oval, ca 3 mm long, 2 mm wide; receptacle tough, somewhat expanded in fruit; peduncle 3–7 cm long, sparsely to densely villous and somewhat flattened and ribbed, arching outward from the common axil of 2 terminal leaves to bear a single flower, elongating and pendulous in fruit; leaves 1 or 2 (3)

per stalk, oriented horizontally, suborbicular to reniform-cordate (or peltate), usually deeply (3) 5–9 lobed, palmate with deep sinuses and \pm bifid lobe tips, with a few shallower lobes and apiculate (to blunt) serrations and dentations of varying sizes along the margins, glabrescent, and darker green above, soft-villous below; solitary leaves robust, usually suborbicular and 5–9 palmately cleft, often peltate near the margin, 15–30 (40) cm broad, each on a ribbed stalk 15–40 cm tall which arises directly from a (bracteate) rhizome; paired leaves (very rarely 0, 1 or 3) of the fertile stalks 3–7 (9) palmately cleft with deep sinuses and marginally attached petioles (or slightly peltate); petioles (4) 7–16 cm long, ribbed and deeply grooved, \pm villous toward the blade, attachment subopposite (to alternate) subtending the peduncle at the stem apex; stem glabrous, grooved and minutely caniculate, 15–30 (40) cm tall; basal bracts (scale leaves) strap-like \pm sheathing, 2–5 (7) cm long, ca 1 cm wide, pale, creamy-green, borne alternately near the point of stem-attachment to the branching rhizome, 2–8 (11) mm thick (colony-forming) with tough, fibrous roots. ($2n = 12$)

Infraspecific Variation: Developmental irregularities are not uncommon in this species. Populations, as well as individual teratological specimens, have frequently been written up in the literature and occasionally named. Plants developing 2–8 carpels (or separate fruits) per flower have been designated forma *polycarpum* Clute. Plants with dark, reddish fruits and flowers have been called forma *deamii* Raym. Leafless flowering stalks are known (though rare), called forma *aphyllum* Plitt., and flowers may be accompanied by 1 or 3 leaves on occasion, rather than two. Another developmental variation is the fusion of the peduncle to one of the petioles and the production of a floral bract.

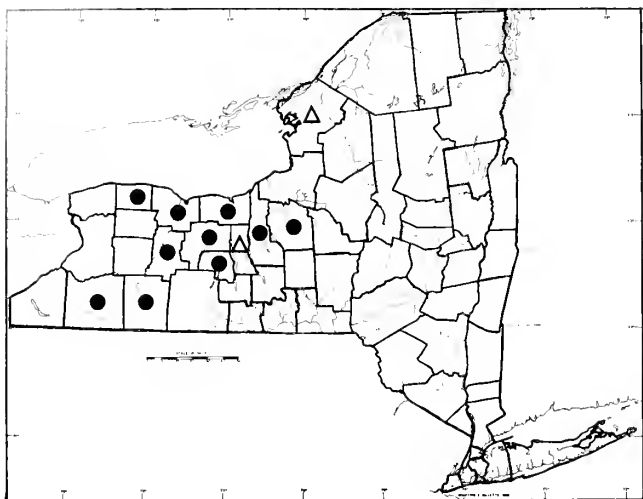
Importance: May-apple is cultivated in temperate climates in gardens and woodlots, and may escape within and outside its natural range. It is a poisonous plant; however, the pulp of the fully ripe fruit is widely known to be edible. They are not tasty, and are mostly eaten by children, who have reportedly been severely poisoned by partially ripe fruit. The pulp may be made into a good marmalade or added to fruit drinks, but the seeds may contain measurable amounts of toxins. The foliage and roots of the plant are particularly poisonous, containing Podophyllotoxin and related resins and lignins. Podophyllin, the crude extract, is a violent cathartic and laxative, and has been used in folk medicine in very small doses. It has also been used as a cytotoxic substance in the treatment of certain types of cancer and venereal warts. The practice of treating tumors in this manner was learned from American Indians. Internal poisoning results in severe gastroenteritis, purging and possible death. Even handling the powdered rhizome may cause skin lesions, conjunctivitis and other symptoms.

2. JEFFERSONIA

Common Names: Twinleaf, Rheumatism-root

Authority: Barton, Trans. Amer. Phil. Soc., vol. 3, p. 342, 1793

A genus of two species: *Jeffersonia diphylla* of the eastern part of North America and *J. dubia* of Manchuria. Both species are cultivated, and ours has been used in folk medicine.



1. *Jeffersonia diphylla* (L.) Pers.

Common Names: Twinleaf, Rheumatism-root, Ground-squirrel Pea, Helmet-pod

Type Description: Linnaeus, Species Pl., p. 505, 1753

Synonyms: *Podophyllum diphyllum* L., *Jeffersonia binata* Bart., *J. bartonis* Michx.

Origin: Arctotertiary Forest

Habitats: Rich, calcareous woodlands in deep soils

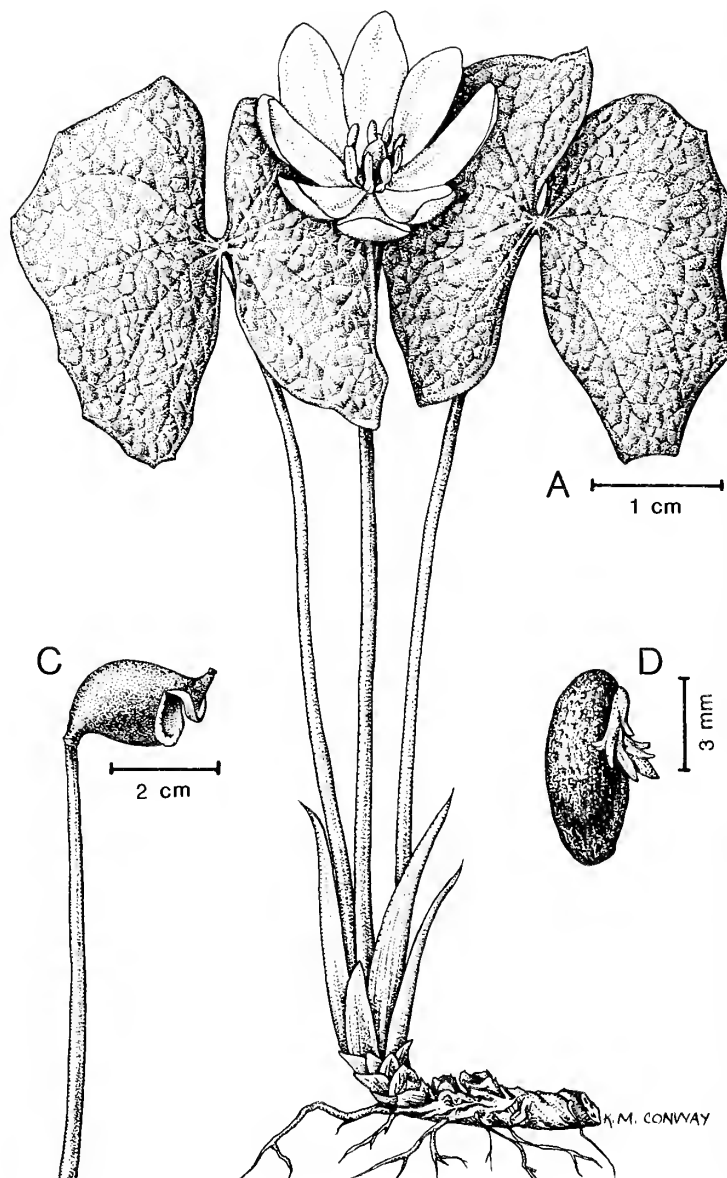
Habit: Erect, acaulescent, perennial herbs

Flowering: Early May (NY)

Fruiting: June–August

General Distribution: Western N. Y. State and adjacent Ontario to Minnesota, Iowa and south to Tennessee and Georgia

Rarity: Near its northern limits in western New York, this species is recorded from fewer than 25 locations in the state.



Description: Plants with bisexual flowers; **stigma** 1 per ovary, truncate at tip, 2-lobed, fleshy, convoluted, 1–1.5 mm broad, persistent; **style** stout, 1–2 mm long, persistent in fruit; **ovary** 1 per flower, superior, elliptic-oblong, 5–7 mm long, 3–5 mm wide, stipitate, glabrous, many-ovuled, becoming a capsule in fruit; **capsule** 2.2–2.8 cm long, 1.3–1.8 (2.1) cm broad, bilaterally symmetrical, oriented \pm horizontally by a contortion of its basal stipe, ovoid-fusiform, somewhat falcate, the terminal portion attenuated abruptly toward the persistent style beak, the surface greenish-tan, muricate-tuberculate, the capsule dehiscing by a large, ringent, subterminal adaxial pore with revolute, lipped margins, the upper fruit then becoming a lid; **seeds** numerous, oblong, 5–7 mm long, 2–2.5 mm wide, surfaces red-brown, muricate; **aril** pale, wing-like, ca 3 mm long; **stamens** usually 8; **anther sacs** linear, 5–6 mm long, dehiscing by 2 long valves which are apically attached; **filaments** ca 2 mm long; **perianth** parts in 2–3 series, all white (greenish or lavender tinted), free; **petals** 8 (9) in 2 series or acyclic, 6–18 mm long, 3–12 mm wide, narrowly to broadly obovate; **sepals** usually 4 (3–5), petaloid, narrowly spatulate, attenuated toward bases, 6–16 mm long, 2–5 mm wide; flower (fruit) borne singly; **receptacle** conspicuously jointed to the stipe, ebracteate (rarely with a linear bract); **scape** slender, 7–55 cm tall, glabrous, \pm ribbed; **leaves** all basal, glabrous, borne on long petioles from the rhizomes; **leaf blade** deeply divided into 2 leaflets (rarely undivided, reniform); **leaflets** borne opposite one another in the same plane forming near mirror-images (“angel-wings”), 1–11 cm long, 0.5–6.5 cm wide, palmately veined from their lateral points of attachment, arcuate, half-oval, the upper lobe somewhat rounded, the lower with a pointed tip, proximal leaflet-margins usually entire, distal margins shallowly sinuate-dentate (or lobed); **petioles** slender, glabrous, \pm caniculate, 7–60 cm tall, often apiculate-tipped (apex between

leaflets); **basal bracts** 3–8 cm long, 4–7 mm wide (much-reduced along rhizome), lanceolate, with pseudo-parallel veins and \pm fleshy (phyllodal); **rhizome** tough, branched (colony-forming), 5–12 mm broad with fibrous, matted roots. ($2n = 12$)

Intraspecific Variation: Plants of Twin-leaf are quite variable in size, some populations being dwarfed with dwarfed flowers. The leaflets may occasionally be joined into a single reniform blade (as in *J. dubia* of Asia). In forma *lobata* Clute, the leaflets are deeply marginally lobed.

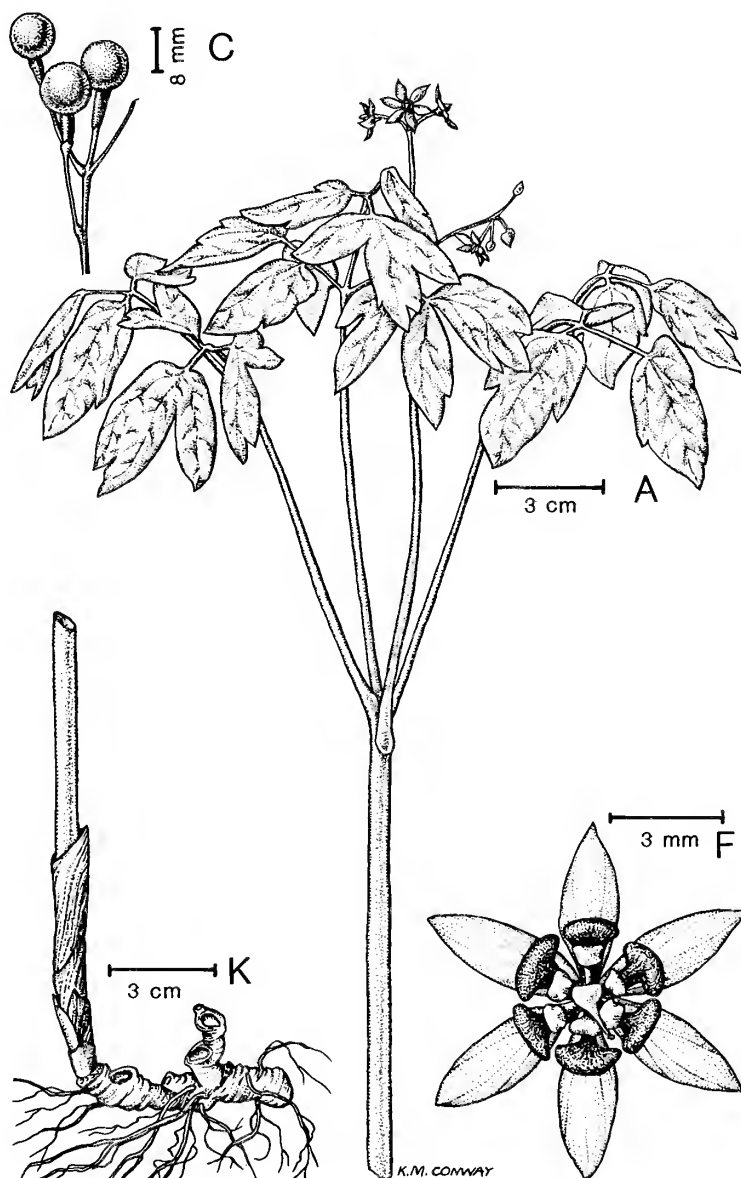
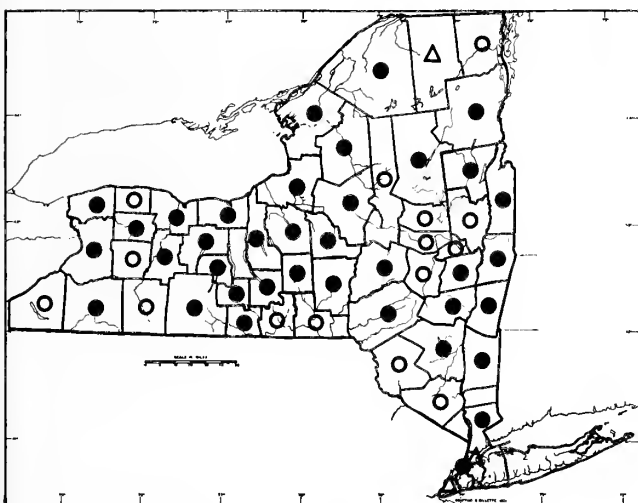
Importance: This species is a very attractive ornamental oddity, grown primarily for its foliage and unusual pod, since flowering is brief. Extract of the root is aromatic and considered to be stimulant, used in tonics and sometimes taken for rheumatism. Also, this extract has been used in folk medicine as a substitute for Snakeroot (*Aristolochia serpentaria*).

3. CAULOPHYLLUM

Common Names: Blue Cohosh, Papoose-root

Authority: Michx., Fl. Bor. Amer., vol. 1, p. 205, 1803

A genus of two species widely disjunct in eastern North America and eastern Asia. They are sometimes cultivated, but are also quite poisonous.



1. *Caulophyllum thalictroides* (L.) Michx.

Common Names: Blue Cohosh, Papoose-root, Squawroot, Blueberry-root, "Blue Ginseng"

Type Description: Linnaeus, Species Pl., p. 312, 1753

Synonym: *Leontice thalictroides* L.

Origin: Arctotertiary Forest

Habitats: Cool, moist woodlands in partial to full shade and rich soils

Habit: Erect, perennial herbs

Flowering: April–May

Seeding: June–August

General Distribution: New Brunswick & Nova Scotia to eastern Manitoba, southward in the Appalachians to Georgia

Description: Plants with **bisexual** flowers; **stigma** 1 per ovary, minute, its **unilateral** surface linear-oblong; **style** 1 per ovary, somewhat falcate, 1.1–1.5 mm long, tapering and enlarged toward the ovary; **ovary** 1 per flower, superior, ovoid and \pm gibbous, glabrous, enlarging from 2 mm at fertilization to 3–4 mm, then ruptured by the developing ovule(s); **ovules** 2, one often aborting, the other enlarging greatly on a columnar stalk, breaking through the ovary summit to become a **berry-like seed** (or both seeds developing); **seed** spheroid, 6–11 mm in diameter, the **integument** blue-purple, glaucous, the surface becoming \pm rugose with age; **endosperm** horny; **funicular stalk** pedicel-like, clavate, 5–7 mm long, stout, greenish-glaucous with a glabrous surface, attached at the **receptacle** where the **ruptured pericarp** often persists, looking much like a bract; **stamens** 6, free; **anther sacs** 1.5 mm long, clavate, dehiscing by hooded, subterminal **pores**; **filaments** ca 1 mm long, \pm flattened; **petals** (5) 6, 1.3–1.8 mm long, clawed, spatulate, with blunt, flabellate to reniform expanded tips, somewhat fleshy, dusky purple (to yellow-green); **sepals** (5) 6, petaloid (each subtending a petal), obovate to narrowly elliptic with entire to erose margins and rounded to acute tips, yellow-green with a purple blush (to deep purple or brownish); **involucre** (subtending the corolla) of 3–4 **sepaloid bracts**, linear-ovate, ca 2 mm long; **pedicels** 5–11 mm long in flower, up to 22 mm long in fruit, shallowly ribbed, often with tiny, acute-tipped **bracteoles** and **bracts**; **inflorescence** and flowers opening early with the developing leaves, paniculate or racemose, usually of 5–12 flower; **leaves** 2 or 3, borne at 2 levels, usually sessile and consisting of whorls of biternate, triternate or pinnatisect compound **leaflets**, or the lower 2 leaves subopposite; **upper leaflet whorl** usually biternate, subtending the inflorescence; **lower whorl** of several long-stalked, compound segments; **immature leaflets** dark purple or blackish-brown (also stalks) in claw-like clusters of linear, toothed segments; **mature leaflets** green, somewhat glaucous below, with obovate, cuneate or half-oval blades, 2–6 (10) cm long, 2–8 (11) cm broad, each blade usually with 1–3 (4) broad lobes with sharp sinuses, lobe tips obtuse to acute, leaflet bases obtuse to truncate, cordate or half-cordate, surfaces glabrous, glaucous; **leaf stalks** up to 25 cm long on lower whorl, ribbed glabrous; **stipules** absent; **stem** glabrous, ribbed, up to 1.4 cm thick and a meter tall; **basal bracts** often 2–6, phyllodal, imbricated, 1–9 cm long, \pm clasping the stem; **rhizome** tough, knotty, often branched, bearing the plant on an upturned **caudex** which bears bract scars of previous years; **roots** tough and thick, entangled in a mat around the **rhizome**. ($2n = 16$)

Importance: Blue Cohosh is sometimes cultivated in shady gardens, but should be avoided where it might be a hazard to children. The bitter, berry-like seeds are rich in the alkaloid Methylecystine and undetermined glycosides. Saponin from the rhizomes may cause severe gastroenteritis. It has also been shown to be an orally active smooth muscle stimulant and oxytoxic. *Caulophyllum* has also been implicated in cases of dermatitis and mucous membrane irritation. The roasted seeds are said to be safe as a coffee substitute. Extract of dried rhizomes has been used in folk medicine (small quantities) as an emenagogue, diuretic and antispasmodic.

4. BERBERIS

Common Name: Barberry

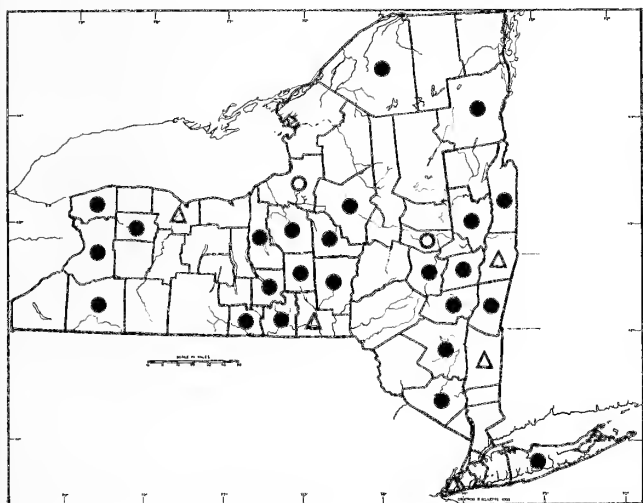
Authority: Linnaeus, Species Pl., p. 330, 1753

Berberis is a genus of over 200 species, primarily distributed in Asia and Africa. The segregate genus, *Mahonia*, differs in having compound (often spiny-margined) leaves and in lacking stem spines. New York State has two introduced species of the genus which occasionally become naturalized after escaping cultivation. The nearest native species is *B. canadensis* Mill. of the southern Appalachians. Barberries are relatively common in cultivation except in grain-growing areas. Due to their role as alternate hosts to stem rust (*Puccinia graminis*) of wheat, *B. vulgaris* and *B. canadensis* have been largely eradicated in some states. The wood, bark and berries of some species have folk uses.

Description: Plants with **bisexual** flowers; **stigma** 1, orbiculate, depressed in the center; **style** usually absent (or short); **ovary** 1, superior with 2–9 (15) erect **ovules**, becoming a several-seeded, indehiscent **berry**, usually oblong and fleshy; **seeds** lacking arils, but with crustaceous integuments, containing elongate **embryos** and albuminous **endosperm**; **stamens** 6, free; **anther** sacs opening by hinged valves; **filaments** tactile; **petals** 6, free, in 2 whorls, each subtending a stamen, margins inrolled, 2 glandular structures at the base, just above the short petal claw; **sepals** usually 6, petaloid, yellowish; **floral bracts** 2–3, small, subtending the calyx directly; **pedicels** slender; **inflorescence** of few to many flowers borne in racemes or umbels (sometimes solitary) from short, **bracteate** shoots; **leaves** simple (excluding *Mahonia*) \pm spatulate, articulated near the base, borne in fascicles on short shoots in the axils of branched or unbranched spines (rarely spineless); **stems** shrubby with arched branches and yellow inner bark and wood, up to 3 (6) meters tall from fibrous root systems.

KEY TO SPECIES OF BERBERIS

1. Mature leaves with toothed margins; flowers and fruits borne in elongate racemes; some spines forked.....1. *Berberis vulgaris* (p. 7)
1. Mature leaves with entire margins; flowers and fruits borne singly or in small umbels; spines unbranched.....2. *Berberis thunbergii* (p. 9)



1. *Berberis vulgaris* L.

Common Names: Common Barberry, European Barberry, Jaundice-berry, Piprage

Type Description: Linnaeus, Species Pl., p. 330, 1753

Origin: Eastern Europe

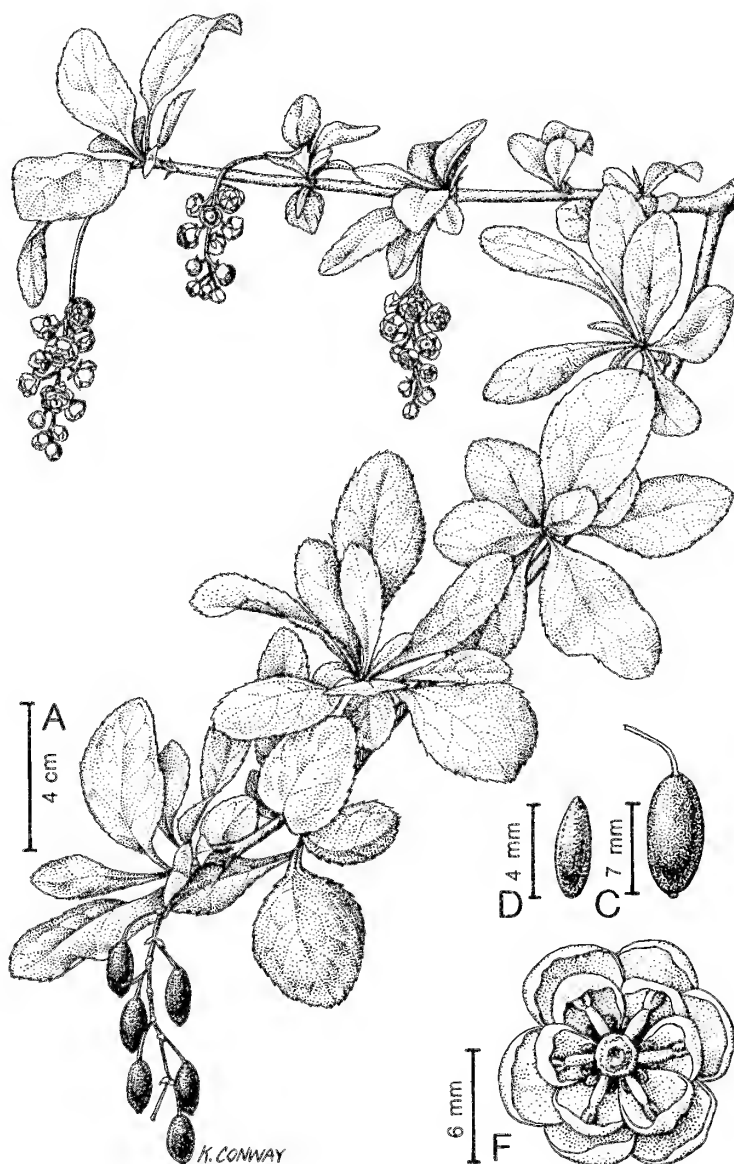
Habitats: Thickets, roadsides, waste places, fencerows and woodland borders, as an escape from cultivation

Habit: Profusely-branching, deciduous shrubs

Flowering: May–June

Fruiting: June, persisting year-round

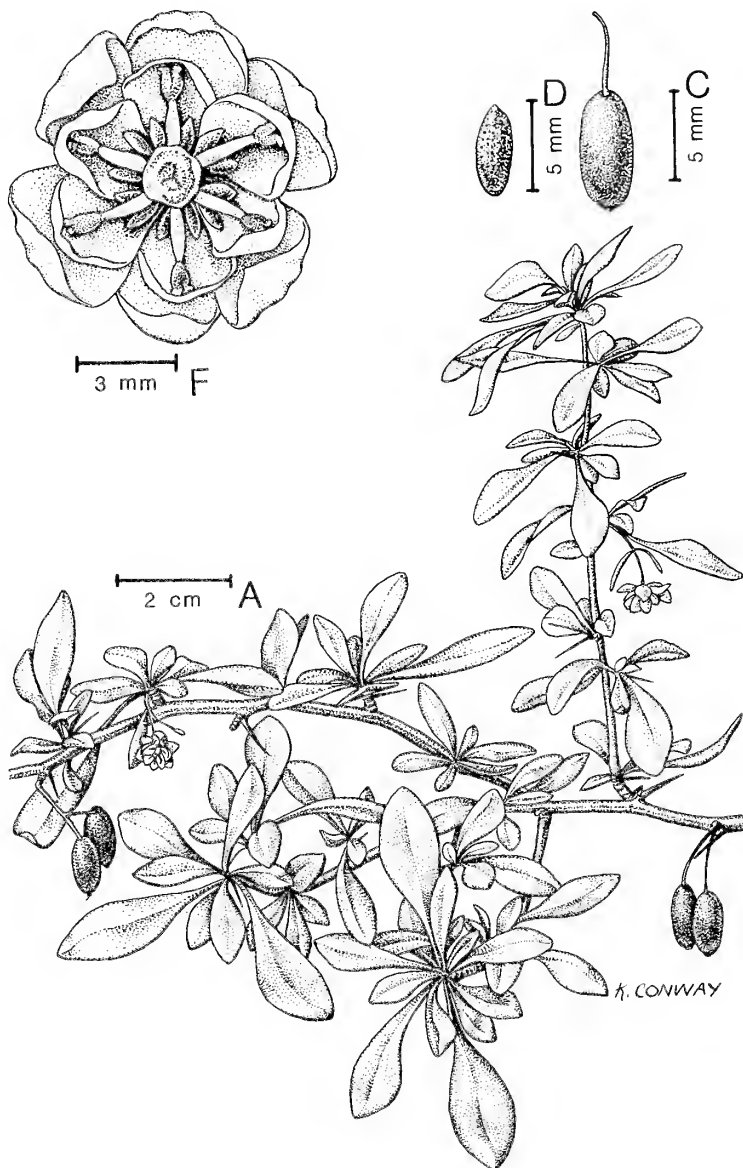
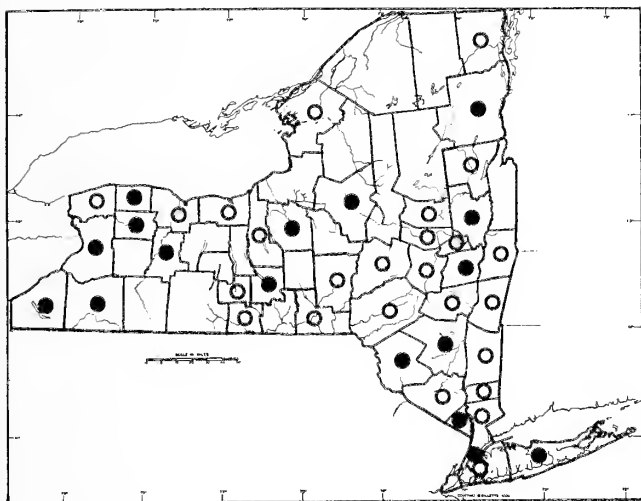
General Distribution: Escaping in temperate climates; a native of Eurasia



Description: Plants with **bisexual** flowers; **stigma** 1 per ovary, discoid, \pm concave in the center, ca 1.5 mm broad, 0.3 mm thick, the surface rugose, margins overlapping the ovary tip, persistent in fruit; **style absent**; **ovary** 1 per flower, 1.9–2.4 mm long, ca 1 mm wide, cylindric, several-ovuled, becoming an elliptic to subglobose **berry** in fruit, 7–12 mm long, 5–9 mm wide, glossy scarlet to dark red; **seeds** often 2–6 per fruit, ca 4 mm long, ellipsoid-clavate and somewhat curved with wrinkled surfaces; **stamens** 6; **anther** sacs opening by conspicuous valves; **filaments** fleshy \pm clavate, ca 2 mm long; **petals** 6, free, each subtending a stamen, creamy yellow, 3–4 mm long, 2–3 mm wide, each with 2 elongate, abaxial **glands** ca 1 mm long at the base, (petals) cucullate, obovate with entire to minutely erose margins; **sepals** 6, free, petaloid, cream yellow to greenish, ovoid-cucullate, 4–5 mm in diameter; **bracts** 2–4 (6), yellow-green, 1.5–2.5 mm long, 0.5–1.5 mm wide, obtuse to acute tipped with entire margins; **pedicels** 5–8 mm long \pm caniculate, each subtended by a minute, lanceolate **bract**; **inflorescences** dense, axillary cymes 3–6 cm long, usually of 12–15 flowers; **peduncle** of the inflorescence 1–1.5 cm long borne on short-shoots, smooth or very obscurely ribbed, flattened, occasionally with 1 or 2 **naked bracts** of the type that subtend pedicels; **leaves** borne in fascicles, tightly spiraling (on short-shoots), 2.5–6 (8) cm long, 0.8–2.8 cm wide, obovate, with rounded to obtuse tips and attenuate bases, the margins profusely serrulate-toothed, each tooth tipped with a flexuous spine ca 1 mm long, the revolute margin of the leaf contiguous with the spines, leaf surfaces green to red-purple, glabrous, the lower with a prominent network of reticulate veins; **petioles** glabrous, \pm winged toward the blade, up to 1.5 cm long, conspicuously **jointed** near the base, the 2–3 mm below the joint expanded and sheathing, persistent on the short-shoot; **short-shoots** bearing both leaves and inflorescences, varying in length with age, usually less than 1 cm long, 4–5 mm wide, sheathed in the tightly spiraling petiole bases of dropped leaves; **spines** present at the base of short-shoots (or absent) greenish to shiny red-brown at maturity, each with a tough expanded base and 2–3 spine branches at the tip (or single), **spine branches** mostly 4–10 mm long; **twigs** and **stems** furrowed with grayish-brown to chalky **bark** which peels away in thin, coriaceous strips; plants branching freely, forming erect to bushy-sprawling shrubs up to 2 (3) meters tall, from dense **root systems**. ($2n = 28$)

Hybridization: Although it has not been reported from New York State, *Berberis x ottawensis* Schneid. is thought to be the natural hybrid of *B. vulgaris* and *B. thunbergii* DC., and might be expected where the two species occur together.

Importance: Common Barberry is best known as an enemy of the wheat farmer, since it may serve as alternate host of the devastating rust, *Puccinia graminis*. Eradication programs have been implemented in agricultural areas of the midwestern United States and Canada with considerable success. In New York State the plants may be found in cultivation and naturalized, but they are less commonly grown than the Japanese Barberry (*B. thunbergii*). The berries are suitable for making jelly, wine and pies. The yellow wood has been used in furniture inlay and extracted for a yellow dye for wool and leather. The wood and bark are also sources of Berberine, a broad-spectrum antibiotic. In folk medicine, a tonic from the bark or roots is said to be alterative, but could be dangerous in quantity.



2. *Berberis thunbergii* DC.

Common Name: Japanese Barberry

Type Description: De Candolle, Syst. vol. 3, p. 9, 1821

Synonym: *B. vulgare* of Kew Index not L. (in part)

Origin: Eastern Asia

Habitats: Fencerows, thickets, old fields and waste places as an escape

Habit: Much-branched, deciduous shrubs

Flowering: Late April–May

Fruiting: June–October (may persist year-around)

General Distribution: Escaping circumboreally in temperate climates; a native of Japan

Description: Plants with bisexual flowers; stigma 1 per ovary, discoid, \pm concave in the center, ca 1.5 mm broad, 0.4 mm thick, the surface rugose, margins overlapping the ovary tip, persistent in fruit; style absent; ovary 1 per flower, 1.5–2 mm long, ca 1 mm wide, broadly cylindric with 2–several ovules, becoming a tough, ellipsoid to subglobose, red berry in fruit, 7–10 mm long, 6–8 mm wide, glossy, smooth; seeds 1 or 2 (–4), elongate-elliptic, 5–6 mm long, 2.8–3 mm wide, often with a flattened side, surface rugose to papillose; stamens 6; anther sacs opening by valves; filaments thick, ca 1.5 mm long; petals 6, free, each subtending a stamen, creamy-yellow ca 3 mm long and broad, ovate-cucullate with entire margins, with basal glands ca 0.7 mm long; sepals 6, free, petaloid, ovate-cucullate yellowish with a blush of red, 3–4 mm long and broad; bracts subtending the calyx 2–4, strap-like, reddish-tinged, ca 2 mm long; pedicels glabrous, finely ribbed, 4–10 mm long, each with a minute, subulate bract at base; flowers borne on short-shoots, singly, paired or in umbellate inflorescences of 3 (–5) flowers; peduncle of inflorescence slender, ribbed, glabrous, 3–8 mm long (or absent on single flowers); leaves borne in fascicles, tightly spiraling on the short-shoots, 0.5–2.5 (3.5) cm long, 2–18 mm wide, entire, spatulate to obovate with rounded to obtuse tips, margins \pm revolute, surfaces glabrous, green to red-purple, blade gradually attenuated to an indistinct petiole, except in the basal 2 mm where it is unwinged and obscurely jointed; short-shoots bearing both leaves and inflorescences, 2–5 mm long and broad, sheathed in the spiraling, expanded petiole bases of leaves of former seasons, reddish to gray-brown; spines present at the bases of short-shoots or with their buds in the axils, 5–8 (11) mm long, with tough, expanded bases, the spine usually unbranched, with small,

abortive lateral spines at the junction with its sheathing base; **twigs** and **stems** deeply furrowed, greenish when young to red-brown, the **bark** stripping, dark brown to nearly black; **wood** yellow; plants profusely divaricately **branching**, up to 2.5 meters tall, from a dense **root** system. ($2n = 18$)

Intraspecific Variation and Hybridization: This species has a number of cultivated forms. Among them are color and growth-form mutants including the diminutive cv. **Minor** (Box Barberry) and the narrow, upright cv. **Erecta** (True-hedge Column-berry). The hybrid of *B. thunbergii* and *B. vulgaris* (*B.x ottawensis*) has not been reported from New York State.

Importance. This species is widely cultivated and can occasionally become a noxious weed of abandoned fields and fencerows.

Lardizabalaceae (Lardizabala Family)

A family of about 6 genera and 30 species of vines (rarely shrubs) native to eastern Asia and western South America. In the United States those cultivated are: *Akebia*, *Lardizabala*, *Decaisnia*, and *Stauntonia*. By far the most commonly cultivated species is *Akebia quinata*, which is relatively hardy and may escape as far north as eastern Canada. Fruits of members of this family are often edible.

FAMILY DESCRIPTION

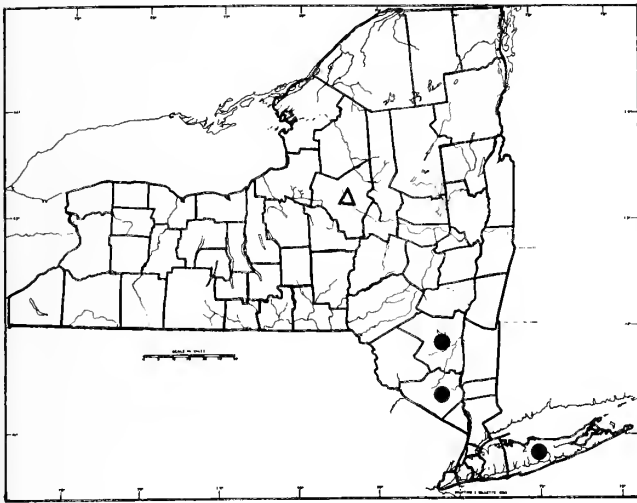
The plants are usually monoecious or dioecious woody vines with alternate leaves which are palmately compound (*Decaisnia*, the exception, is a shrub with bisexual flowers and pinnately compound leaves). The perianth may consist of one or two whorls and may differ in size or coloration between male and female flowers. Perianth parts are free, in whorls of threes, including such reduced series as petaloid nectaries. When petals are absent or reduced, sepals are often petaloid; stamens are 6, free or basally united. There are 3–15 free ovaries, each with (1) 2 to many ovules, parietal placentation and a single sub-sessile stigma. The fruits are berries or fleshy follicles which dehisce along a single ventral suture. The embryo is small, straight and embedded in fleshy endosperm.

1. AKEBIA

Common Names; Five-leaf, Three-leaf Akebia, Chocolate Vine

Authority: Decne., Arch. Mus. Hist. Nat., Paris, vol. 1, p. 195, 1839.

A genus of two species of vines, native to China, Japan and Korea. In addition to the following species, the Three-leaf Akebia, *A. trifoliata* (Thunb.) Koidz., is cultivated, but not known to escape in New York State.



1. *Akebia quinata* (Houtt. ex Thunb.) Decne.

Common Names: Five-leaf Akebia, Five-leaf, Chocolate Vine

Type Description: Houtt., in Thunb. Fl. Jap., p. 148, 1784

Synonyms: *Akebia lobata* (Houtt. ex Thunb.) Decne., *Rajania quinata* Houtt. ex Thunb.

Origin: Eastern Asia

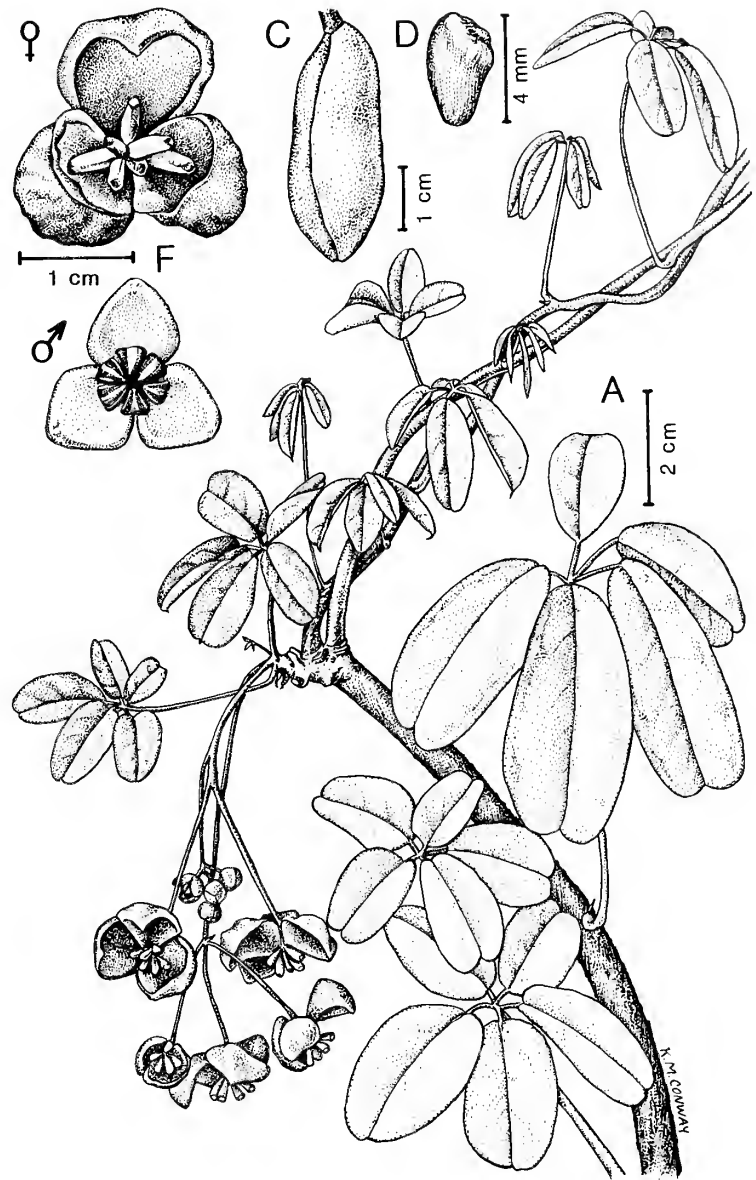
Habitats: Thickets, vacant lot borders, waste places and clearings as an escape from cultivation

Habit: High-climbing, perennial, semi-evergreen vines

Flowering: May–June

Fruiting: July–September

General Distribution: A sporadic escape from cultivation in North America; native to eastern Asia



Description: Plants **monoecious**; **female flowers**: stigma 1 per ovary, cleft and bilabiate, 1.0–1.5 mm broad, glossy purple-brown; **style absent**; **ovaries** usually 4–6 per flower, free, superior, cylindric, 3–5 mm long, 1–2 mm wide, often arched and divergent, 1-loculed, 1-carpelled, 1 to 2 ovaries per flower maturing into large, fleshy, berry-like **follicles**, (follicle) up to 8 cm long and 4 cm wide, compressed dorsiventrally, oblong, purse-like, dehiscing along an adaxial suture, purple or creamy, blotched with purple, glaucous with a juicy, yellow-green fleshy **endocarp**, bearing a cylindric, parietal **placenta** with numerous **seeds**; **rudimentary anthers** 0–6, minute, less than 1 mm long; **trapezoidal** to narrowly tapered toward their blunt tips; **petals absent**; **perianth** (female flowers) of 3 petaloid, free **sepals**, dusky purple, strongly cucullate, often with slightly reflexed margins, 7–12 (14) mm long, 5–9 (12) mm broad; **receptacle** becoming enlarged, woody, jointed to the fruit; **male flowers**: **ovaries absent** or represented by sterile tissue; **stamens** 6, free at base, 2.5–3.5 mm long; **anther sacs** comprising most of the length of the stamens, falcate, inwardly arched to form a turbinate androecium, purplish, dehiscing first by pores, then extrorsely valved; **filaments** minute, flattened; **petals absent**; **perianth** (male flowers) of 3 petaloid **sepals**, free, rose-purple to dusky-purple, flat to weakly cucullate, ovate to triangular-obtuse, 3–6 mm long, 2–5 mm wide, **receptacle** not enlarging; **inflorescence** a cyme-like, few-flowered panicle, usually with 3–8 male flowers borne terminally and 2–4 female flowers attached below; **pedicels** slender, glabrous, ribbed, yellow-green, 1–5 long in male flowers, up to 22 mm long in female flowers, placing them in

proximity with the males; **pedicels** subtended by linear, pellucid bracts, ca 1 mm long; **peduncles** mostly 1–2 cm long, borne singly or several per node, subtended by broad coriaceous **bracts** at the nodes; **leaves** compound, 5-palmately divided; **very young leaflets** linear-lanceolate, strongly apiculate; **mature leaflets** broadly oval to oblanceolate, emarginate or rounded, often with a tiny, reflexed apiculation persisting at the tip, obtuse to acuminate at base, 1.5–5.5 (7) cm long, 0.6–3.2 (4) cm broad, glabrous; **petiolules** glabrous, 1–10 mm long, somewhat ribbed or winged; **petioles** slender, glabrous, ribbed, up to 15 cm long, slightly expanded at bases; **stipules absent**; **bud scales** broad, oval to triangular-acute, coriaceous; **nodes** enlarged, woody; **internodes** smooth or ribbed when young, becoming dotted with oval, protuberant **lenticels**, eventually forming **bark** which is yellowish to red-brown, splitting longitudinally, becoming charcoal to grayish and fibrous on older **stems**; stems twining and climbing up to 15 meters or more from a fibrous, perennial **rootstock**. ($2n = 32$)

Importance: This vine is attractive and easily propagated by stem or root cuttings; seeds usually are set only after hand pollination. It is widely cultivated, but may spread aggressively and escape. The gelatinous pulp of the fruit is eaten in countries where the plant is native. The leaves are also extracted to make a tea, and young shoots are woven into baskets in Japan.

Menispermaceae (Moonseed Family)

This large group is primarily tropical and absent from Europe. It comprises up to 80 genera and 400 species, depending upon the authority consulted, but probably has far fewer defensible taxa. The plants are usually dioecious vines. This family has historically been included under Magnoliaceae, Berberidaceae and Annonaceae. In North America, north of Mexico, the representatives are: *Cocculus* (2 spp.) in southern states, *Cissampelos* (1 sp.) from Florida, *Calycocarpum* (1 sp.) from the south and midwest, and *Menispermum* (1 sp.) from the eastern U.S. and adjacent Canada. Over 100 alkaloids have been extracted from members of the family, about $\frac{2}{3}$ of which are not found outside Menispermaceae. A number of species, including *Menispermum canadense* L. are known to be poisonous. The root extract of a tropical genus, *Chondrodendron*, yields curare—used locally as a coating to poison darts and arrowheads. In medicine curare is used in controlled doses to paralyze skeletal muscles temporarily during surgery.

FAMILY DESCRIPTION

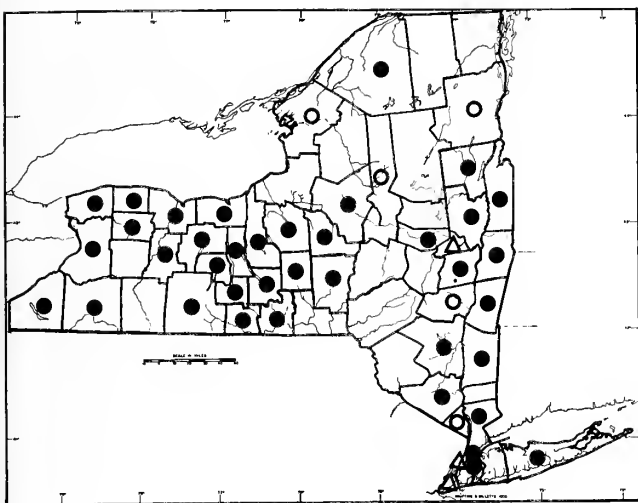
Members of this family are primarily dioecious, woody vines (rarely shrubs or trees). Leaves are alternate, simple (or trifoliate), entire to deeply palmately cleft and estipulate. The unisexual flowers are small and greenish with both calyx and corolla usually present and 6-parted. Stamens are 3 to many, often 6, free or connate at base (sometimes monodelphous). Ovaries are unfused, superior, 3–6 per flower, each a one-loculed carpel; placentation is parietal. The stigma is capitate or discoid, often scalloped or lobed. The fruit is a drupe or achene. Seeds contain a curved embryo, with or without endosperm.

1. MENISPERMUM

Common Names: Moonseed, Yellow Parilla

Authority: Linnaeus, Species Pl., p. 340, 1753

Menispermum is a genus with one species in eastern North America (*M. canadense*) and one in eastern Asia (*M. dahuricum* DC.), a classic pattern of Arctotertiary disjunction. These may constitute a single species, but require further study. Moonseed is cultivated and may be dangerous to children, since the grape-like fruits are poisonous.



1. *Menispermum canadense* L.

Common Names: Moonseed, Yellow Parilla, "Texas Sarsaparilla"

Type Description: Linnaeus, Species Pl., p. 340, 1753

Synonyms: *Menispermum angulatum* Moench, *M. virginicum* Willd., *M. mexicanum* Rose

Origin: Arctotertiary Forest

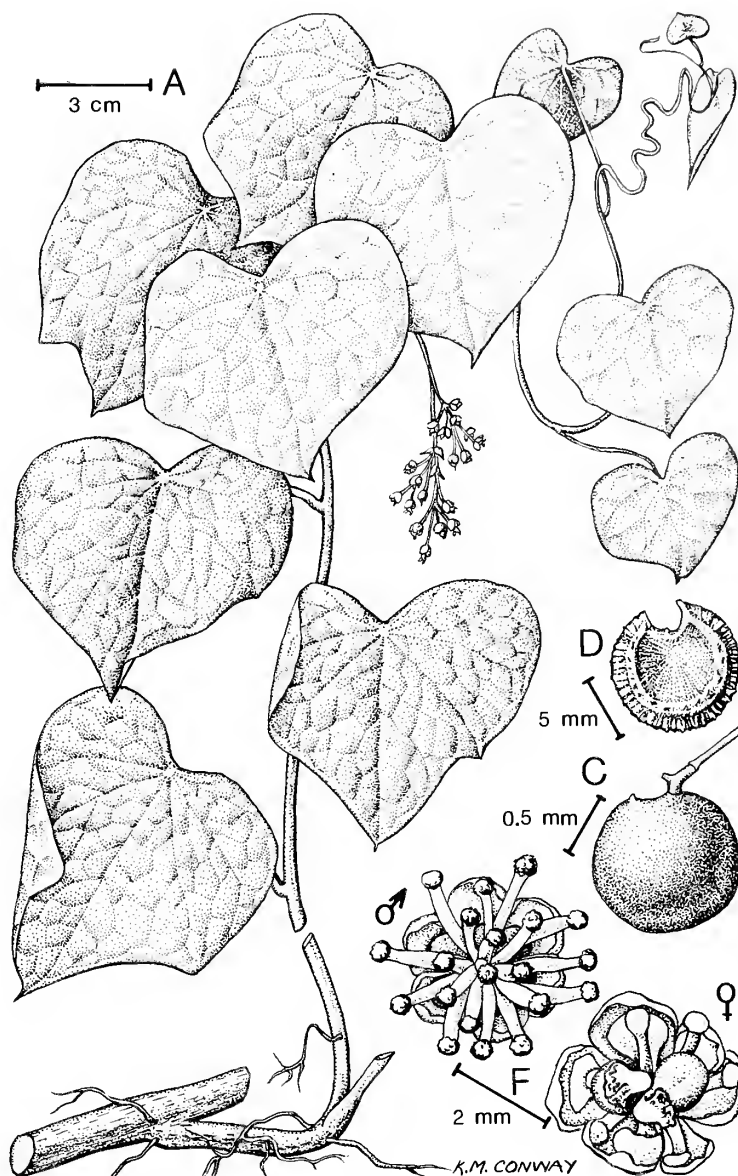
Habitats: Woods and thickets, especially moist bottomlands and streambanks

Habit: Perennial vines

Flowering: June—July

Fruiting: July—September

General Distribution: Western Quebec and New England to Georgia and west to Oklahoma



Description: Plants dioecious; female flowers: stigma 1 per ovary, ca 0.2 mm wide, rotate with minutely scalloped margins; style short, reflexed outward; ovaries 2 (4), reniform, ca 1 mm long, the abaxial surface convex, each ovary becoming a fleshy, glaucous **drupe**, 1.1–1.4 cm in diameter, subglobose, but developing unevenly to leave the stigma displaced laterally as a small protuberance 2–4 mm from the fruit base, fruit color dark purple to black; ovules 2, one aborting, the other becoming a crescent-shaped **seed**, 7–9 mm in diameter, laterally compressed, ca 3 mm wide with 3 prominent ridges along the outer perimeter, their walls with spiny ribs and furrows; embryo curved within an albuminous **endosperm**; staminodes usually 6, 1.0–1.5 mm long, each composed of a thick filament and bulbous tip; petals 4–8, free, ovate, greenish-white, 1.5–1.8 mm long, ca 0.8 mm wide; sepals 4–8, free, ovate, greenish-white, 1.7–2.1 mm long, ca 1 mm wide; male flowers: ovaries absent; stamens 12–24, from 2.0–2.5 mm long; anther sacs globose; filaments fleshy, free at base; petals 2–6, greenish, lanceolate, ca 1.5 mm long, 0–4 mm wide; sepals greenish, 4–8, ovate, ca 2 mm long, 1 mm wide; inflorescences 3–9 cm long, axillary panicles; pedicels 1–3 mm long (up to 1 cm in fruit), ribbed, glabrous or with a few pilose hairs; foliar bracts subtending pedicels and peduncles, linear-lanceolate, 1–2 (4) mm long with ciliate margins; peduncles and rachises shallowly ribbed, often sparsely villous; leaves oval with cuspidate tips when young, becoming shallowly (to deeply) 3–7 (9) lobed, the lobes rounded to acute-tipped at maturity, often with a residual apiculation, leaf bases truncate to

cordate (peltate), upper surfaces bright green, very sparsely short-villous, lower surfaces pale to gray-green, sparsely to moderately villous, mature leaves up to 20 (30) cm broad, obscurely peltate, the **petioles** attached near the basal leaf margins, elongating with age becoming up to 20 (25) cm in length, ribbed and sparsely villous, often twisted; stems twining, reddish-brown, ribbed, sparsely to densely arachnoid-villous, especially near the growing tips, climbing up to 6 meters from a tough, fibrous **root system**. (2n = 52)

Importance: Like other members of its family, this species is occasionally cultivated, primarily for its foliage and climbing habit, and it may escape. It is a poisonous plant, the toxic principles being isoquinoline alkaloids (including Dauricine) with an action much like curare. There are reported cases of convulsion, paralysis and death in children after they ingested the grape-like fruits. The fruits are, however, not apparently injurious to birds for which they serve as food. It is a common phenomenon for birds to thrive on fruits or seeds which are poisonous to mammals, and they should never be used as indicators of the edibility of plant materials for humans.

Papaveraceae (Poppy Family)

The Papaveraceae: a family of some 25 genera and over 200 species worldwide. The plants are mostly herbaceous, often with showy flowers, and a number of the genera are important horticulturally. The species treated here are mostly naturalized after escape from cultivation, since Bloodroot (*Sanguinaria canadensis* L.) is the only member of the family native to the state. The largest genus of the family is that of true poppies, *Papaver*, with 60–80 species. In addition to their usefulness as ornamentals, poppies and their relatives are valuable sources of alkaloids. The best known of these is Opium Poppy (*Papaver somniferum* L.), whose seeds also have commercial uses. Members of Papaveraceae are most common and prolific in southern, dry climates, but range to boreal and arctic habitats. Mediterranean climatic zones of southern Europe and the west coast of the U. S. and Mexico are particularly rich in members of the poppy family.

FAMILY DESCRIPTION

Herbs or rarely shrubs or trees with milky sap (to watery), often with latex and characteristically containing isoquinoline alkaloids. Plants annual, biennial or perennial with unbranched or branched stems or scapose from rhizomes or caudices. Leaves are usually alternate, but may be paired or whorled near the branch tips; they are often divided or lobed and cut, but may be entire. Plants are glabrous to densely pubescent, and may have setae or spiny armature. Flowers are bisexual, usually showy and brightly colored, solitary or in panicate or umbellate clusters. The calyx is of 2–4 distinct sepals which enclose the bud and usually drop with the opening of the flower. The corolla is of 4–6 or 8–12 petals (rarely absent) which are distinct or very slightly fused at base. Stamens are 4 to many, centripetal, usually numerous with 2-celled anthers. Filaments are slender, clavate or alate-petaloid. Ovary 1, superior, of 2 to many carpels, but unilocular (some genera have septations which break down in fruit development). Styles are very short, usually obsolete; stigmas are (1) 2–18 or more, corresponding with carpel number. They may be fused into a persistent radiate disc which caps the fruit. The fruits are various types of capsules (or rarely follicles), dehiscent by valves, sutures or indehiscent. Placentation is parietal, and each capsule usually bears many seeds. Seeds are quite varied in color, shape, reticulations, caruncles, aril types, etc. They contain small embryos and albuminous, oily or mealy endosperm.

KEY TO GENERA

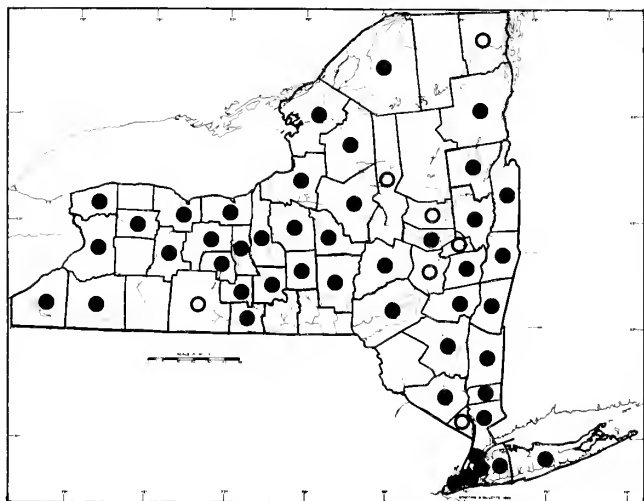
1. Perianth of 2 creamy, petaloid sepals; petals absent; flowers in a much-branched, terminal panicle.....4. *Macleaya* (p. 21)
1. Perianth of 2 or more whorls of unlike parts; petals present; flowers borne singly or in small, umbellate clusters(2)
 2. Plants acaulescent, the leaves and flowering scapes borne directly from a rhizome; leaves palmately veined1. *Sanguinaria* (p. 16)
 2. Plants caulescent, the leaves and flowers borne on above-ground stems; leaves pinnately veined(3)
3. Leaves multifid with linear segments5. *Eschscholzia* (p. 23)
3. Leaves not multifid, but lobed, pinnatisect or entire(4)
 4. Capsules more than 10 times longer than broad(6)
 4. Capsules no more than 5 times longer than broad(5)
5. Leaves spiny; capsule opening by 4–6 valves7. *Argemone* (p. 34)
5. Leaves not spiny; capsule opening by pores or indehiscent6. *Papaver* (p. 24)
 6. Petals 1 cm long or less; flowers in umbellate clusters2. *Chelidonium* (p. 17)
 6. Petals 2 cm long or more; flowers solitary3. *Glaucium* (p. 20)

1. SANGUINARIA

Common Names: Bloodroot, Puccoon.

Authority: Linnaeus, Species Pl., p. 505, 1753

A North American genus with a single species, but very closely related to the eastern Asian genus *Eomecon*, which should possibly be included in *Sanguinaria*. The single species of *Eomecon* differs from *S. canadensis* in having the sepals fused. It is also pubescent with cordate leaves and more than one flower per scape; however, *Sanguinaria* also will occasionally have two or more flowers in a bracteate inflorescence, suggesting common ancestry.



1. *Sanguinaria canadensis* L.

Common Names: Bloodroot, Puccoon, Puccoon-root, Red Puccoon, White Puccoon, Tetterswort, Indian-paint, Red-root, Corn-root, Pauson, Sweet-slumber, Snake-bite, "Turmeric"

Type Description: Linnaeus, Species Pl., p. 505, 1753

Synonyms: *Sanguinaria acaulis* Moench., *S. vernalis* Salisb., *S. dilleniana* Greene

Origin: Arctotertiary Forest

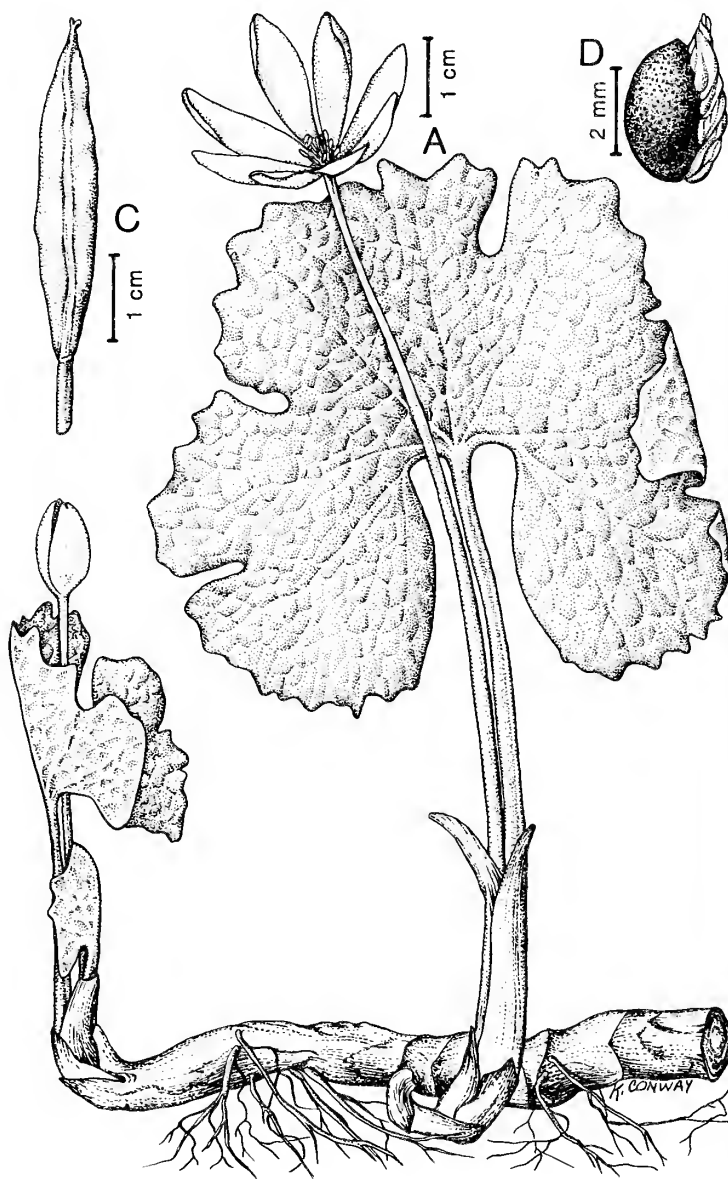
Habitats: Rich woods, often alluvial soils in calcareous places

Habit: Acaulescent, scapose, perennial herbs

Flowering: April–May (NY)

Fruiting: May–June (July)

General Distribution: Nova Scotia to Manitoba, west to Kansas and south to e. Texas and northern Florida



Description: Plants with bisexual flowers; stigma strongly 2-lobed, 1–2 mm in diameter, persistent; style narrowly-cylindric, contiguous with the ovary, up to 1.5 mm long in fruit; ovary fusiform, 4–7 mm long, 2–3 mm wide, glabrous, becoming an elliptic-fusiform capsule which is brown, glabrous, glaucous, 2.5–4.5 (6) cm long (excluding style) 0.8–1.5 cm wide, 2-valved, acropetally dehiscent along 2 sutures, the valves not dropping, unilocular with 2 placentae, capsule base often somewhat stipitate at maturity; seeds numerous, obovate, 3.2–3.7 mm long, 2.2–2.8 mm wide (excluding aril) with a basal nipple, greenish-tan when immature, becoming rich rust-red to dark red-brown at maturity, the seedcoat minutely and irregularly pitted-reticulate; aril creamy-golden, crested and wing-like, often longer than the seed (up to 4.2 mm); stamens 14–30, varying in length; anther sacs oblong, 2–4 mm long, golden; filaments 3–11 mm long, slender; petals free, usually 8 (6–12), in 2 or more series, narrowly oblong

to elliptic or spatulate, entire (rarely lobed) 1–2 (3) cm long, 0.4–1.2 (1.6) cm wide, white to creamy (pink); **sepals** 2, membranous, glabrous, cucullate, often notched irregularly at apex, 1.0–1.5 cm long, early deciduous; **flower** borne singly, scapose (very rarely 2–3 pedicillate flowers with bracts); **scape** naked, slightly ribbed, glabrous, 10–20 (35) cm tall; **leaves** 1 per node, arising from near ground level, each associated with a stipe, enfolding the bud when young, growing throughout the season and changing shape from cordate-ovate to broadly reniform at maturity, up to 20 cm long, 30 cm wide with large, irregular dentations and crenations as well as incisions with rounded sinuses which make the blade palmately lobed (also palmately veined), blade tip rounded, basal lobes cordate to sagittate, leaf surfaces glabrous, the lower surface pale green to conspicuously glaucous (especially when young); mature **petioles** up to 35 (45) cm tall, ribbed, glabrescent, subtended by 2–6 ovate to lanceolate **bracts**, often with falcate, emarginate or obtuse tips, partially sheathing, membranous, 0.5–10.5 cm long, 5–12 mm wide, with pseudo-parallel veins; **stems** consisting only of tough, branching **rhizomes** 5–20 mm in diameter with fibrous **roots** and orange-red **sap**. ($2n = 18$)

Intraspecific Variation: Plants of this species vary in the degree of leaf lobing and in their size, color and glaucousness, as well as the length and branching of the rhizome; fruiting stipes may overtop the leaves or not. Variety *rotundifolia* (Greene) Fedde combines some variations of these features with large, undulate, practically uncut leaves, and probably deserves recognition as a clinal, southern race at best. Flower color varies from white to pink, and the cultivar Multiplex, has numerous petals replacing the stamens and ovary. These variations have been found on numerous occasions, and their discovery in the wild usually generates some colorful horticultural literature. Multiplex has also been called var. *plena* Barcl. as well as cv. “Flore Pleno” in the past.

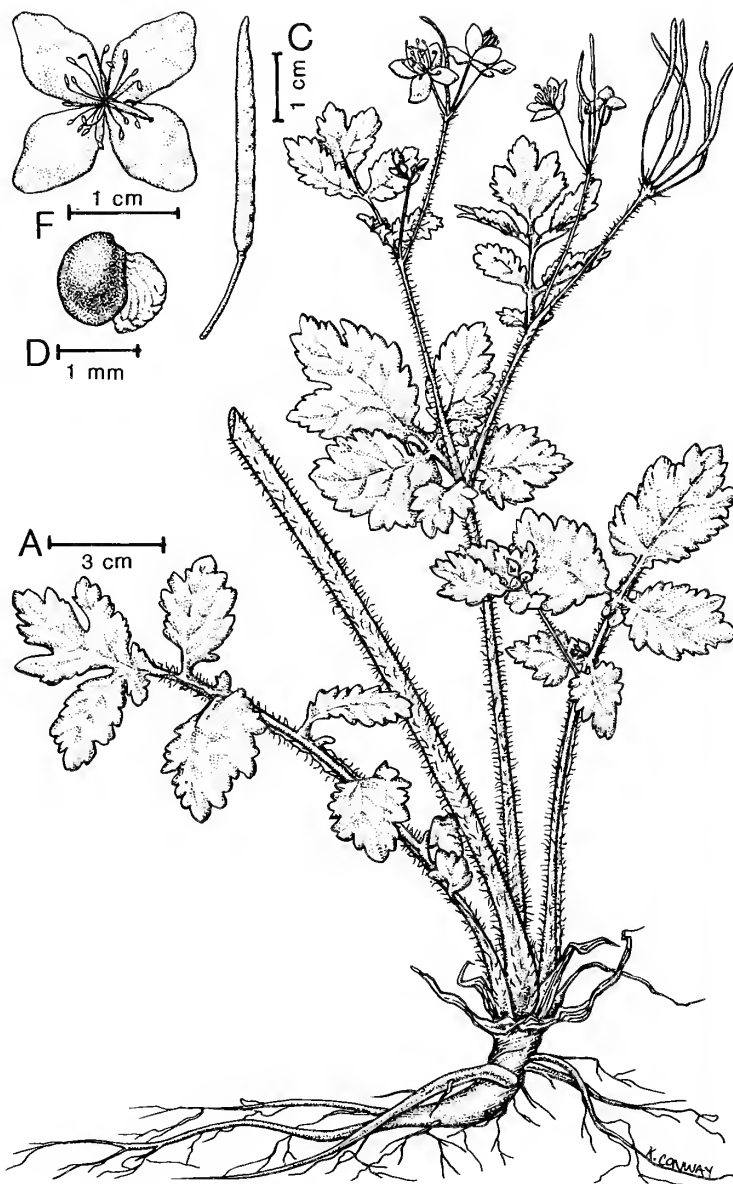
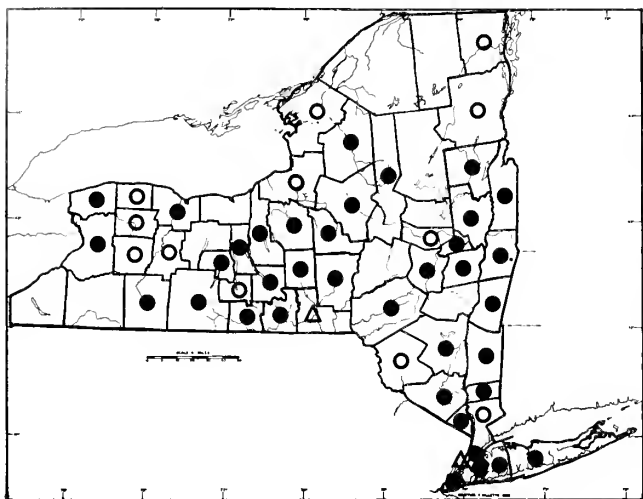
Importance: *Sanguinaria* is potentially poisonous, but not well documented as a threat to man or livestock. The plants contain isoquinoline alkaloids, of which Sanguinarine, named for the genus, has been investigated as a poisoning agent from *Argemone*. The generic name comes from the blood-like appearance of the juice, which was used by American Indians as a facial stain. Medicinal use has been quite varied: early North American settlers used a tea of Bloodroot to gargle for sore throat, while a similar solution was used by the Native Americans of the Mississippi Valley as an internal treatment of rheumatism. In quantity or undiluted solution the Sanguinarine is emetic, causing vomiting and diarrhea and possible shock, fainting and coma. The extract of powdered rhizome became popular in medicine during the early 19th century, especially in Europe, and it is still a common medicine in Russia. British doctors developed a flour paste with *Sanguinaria* extract and zinc chloride which was used to treat various warts, polyps and superficial cancers of the nose and skin. It was applied after erosion of the tumor with acid. This practice fell into disrepute until more recent studies showed Sanguinarine and Chelerythrine from the plants to be active against types of carcinoma and sarcoma in mice. A revival and refinement of 19th century techniques is now used with considerable success against certain carcinomas in humans and pets. Protopine, known from this and other genera of the family, shows bradycardial action. These plants are popular in cultivation, being easily propagated by rhizome cuttings. They are prized in Europe where they are not native.

2. CHELIDONIUM

Common Names: Celandine, Swallow-wort

Authority: Linnaeus, Species Pl., p. 505, 1753

A genus with a single species, though species from other genera have historically been included in it. *Chelidonium majus* L. is a common weed in northeastern North America and in Eurasia including areas of Europe where it is also native. The acrid, yellow-orange juice is used medicinally and may be poisonous when undiluted.



1. *Chelidonium majus* L.

Common Names: Greater Celandine, Celandine, Swallow-wort, Rock-poppy Tetter-wort, Kill-wort, Wart-wort

Type Description: Linnaeus, Species Pl., p. 505, 1753

Origin: Europe

Habitats: Roadsides, yards and walls, moist waste places and disturbed woodlands as an escape from cultivation; now firmly naturalized

Habit: Erect and spreading biennial or perennial herbs

Flowering: April–August

Fruiting: May–October

General Distribution: Naturalized over most of the eastern United States and Canada; native and ubiquitous in Eurasia

Description: Plants with bisexual flowers; stigma 1, with 2 rough faces outwardly directed ca 45° from vertical (roof-like), persistent in fruit, not enlarging; style 0.8–1.1 mm long, cylindric, glabrous, persistent; ovary 1 per flower, superior, linear-cylindric, 4–7 mm long, ca 0.5 mm wide, becoming a linear capsule, glabrous, 2–4 (5) cm long, 2–3 (4) mm wide, straight or slightly curved, brown to tan at maturity, dehiscent from the base upward along sutures associated with two slender ribs, the valves eventually curling and falling away; seeds borne in two rows, few to numerous, 1.2–1.7 mm long, 0.7–1.0 mm wide (excluding the aril) ellipsoid, slightly flattened on one side, reticulate, shiny, red-brown, the aril plump, crested, wing-like, 0.5–1.8 mm long, creamy-golden; stamens 4–15 or more, yellow, 4–6 mm long; anther sacs elliptic, ca 1.5 mm long; filaments slender but expanded upward; petals 4 in two pairs, 7–11 (17) mm long, 5–9 (14) mm wide, elliptic to narrowly ovoid, bright yellow (creamy or orange-yellow); sepals 2, enclosing the bud, early-deciduous, yellow-green ca 8 mm long, glabrous or with a very few villous trichomes; inflorescences near the branch tips, stalked umbels, usually 3–6 flowered; pedicels slender, often glabrous and somewhat ribbed, elongating up to 3 cm in fruit; bracts at the pedicel bases minute, glabrous or ciliate; peduncle of the umbel 3–5 (7) cm long, glabrous to sparsely villous, strongly grooved; leaves glaucous, sparsely villous to almost glabrous, deeply 5–7 (or more) pinnatifid with variously lobed and dentate (rarely lacinate) margins on the broad, rounded lobes; cauline leaves reduced upward, the smaller ones subtending the peduncles sometimes scarcely lobed; basal leaves formed each year in a rosette; peduncles sparsely villous, winged and grooved; stems winged and grooved, sparsely to densely villous, up to 1.3 meters tall from a tough, biennial or perennial taproot and fibrous roots with orange-yellow latex and sap. ($2n = 12$)

Infraspecific Variation: A large-flowered form (up to 3.5 cm in diameter) is known for this species. The variety *laciniatum* (Mill.) Syme has deeply incised leaves.

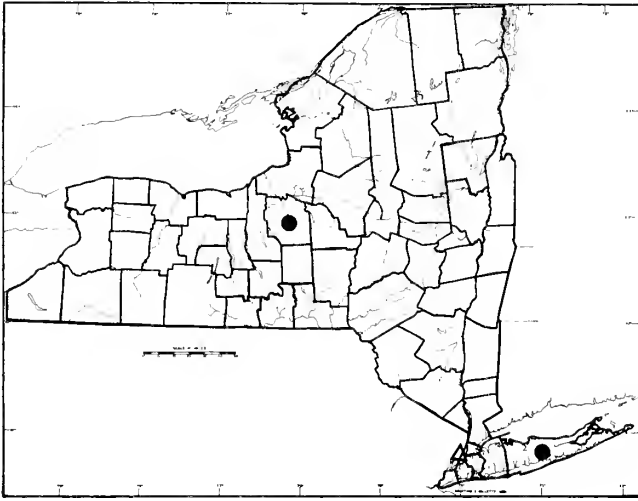
Importance: This plant was introduced into North America by European settlers who used it as a medicinal herb. The yellow-orange sap has been extracted since ancient times and used in dilute solutions for various internal and external ailments. The teachings of Pliny and Dioscorides refer to it in treatment of "film of the eyes". The technique was supposedly learned from swallows who were said to rub *Celandine* in the eyes of their young. Mixed with milk or made into a salve, it is still used by some nature healers and reputed to aid with problems ranging from cataracts to impotence. The juice has been used to erode corns and warts, hence the strange common name of Wart-wort. This juice is rich in alkaloids such as Berberine, Protopine, Chelidonine and Sanguinarine, etc. and plants are included on poisonous plant lists. Deaths from ingestion of the bitter foliage have been reported from Europe but not North America. Professor M. L. Fernald once reported eating the very young greens in salad without ill effects, but it should be avoided as a foodstuff. Sparteine, found in *Chelidonium*, has been used to restore heart arrhythmia and in cases of atrial fibrillation. It is also a diuretic, and shows some experimental hypoglycemic activity. The juice and powder have been used for toothache and by dentists during and after tooth removal.

3. GLAUCIUM

Common Names: Horned Poppy, Sea Poppy

Authority: Miller, Gard. Dict. abr. ed., p. 4, 1754

This is a genus of about 20 species native to southern Europe and central Asia. The following species occurs in New York State as an escape from cultivation.



1. *Glaucium flavum* Crantz

Common Names: Horned Poppy, Horn-poppy

Type Description: Linnaeus, Species Pl., p. 506, 1753

Synonyms: *Chelidonium glaucium* L., *Glaucium glaucium* (L.) Karst., *Mosenthinia glaucium* (L.) Kuntze, *Glaucium luteum* Scop.

Origin: Mediterranean Region

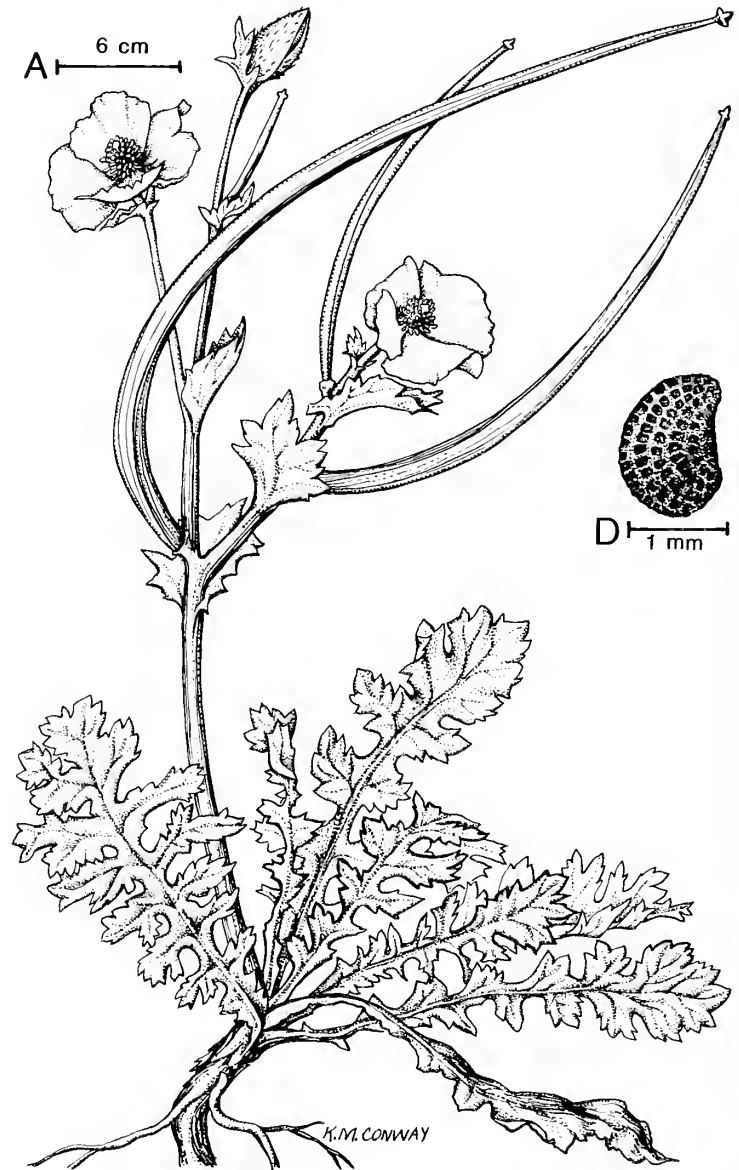
Habitats: Sandy to gravelly places, seashores, waste places and borrow pits as an escape

Habit: Erect or spreading biennials or perennials

Flowering: June–August

Fruiting: July–October

General Distribution: Escaping in the northeastern U. S. and eastern Canada; native to southern Europe and northern Africa



Description: Plants with **bisexual** flowers; **stigma** 1 per flower, ca 2 mm tall, 3 mm wide, with two laterally diverging or slightly reflexed **lobes**, the other 2 opposite lobes folded upward upon one another giving the stigma a hat-like appearance, **receptive surfaces** glandular to minutely tufted-puberulent, (stigma) persistent in fruit becoming 4–5 mm wide, ca 3 mm high; **style** **absent**; **ovary** 1 per flower, superior, linear-cylindric, 1.0–1.5 cm long, 1–2 mm wide, muricate, especially above, becoming an extremely elongate, tuberculate, pod-like **capsule**, greenish-tan to brown, 15–40 (50) cm long at maturity, 4–7 (9) mm wide, conspicuously jointed to the **receptacle**, arching upward or outward and dehiscent along 2 sutures from the tip to near the base, 2-chambered with corky tissue surrounding the numerous **seeds**; seeds 1.5–2.0 mm long, ca 1 mm wide, dark red-brown to chocolate with a moderately prominent reticulum of oblong fields; **stamens** numerous, 5–14 mm long; **anther** sacs linear-oblong, ca 2 mm long, 0.4 mm wide, yellow; **filaments** yellow, slender but flattened, 3–12 mm long; **petals** usually 4, obovate, 2.5–3.5 (4) cm long and broad, golden yellow (pale orange), entire; **sepals** 2, early-deciduous, glaucous,

glabrous to short-strigose, enclosing the **bud**, oblong-lanceolate with minutely spined tips; **flowers** borne singly, terminally or in branch axils; **peduncles** glaucous, ribbed, glabrous, 3–15 (25) mm long, stout and elongating little in fruit, subtended by **bracteal leaves** which are ovate to lanceolate and shallowly lobed with acute, apiculate tips and clasping bases, surfaces glaucous, glabrous or with a few short, stout-based hairs; **cauline leaves** similar, but larger and more deeply lobed, up to 10 cm long, 4 cm wide; **basal leaves** in a dense rosette, up to 35 cm long, 10 cm broad, deeply pinnatisect, lower lobes serrate and dentate, the upper more deeply lobed with apiculate tips, surfaces sparsely to densely white-tomentose; **petioles** tomentose, flattened and basally strongly ribbed, 2–5 cm long (absent on cauline leaves); **stems** stout, ribbed, glaucous, glabrescent, branched above, up to 9 dm tall, from a tough first-year **caudex** and stout biennial or perennial **taproot** system with yellow **latex**. ($2n = 12, 24$)

Infraspecific Variation: In Europe *G. flavum* is distinguished from *G. leiocarpum* Boiss. on the basis of its capsule being tuberculate throughout its length, and lacking constrictions between the seeds. In our materials the tuberculate surfaces are primarily on the upper portions of the capsules (as in *G. leiocarpum*), but capsules lack constrictions as they should in *G. flavum*.

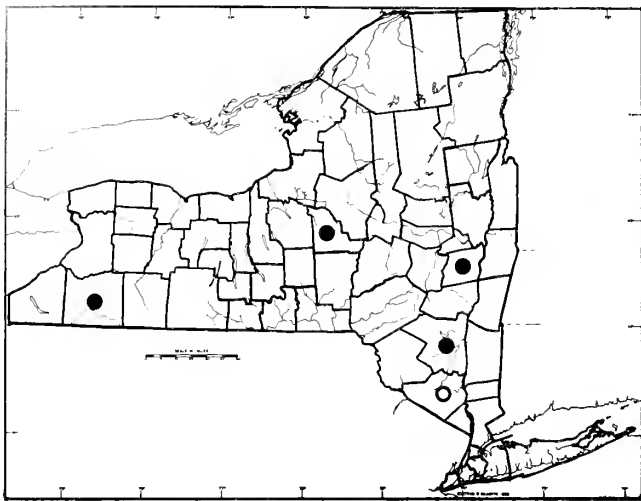
Importance: The Horned Poppy is widely cultivated and escapes in sandy or disturbed soils, especially along coasts. The oil from pressed seeds has been burned in lamps and used in food preparation and soap manufacture. In folk medicine the extract of the plant is known as a purgative, hydragogue and sedative. The juice has been used as an adulterant of opium.

4. MACLEAYA

Common Names: Plume Poppy, Tree Celandine

Authority: R. Brown, in App. Denh. Trav., p. 218, 1826

A genus of two species of eastern Asian herbs. They are atypical of the Poppy Family, having no petals and few seeds (one in *M. microcarpa*) per capsule. They are most closely related to the genus *Bocconia* in which they were first described. As cultivated plants, Plume Poppies are grown for their foliage since the flowers are not showy. The following species escapes cultivation in New York State.



1. *Macleaya cordata* (Willd.) R. Br.

Common Names: Plume Poppy, Tree Celandine

Type Description: Willdenow, Species Pl., ed. 2, p. 841, 1799

Synonyms: *Bocconia cordata* Willd., *B. japonica* Andre, *B. cordata* var. *thunbergii* Miq.

Origin: Eastern Asia

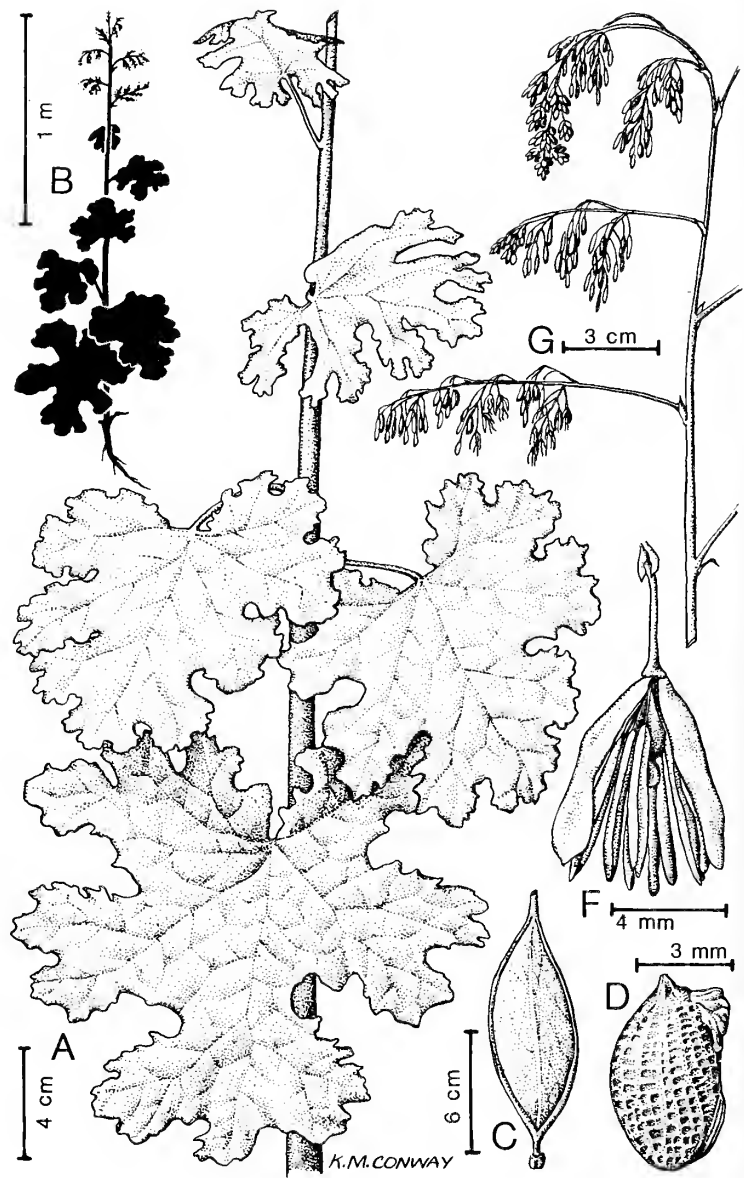
Habitats: Disturbed ground and sandy places as an escape from cultivation

Habit: Tall, colony-forming perennials

Flowering: Late July–August

Fruiting: August–October

General Distribution: Northeastern United States as an escape; native of Asia, also escaping cultivation there



Description: Plants with bisexual flowers; stigma 1 per ovary, glandular, clavate or 2-lobed, 0.5–1.2 cm long, about half as wide, persistent but enlarging little in fruit; style 1, short, cylindric, 0.3–0.8 mm long in fruit; ovary 1 per flower, superior, slightly stipitate, 3–5 mm long, 1–2 mm wide, clavate, becoming an oblongate, 2-valved, 2-loculed capsule, 8–18 (22) mm long (smaller ones aborted), 4–5 (7) mm wide, flattened with 2 slender ribs at the margins, dehiscing as the valves break away from the ribs in the upper half of the fruit, capsule stipitate at base; seeds (2) 4–6, plump, ellipsoidal, dark purplish-brown when mature, surface with an indistinct reticulum the aril plump, linear-lanceolate, ca 1 mm long, creamy-golden; stamens 20–30 in number, 5–8 mm long; anther sacs linear, 3–5 mm long ca 0.3 mm wide; filaments 2–3 mm long, delicate, filamentous; petals absent; sepals 2, cucullate, 5–9 mm long, ca 2 mm wide, creamy-white to pale salmon-pink; inflorescences 1-several, terminal and axillary, much-branched panicles, lanceolate to lance-elliptic in outline, (5) 20–50 (65) cm in length, about 1/3 as broad; pedicels (3) 4–7 mm long, slender and conspicuously jointed to the receptacle; floral bracts subtending the pedicels coriaceous, 3-ribbed, lanceolate, 1.5–2.0 mm long with lacerate to glandular-ciliate margins; peduncle and rachis of the inflorescence glabrous, terete, somewhat ribbed, glaucescent, the peduncle 3–15 cm long; leaves much reduced upward on the stem, suborbicular to ovate-cordate in outline, with 5–11 large lobes and oval to elliptic sinuses, minor lobing and blunt dentations near the lobe tips, glaucous, densely white, short-villous below, glabrous above, lower leaves up to 30 cm long, 25 cm wide, the uppermost around 5 cm in diameter; petioles (1)

2–16 cm long, glabrous, ribbed, glaucescent, slightly clasping at base; stems terete, ribbed, glaucous, especially at the nodes; plants up to 2.8 m high from a stout, perennial rootstock. ($2n = 20$)

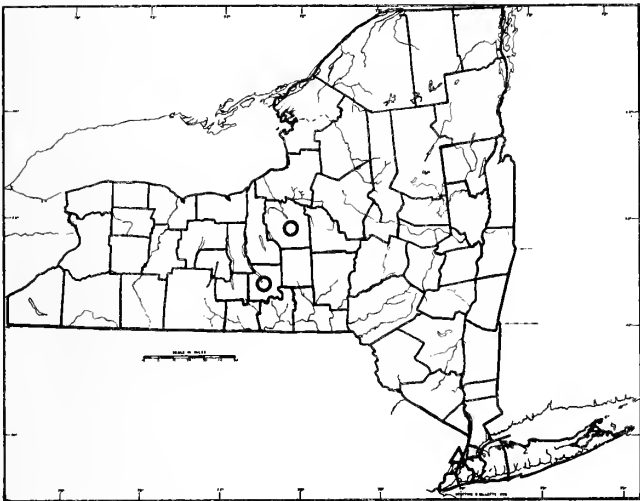
Importance: This species is grown mainly for its foliage as a border plant or to fill in areas of the garden difficult to maintain. Its aggressive spreading and colony-forming tendencies and persistence after escape have not helped its popularity as a cultivated plant.

5. ESCHSCHOLZIA

Common Names: California Poppy, Mexican Gold

Authority: Cham. in Nees, *Horae Phys. Berol.*, p. 73, 1820

A genus of 10–14 species native to the west coast of North America. They are showy, widely cultivated and bred for color forms. The most commonly cultivated species, *E. californica*, is known to escape and persist in New York State.



1. *Eschscholzia californica* Cham. ex Nees

Common Name: California Poppy (State Flower of California)

Type Description: Chamisso in Nees, *Horae Phys. Berol.*, p. 73, 1820

Synonyms: *Escholtzia* and *Eschscholtzia* are common misspellings of the generic name; *Eschscholzia crocea* Benth., *E. douglasii* Benth., *E. peninsularis* Greene, *E. maritima* Greene, *E. cucullata* Greene, *E. glauca* Greene, etc. (a large number of additional synonyms and varietal combinations exist which have no bearing on our garden escapes which have traditionally been treated as *E. californica*)

Origin: West coast of North America

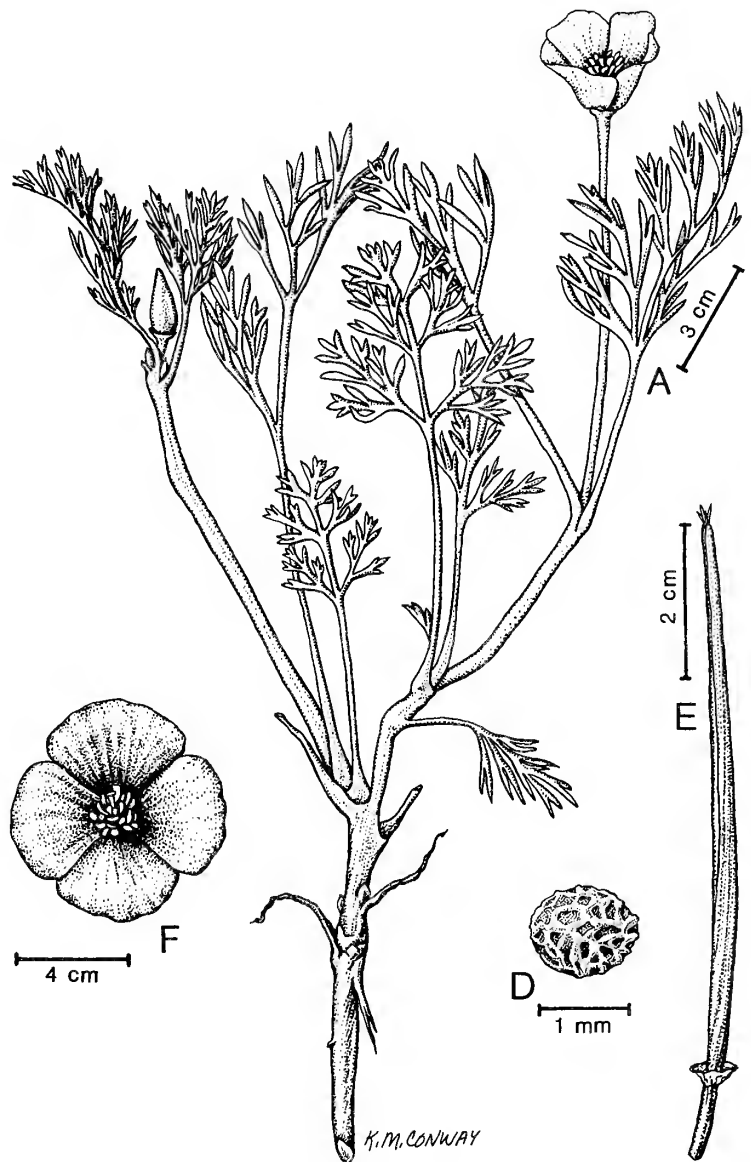
Habitats: Meadows, fields, roadsides as a garden escape

Habit: Freely branching annual or perennial herbs

Flowering: June–September (NY), from February on in CA

Fruiting: July–October

General Distribution: Primarily cismontane California; escaping cultivation elsewhere



Description: Plants with **bisexual** flowers; **stigmas** 4 (6), linear, yellow to orange, 3–5 mm long, usually persistent in fruit; **styles** short or indistinguishable; **ovary** 1 per flower, superior, fusiform-cylindric, 3–5 mm long, 1–2 mm wide, becoming a tan, linear **capsule** 3–8 (10) cm long, 1–3 (5) mm wide, glabrous, 10-nerved, 2-valved, dehiscent from the base; **seeds** numerous, borne on 2 **placentae**, spherical to elliptic, 1.5–1.8 mm long, 1.2–1.8 mm wide, seedcoat dark ocher to black with a tan reticulum overlying it, the reticulum itself minutely pitted; **aril** **absent**, **stamens** 16-many, usually golden-orange; **anther** sacs 4–8 mm long, linear; **filaments** 0.2–4.5 mm long, filamentous, yellowish, free; **petals** 4 in two series, free, cuneate with broad, rounded tips, 2–6 cm long and broad, overlapping upward to make the **corolla** a shallow cup, deep orange to bright yellow or pinkish (white); **sepals** (2) fused to form a hood-like **calyptra** 1–4 cm long, 0.5–2.5 cm broad, glabrous, pushed off by the expanding petals; **receptacle** expanded into a collar-like **torus**, 2-rimmed, the inner erect and hyaline, the outer ribbed, spreading 2–4 mm wide; **flowers** borne singly at branch tips; **peduncles** 3–15 cm long, ribbed; **leaves** much-dissected with linear segments, glaucous, glabrous to densely white-puberulent, up to 6 cm long, 4 cm broad; **petioles** 1–4 (5) cm long, winged and ribbed; **stems** terete, ribbed, much-branched, 2–7 dm long, ascending or lax, from an annual or perennial **taproot** and fibrous **root system** with pale, watery **juice**. ($2n = 12$)

Infraspecific Variation: This is an extremely polymorphic species even as it occurs in nature, with over 50 species names applied to its members in the past. The more easily recognizable varieties are explained in Munz (1963). In addition to natural variation, cross-breeding by horticulturists has proliferated the number of forms, many of which have names in the trade, such as: “Alba”, “Crocea” and “Rosea”.

Importance: These plants are popular in the seed-packet trade, grown as annuals, and may sometimes form winter rosettes and persist after escape from cultivation. California Indians ate the greens boiled or roasted over hot stones, and they were reported to have used the mildly narcotic juice as a toothache remedy.

PAPAVER

Common Name: Poppy

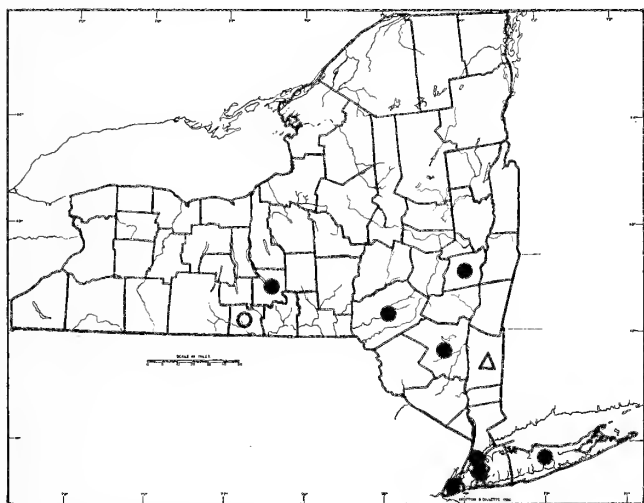
Authority: Linnaeus, *Species Pl.*, p. 506, 1753

A genus of 60–80 species of herbs distributed primarily in the northern hemisphere. Many species are concentrated around the Mediterranean Sea. They are widely cultivated and commercially valuable for their alkaloids.

Description: Plants with **bisexual** flowers; **stigmas** (2) 4–20, usually forming a persistent, radiate **disc** which is sessile on the capsule; **style** absent or very short and broad; **ovary** 1 per flower, superior, oblong or orbicular, glabrous or with setae, becoming a globose to oblong or obconic **capsule** with 4–20 carpels, unilocular or with partial partitioning, dehiscent by **pores** (rectangular hatches) or indehiscent; **seeds** numerous, borne parietally, often with reticulate and pitted surfaces; **stamens** centripetal, usually numerous; **petals** usually 4, free; **sepals** 2 (–4), enclosing the bud, early-deciduous; **peduncles** elongating in flower and fruit, sometimes scapose, glabrous, setose or pubescent, often glaucous; **cauline leaves** oval to lanceolate, usually dentate or pinnately divided or lobed, often glaucous, glabrous to densely pubescent, **petiolate**, sessile or clasping; **basal leaves** often narrower, forming well-defined rosettes in biennial species, otherwise much like cauline leaves; **stems** terete or unevenly ribbed, containing milk or colored sap and **latex**, arising from an annual or biennial **taproot** or perennial **rootstock**.

KEY TO SPECIES OF PAPAVER

1. Upper cauline leaves petioled or sessile, but not clasping the stem at their bases; buds finely pubescent or setose(3)
1. Upper cauline leaves with clasping bases; buds usually glabrous, glaucous.....(2)
 2. Buds 2–4 cm long; capsules 2–6 (9) cm tall; flowers variously colored and spotted, but rarely red.....
.....1. *Papaver somniferum* (p. 25)
 2. Buds 1–2 cm long; capsules 1.8 cm tall or less; flowers red with blackish basal spots
.....2. *Papaver glaucum* (p. 27)
3. Mature capsules not much longer than wide, subglobose to oblong or broadly conic(5)
3. Mature capsules about twice as long as wide, narrowly oblong or obconic.....(4)
 4. Anthers yellow; plants perennial; capsules obconic, strongly ribbed.....3. *Papaver atlanticum* (p. 29)
 4. Anthers purple; plants annual; capsules narrowly oblong, not strongly ribbed.....
.....4. *Papaver dubium* (p. 30)
5. Petals 4–6 cm long; robust, perennial plants; buds mostly over 2 cm long5. *Papaver orientale* (p. 31)
5. Petals 1.5–3.5 cm long; slender to moderately robust annual plants; buds mostly less than 2 cm long.....
.....6. *Papaver rhoeas* (p. 33)



1. *Papaver somniferum* L.

Common Names: Opium Poppy, Common Poppy, Garden Poppy, White Poppy

Type Description: Linnaeus, Species Pl., p. 508, 1753

Synonyms: *Papaver setigerum* DC. (in part), *P. "mursellii"*, *P. somniferum* ssp. *hortense* (Huss.) Corb.

Origin: Western Mediterranean region, cultivars probably derived from *P. somniferum* ssp. *setigerum* and modified considerably by selection

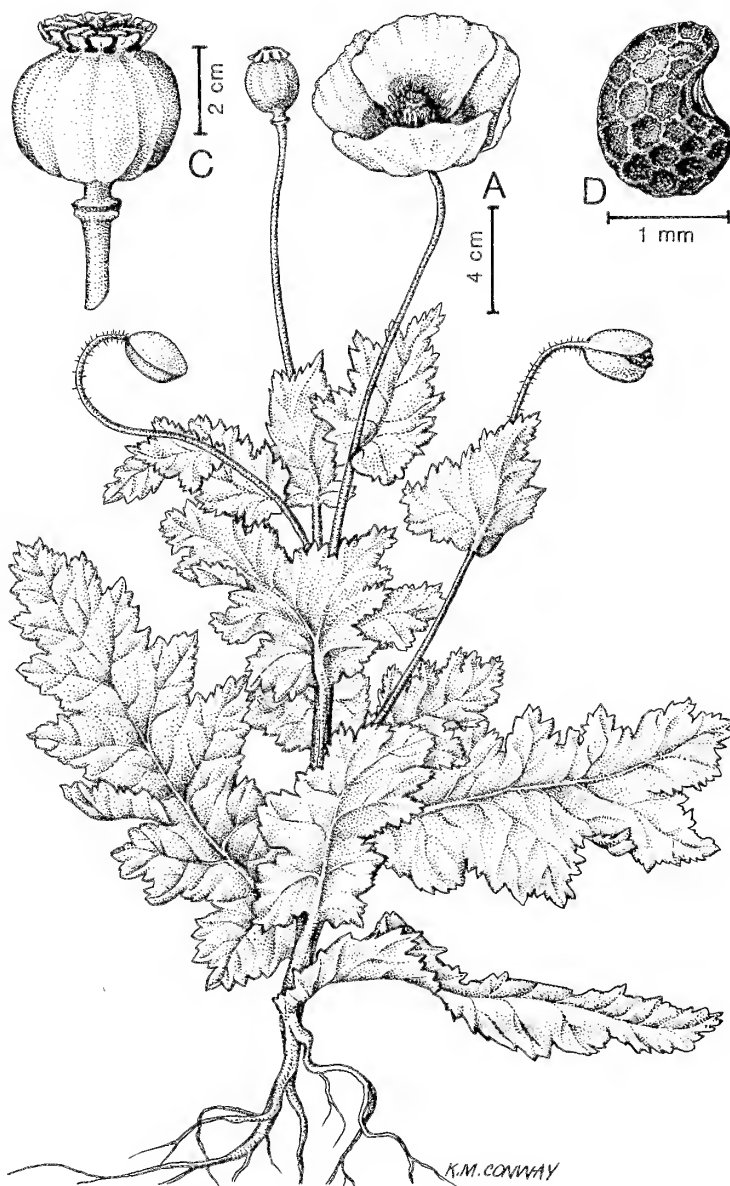
Habitats: Waste places, old gardens, dumps, escaping (illegal) cultivation onto disturbed ground

Habit: Erect, sparsely branching annual

Flowering: June–September

Fruiting: July–October

General Distribution: Native to southern Europe, but escaping cultivation throughout the world in all but the most severe climates

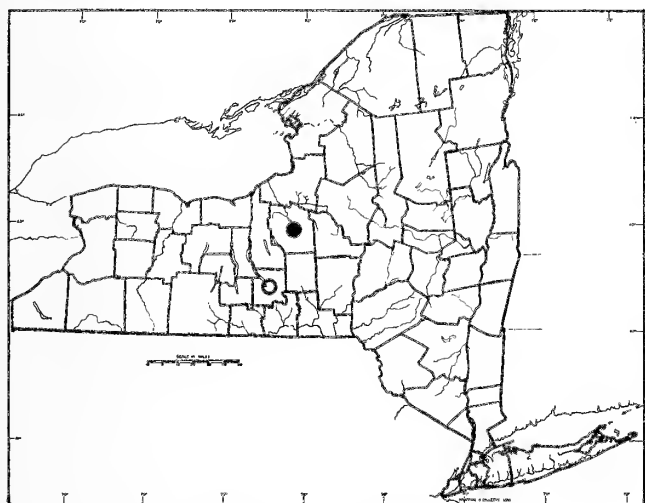


Description: Plants with **bisexual** flowers; **stigmas** (5) 8–15 (20), sessile, forming a radiate **stigmatic disc** which is flat or slightly concave or convex with conspicuous **interstigmatic tissue**, persistent becoming woody to papery in texture in fruit and 8–40 mm in diameter, the pollen-receptive areas purplish-glandular radiating in a star-pattern from the disc center to the free **stigmatic lobes** which may be irregularly truncate or somewhat rounded to obtuse; **styles absent**; **ovary** 1, subglobose, smooth, enlarging greatly to become a fleshy **capsule** 2–6 (9) cm tall and 1.5–6.0 (7) cm wide, with 5–20 inconspicuous nerves corresponding with **carpels**, sometimes dehiscent from above, but often indehiscent in cultivated strains, subglobose to oblong, bluish green to tan with a glaucous sheen and purple hue; **seeds** numerous, reniform, 1.0–1.5 mm long, ca 1 mm in other dimensions, seed coat white, gray, amber or bluish to black with compound reticulations and pits; **stamens** numerous, 1–2 cm long; **anther sacs** linear, ca 4 mm long; **filaments** pale, slender; **petals** 4, broadly ovate to somewhat cuneate entire, (or lacerate), 3–6 cm long and broad, with many pseudo-parallel veins which are often accompanied by pigmentation, white or blue to rose-pink, deep mauve or crimson, often with streaks of above colors, each petal with a basal, dark spot of color 1.0–2.5 cm in diameter; **sepals** 2, early-deciduous, enclosing the bud, smooth, 2–4 cm long, 1–3 cm wide; **buds** oblong; **peduncles** stout, ribbed, up to 30 cm long, glaucous and glabrous or with bristly **setae** in the upper 3–4 cm; **upper cauline leaves** sessile, perfoliate, irregularly dentate and shallowly toothed and/or lobed, glaucous, glabrous and bluish-green, conspicuously reticulate-veined, the upper leaf pair often 3–5 cm long, 2–4 cm broad; **middle cauline leaves** similar, but more deeply cut and pinnately lobed, much larger, up to 40 cm long, 15 cm wide or more, sessile-auriculate; **lower leaves** somewhat smaller, narrower, often oblanceolate, not as clasping and sometimes with short **petioles**; **stems** tough, shiny-glabrous, fluted and ridged, up to 1.5 cm thick near base, and up to 1.5 meters tall, sparsely branched or unbranched, from a tough, deep **taproot** with fibrous secondary **roots**.
(2n = 22)

Intraspecific Variation: Because *P. somniferum* is a multi-use plant cultivated by man, it is extremely variable with a history of selective breeding for drug production, seed production and for attractive horticultural features. It was undoubtedly a variable species in nature also, and it is considered to have one native subspecies in Europe: ssp. *setigerum* (DC.) Corb. (also a weed) and two in cultivation. Subspecies *somniferum* was probably originally derived from ssp. *setigerum*, from which it differs in being larger in most aspects, having about twice the number of stigmatic lobes, and in rarely being setulose. Subspecies *songaricum* Basil. is much like ssp. *somniferum* but differs in having flat, obtusely tipped stigmatic lobes rather than sulcate, truncated ones. Both the cultivated subspecies have escaped in New York State occasionally. In addition to these variations, there are a considerable number of flower-size and color forms, and seeds vary widely in color patterns. Double-flowered plants are known under the name "Carnation Poppy".

Importance: Under U. S. federal law it is illegal for an unlicensed individual to obtain, transport, grow or permit this species to be grown on land under his/her control. Prior to regulation this species was known as the Common Poppy, and was one of the more frequent poppies in garden cultivation. It has now largely been replaced by orange and red or pink and yellow flowered species, but many people are unaware or resist the law and continue to grow it. Opium Poppy derives its epithet, *somniferum*, from the long-known sleep-inducing qualities of the milky extract of the capsule. It is clear from Summerian idiograms that its narcotic properties were known at least 6,000 years ago. Plant remains have also been found in sites of dwellings some 4,000 years old of Stone Age lake dwellers of Switzerland. The mind-altering effects of opium, its derivatives and precursors have much changed legal, medical, political and religious history over the centuries. Fortunes, governments and empires have risen and fallen as the result of events involving opiates. Our own Hudson River was explored by Henry Hudson as he sought a fabled Northeast Passage to Cathay in the Orient, which provided much of the opium that was one of the more profitable and highly prized cargos of the day. *Papaver somniferum* and its subspecies have been extensively studied, since they represent the only plants so far found to produce morphine. They also accumulate thebaine and codeine which are morphine precursors, as well as various benzyloquinolines. Eating of the unripe fruit has long been known to cause stupor, coma and shallow, slow breathing; smoking opium (with tobacco) produces similar effects when maintained past an initial euphoric state. Raw opium was used as a poison, even in ancient times, and has a long history of abuse and use in murder and suicide—often disguised as medicine, for which it is also used. Opiates have been used historically in treatment of pain and for narcotic, antispasmodic, hypnotic, anodyne, analgesic and sedative effects, and to induce respiratory depression. Capsules have been used as fomentation in sprains, bruises, neuralgia, toothache, etc. The two major grades of opium are soft (shipping) and druggist's opium, though many commercial names have been applied, usually having to do with the country of origin. Licensed drug

manufacturers produce for medical use: codeine, narcotine, laudenine, papaverine and the more dangerously addictive morphine and heroin (diamorphine). The latter is widely produced illegally and uscrupulously marketed for high prices. By contrast, codeine is mild enough to have been used in Paragoric to sooth colicky infants to sleep. For a few infants, however, the effect may be to stimulate wakefulness and activity for many hours. Poppy seeds contain only a slight trace of opium, and are not known to produce a narcotic effect even when ingested in quantity. They are commonly used in baking, sprinkled on rolls and bread. Black seeds are preferred for this purpose. Poppy seeds have been reported to prevent scurvy, as they contain some Vitamin C. Paler seeded forms are preferred for making emulsions, and the oil of the poppy seed is used in foods (such as salad dressings) and in the manufacture of paint, varnish and soap, due to drying and adhesive properties.



2. *Papaver glaucum* Boiss. & Hausskn.

Common Name: Tulip Poppy

Type Description: In Boissier, Fl. Orientale, vol. 1, p. 116, 1867

Origin: North Africa

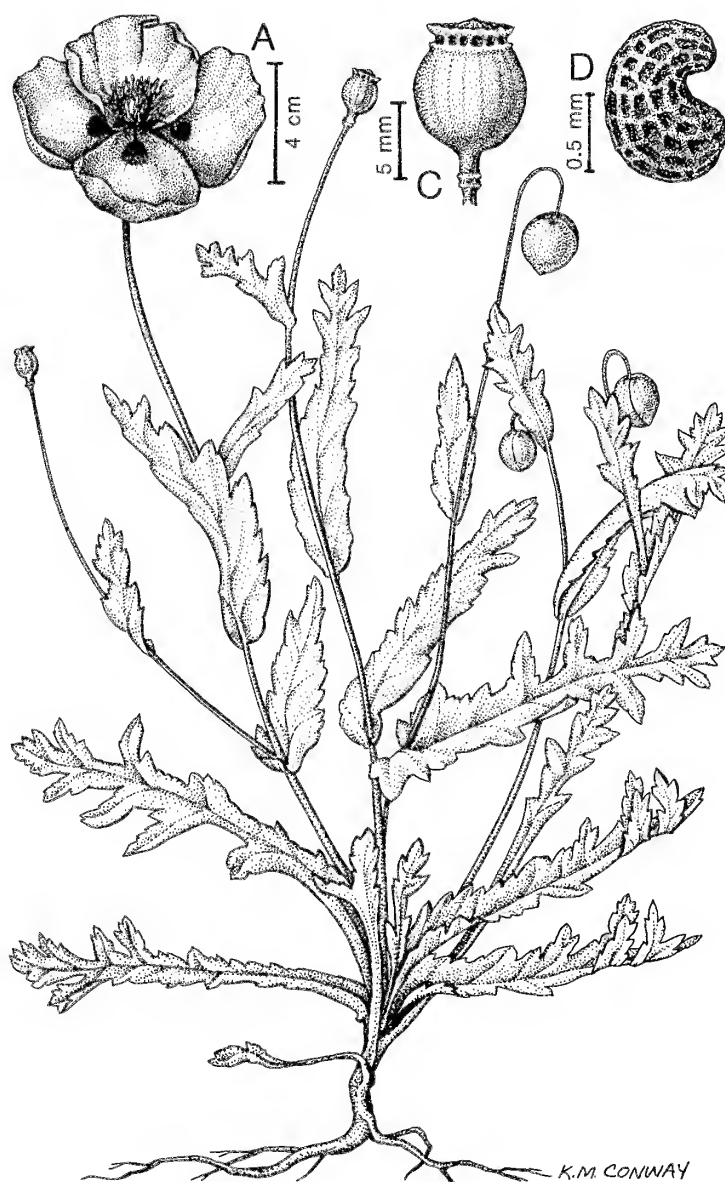
Habitats: Disturbed ground as a rare escape

Habit: Erect and spreading, branched, annual herbs

Flowering: June–August

Fruiting: July–September

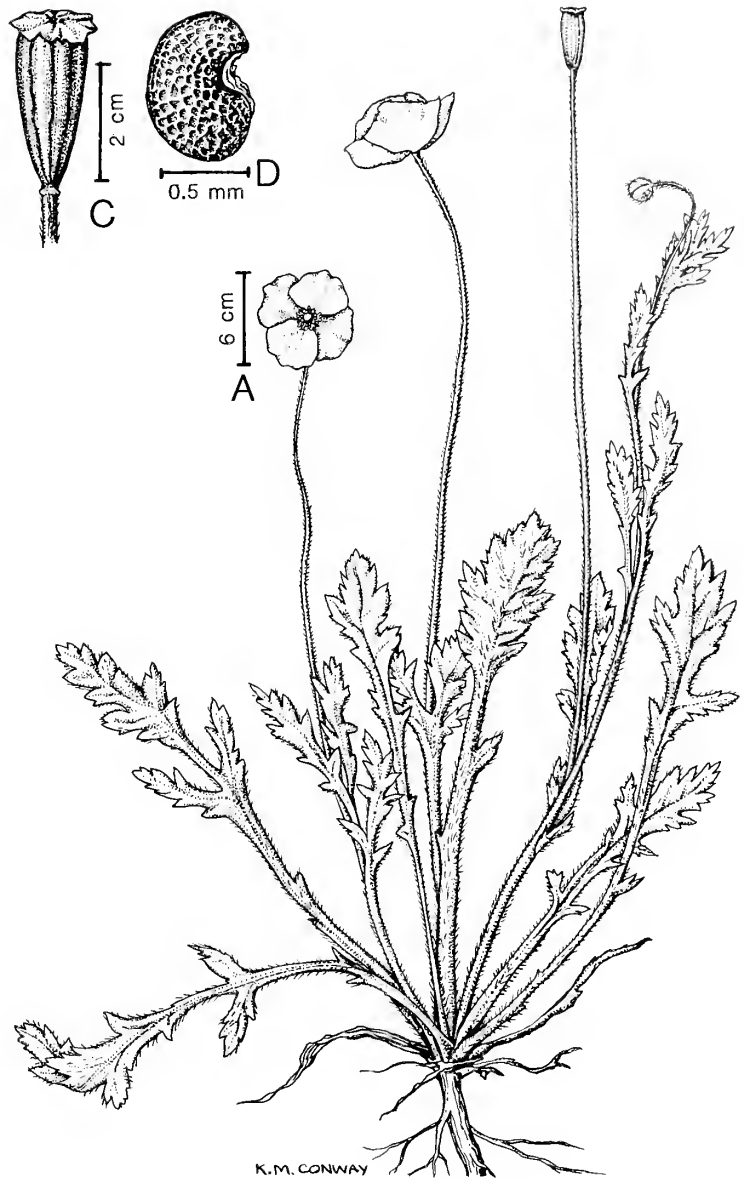
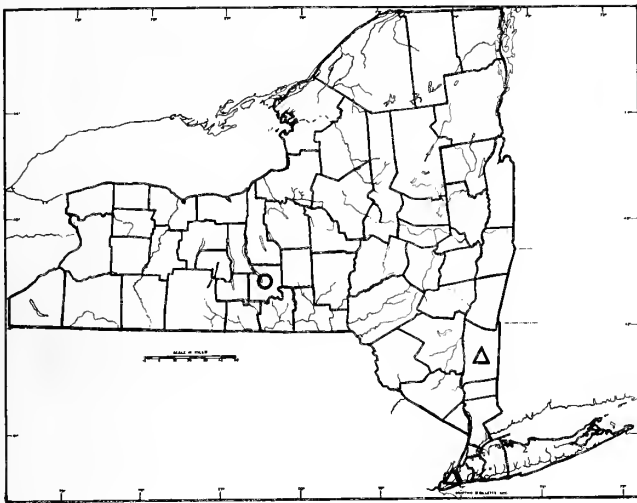
General Distribution: Native to Syria, Iraq, Iran, cultivated and escaping widely in North Africa and Asia, less commonly elsewhere



Description: Plants with **bisexual** flowers; **stigmas** (6) 8–15 (18) on a radiate **disc**, persistent in fruit, becoming papery to woody in texture, the disc flat to somewhat concave, 0.5–1.1 cm broad, **receptive surfaces** purplish, forming a narrow, star-like, radiate pattern from the disc center to the **stigmatic lobes** which are rounded to blunt with entire to wavy (rarely laciniate) margins; **styles** absent; **ovary** 1 per flower, superior, subspherical to oblong, glaucous, with 6–18 **carpels**, the single cavity partially divided by carpel walls, forming imperfect **locules** as it develops into a **capsule** which is ovoid to subspherical, ca 1 cm tall and broad, dehiscent by pores at the lower margin of the stigmatic disc; **seeds** numerous, borne parietally, 0.8–1.2 mm long, ca 0.7 mm wide, with a complex, deep-pitted reticulum, brownish when dry, reniform to distinctly comma-shaped; **stamens** 100 or more, 1–2 cm long; **anther sacs** ca 2 mm long, linear, brownish, appearing golden with pollen at anthesis; **filaments** dark purple-brown to black, filiform; **petals** 4 (–6), ovate to cuneate, 3–5 cm long, 3–5 (–7) cm broad, scarlet (to brick red) each with a brownish-black spot near the base and a white line along the upper margin of the spot; **sepals** 2(–3), early deciduous, 1.2–2.1 cm long and broad, forming a subglobose **bud**, glabrous, slightly glaucous, darkly spotted at the immediate base; **peduncles** ribbed, elongating during flower and fruit development, up to 35 cm long, densely appressed-hirsute above, less so below; **cauline leaves** glabrous, glaucous, (2) 4–20 cm long, 1–4 cm wide, lanceolate to obspatulate, clasping the stem, margins dentate, often pinnately narrow-lobed, the lobes obtusely tipped to minutely apiculate; **basal leaves** forming a loose rosette, similar to cauline leaves but up to 25 cm long and sometimes with short **petioles**; **stems** branching near the bases (or single), glabrous or puberulent, ribbed, up to a meter tall, from a wiry annual (biennial?) **taproot** and fibrous **lateral roots** and a milky **sap**.

Infraspecific Variation: Like other poppies this species may be dwarfed in its dimensions by poor soil and dry conditions; it may also vary somewhat in coloration, but it is much more stable in this than its close relative, the Opium Poppy.

Importance: Tulip Poppy is a beautiful plant in cultivation, but it has not received the attention in North America that it has in Africa and Asia where it more frequently escapes.



3. *Papaver atlanticum* (Ball) Cosson

Common Name: Morocco Poppy

Type Description: Ball, Ill. Fl. Atl. vol. 1, p. 11, 1882

Origin: North Africa

Habitats: Waste places, old gardens, roadsides as a rare escape

Habit: Short-stemmed perennials with tall scapes

Flowering: May–August

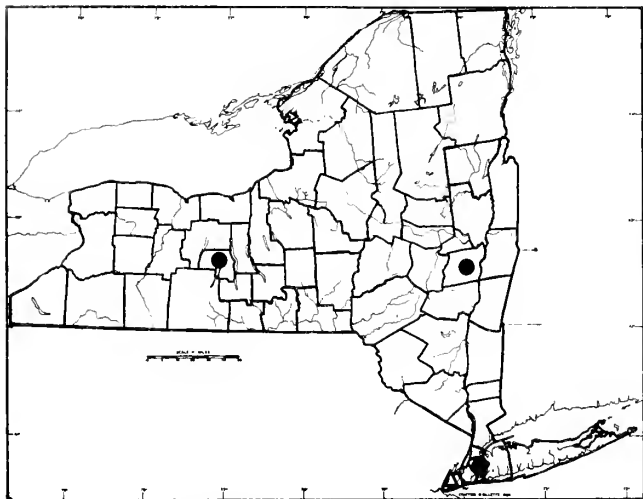
Fruiting: May–September

General Distribution: Native of Morocco, occasionally escaping cultivation in Eurasia and North America

Description: Plants with bisexual flowers; stigmas 6 or 8 (10) on a flat to pyramidal radiate disc with purplish, glandular receptive ridges, the star-shaped pattern terminating in the 6–10 stigmatic lobes which are rounded to obtuse with undulate margins, the disc persistent in fruit becoming 6–12 mm broad and papery in texture; styles absent; ovary 1 per flower, superior, clavate, 7–15 mm long, strongly ribbed, glaucous, becoming a clavate capsule, greenish to brown, 1.5–2.8 cm long, 4–11 mm broad at summit, strongly ribbed, dehiscing by pores just below the margin of the stigmatic disc; seeds numerous, borne parietally, ca 0.7 mm long, 0.5 mm wide, plump reniform to comma-shaped, shallowly reticulate; stamens numerous, centripetal, 4–11 mm long, the inner ones longest; anther sacs golden, linear-ovate, ca 2 mm long; filaments golden, flattened (or filiform above); petals usually 4, ovate-cuneate to triangular, 2.5–4.1 cm long and broad, pale orange to dull orange-red, unspotted or with a diffuse, creamy spot near each petal base; sepals usually 2, early deciduous, 1.0–1.5 (1.9) cm long, 0.7–1.2 cm wide, sparsely to densely pilose, forming an oblong bud; flowers solitary on scape-like peduncles; peduncles 15–60 cm long, terete or ridged deeply, appressed-hispid to hispid below; cauline leaves (2) 5–30 cm long, oblanceolate to spatulate, pinnately lobed with few, widely spaced, narrow lobes on the winged rachis below, and many dentate and shallowly incised lobes near the tip; basal leaves similar, up to 35 (40) cm long, densely hispid, forming a loose rosette; petioles winged from near the bases, contiguous with the blades, hispid; stems hispid, ribbed, up to 18 cm tall, usually short, the plant deriving most of its height (up to 8 dm) from the scapose peduncles; plants arising from tough perennial taproots and fibrous root systems with slightly milky juice.

Intraspecific Variation: Plants may be dwarfed and almost stemless; flower color varies from deep orange to almost white, and spots are not always present. This species is very closely related to *P. rupifragum* Boiss. & Reut., which differs in being subglabrous and in its smaller, brick-red flowers. *Papaver lateritium* C. Koch has larger, brick-red flowers, an obovate-clavate capsule like *P. atlanticum*, and may be conspecific with it.

Importance: This species is not a common cultivar, but it escapes occasionally in Eurasia and North America.



4. *Papaver dubium* L.

Common Names: Blind Eyes, Grainfield Poppy, Headache Poppy, Long-pod Poppy, Smooth-fruited Poppy

Type Description: Linnaeus, Species Pl., p. 1196, 1753

Synonyms: *Papaver obtusifolium* Desf., *P. modestum* Jord., *P. nothum* Steven, *P. mairei* Batt., *P. laevigatum* Beib.?, *P. albiflorum* (Bess.) Pacz.

Origin: Southern Europe

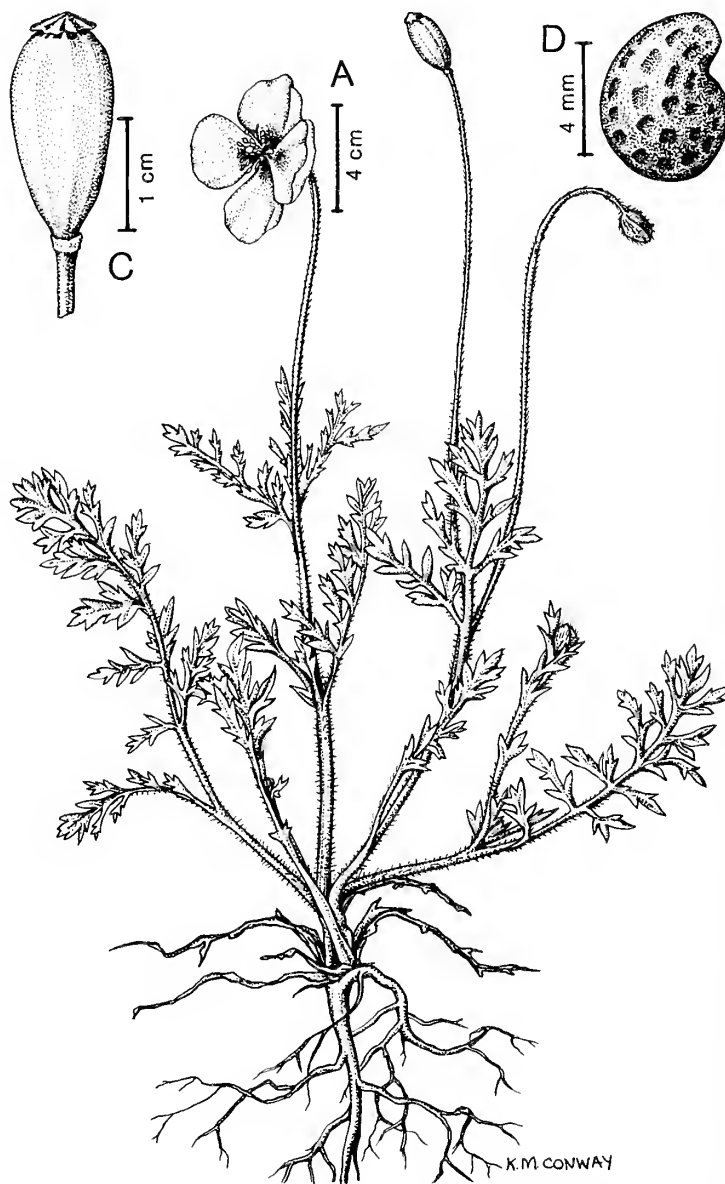
Habitats: Grainfields, waste places, vacant lots, roadsides as an escape or adventive weed

Habit: Erect or ascending, unbranched or basally branching annuals

Flowering: May–August

Fruiting: May–October

General Distribution: Widespread escape, especially in warmer climates

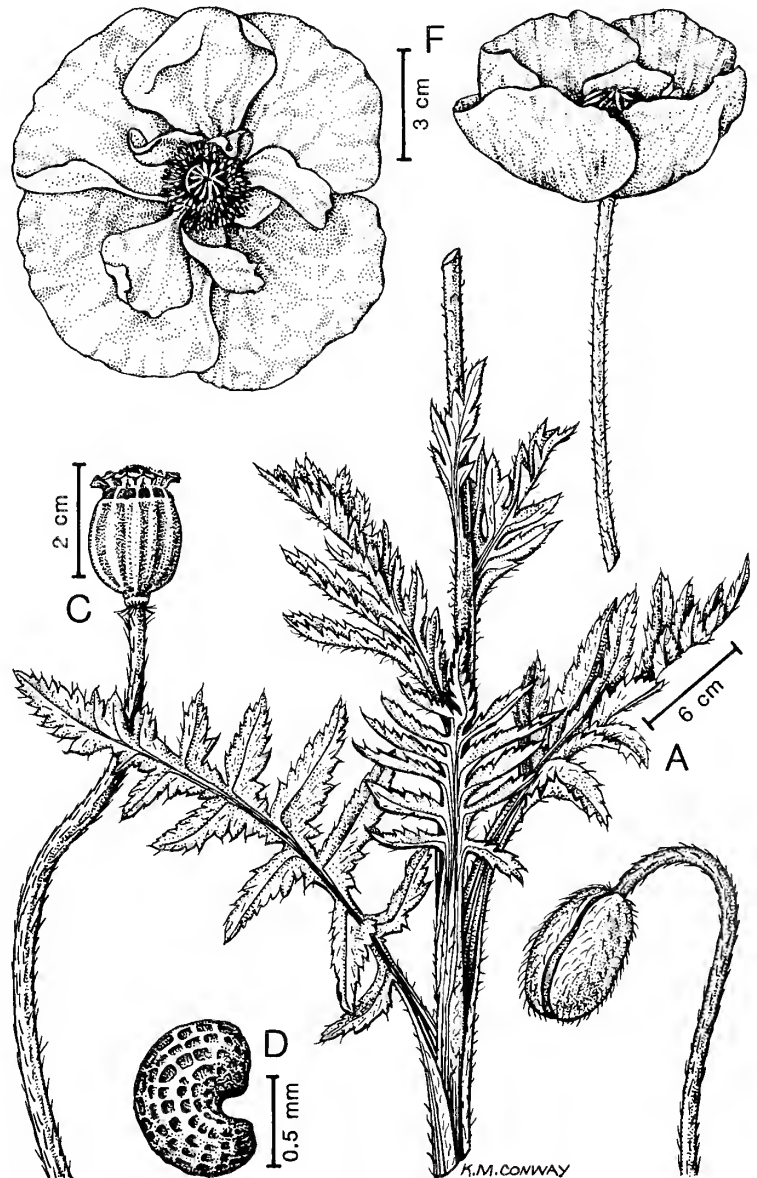
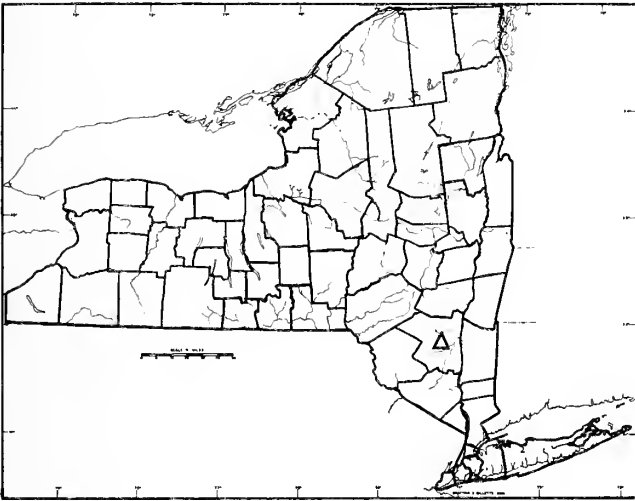


Description: Plants with bisexual flowers; stigmas usually 7–9, radiate on a persistent, convex stigmatic disc which is obtusely pointed at the summit, with its glandular receptive areas borne along prominent ridges radiating to the stigmatic lobes, the lobes obtuse, yellow-green to tan, somewhat leathery and undulate-margined, the stigmatic disc becoming more flattened and up to 1 cm broad in fruit; styles absent; ovary 1 per flower, superior, oblong, 3–10 mm long, 4–5 mm wide, smooth, becoming an oblong-cylindric to obovoid capsule, 1.5–2.2 cm long, 0.7–1.0 cm wide, glabrous, yellow-green to tan and glaucous with visible ribs, opening by pores at the base of the stigmatic disc; seeds numerous, borne parietally, 0.6–0.8 mm long, ca 0.4 mm wide, reniform to comma-shaped, purplish-gray to brownish, shallowly and boldly reticulate; stamens numerous, 5–12 mm long; anther sacs plump, ca 1.5 mm long, purplish-lavender; filaments deep violet to purple-brown, filiform; petals usually 4, broadly oval to suborbicular, 1.5–3.0 (3.5) cm long and broad, red to rose-pink or red-orange, unspotted, or each petal with a dark spot near the base; sepals 2 (–3), early deciduous, 1.2–1.7 cm long, densely hispid, forming an oblong-ovate bud; peduncles 15–30 (40) cm tall, appressed-hispid to strigose above, hispid below; cauline leaves 4–15 cm long 2–7

cm wide, bipinnately (or pinnately) lobed and dissected, the lobe tips setose, surfaces appressed-hispid, glaucescent; basal leaves less divided, pinnate or merely lobed; petioles short, winged, confluent with the blades; stems hispid, ribbed, 2–6 dm tall, caulescent to subscapose, often branched near the base, from a tough, pale, annual taproot system with milky juice and latex. ($2n = 42$)

Intraspecific Variation: This is a variable species in most of its features. Dwarfed plants which produce small or abortive fruits may be difficult to distinguish from *P. rhoeas* under similar circumstances. The species complex to which it belongs in Europe includes about seven taxa which might be better included in the broad range of variability of a polymorphic *P. dubium*. They vary in flower, anther, filament and juice color as well as such characters as leaf lobing, petal shape (size) and capsule attenuation. Such variations are sometimes seen in garden varieties, belying past hybridization and artificial breeding. Least reliable among European segregates from this species is perhaps *P. albiflorum* (Besser) Pacz. with white or pale pink, unspotted flowers.

Importance: *Papaver dubium* is cultivated, spread in hay and sown as a contaminant with grain seed. It can be a troublesome weed in warmer climates, but it escapes only occasionally in New York State. Like other poppies it contains isoquinoline alkaloids and should be considered poisonous.



5. *Papaver orientale* L.

Common Names: Oriental Poppy, “Old-fashioned Poppy”

Type Description: Linnaeus, Species Pl., p. 508, 1753

Synonyms: *Calomecon orientale* (L.) Spach., *Papaver grandiflorum* Moench., *P. spectabile* Salisb., *P. paucifoliatum* (Trautv.) Fedde, *P. orientale* var. *paucifoliatum* Trautv., *P. orientale* var. *parviflorum* Busch

Origin: Southern Caucasus

Habitats: Disturbed sites, waste places, old gardens, roadsides, as an escape from cultivation (alpine in its native habitats)

Habits: Colony-forming, erect and spreading perennials

Flowering: May–August

Fruiting: May–September

General Distribution: Escaping cultivation rarely, but worldwide; native to Iran, Turkey and southern Russia

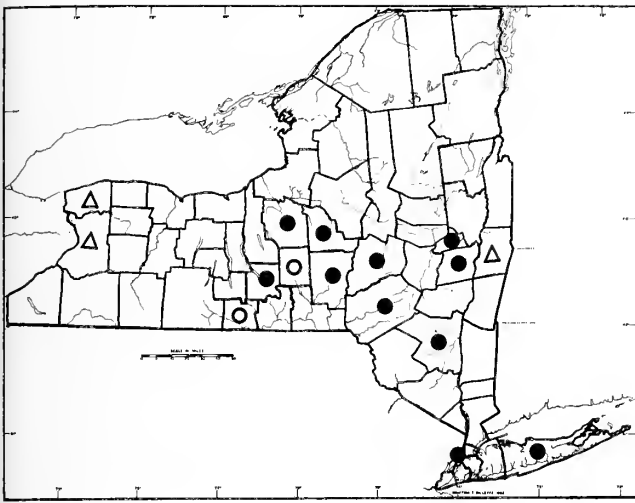
Description: Plants with **bisexual** flowers; stigmas 8–15, on a slightly convex **stigmatic disc** which is persistent, becoming leathery, up to 1.5 cm broad in fruit, the glandular receptive areas radiating from the center of the disc along ridges to the **stigmatic lobes** which are obtuse or rounded with slightly undulate margins; **styles absent**; **ovary** 1 per flower, superior, obovoid, 6–9 mm tall, 5–8 mm wide, becoming an oblong, obovoid or obconic **capsule**, 1.2–2.3 cm long, 1.0–1.8 cm broad in the upper half, greenish-tan to brown when dry, glaucescent, opening by **pores** below the rim of the stigmatic disc; **seeds** numerous, borne parietally, 0.6–0.8 mm long, ca 0.5 mm wide, reniform to comma-shaped, grayish to brown when dry, evenly reticulate; **stamens** over 100, mostly about 1 cm long; **anther sacs** 1.8–3.0 mm long, oblong, pale violet to yellowish; **filaments** gray-brown to dark purple, filamentous; **petals** 4 (6) or double with narrower inner petals, the outer ones suborbicular to broadly oval, up to 6 cm long and broad, pale orange or orange-pink, lacking dark basal spots, but sometimes with pale, bluish or white, rectangular markings near the petal bases; **sepals** 2 (3) in number, (2.0) 2.2–3.4 cm long, cucullate, early deciduous, with spreading-setose hairs, forming an oblong, pendulous **bud**; **floral bracts absent**; **peduncles** 10–36 cm long, nodding in bud, appressed-setose above, spreading-setose below; **cauline leaves** oblanceolate to spatulate, strongly pinnatisect, especially below, with serrated lobes and tips bearing strong setae, surfaces spreading-setose, the upper cauline leaf remote from the flower; **basal leaves** forming a rosette each year, longer than cauline leaves reaching up to 60 cm long, 12 cm wide, otherwise similar; **petioles** varying greatly in length, winged and confluent with the blades above, ribbed and strongly spreading-setose; **stems** caulescent or almost acaulescent with 2–4 cauline leaves, stem bases surrounded by flat, but not sheathing, **petiolar bases**, (stems) terete or deeply grooved and ribbed, spreading-setose above, to densely pilose near the bases, often 1-branched; plants up to 1.3 m tall from thick, spreading, perennial **rootstocks**. ($2n = 28$)

Note: *Papaver orientale* has been confused in the literature with two related species which are also widely cultivated. Chemical, cytogenetic and taxonomic papers prior to 1974 are rich in mis-information on “*P. orientale*” as it is treated there. See Goldblatt (1974) for clarification, in addition to the following brief summary:

Closely Related Species: *Papaver bracteatum* Lindl. ($2n = 14$) has well-developed, persistent, floral bracts; the uppermost leaf is high on the stem, often proximal to the flower; buds are \pm erect on the peduncles; petals are blood-red with a black radial stripe near the base. The stigmatic disc is pyramidal at maturity.

Papaver pseudo-orientale (Fedde) Medw., ($2n = 42$) may have one or more persistent floral bracts; the uppermost leaf is high on the stem; buds are on \pm erect peduncles; flowers are deep vermilion to orange, usually with dark brown to black, rectangular or trapezoidal marks near the petal bases. Both *P. bracteatum* and *P. pseudo-orientale* are commonly cultivated and often called “Oriental Poppy.” Either or both may escape cultivation in the state, though we presently have no records of this having occurred.

Intraspecific Variation: When separated from the two distinct species discussed above, *P. orientale* shows far less variation than formerly indicated in the literature. Plants vary in the distance of the upper leaf from the flower, but do not have leaves or bracts near the flower. Color of petals varies in shades of orange and pink (or white in cultivar “*Albiflora*”); pale spots may be present or absent from the petals; stamens vary from purple to brownish-black but are consistently dark.



6. *Papaver rhoeas* L.

Common Names: Corn Poppy, Shirley Poppy, Field Poppy, Red Poppy, Flanders Poppy, African Rose, Corn Rose, Headache, Red-weed, etc.

Type Description: Linnaeus, Species Pl., p. 507, 1753

Synonyms: *Papaver strigosum* (Boenn.) Schur., *P. timidulum* Klokov, *P. tenuissimum* Fedde, *P. laciniatum* Hort., *P. intermedium* Hort., *P. integrifolium* Vig., *P. rapiferum* Fedde, *P. umbrosum* Mott.

Origin: Mediterranean Region

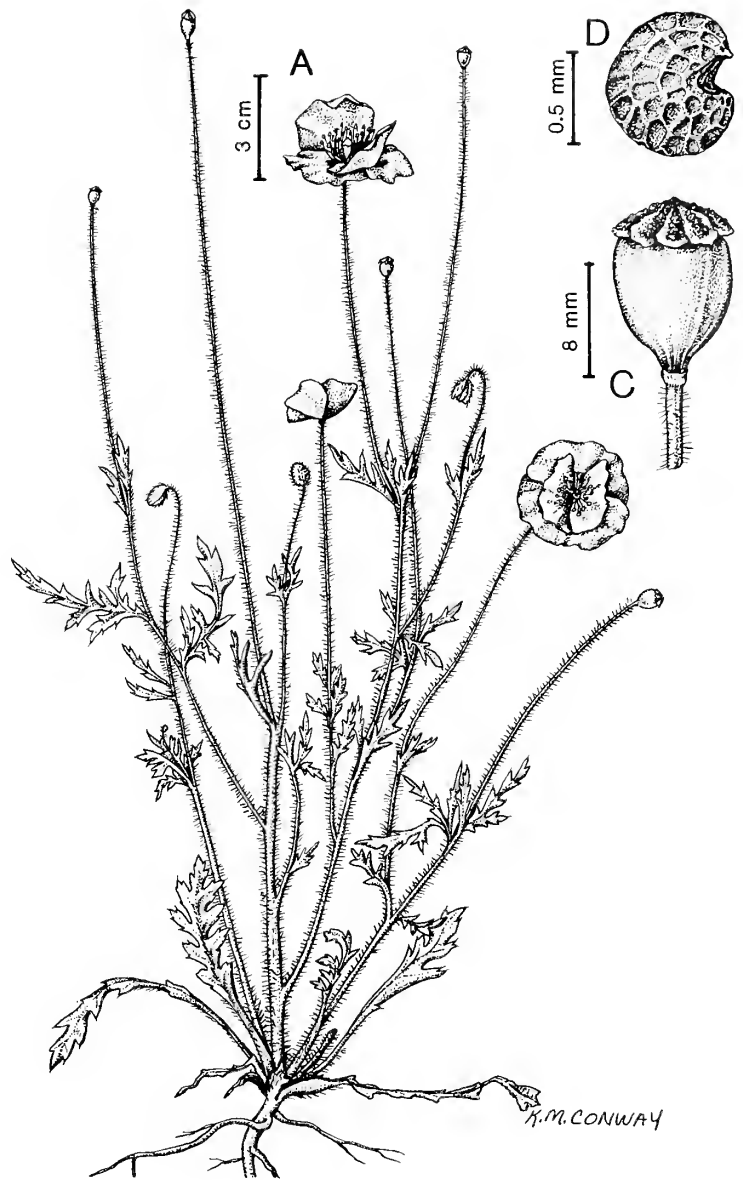
Habitats: Waste places, roadsides, cultivated ground as an escape from cultivation

Habit: Erect to spreading annuals (biennials)

Flowering: May–September

Fruiting: May–October

General Distribution: An aggressive weed of cultivation in Eurasia and occasionally North America, usually casually adventive; native to southern Europe and northern Africa.



Description: Plants with **bisexual** flowers; **stigmas** 5–15 (18) on a **radiate disc** which is yellowish, leathery and persistent in fruit, somewhat convex becoming flatter with maturity, 5–11 mm wide, the receptive stigmatic zones glandular, purplish, along ridges radiating from the disc center to **stigmatic lobes** which are flared with overlapping lobes, obtuse tips and wavy margins; **styles absent**; **ovary** 1 per flower, superior, ovoid, glabrous, 3–5 mm long and broad, becoming a glabrous, glaucous **capsule** 8–15 (20) mm tall, 6–14 (16) mm wide, ovoid to subglobose, tannish-green to brown at maturity with pale ribs, dehiscing by **pores** below the rim of the stigmatic disc, the tissue in that region often further breaking down, leaving the disc suspended by internal tissue much like a parasol above a cup; **seeds** numerous, borne parietally, 0.7–1.0 mm long, ca 0.6 mm wide, strongly comma-shaped with a basal nipple, amber with a purple sheen and a moderate to bold, simple reticulum of rectangular fields; **stamens** numerous, (2) 4–11 mm long; **anthers** subglobose to oblong, 0.4–1.0 mm long, bluish-purple (often the pollen as well); **filaments** lavender to purple-black, filamentous; **petals** 4 (or more), broadly orbicular, entire (rarely lacerate), (1) 2–4 cm long and broad, red, purple, rose, pink or white (various color combinations with white streaking in hybrid Shirley Poppies), often with dark spots near the petal bases; **sepals** 2 (–4), hispid to villous, 0.5–2.1 cm long, forming an oblong **bud**; **peduncles** 7–40 (60) cm long, sparsely to densely hispid, especially above, shallowly to deeply ribbed,

nodding (or erect) in bud; **cauline leaves** hispid to glabrescent, 3–20 cm long, 1– cm wide, reduced upward, the upper ones subopposite, clustered beneath peduncles, pinnately or bipinnately lobed (unlobed in dwarf plants), often caudate, coarsely dentate with acuminate, setose tips; **basal leaves** similar, but more broadly (sometimes bluntly) lobed, sometimes forming a **rosette**, up to 30 cm long, 12 cm wide near the sparingly lobed tips; **petioles** absent or present only on the lower leaves, ribbed, hispid; **stems** slender to relatively stout, ribbed, hispid, simple to 4–5 branched near the base; plants 1–9 dm tall arising from a tough, yellowish annual or biennial **taproot** with fibrous **roots** and milky **sap**. (2n = 14)

Intraspecific Variation: Plants growing under severe drought conditions may be dwarfed in nearly all characters, having narrow, non-overlapping petals, subtire leaves etc., and may be mistaken for depauperate *P. dubium* if fruits are not well developed. Color variations in this species are numerous, including striping and spotting combinations as well. Shirley Poppies of the horticultural trade are bred for such variation, and are commonly streaked with white and/or white blotched near the petal bases, with whitish filaments and yellow (rather than bluish) pollen. Stems may be slender and unbranched to robust with several stout basal branches. Peduncles may have appressed rather than spreading hispidity. A closely related species (perhaps better treated as a variety) is *P. commutatum* Fisch. & Mey. The capsule is broad and slightly stipitate, foliage is villous and the black spots are most prominent toward the centers of the petals.

Importance: *Papaver rhoeas* is the most commonly cultivated annual Poppy in most parts of North America. If one orders poppy seeds from a catalog, the likelihood of receiving this species is extremely great, no matter what species was advertised. The artificial American Legion poppy was designed with Shirley Poppy in mind. *Papaver rhoeas* does not usually persist for long in New York State unless the soil is continually disturbed, as in cultivated fields or dumps. In some parts of Eurasia it is known as a noxious weed of cultivated fields. The petals of Corn Poppy have been used in folk medicine for centuries, primarily as an expectorant and (reputed) mild pain killer, but mostly for the rosy color imparted by flower pigments to the solution. These pigments have also been used to color wines. *Papaver rhoeas* has been implicated in livestock poisoning in Europe. The plants are usually distasteful to animals, but may enter their diet as a contaminant of hay or feed-grain.

7. ARGEMONE

Common Names; Prickly Poppy, Mexican Poppy

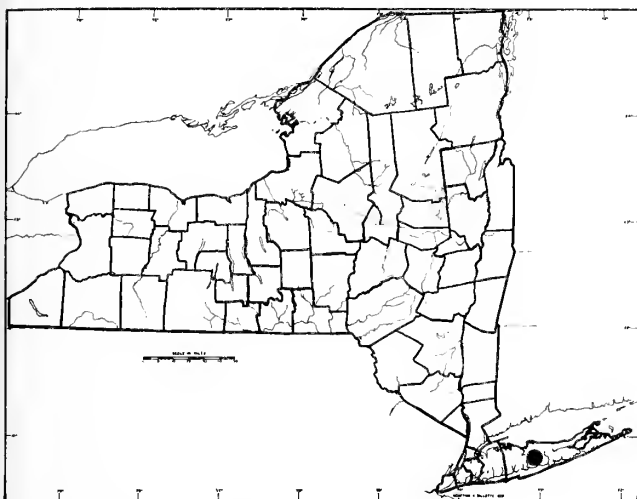
Authority: Linnaeus, Species Pl., pp. 508–509, 1753

A genus of about 20 species native to areas of low rainfall from southern North America to South America (one species in Hawaii). The two species found in New York are infrequent escapes from cultivation, but are native further south in the United States. These poppies are popular as garden ornamentals, and they also have alkaloids which have been used medicinally.

Description: Plants with **bisexual** flowers; **stigma** 1, with 3–5 (7) lobes corresponding to carpel number, the lobes flattened with felt-like, purplish receptive areas; **style** 1, very short, evident only in mature fruit; **ovary** 1, unilocular, but of (3) 4–5 (–7) **carpels** and their many-ovuled **placentae**, becoming a dehiscent **capsule**, elliptic to oblong-ovate or linear-oblong, glabrous to very spiny, dehiscing with **valves** splitting along fluted **sutures**, the **vascular elements** remaining within as a cage-like framework; **seeds** brownish to black, 1–3 mm long; **endosperm** copious; **embryo** straight, minute; **stamens** 20–250 or more; **anther sacs** linear, coiled after dehiscence; **filaments** filiform or rarely clavate; **petals** usually 6, in 2 whorls, 1.5–7.5 cm long, making **flowers** up to 15 cm broad, usually yellow, golden or white (lavender-tinged); **sepals** early-deciduous, usually 3 (2–6), smooth to prickly or hispid, each with a subterminal **horn** which is hollow and vegetative below and spined at the tip; **flowers** borne singly at branch tips and in their upper leaf axils; **peduncles** stout, varying in length, subtended by single or paired **foliar bracts**; **leaves** reduced upward on the stem with a **basal rosette**; **cauline leaves** glaucous, sessile, often clasping, dentate, each tooth terminating in a **prickle**, the margins also usually lobed, oval to oblong in outline; **basal leaves** similar, oblong to oblanceolate; **stem** glaucous, erect or ascending, 1–10 (–20) dm tall, smooth to closely prickly, from a persistent or ephemeral, annual or biennial **taproot** with fibrous **roots**.

KEY TO SPECIES OF ARGEMONE

1. Flowers white; stamens more than 100 1. *Argemone albiflora* (p. 35)
1. Flowers yellow; stamens 50 or fewer 2. *Argemone mexicana* (p. 37)



1. *Argemone albiflora* Hornem.

Common names: Prickly Poppy, White Prickly Poppy

Type Description: Hornemann, Hort. Hafn., p. 489, 1915

Synonyms: *Argemone alba* Lestib. non James (*nomen nudum*), *A. georgiana* Croom, *A. mexicana* of authors non L., and white-flowered plants included under it, *A. mexicana* var. β Lamarck, *A. mexicana* β *albiflora* DC., *A. intermedia* Sweet (in part) as to Ill. specimens (a name excluded in Ownbey's 1958 monograph)

Origin: Northern coast of the Gulf of Mexico

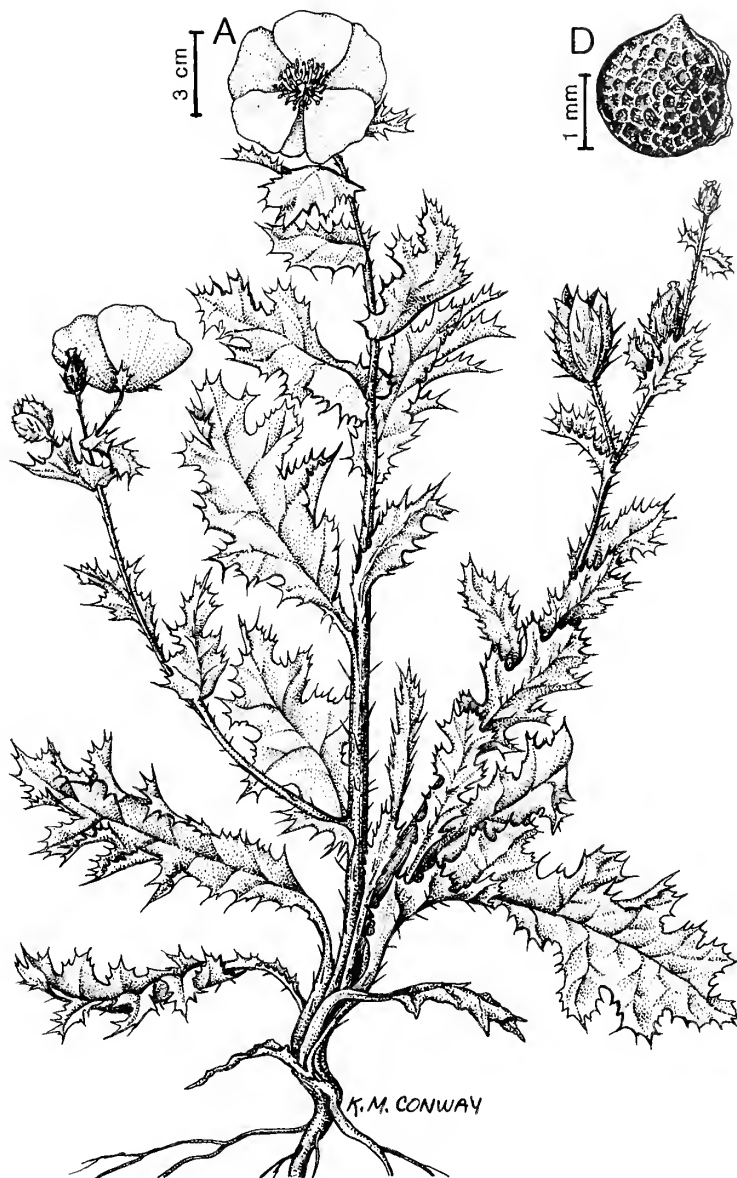
Habitats: Roadsides, waste places, beaches and dunes in sandy soil or gravelly clay, mostly adventive from gardens

Habit: Erect or spreading annuals or biennials

Flowering: (March) May–August

Fruiting: (April) June–October

General Distribution: Coastal Plain of the southern United States from Mississippi to North Carolina (possibly native only to Northern Florida) escaping cultivation in New York, New England, Illinois, Kentucky and Arkansas

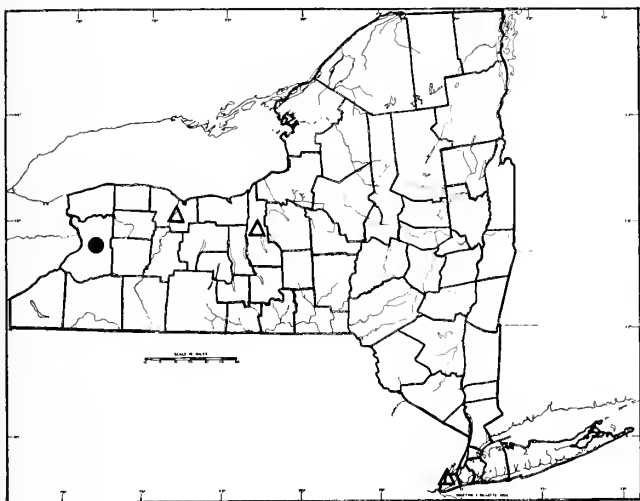


Description: Plants with **bisexual** flowers; **stigma** 1, 3–7 lobed, corresponding with carpel number, purplish becoming 3–4 mm broad and 2–3 mm tall in fruit where it is persistent; **style** very short, only evident in fruit; **ovary** 1, oblong with (3) 4–5 (7) **carpels**, becoming an oblong to oblong-elliptic **capsule** 12–15 (25) mm wide (excluding spines) and 20–40 (45) mm long, armed with widely spaced, stout, spreading **spines** which are basally herbaceous, unbranched and mostly 2–8 (10) mm long; **seeds** blackish-brown, 1.9–2.1 mm long, ovoid with a bold reticulum and concavities; **stamens** 7–12 mm long 100 or more; **anther sacs** linear; **filaments** slender; **petals** 6 (rarely 8) in two whorls, white, obovate-cuneate, mostly 2–4 cm long, 2.5–4.5 cm wide; **sepals** usually 3, valvate in bud with subterminal horns 1–3 mm long which are prickly-tipped, early deciduous, each sepal ca 2 cm long, 1.3 cm wide, cucullate and sparsely spiny; **spines** of sepals 2–3 mm long; **buds** tending to be clustered in close proximity to **foliar bracts** on very short **peduncles** which elongate during flowering and fruiting ranging from a few mm to 3 cm in length during this process; **peduncles** stout, glaucous green to brown in fruit usually with a number of **spines** toward the summit; **bracteal leaves** smaller, but like other **cauline leaves**; **cauline leaves** ovate to narrowly obspatulate, lobed $\frac{1}{3}$ – $\frac{2}{3}$ the distance to the midrib, glabrous above, spiny on the major veins below, coarsely toothed with

spine-tipped dentations, larger leaves usually 15–20 cm long, 8–10 cm wide, somewhat glaucous; **basal leaves** in a rosette, narrowly oblanceolate, mostly 7–15 cm long, 2–4 cm wide, otherwise like cauline leaves; **stems** stout, somewhat ribbed, glaucous, green to reddish-brown, up to 1.5 m tall, often branched, sparsely to moderately prickly, from a deep **taproot** with yellow **latex**. ($2n = 28$)

Intraspecific Variation and Hybridization: This species is a member of a complex of white-flowered plants that naturally range from northern Florida to Texas and Montana. Escape from cultivation in the east and midwest has resulted in varied interpretations of the taxa involved, such as in Illinois where two subspecies of *A. albiflora* may be found. Ownbey (1958) recognized *A. albiflora* ssp. *texana* Ownb. which differs from ssp. *albiflora* in its narrower capsules which have numerous small spines interspersed between the large ones; the seeds are also considerably smaller, averaging about 1.7 mm. Ownbey also recognized *A. polyanthemos* (Fedde) Ownb. which he renamed as a segregate which had formerly been known as *A. intermedia* Eastw. (incorrectly *A. intermedia* Sweet). These taxa all have a somatic chromosome number of 28 and hybridize freely both experimentally and where they come into contact after escaping cultivation. Of *Argemone polyanthemos*, which ranges from Texas north to Montana, Ownbey said: "*A. polyanthemos* is distinguished by the sparingly prickly stems, the succulent, usually shallowly lobed leaves which are devoid of prickles on the upper surfaces, the upper ones usually clasping, and by the stoutly, but distantly spinescent, elliptical capsules. The species is closely related to *A. albiflora* Hornem., and treated more conservatively, *A. polyanthemos* would probably be made a subspecies of the latter." All three of the entities discussed here are in cultivation and might possibly escape within our state borders.

Importance: *A. albiflora* and its close relatives have Protopine and Berberine type alkaloids but lack the Pavine type also known in the genus. Though this species is not commonly cited in the literature, it can be poisonous causing vomiting, and if ingested by livestock the oily principle may be transmitted to humans through the milk as has been reported in *A. mexicana*. The plants are usually distasteful to cattle, but may be introduced into their feed as a contaminant. *A. albiflora* and its relatives are widely cultivated worldwide in relatively dry garden sites.



2. *Argemone mexicana* L.

Common Names: Prickly Poppy, Mexican Poppy, Mexican Thistle, Devil's Fig, Bird-in-the-bush, Yellow Thistle, Jamaica Thistle, Queen Thistle

Type Description: Linnaeus, Species Pl., p. 508, 1753

Synonyms: *Ectrus mexicanus* (L.) Nieuwl., *Argemone spinosa* Moench, *A. versicolor* Salisb., *A. sexvalvis* Stokes, *A. vulgaris* Spach, *A. mucronata* Dum., *A. leiocarpa* Greene

Origin: Probably the West Indies (may be native to Florida)

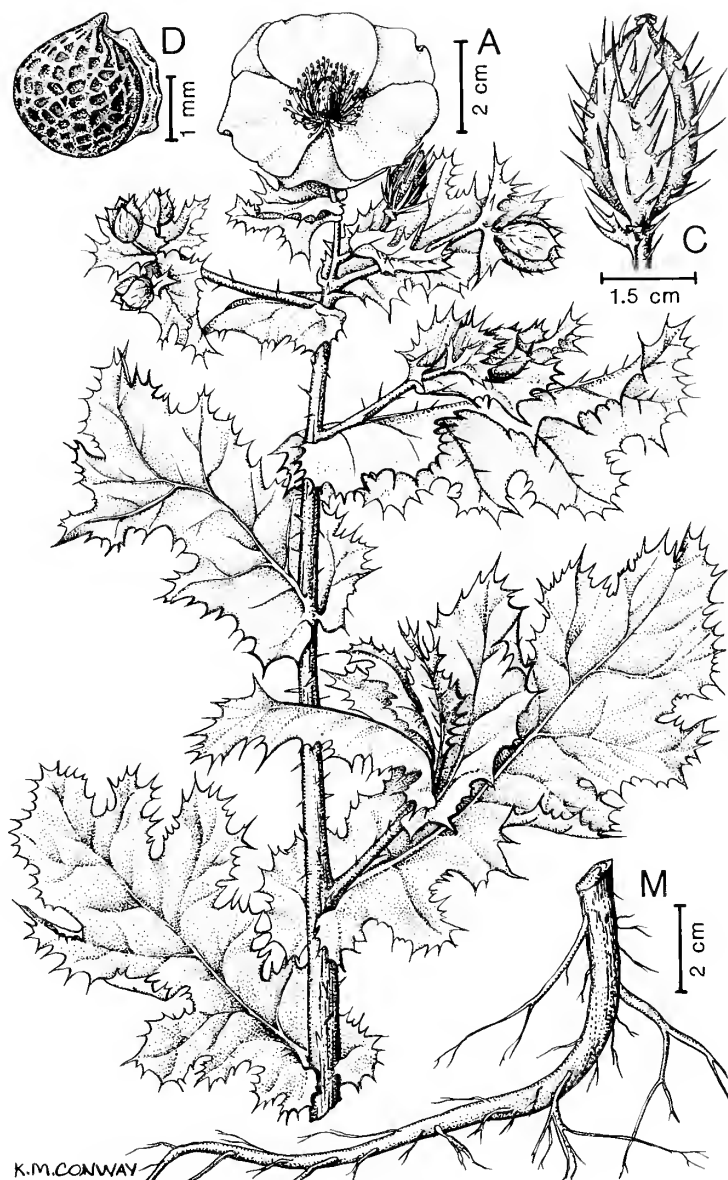
Habitats: Waste places, roadways, weedy in open, disturbed sites

Habit: Erect or spreading, annuals

Flowering: April–October (year-round elsewhere)

Fruiting: May–November (year-round elsewhere)

General Distribution: Originally from the Caribbean area, this plant has become a prolific weed through the warmer parts of the world, but rarely escapes in New York State.



Description: Plants with bisexual flowers; stigma 1, 4–6 lobed, corresponding with carpel number, purple, persistent, up to 2 mm high and 4 mm wide in fruit; style very short, usually visible only in fruit where it becomes 1–2 mm long; ovary, 1, oblong with 4–6 carpels, becoming an oblong to broadly elliptic capsule 12–20 mm wide (excluding spines) and 25–45 mm long, armed with stout, ascending spines, widely spaced, mostly 6–8 (10) mm long (or lacking spines in forma *leiocarpa*); seeds 1.6–2.0 mm long, brownish-black, reticulate due to small, often narrow concavities; stamens 30–50 in number, 6–12 mm long, yellow; anther sacs linear, curling after dehiscence; filaments slender; petals usually 6, obovate to obcuneate, 1.5–3.5 cm long and wide, bright yellow; sepals usually 3, valvate in bud, each with a subterminal horn, cucullate, glaucous, sparingly prickly or smooth, 9–15 mm long and wide, the horns 2–8 mm long; buds spherical or slightly oblong; flowers single, terminal or axillary on stout, spiny or glabrous peduncles up to 3 cm long; bracteal leaves like other cauline leaves, but often smaller; cauline leaves lobed $\frac{1}{2}$ – $\frac{3}{4}$ the distance from the margin to midrib (or less upward on smaller leaves) with broad, oval

sinuses, oval to linear-obovate in general outline, the tips of the lobes with spines up to 8 mm long, leaf color glaucous green with bluish markings along the veins, lower leaf surfaces sparingly prickly or smooth, upper surfaces smooth, the upper leaves clasping the stems; **basal leaves** oblanceolate, up to 25 cm long, 13 cm wide; **stems** stout up to a meter tall, single or usually branched, brownish to glaucous blue-green, sparingly prickly (or smooth) with reflexed, slender **spines** 3–4 mm long; **taproot** slender and tough with bright yellow **latex**. ($2n = 28$)

Infraspecific Variation: Some authors do not distinguish *Argemone ochroleuca* Sweet from *A. mexicana* as is done here, following Ownbey (1958). *Argemone ochroleuca* has pale lemon colored petals, and while this is known from some central American populations of *A. mexicana*, there are bud and style characters separating the species as well. Although it has only been found in the Florida Keys, Africa and Brazil, the non-prickly forma *leiocarpa* (Greene) Ownb. deserves mention.

Importance: Mexican Poppy is widely known as a poisonous plant and a purgative. Seeds have poisoned human beings when contaminating home-grown cereal grains, and numerous animal and bird poisonings are ascribed to the species. Symptoms are vomiting, diarrhea, induced glaucoma, edema, fainting and coma. The plants are usually distasteful to livestock, but contaminated feed has been blamed for epidemic dropsy and glaucoma in India where *Argemone* oil was transmitted to humans in milk. In Latin America small doses of *Argemone* extract have been administered as medicine for ophthalmia, and glaucoma and other ailments with mixed results. *Argemone mexicana* contains Protopine and Berberine type alkaloids, but lacks Pavine alkaloids found in such species as *A. platyceras* and *A. munita*. The leaves and seeds contain Sanguinarine, Dihydrosanguinarine, Protopine and Berberine. The oil of *Argemone* has been burned in lamps in Mexico and used in the manufacture of soap. Although *A. mexicana* is a noxious weed throughout most of the tropics, it is still widely grown in gardens.

Fumariaceae (Fumitory Family)

The Fumariaceae: a family of about 15 genera and up to 400 species, distributed mostly in temperate Eurasia. It has received various interpretations including frequent subordination under Papaveraceae as a subfamily (Fumarioideae). Although the two families are clearly related, the Fumariaceae is the larger and more coherent aggregation, unified by highly specialized and complex structural similarities in the flowers. Members of Fumariaceae also have watery juice rather than latex, and their inflorescences are racemose or cymose. Genera such as *Corydalis*, *Fumaria* and *Dicentra* are known for their alkaloid content and used medicinally. They may also be poisonous, having been proven toxic to livestock. The family is of minor importance in the horticultural trade, and some of its members are widespread weeds.

FAMILY DESCRIPTION

Herbaceous plants, sometimes vining, with watery sap, containing isoquinoline alkaloids. Plants are annual, biennial or perennial, usually with branching stems from taproots, rhizomes, bulblets or tubers. The stems and leaves are often glabrous and glaucous but may be pubescent. Leaves are alternate, usually pinnately dissected and lobed, cauline and/or in basal rosettes, reduced upward on the stem. Flowers are bisexual, bilaterally symmetrical or irregular, erect or nodding, borne in racemes or cymes. There are 2 bract-like sepals which are small and often deciduous. Petals are dimorphic, in outer and inner series of 2 members each. Outer petals are larger, often saccate or spurred. Inner petals are narrower, apically united into an expanded, terminal crest which is connate over the stigma and anthers, enclosing them, especially in bud (inner petal tips rarely free). Stamens 6, in two sets of 3, their united filaments often expanded at the bases, spurred or adnate to other tissue below, each set consisting of a central stamen with 2 anther sacs and 2 outer stamens each with a single sac. The stigma is 2-lobed or capitate with 2-several receptive surfaces, borne on a slender style. The single ovary is superior, 2-many carpelled, 1-locular, becoming a 2-valved capsule in fruit (single-seeded nut in *Fumaria*). Dehiscence is basipetal, acropetal or rarely by 1-seeded joints (indehiscent). Placentation is parietal; seeds are one to many, often lustrous and arillate, each with a minute embryo and fleshy to liquid endosperm.

KEY TO GENERA

1. Plants delicately vining, climbing by petioles, the central axis conspicuously elongate; corolla, spongy-saccate and turgid, persistent in fruit2. *Adlumia* (p. 44)
1. Plants lax to erect; corolla deciduous or withering in fruit.....(2)
 2. Outer petals alike, saccate or spurred; flowers pendulous1. *Dicentra* (p. 39)
 2. Outer petals unlike, only the upper one basally spurred; flowers \pm laterally disposed(3)
3. Fruit small, globose, 1-seeded, indehiscent; seeds without arils; flowers reddish and less than 9 mm long ...
.....4. *Fumaria* (p. 51)
3. Fruit elongate, several-seeded, dehiscent; seeds arillate; flowers yellow or (if pinkish) more than 10 mm long
.....3. *Corydalis* (p. 45)

1. DICENTRA

Common Names: Bleeding Heart, Dutchman's-breeches, Squirrel-corn

Authority: Bernhardt, Linnaea, vol. 8, p. 457 (468), 1833 (*nom.cons.*)

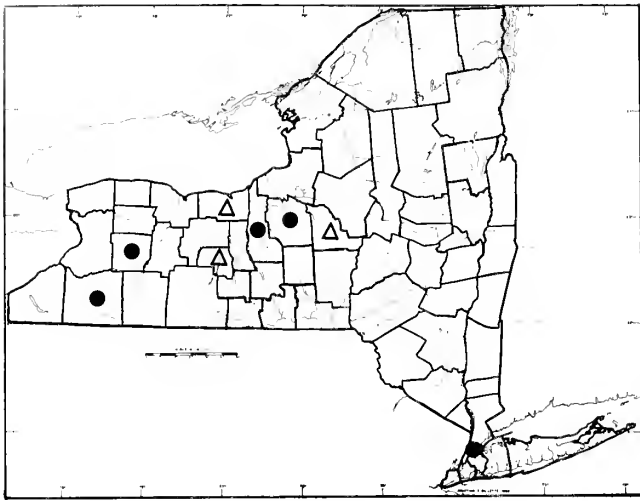
A genus of some 15–20 species of perennial herbs (rarely vines) of North America and eastern Asia. Most of the species are known to be cultivated, and may escape within and outside their native ranges. Their alkaloids are used in medicine, and several species are known to be mildly poisonous.

Description: Plants with **bisexual** flowers; **stigma** 1, flattened, 2-lobed; **style** 1, slender, persistent in fruit; **ovary** 1, cylindric, becoming a 2-valved **capsule**, dehiscing basipetally or acropetally; **seeds** few to many, arillate, somewhat flattened, reniform to oblong-spheroid, often lustrous; **stamens** 6, their filaments partially fused into 2 columns of 3 stamens, each opposite the outer petals; **petals** 4, in two series; **outer petals** alike, both being either saccate or spurred at base with \pm reflexed apical limbs; **inner petals** also alike, narrow, forming a terminal **crest** and fused at their tips, enclosing the stigma and anthers; **sepals** small, ovate to lanceolate, appressed (not peltate); **inflorescence** a terminal cyme or raceme, branched or simple with nodding or pendulous flowers (rarely axillary, single-flowered or with erect flowers); **pedicels** usually bracteolate and bracteate; **peduncle** usually a naked scape; **leaves** pinnately or ternately dissected in a basal **rosette** (rarely cauline) with slender, glabrous **petioles**; plants usually acaulescent from **rhizomes**, **bulblets**, **tubers** or **taproots**.

KEY TO SPECIES OF DICENTRA

1. Inflorescence a raceme-like thyrses of pink to purple flowers; apex of the flower with two tiny, free lobes (not contiguous with the petal wings)1. *Dicentra eximia* (p. 40)
1. Inflorescence a simple raceme of white to creamy flowers*; apex of the flower unlobed or lobed by the lateral wings of the inner petals(2)
 2. Bases of the outer petals prolonged into horn-like spurs, arched and narrowed toward their tips; tubers pinkish, congested, with many small bulblets2. *Dicentra cucullaria* (p. 41)
 2. Bases of the outer petals cordate-saccate; tubers yellowish, with few small bulblets
.....3. *Dicentra canadensis* (p. 43)

* Orange and purple in a very rare form not known from NY.



1. *Dicentra eximia* (Ker.) Torr.

Common Names: Wild Bleeding-heart, Turkey-corn, Staggerweed

Type Description: Ker., Bot. Reg., vol. 1, pl. 50, 1815

Synonyms: *Fumaria eximia* Ker., *Corydalis formosa* Pursh, *Bicuculla eximia* (Ker.) Millsp. (*Bikukula*), *Capnorchis eximia* (Ker.) Planch, (*Diclytra*)

Origin: Eastern North America

Habitats: Rocky woodlands, cliffs and borders (also cultivated)

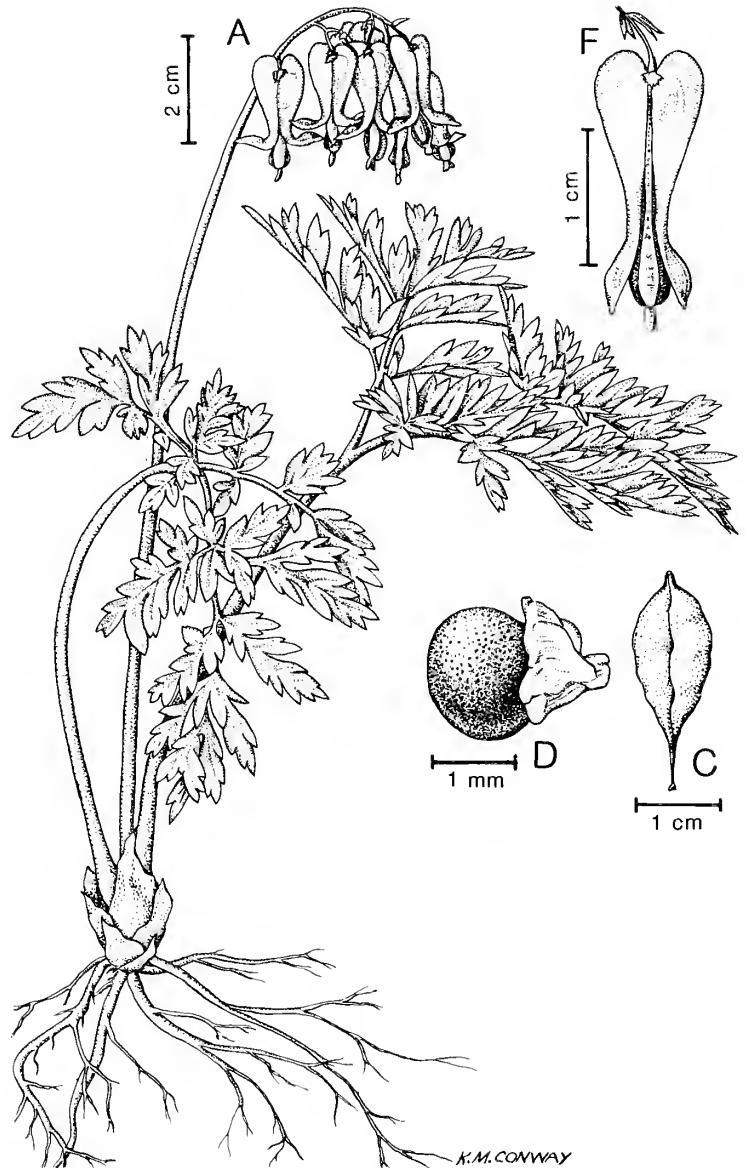
Habit: Acaulescent, perennial herbs

Flowering: April–September

Fruiting: May–October

General Distribution: (New York) New Jersey and Pennsylvania to the Southern Appalachians of Tennessee and Georgia

Rarity Status: Endangered or possibly extirpated in New York State

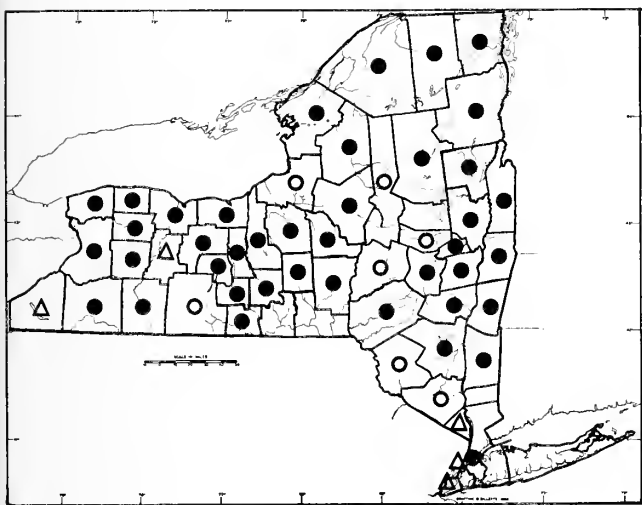


Description: Plants with **bisexual** flowers; **stigma** 1 per ovary, persistent, 2-crested, flattened, ca 0.8 mm wide; **style** 1, slightly ribbed, slender, 9–14 mm long, persistent in fruit; **ovary** 1, 2-carpelled, superior, 3–4 mm long, ovoid, becoming a brownish, fusiform, 2-valved **capsule** 1.5–2.1 cm long (excluding style), 5–8 mm wide, exserted from the withering corolla; **seeds** numerous, 1.2–1.5 mm long, somewhat flattened, dull brown; **aril** nearly as large as the seed, crested and convoluted, creamy-golden; **stamens** 6, in columns, 1.2–1.5 cm long; **anther** sacs golden, ca 0.8 mm long, oblong; **filaments** free in their terminal 1.5 mm, sheathing the style in a tight tube for 4–5 mm, united into 2 arching sheaths in the lower 7–9 mm and attached opposing the outer petals; **inner petals** 2, pale pink to rose, linear-spatulate, 1.5–1.9 cm long, expanded into cucullate lobes 3–5 mm broad at the tips and subterminally fused enclosing the stigma; **terminal lobes** of the inner petals 2, free, pink, flat, 1.7–2.1 mm long, up to 1 mm wide, attached at the point of inner-petal fusion; **inner-petal wings** prominent near the petal tips, up to 1.5 mm broad, abruptly narrowed above, not confluent with the terminal lobes; **outer petals** 2, pink to deep rose-purple, saccate and cordate at the base, narrowed upward to a divergent, expanded cucullate **limb**, the lower portion 1.2–1.8 cm long, ca 4 mm broad at base, the limb 4–5 mm long, 2–3 mm wide, acute tipped; **sepals** 2, persistent, 1.8–2.3 mm long and broad, oval, with ragged margins, base truncate to subcordate, tip acute, texture somewhat membranous; **inflorescence** a thyrsus of 2–8 (11) fascicles, 3–10 cm long, erect or arching, raceme-like at first but the flower clusters continuing to develop through the season producing up to 10 flowers per node, the axis occasionally branched to produce a smaller inflorescence subtending the terminal one; **pedicels** irregularly branching from **peduncles** in fascicles, their combined length up to 1.5 cm; **bracts** and **bracteoles** two to several, often

in subopposite pairs, lanceolate, acute to subulate, 2–6 mm long with pellucid, entire or irregularly toothed margins; leaves pinnately and ternately compound and lobed with elongate segments, their tips obtuse to acute-apiculate, the surfaces glaucous, glabrescent, blade area roughly triangular, up to 30 cm long and broad; petioles 12–26 cm long, ribbed, glabrous, subtended by scales which are irregularly toothed, up to 2 cm long; stem ribbed, usually naked, scapose (if the inflorescence is branched, a compound bract, intermediate between bract and leaf may be produced at the node); scape 25–40 (45) cm tall, arising from a tough, scaly rhizome and fibrous root system. ($2n = 16$)

Infraspecific Variation: Plants vary considerably in size, erectness, leaf-lobing and inflorescence density. Because this species has been hybridized with others in cultivation, garden plants may not comply in every respect with the preceding description of robust native plants known from our area. Flower color is especially variable in cultivars, ranging from pale pink to dark purple. Inflorescences of some southern plants are not uncommonly open-paniculate.

Importance: These showy plants have long been garden favorites and may escape cultivation within and outside their native ranges. Plants contain Protopine and other alkaloids, and are poisonous.



2. *Dicentra cucullaria* (L.) Bernh.

Common Names: Dutchman's-breeches, Soldier's-cap, Breeches-flower, Little-boy's-breeches, Little-boys-and girls, White Harts, Butterfly-banners, Little Indians

Type Description: Linnaeus, Species Pl., p. 700, 1753

Synonyms: *Fumaria cucullaria* L., *Cucullaria bulbosa* Raf., *C. cucullaria* (L.) Farw., *Bicuculla cucullaria* (L.) Millsp. *Bikukulla* Capnorchis *cucullaria* (L.) Planch., *Dicentra occidentalis* Rydb. (in part)

Origin: Temperate North America

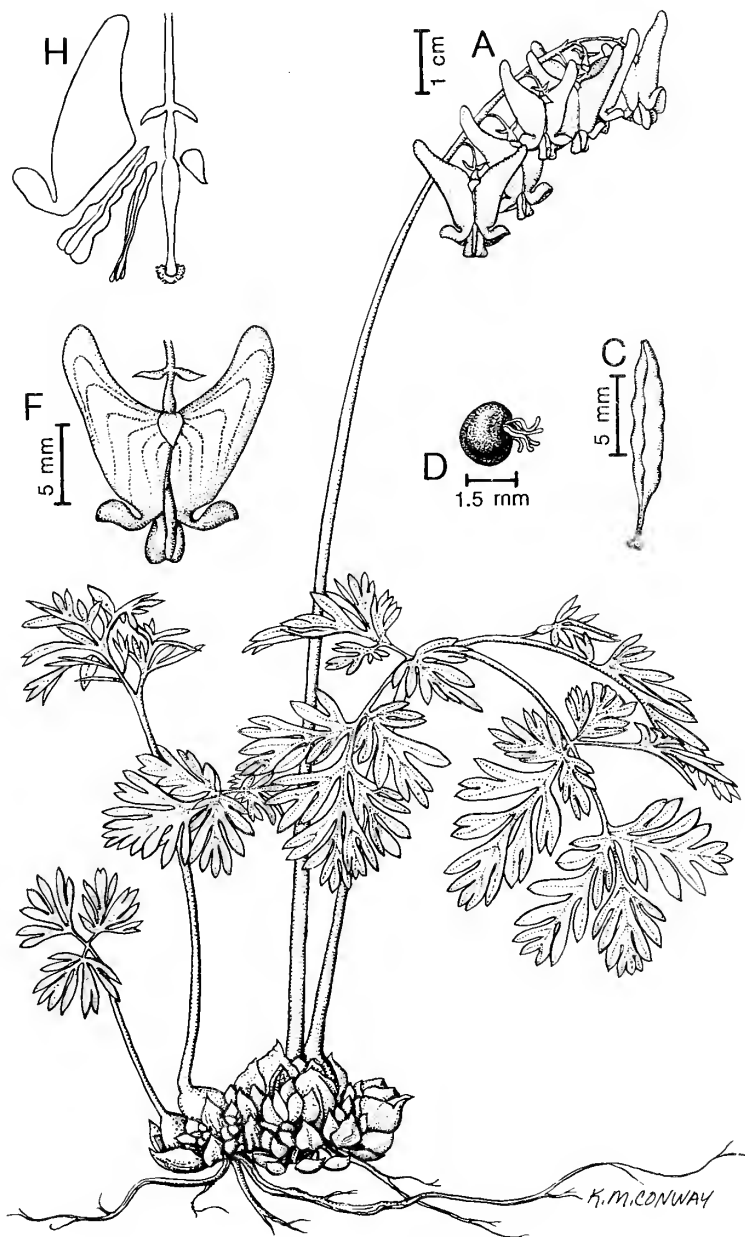
Habitats: Rich woodlands and cliffs

Habit: Scapose, perennial herbs

Flowering: April–June

Fruiting: May–July

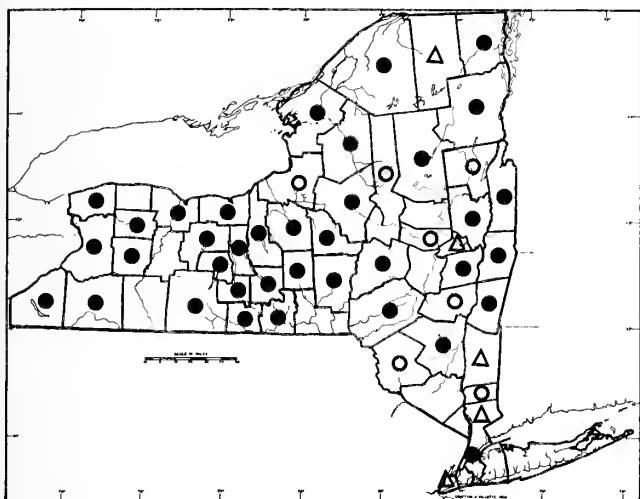
General Distribution: Nova Scotia to Ontario and Kansas, south to the Piedmont of Georgia and Alabama (disjunct westward to Idaho, Oregon and Washington State)



Description: Plants with **bisexual** flowers; **stigma** 1 per ovary, minute, persistent, flattened and obscurely 2-lobed; **style** 1, slender, persistent, 3–4 mm long in flower and fruit; **ovary** 3–5 mm long, linear-cylindric, many **ovuled**, becoming a fusiform **capsule** ca 1 cm long, 4 mm wide, brown, glabrous, dehiscing basipitally along one or both **sutures**, the 2 **valves** conforming somewhat in outline to the seeds within; **seeds** glossy, ebony, 1.7–1.9 mm long, ca 1.6 mm wide, shallowly reniform, tufted-arillate; **stamens** 6; **anther** sacs pale yellow, ca 0.6 mm long; **filaments** 7–10 mm long, slender above, winged below and united around the ovary apex, arching in 2 loosely adherent columns of 3; **perianth** withering, but somewhat persistent; **inner petals** 2, white to creamy, fused to the outer petals for 5–7 mm below, with a prominent **mid-vein**, the **limbs** 4–6 mm long, ca 2 mm wide at their blunt tips, cucullate, enclosing the stigma and fused at their tips, **lateral wings** inconspicuous, their tips not protruding beyond the floral **apex**; **outer petals** 2, white to creamy (pinkish-tinged), saccate and conspicuously spurred (1.0) 1.4–2.1 cm long, the **spurs** arched outward, narrowing toward the tips which curve upward from the drooping flower, **petal limbs** 2.5–3.8 mm long, reflexed $\pm 90^\circ$ from the axis, cucullate, obtusely tipped, creamy to ochre-yellow; **sepals** 2, at the inner petal bases, whitish to greenish-cream, 2–3 mm long, 1–2 mm wide, ovate to ovate-lanceolate with ragged-dentate (to entire) margins; **pedicel** (3) 5–7 (9) mm long, conspicuously broadened upward from the middle at the point of attachment of a pair of subopposite, pellucid, pale **bracteoles** which are 2–3 mm long, toothed and linear-lanceolate; **bract** at the pedicel base similar but broader and sometimes lobed; **inflorescence** a simple raceme, usually of 6–10 flowers, often terminating in an abortive pedicel; **scape** slender, glabrous, 10–20 (28) cm tall; **leaves** basal, finely ternately and pinnately compound and lobed, the **lobes** glabrous, linear to oblanceolate-spatulate, up to 2.5 cm long and 3 (5) mm wide; **petiolules** slender, sometimes slightly winged, glabrous, the lower ones with slightly clasping bases; **petiole** 4–15 cm long, glabrous, often ribbed below, subtended (along with scapes) by pellucid to scarious, pale **bracts** and **stipules** which vary from minute to 1.5 cm long and 1.2 cm wide, ovate with irregularly dentate margins and obtuse to acute tips; scapes and leaves arising from lenticular **tubers** 8–15 cm in diameter, pinkish and usually clustered with numerous smaller **bulblets**, tiny **bracts** and tough, fibrous **roots**. (2n = 32)

Infraspecific Variation: Plants of the western United States tend to have broader leaf segments (3–5 mm) and have been given varietal status by some authors [var. *occidentalis* (Rydb.) M. Peck]. The very rare forma *purpuritincta* E. H. Eames occurs on the Richelieu River near Montreal P.Q., and has purple sepals and pink and orange petals.

Importance: These plants are cultivated, being spread by tubers to shady garden spots. The species should be considered toxic due to the presence of isoquinoline alkaloids such as Protopine, Aporphine and Protoberberidine. There have not been reported cases of human poisoning in the U. S., but livestock losses have been known, especially in Virginia, where cattle were allowed to graze woodlands. Experiments have shown that livestock may ingest up to 4% of their body weight of *Dicentra* before showing trembling symptoms. Dried tubers of Dutchman's-breeches have been extracted for a weak tea, said to be alterative (health-restoring), but this could be a detrimental or even dangerous practice.



3. *Dicentra canadensis* (Goldie) Walp.

Common Names: Squirrel-corn, Turkey-corn, Turkey-pea, Colic-weed, "Wild Hyacinth" (from its odor)

Type Description: Goldie, Edinb. Phil. Jour., vol. 6, p. 329, 1822

Synonyms: *Corydalis canadensis* Goldie, *Capnorchis canadensis* (Goldie) Kuntze, *Bicuculla canadensis* (Goldie) Millsp. (*Bikukulla*, *Diclytra*)

Origin: Temperate North America

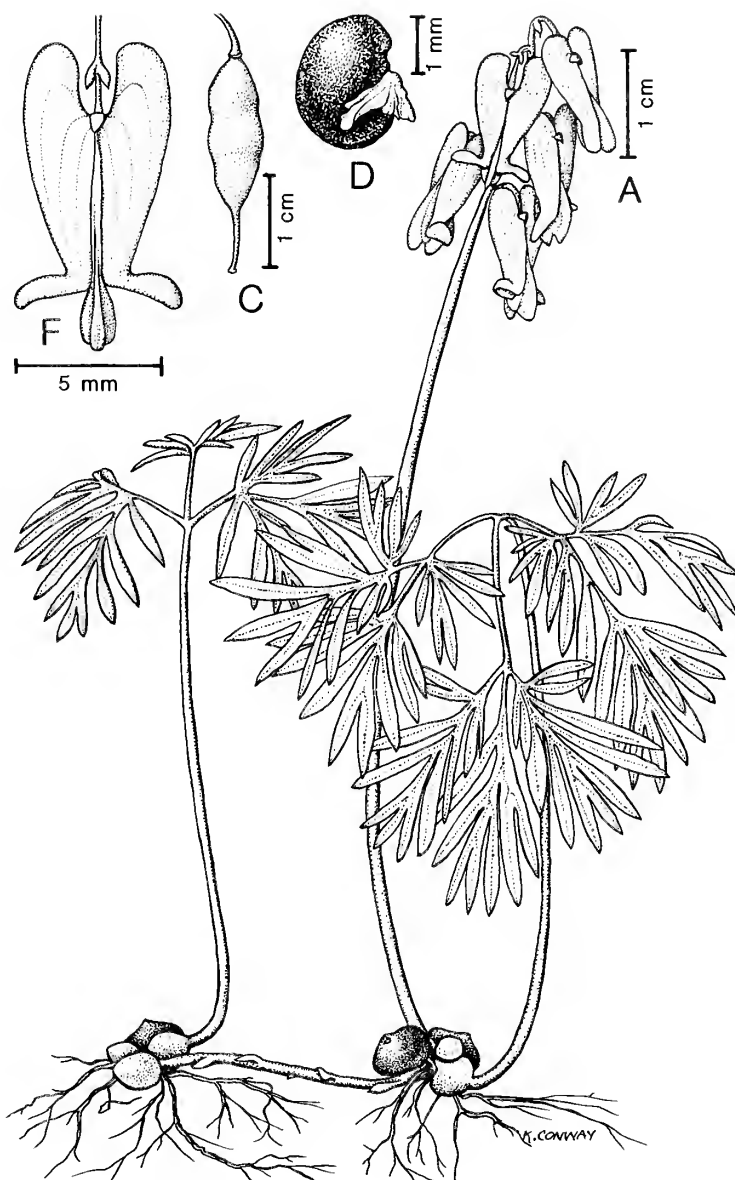
Habitats: Rich woodlands and cliffs

Habit: Scapose, perennial herbs

Flowering: April–May

Fruiting: May–June

General Distribution: Southwestern Quebec to Minnesota and Missouri, south to North Carolina and Tennessee in the Appalachians



Description: Plants with bisexual flowers; **stigma** 1 per ovary, 2-lobed, flattened, ca 1 mm broad, persistent; **style** 1, slender, 4–6 mm long in flower and fruit, persistent; **ovary** 1, slenderly cylindric, 5–7 mm long, several ovuled, glabrous, becoming a smooth, olive-brown, 2-valved **capsule**, fusiform to slightly falcate, 1.4–1.7 cm long, 4–6 mm wide, striated by its veins and 2 **sutures**; **seeds** usually 5–10 per capsule, very glossy, ebony, 2.2–2.6 mm long, ca 2 mm deep and 1.5 mm wide; **aril** pale, wing-like, tufted; **stamens** 6 in 2 loose groups of 3; **anther** sacs pale yellow, ca 0.6 mm long; **filaments** 8–10 mm long with wings up to 1 mm broad toward the base; **inner petals** 2, white to creamy, 1.1–1.3 cm long, 1–1.5 mm wide below, not adherent to the outer petals, strongly winged, cucullate toward tips and expanded up to 3 mm in width where they fuse at the tips to enclose the stigma; **inner petal wings** ca 0.5 mm wide below to 2.5 mm broad near their tips which extrude beyond the floral apex as rounded lobes; **outer petals** 2, white to creamy, 1.0–1.6 cm long, saccate-cordate, making the flower 6–11 mm wide, the bases rounded to somewhat elongate, but not conspicuously spurred, the **outer petal** limbs reflexed $\pm 90^\circ$ from the axis, 4–6 mm long, cucullate, obtusely tipped, often pinkish or purplish-tinged; **sepals** 2, minute, membranous, deltoid to ovate sometimes with an irregular lobe; **pedicels** 4–8 (11) mm long, broadening upward from near the middle at the point of attachment of 2 subopposite, linear-lanceolate **bracteoles** which are 2–3 mm long, pale, membranaceous with irregular margins; **bract** at base of pedicel oblong to spatulate, sheathing at base, up to 4 mm long, 2 mm wide, pale, greenish, membranaceous with pink veins; **inflorescence** a simple raceme, usually of 3–8 flowers, often ending in a sterile lobe or pedicel; **scape** glabrous to puberulent, often ribbed below, 6–22 (26) cm tall; **leaves** basal, finely ternate and pinnatisect, the **lobes** glabrous, linear to oblanceolate, up to 2.5

cm long, 5 mm wide; **petiolules** narrowly winged, not clasping at bases; **petioles** 4–18 (2) cm long, glabrous, caniculate, subtended (along with the scapes) by pellucid to scarious **stipules** and **bracts** up to 1.4 cm long, 1.1 cm wide, ovate with irregular margins and obtuse to apiculate tips; scapes and leaves arising from spheroid to ovoid (or flattened) **tubers** 6–12 mm in diameter, dull yellowish-brown to golden in color, borne on slender, wiry **rhizomes** with very few associated **bulblets** and fibrous, tough **roots**. ($2n = ca\ 64$)

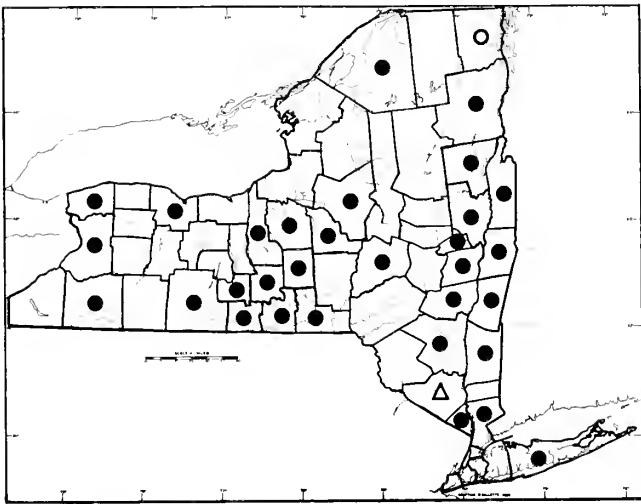
Importance: This species is sometimes cultivated by transfer of the tubers to shaded garden plots. Wildlife, such as game birds and squirrels eat the tubers. Squirrel-corn has been extracted for a tea used in folk medicine, reputed to cure various ailments including colic; however, it should be used with extreme caution, since it is known to contain harmful isoquinoline alkaloids. It has been implicated in livestock deaths and should be considered poisonous in quantity.

2. ADLUMIA

Common Names: Allegheny Vine, Mountain Fringe

Authority: Rafinesque, Med. Rep. II, vol. 5, p. 352, 1808 (nom. cons.)

A genus of a single species of delicate vines with a widely disjunct distribution in Korea and the mountains of eastern North America. *Adlumia* is sometimes cultivated.



1. *Adlumia fungosa* (Ait.) Greene ex B.S.P.

Common Names: Allegheny Vine, Mountain Fringe, Climbing Fumitory, Canary Vine, Cypress Vine, Fairy Creeper, Allegheny Fringe, Wood Fringe

Type Description: Aiton, Hort. Kew., vol. 3, p. 1, 1789

Synonyms: *Fumaria fungosa* Ait., *F. recta* Michx., *Adlumia cirrhosa* Raf. (not Raf. ex DC.), *A. asiatica* Ohwi, *A. komarovii* Popov

Origin: Arctotertiary Forest

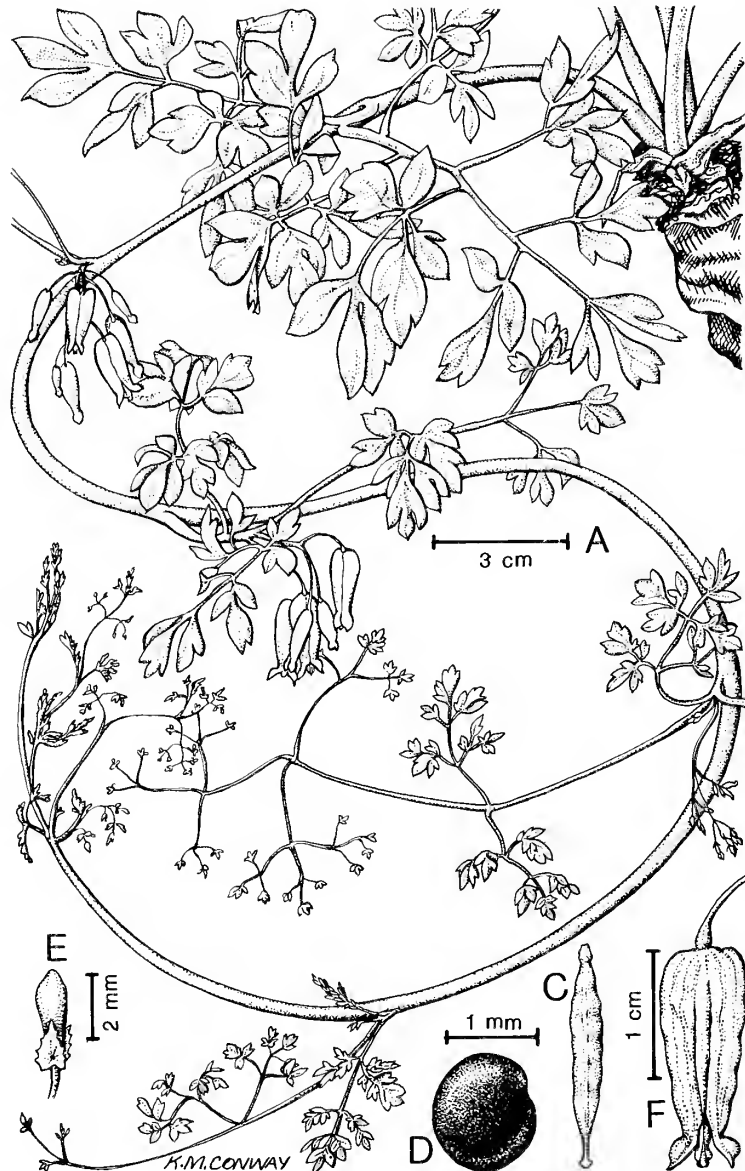
Habitats: Rich woods, usually montane, shaded cliffs and moist, calcareous places

Habit: Slender vines twining by the petioles on plants or rocks, biennial (or perennial in Asia?)

Flowering: June–October

Fruiting: Late June–October

General Distribution: Korea and North America from New England, Quebec and Ontario to the southern Appalachians of North Carolina and Tennessee



Description: Plants with **bisexual** flowers; **stigma** 2-lobed, wedge shaped, enclosed by the tips of the inner petals and capped by a waxy pollen mass; **style** 1, 3–4 mm long, slender; **ovary** 1, slender, cylindric, 0.9–1.3 cm long, glabrous, pale green, becoming a tan, 2-valved **capsule** which enlarges only to accomodate the breadth of developing seeds, dehiscent from the base along 2 prominent **sutures**; **seeds** usually 5 per capsule, shiny black, very smooth, ca 1.5 mm long, 1 mm broad, oval with a small indentation; **aril absent**; **stamens** 6, in 2 columns opposite the outer petals; **anther sacs** 8, the central stamen of each column with 2 sacs, the 2 flanking stamens with 1 sac each; each **staminal column** of 3 **filaments**, free near the anthers, fused below into a tubular sheath which is adnate to the lower corolla in a zone of spongy tissue; **flower** persistent in fruit, not readily wilting, retaining its color and shape until necrosis sets in; **petals** dimorphic, in 2 pairs of 2, united for most of their lengths into a spongy, saccate **corolla** which is white, pink or purple-tinged, narrowly flattened-ovoid (purse-shaped) and bilateral, 14–18 mm long, 4–7 mm wide and 2–4 mm across, obtuse to subcordate at base; **inner petals** 2, opposite the outer ones, very narrow, fused to the outer petals below, free above, their tips grooved, keeled and clawed, expanded to form a crown-like **hood** which caps the stigma and entraps pollen beneath the fused, inner petal tips; **outer petals** 2, forming most of the corolla sac, free at their divergent tips, the **free limbs** acute, strongly cucullate, yellowish, 2–3 mm long, enclosing the crest of the inner petals in bud; **sepals** 2, early deciduous, enfolding the young, clavate bud, but dropping as it expands, (**sepals**) 2.0–2.5 mm long, 0.8–1.1 mm wide, peltate, being minutely stalked well above the blade base, lanceolate, acuminate tipped, the peltate base rounded to hastate, margins irregularly toothed, pellucid, reddish-tinged; **inflorescences** few to many, 1 or 2 in the axil of a leaf, much-branched cymose-paniculate with up to 30 flowers each; **pedicels** (2) 5–14 mm long, ribbed and swollen near receptacle base, glabrous or minutely scaly with one or more minute linear-lanceolate, pellucid **bracts** which vary in size; **peduncles** smooth, usually glabrous, 1–4 cm long; **cauline leaves** compound, pinnately much-divided, the leaflet-bearing portion (blade) mostly 5–10 cm long, 4–7 cm wide, **leaflets** minute when blade expands, becoming 5–25 (30) mm long, 5–20 (23) mm wide, variously lobed and incised with obtuse to apiculate tips, bases obtuse to attenuate, surfaces glabrous; **basal leaves** similar, but forming a stemless, first year rosette; **petiolules** slender, glabrous to puberulent, terete or flattened and ridged (cauline ones) sometimes twining; **petioles** up to 15 cm long, usually glabrous, terete to ribbed or winged, tortuously twisted where twining on other stalks (those of the basal rosette not twining, flattened, ribbed and somewhat sheathing at bases); **stem** developing the second year, a single, elongate axis climbing or trailing up to 5 meters from a slender, biennial **taproot** and fibrous **root system**.

(2n = 32)

Importance: These vines are cultivated and may persist or escape.

3. CORYDALIS

Common Name: Corydalis

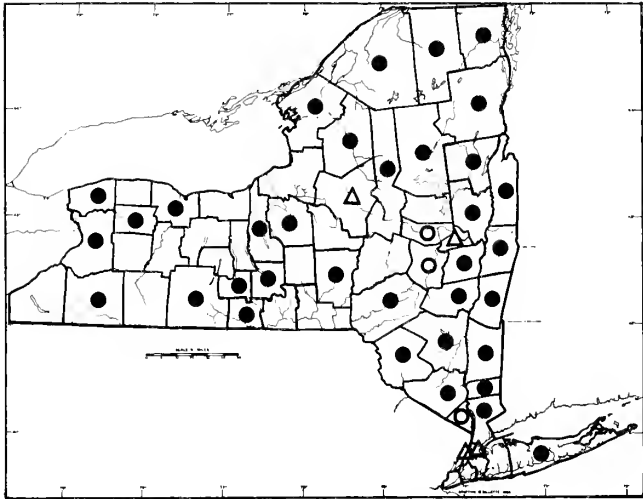
Authority: Ventenat (not Medic.), *Choix de Pl.*, t. 19, 1803 (*nom. cons.*)

A genus of over 200 species with its center of diversity in Asia. *Corydalis* is distributed mostly in the boreal Northern Hemisphere, but also has species in South Africa. *Corydalis* species are sometimes grown as garden curiosities, and are rich in alkaloids, some of which are poisonous.

Description: Plants with **bisexual** flowers; **stigma** 1 per flower, apically flattened, often 2-lobed with 4–8 smaller, receptive lobes; **style** 1, linear, persistent (rarely articulated and deciduous); **ovary** 1 per flower, cylindric-falcate, becoming a cylindric (to somewhat inflated) 2-valved **capsule**, often falcate-torulose, acropetally dehiscent and transversely ribbed between the **seeds**; seeds orbicular to reniform, sometimes flattened, usually lustrous and **arillate**; **stamens** in 2 groups of 3, the upper cluster with a **nectariferous spur** adnate within the **upper petal spur**; **inner petals** 2, similar, apically fused; **outer petals** 2, unlike, the upper one saccate-spurred; **sepals** ovate to lanceolate, small and sometimes peltately attached; **flowers** ± horizontally oriented, bilateral, borne in terminal **racemes** or **panicles** which elongate with age; **pedicels** and **peduncles** varying in length, the larger ones with leaflet-like **bracts** at the base; **cauline leaves** alternate, reduced upward, otherwise like basal ones; **basal leaves** often in a rosette, pinnately dissected into many lobes, these and the lower cauline leaves with **petioles**; **stems** semi-succulent, hollow, spreading or erect from annual or biennial **root systems** (less commonly perennial **rhizomes** or **tubers**).

KEY TO SPECIES OF CORYDALIS

1. Flowers bicolored, pink or rose-purple and yellow; mature fruit mostly ascending, linear; stigma not 2-lobed; stems usually erect1. *Corydalis sempervirens* (p. 46)
1. Flowers yellow; mature fruit mostly spreading or drooping; stigma 2-lobed; stems lax or weakly ascending (2)
 2. Mature flowers 7–9 mm long; upper petal with an undulate to toothed crest toward its tip2. *Corydalis flavula* (p. 48)
 2. Mature flowers 10–20 mm long; upper petal without a conspicuous, lobed crest3
3. Sepals lance-acuminate, usually entire, not lacerate; leaflets with lobes mostly 3–6 mm broad, conspicuously glaucous beneath3. *Corydalis lutea* (p. 49)
3. Sepals ovate to lanceolate, lobed and lacerate; leaflets finely divided into lobes, usually less than 2 mm broad4. *Corydalis aurea* (p. 50)



1. *Corydalis sempervirens* (L.) Pers.

Common Names: Pink Corydalis, Rock Harlequin, Rock Fumitory, "Pale Corydalis"

Type Description: Linnaeus, Species Pl., p. 700, 1753

Synonyms: *Fumaria sempervirens* L., *Capnodes sempervirens* (L.) Borkh., *Fumaria glauca* Curt., *Capnodes glauca* (Curt.) Moench, *Corydalis glauca* (Curt.) Pursh, *Corydalis rosea* Eat. (*Neckeria*)

Origin: North America

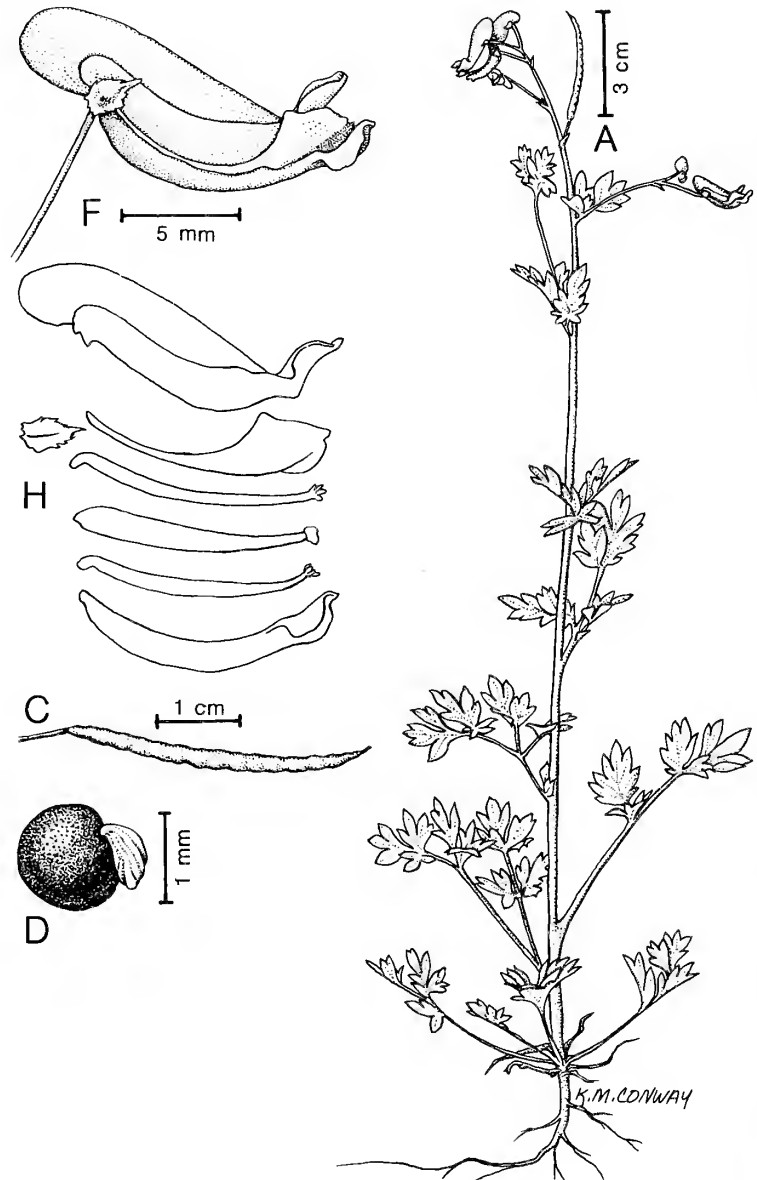
Habitats: Rocky, sunny places or partial shade, disturbed sites, limestone flatrock, clearings, often in shallow soil

Habit: Slender, erect biennials (annuals)

Flowering: May–September

Fruiting: May–October

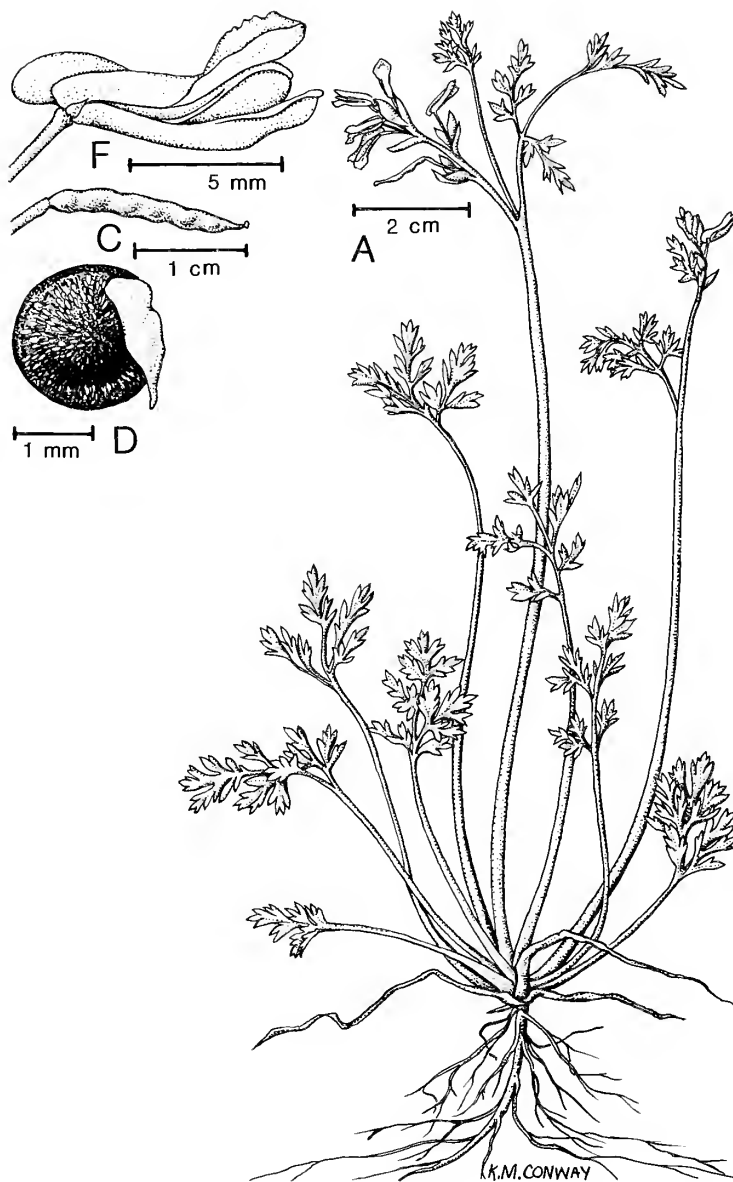
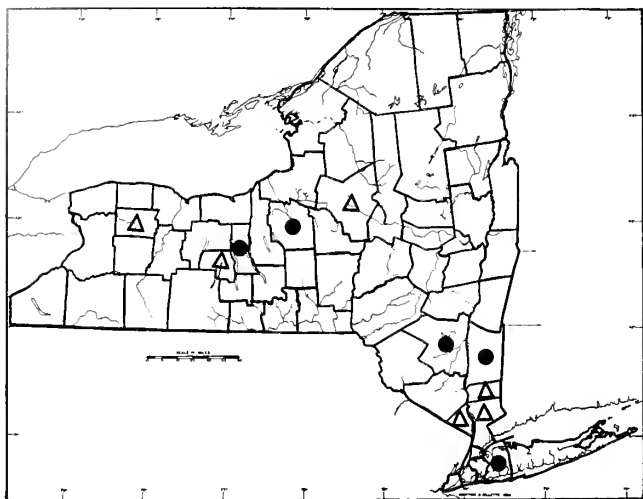
General Distribution: Newfoundland to Alaska, south to British Columbia, Minnesota, Illinois and Georgia (also reported from Siberia)



Description: Plants with **bisexual** flowers; **stigma** 1 per flower, flattened, 4-lobed, persistent in fruit becoming up to 0.8 mm broad; **style** 1, broadest near the stigma, persistent in fruit, becoming 3–4 mm long; **ovary** 1 per flower, linear-cylindric, ca 1 cm long, becoming a slender, 2-valved **capsule**, usually erect or ascending, somewhat falcate near the tip, tan, leathery in texture, prominently veined, 2.5–4.5 (5) cm long, 2–3 mm wide, dehiscing acropetally along 2 **sutures**, shedding about 20 **seeds**; seeds 0.8–1.1 mm long, variously compressed (with 1 or more flat sides) to spheroid, black, shiny, finely reticulate, with pale **arils** ca 0.5 mm long; **stamens** 6; **anther** sacs golden, minute; **filaments** slender, pale 8–10 mm long, coherent in **phalanges** of 3 each, the upper phalange with a blunt **spur** ca 1 mm long adherent within the upper petal spur; **perianth** bilaterally symmetrical, pink and yellow; **petals** 4, free, but closely associated to give the flower a tubular appearance; **inner petals** 2, borne laterally, 9–12 mm long, the basal 5–8 mm attenuated into a narrow claw, the expanded limbs attached at their tips over the stigma, each limb with a fold below and an obtuse lobe on its upwardly directed margin; **outer petals** 2, dissimilar: **upper petal** 10–15 mm long, including a saccate **basal spur** 3–4 mm long, the spur blunt, pink, not recurved toward the pedicel, the **petal hood** narrow, only slightly crested or **uncrested**, the tip flexed upward at maturity with upfolded lateral margins in the terminal 2 mm of the corolla tip which is bright yellow to cream; **lower petal** 10–13 mm long, unspurred; **sepals** 2, ovate-acute with unevenly toothed margins, attached peltately, 2–3 mm long, somewhat translucent, pinkish-green; **pedicels** slender, erect, 5–20 mm long in fruit, the longer ones in the lower inflorescence; **inflorescences** 1 to several, terminal on the erect branches, racemes or panicles; **bracts** lanceolate, pale green 1–2 mm long, the lower ones sometimes lobed; **upper cauline leaves** leaflet-like, intergrading with inflorescence bracts, sessile; **lower cauline leaves** like basal leaves with **petioles** up to 3 cm long; **basal leaves** pinnately dissected the larger with 5 major lobes, further dissected into terminal lobes which are oblong-elliptic, obtuse-apiculate, \pm glaucous due to surface texture, glabrous; **basal petioles** (1) 3–9 cm long; **stems** usually single, divaricately branched above (may be dwarfed and unbranched in poor conditions), terete to irregular in x-section due to ribbing, erect, 30–80 cm tall from a twisted, biennial **taproot** with thick lateral branches. ($2n = 16$)

Intraspecific Variation: This is a remarkably uniform, widespread species, varying phenotypically in its stature in response to environmental stresses, and having a deep, rose color-phase prized by horticulturists.

Importance: These plants are sometimes grown in rocky gardens or along gravelly paths. Related species are suspect in poisoning cases due to their alkaloid content, but this species has not been implicated.



2. *Corydalis flavula* (Raf. ex Desv.) DC.

Common Names: Yellow Harlequin, Yellow Fumewort, Yellow Rock-harlequin, Yellow Corydalis, Colic-weed, "Pale Corydalis"

Type Description: Rafinesque, in Desv., Jour. Bot., vol. 1, p. 224, 1808

Synonyms: *Fumaria flavula* Raf. ex Desv., *Capnodes flavulum* (Raf. ex Desv.) Kuntze (not *Capnoides*, as in House, 1924); *Neckeria flavula* (Raf. ex Desv.) Millsp., *Corydalis geyeri* Fedde, *C. aurea* α *flavula* (Raf. ex Desv.) Wood, "*C. flavidula*"

Origin: North America

Habitats: Moist, loose soil in rocky woodlands of sandy to calcareous areas

Habit: Sprawling to ascending colonies of annuals

Flowering: April–May

Fruiting: April–June (July)

General Distribution: Sporadic, from New York and Connecticut to Nebraska, south to Louisiana and North Carolina

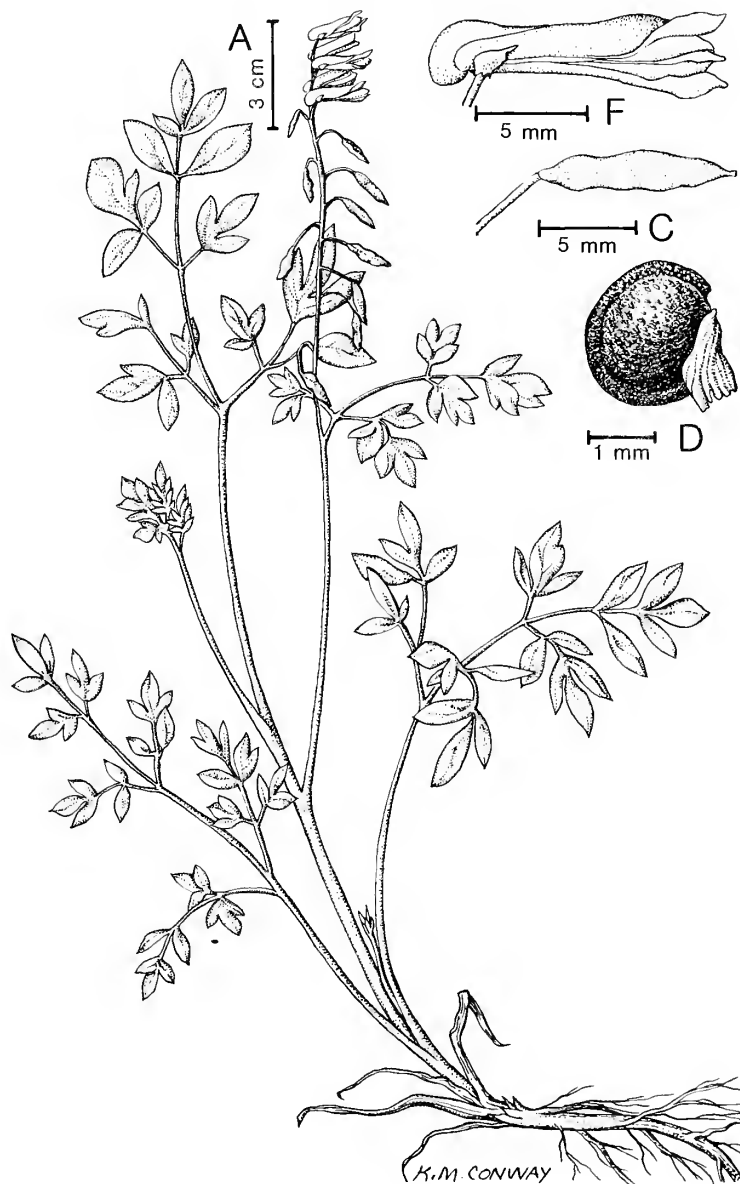
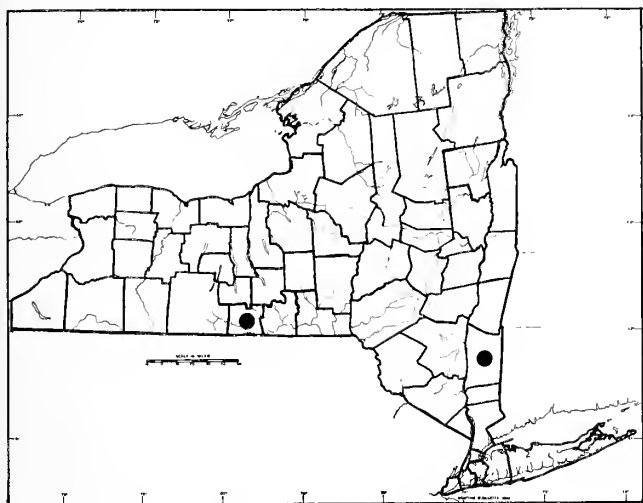
Rarity Status: These plants are rare and threatened in New York State and the species appears on the state list (Mitchell & Sheviak, 1981)

Description: Plants with bisexual flowers; stigma 1 per flower, flattened, the 2 major lobes widely divergent, ca 0.3 mm wide, usually deciduous in fruit; style 1, broadest near the base, 1–2 mm long, persistent in fruit, becoming 2–3 mm long; ovary 1 per flower, ca 4 mm long, 1 mm wide, falcate, becoming a cylindric, 2-valved capsule, spreading or pendulous, (14) 16–20 (23) mm long, 2–3 mm wide, glabrous, tan, leathery, the walls contracted between the enlarged seeds to give a beaded appearance to the capsule which is dehiscent along 2 sutures (acropetally) to release about 6–12 seeds; seed lenticular with a distinct marginal ridge, black, glossy, minutely alveolate, particularly near the margin, 1.8–2.0 mm broad, ca 1 mm thick; aril ca 1 mm long, creamy, wing-like, wrinkled; stamens 6; anther sacs golden, minute; filaments 5–6 mm long, slender, creamy, united into 2 phalanges, the upper with a spur 0.5 mm long within the upper petal spur; perianth bilaterally symmetrical, creamy yellow (sometimes small, cleistogamous); petals 4, free but closely associated to give the corolla a tubular appearance; inner petals 2, borne laterally, 5–6 (7) mm long, clawed at bases, expanded at tips where they are united over the stigma; outer petals 2, dissimilar: upper petal 7–9 mm long including the saccate, basal spur which is 1–1.5 (2) mm long, its blunt tip curved under toward the pedicel; petal hood with upcurved, slightly undulate to toothed margins near the tip, bearing an abrupt crest along its summit, the crest margin undulate to sharply toothed; lower

petal 5–8 mm long, unspurred, uncrested or with a small undulate crest; **sepals** minute, often deciduous, scarious, lanceolate, sometimes toothed, ca 0.3 mm long; **pedicels**, 3–11 (16) mm long, slender, glabrous, usually reflexed in fruit, each subtended by a **bract**; bracts ovate to lanceolate or lobed, 5–12 mm long, 3–9 mm broad, entire or dentate at margins and with acute to acuminate tips, somewhat sheathing at bases; **inflorescence** a short, crowded terminal or subterminal raceme; **cauline leaves** similar to basal ones, smaller but not reduced greatly upward, short petioled to sub-sessile; **basal leaves** pinnately compound with 5–7 main lobes, these further dissected and lobed, the ultimate leaf lobes elliptic to linear, apiculate, the surfaces glabrous, glaucous, variable in size but mostly 4–8 mm long; **petiolules** and petioles slightly winged, glabrous; **basal petioles** up to 10 cm long; **stems** erect when young, soon trailing and ascending, ribbed and fluted, juicy, branched mostly from near the base, 15–30 (–40) cm long, from an annual **taproot**. ($2n = 16$)

Infraspecific Variation: Cleistogamous plants are known in which the flowers are small and poorly developed; the vegetative portion of such plants is often very lax and diffusely branched with larger terminal leaflets and lobes.

Importance: This species contains a number of alkaloids and is suspected in livestock poisoning in Virginia.



3. *Corydalis lutea* (L.) DC.

Common Names: Yellow Corydalis, Rock Fumitory

Type Description: Linnaeus, Mant. Pl., ii, p. 258, 1771

Synonym: *Fumaria lutea* L.

Origin: Southern Europe

Habitats: Rocky places, especially walls, as an escape (calciphile)

Habit: Sprawling perennials

Flowering: May–August

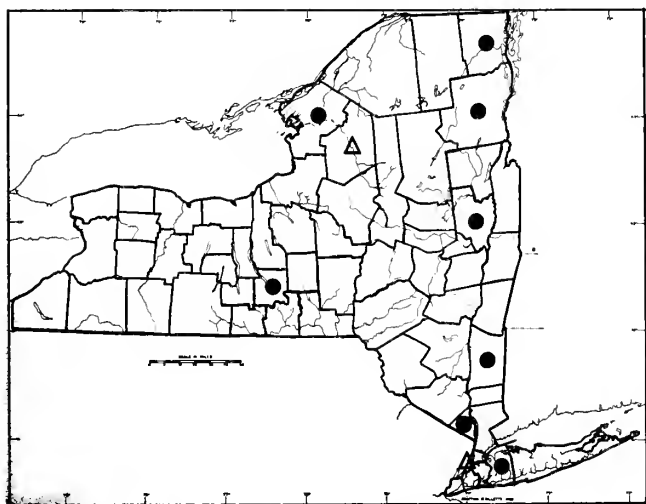
Fruiting: June–September

General Distribution: A rare escape in North America, but widely naturalized in Europe where it is also native in part

Description: Plants with **bisexual** flowers; **stigma** 1 per ovary, its 2 major lobes laterally divergent, ca 0.8 mm wide, somewhat flattened, usually not persistent in fruit; **style** 2–3 mm long, cylindric, persistent; **ovary** 1 per flower, slender, cylindric, 5–9 mm long, becoming a 2-valved **capsule**, usually pendulous, plump-cylindric, 8–12 mm long, 2–3 mm wide, somewhat constricted between seeds, tan, acropetally dehiscent along 2 **sutures** to release the 3–7 **seeds**; seeds lenticular, black, shiny, somewhat alveolate, ca 2 mm broad, with a definite marginal ridge;

aril pale, wing-like; **stamens** 6; **anther sacs** golden, minute; **filaments** pale, slender, united in 2 **phalanges**, the upper phalange with a **spur** 1.5–2 mm long within the upper petal spur; **perianth** bilaterally symmetrical, pale yellow to dark yellow near the corolla tip; **petals** 4, free, but closely associated to give the **corolla** a tubular appearance; **inner petals** 2, borne laterally, 9–13 mm long, clawed at bases, expanded into broader lobes toward the apices where they are fused at the tips over the stigma; **outer petals** 2, dissimilar: **upper petal** 12–20 mm long including a saccate **basal spur** 2.5–3 mm long, the spur narrowed toward its tip which is recurved toward the pedicel, **upper petal hood** uncrested (or very slightly crested), its lateral margins entire to weakly undulate, up-curved toward their tips; **lower petal** 7–10 mm long, unspurred, uncrested; **sepals** 2, pale, yellow-green, persistent, 2–3 mm long, lanceolate with truncate bases and acute to acuminate tips, the margins entire or irregularly serrate; **pedicels** slender, elongating up to 1.5 cm in fruit, reflexing with age; **inflorescence** a few-flowered raceme; **bracts** like the sepals; **upper cauline** leaves leaflet-like, short petioled; **lower cauline** leaves much like the basal ones, but reduced upward; **basal leaves** biternately to triternately compound, the segments further divided and lobed; **leaflets** elliptic, lobed or unlobed, mostly 4–9 mm long, 3–7 mm wide, glabrous, green above, whitish-glaucous below, apiculate tipped; **petiolules** and **petioles** not conspicuously winged; **basal petioles** up to 12 cm long; **stems** lax, freely branching, ribbed, up to 40 cm long from a perennial base and fibrous **roots**. ($2n = \pm 54?$)

Importance: These plants are grown commonly as garden ornamentals, especially on walls and sunny slopes, and they infrequently escape cultivation. They contain a variety of alkaloids and may be considered poisonous.



4. *Corydalis aurea* Willd.

Common Name: Golden Corydalis

Type Description: Willdenow, Enum., p. 740, 1806

Synonyms: *Capnodes aureum* (Willd.) Kuntze, *Neckeria aurea* (Willd.) Millsp. (see Ownbey, 1947 for extensive, non-NY synonymy)

Origin: Western North America

Habitats: Rocky places, especially limestone, in coniferous or mixed woodlands and clearings

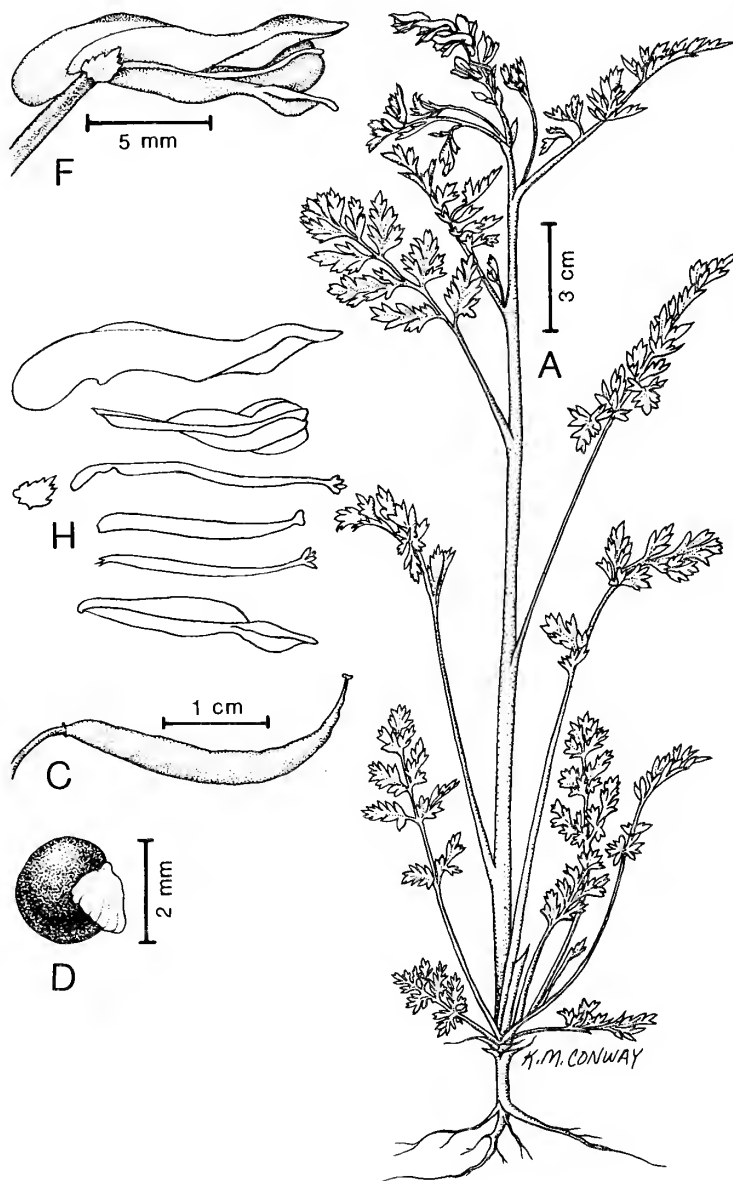
Habit: Sprawling to ascending annuals or biennials

Flowering: May–July

Fruiting: May–August

General Distribution: Alaska to Mexico and the Rocky Mountains, scattered eastward in glaciated areas to southeastern Quebec

Rarity Status: This species is sporadic and rare in eastern North America, and appears on the New York State rare plant list (Mitchell & Sheviak, *ibid.*)



Description: Plants with **bisexual** flowers; **stigma** 1 per flower, its 2 major lobes laterally divergent, persistent in fruit, up to 1 mm broad; **style** 1, slender, broadest toward base, persistent, becoming 3–4 mm long in fruit; **ovary** 1 per flower, 5–6 mm long, cylindric, slightly falcate, becoming a cylindric, often arcuate, 2-valved capsule, pendulous at maturity (in ours), 1.5–3.0 cm long, 2.5–3 mm wide, constricted between the seeds, leathery, tan, usually with 2 prominent veins opposite the **sutures**, dehiscing acropetally to release (3) 7–12 seeds; **seeds** 1.9–2.0 mm long, plump-lenticular to comma-shaped, very shiny black, minutely and inconspicuously reticulate, the marginal ridge absent; **aril** wing-like, pale, ca 1.5 mm long; **stamens** 6; **anther** sacs golden, minute; **filaments** slender, 7–8 mm long, coherent into 2 **phalanges**, the upper phalange prolonged backward as a spur 2–3 mm long within the upper petal spur; **perianth** bilaterally symmetrical, yellow with darker yellow near the corolla tip; **petals** 4, free, but closely associated in a **corolla** which appears tubular; **inner petals** 2, borne laterally, narrowed in their distal half into claws which bear small wings, the expanded blades attached over the stigma at their tips, total length 8–10 mm; **outer petals** 2, dissimilar: **upper petal** 12–16 mm long including a saccate, **basal spur** 3–5 mm long, the spur straight or slightly downcurved, but not strongly recurved toward the pedicel, **petal hood** with a greenish swelling along its median, but **not crested** (extremely rarely with a small crest), lateral margins upturned, entire to undulate or sharply toothed, with an apiculate tip; **lower petal** 9–11 mm long, unspurred uncrested, the tip similar to the hood of the upper petal; **sepals** 2, scarious, ovate, 1–2 mm long, ca 1.5 mm wide, acute to acuminate-tipped, truncate to cordate-hastate at bases, the margins irregularly toothed or incised; **pedicels** slender, elongating and reflexing downward in fruit, up to 10 mm long; **inflorescence** a terminal or axillary raceme, usually surpassed by the leaves; **cauline leaves** not much reduced upward, petioled, much like basal leaves; **basal leaves** few to densely clustered in a **rosette**, pinnately compound into 5–7 major lobes, further dissected, the ultimate **leaflets** usually deeply cleft into narrow segments, broadly to narrowly elliptic in outline, the surfaces glabrous, \pm glaucous, tips apiculate; **petiolules** and **petioles** glabrous, terete to slightly winged, somewhat clasping at bases, the petioles 2–8 cm long, not much reduced upward; **stems** erect when young, soon becoming prostrate to ascending, semisucculent, glabrous, 15–35 (50) cm long, arising from an annual **root system** or developing a biennial, **basal caudex** with fibrous **roots**. ($2n = 16$)

Infraspecific Variation: Most of the variability of this species lies outside of New York State in the contiguous part of its distribution range. Our materials correspond to ssp. *aurea*, while plants of the south-central states are treated as ssp. *occidentalis* (Engelm.) Ownb., with larger, long-spurred flowers and more erect fruits.

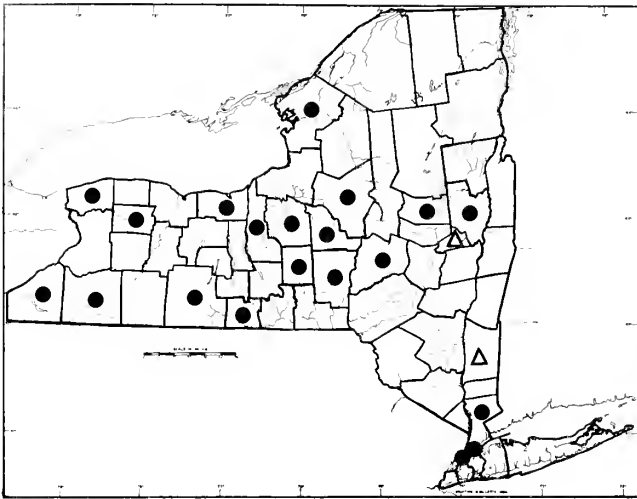
Importance: These plants are sometimes grown in rock gardens. Due to their alkaloid content, they have been cited in some cases of livestock poisoning.

4. FUMARIA

Common Names: Fumitory, Earth-smoke

Authority: Linnaeus, *Species Pl.*, p. 699, 1753

A genus of over 40 species, many of which are cosmopolitan weeds, native to Eurasia and north Africa, mostly around the Mediterranean area. In New York State the only established species is the infrequently introduced *Fumaria officinalis* L., an adventive associated with agriculture. Some species of the genus contain medicinally active alkaloids.



1. *Fumaria officinalis* L.

Common Names: Common Fumitory, Fume-wort, Earth-smoke, Hedge Fumitory, Fume-root, Wax-dolls

Type Description: Linnaeus, Species Pl., p. 700, 1753

Origin: Mediterranean region

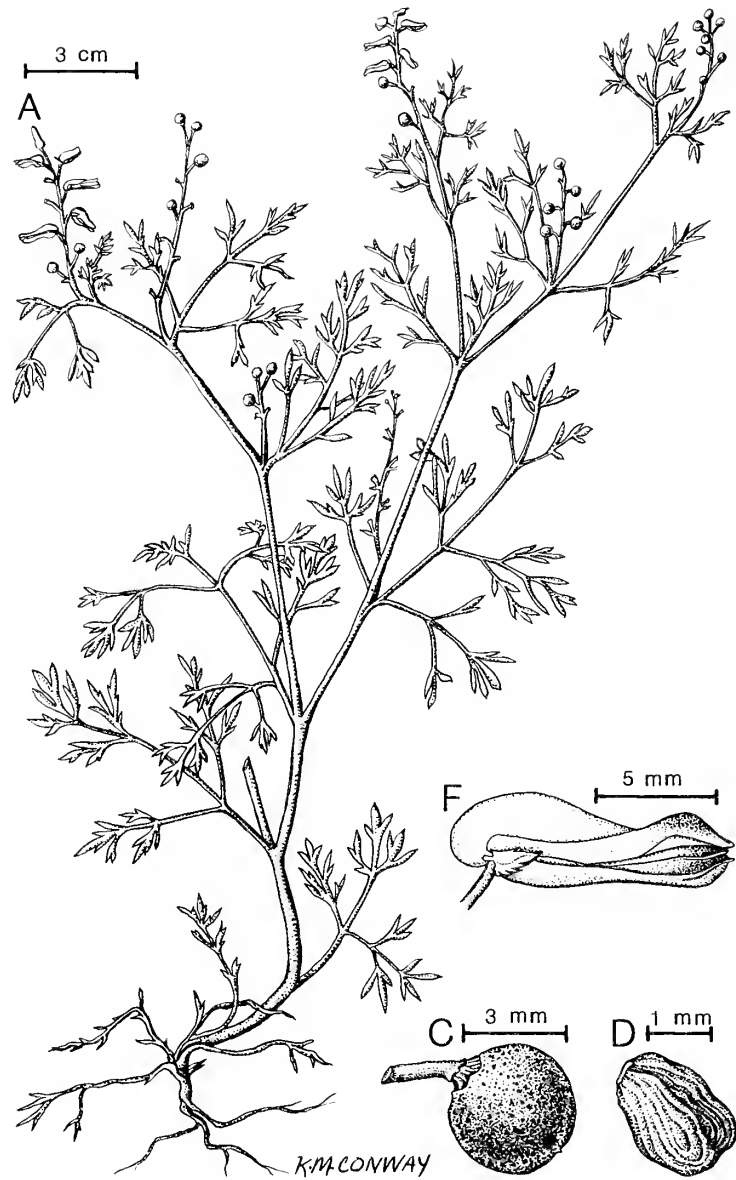
Habitats: Waste places, agricultural fields, borders, roadsides

Habit: Erect to spreading and sprawling annuals

Flowering: May–August

Fruiting: June–September

General Distribution: A widely escaped weed, especially in warm-temperate North America; native to southern Eurasia and north Africa



Description: Plants with **bisexual** flowers; **stigma** 1 per flower, its 2 lobes laterally divergent, flattened, up to 0.5 mm wide; **style** 1, slender, 5–6 mm long, articulate at base and deciduous; **ovary** 1 per flower, superior, fusiform, 1.2–1.4 mm long, glabrous, becoming a single-seeded indehiscent **fruit (nutlet)**, globose to lenticular-reniform, usually with 2 indentations near the stigma scar, ca 3 mm wide 2.6 mm thick at maturity, greenish-tan to brown, the surfaces rough, minutely muricate; **seed** 1 per fruit, ca 2 mm long, 1 mm wide, brown, ridged; **aril absent**; **stamens** 6; **anther sacs** minute, golden; **filaments** united into 2 distinct **phalanges** (upper and lower), slender above, expanded and sheathing toward the base, pale, 4–6 mm long; **corolla** bilaterally symmetrical; **petals** 4, pale rose pink to deep purple-maroon near their tips, basally free, but closely associated to give the corolla a tubular appearance; **inner petals** 2, similar, 3.5–4.5 mm long, borne laterally, clawed toward their bases, expanded and ridged near their tips where they are fused-cucullate over the stigma; **outer petals** 2, dissimilar: **upper petal** 12–13 mm long including a saccate **basal spur**, 2.0–2.8 mm long, straight, but with a small downcurved lobe below, **petal hood** with a greenish, swollen area along the midline, laterally cucullate and blunt-tipped; **lower petal** 5–6 mm long, narrowly clawed at base, the terminal 2 mm expanded, cucullate, green and maroon; **sepals** (1) 2–3 mm long, whitish to translucent with green midribs and pink-tinged margins, peltate to truncate or hastate at bases, acute to acuminate tipped with ragged, toothed margins; **pedicels** 2–4 mm long, sometimes flattened or grooved, glabrous; **inflorescence** a narrow raceme, terminal or more often lateral or sub-terminal; **bracts** lanceolate, 1.5–3 mm long, green with whitish (usually entire) margins, somewhat clasping at bases of the pedicels; **cauline leaves** up to 12 cm

long, variously compound, pinnately dissected and lobed, the ultimate segments mostly with 2–3 mm wide lobes, oblanceolate, blunt or apiculate-tipped, glabrous; basal leaves similar though often smaller, in a rosette, few in number or absent; petiolules and petioles glabrous, rarely entwining other low vegetation; lower petioles up to 5 cm long; stems ribbed, somewhat glaucous, ascending to sprawling up to 50 cm from a slender taproot and diffuse annual root system which exudes a nitrous, smoky odor. ($2n = 32, 14?, 16?$)

Intraspecific Variation: This species, like a number of its relatives, can produce small, pale cleistogamous flowers which do not conform to the above description.

Importance: Fumitory can be an annoying weed of crop fields and gardens, especially further south. It has been extracted for a yellow-green dye in the Mediterranean region. In folk medicine *Fumaria officinalis* has been employed as a laxative and "blood purifier" with questionable success; it does contain Protopine (Fumarine), however, which has been shown experimentally to induce bradycardia.

APPENDIX I

FUNGI ASSOCIATED WITH PLANT SPECIES IN THIS TREATMENT

To be included on this list, a fungus must occur on a species in this treatment somewhere in the United States. If a fungus occurs in New York State and has not as yet been recorded on a host covered in this treatment, but has been collected on such a host in some other state, it is marked with a single asterisk (*).

Abbreviations of states indicate a literature citation for each. Double asterisks (**) indicate that a herbarium specimen with New York State host information has been seen.

PERONOSPORALES

Peronospora arborescens (Berk.) de Bary, Downy mildew or false mildew on *Argemone mexicana* (Tex.) this nearly cosmopolitan fungus has also been recorded on numerous *Papaver* sp. and *Chelidonium majus* on other continents

Peronospora corydalis de Bary, Downy mildew or false mildew on *Corydalis aurea* (Ind.), or *Corydalis semper-virens* (Mass., Md., N.Y. **), on *Dicentra canadensis* (N.Y. **)

Peronospora dicentrae Syd. ex Gaum., Downy mildew or false mildew on *Dicentra canadensis* (N.Y. **), on *Dicentra cucullaria* (Ind., Md., Mich., Mo., N.Y., Va., Wisc.)

Pythium paroecandrum Drechs., Leaf and stem rot of *Sanguinaria canadensis* (Va.)

ERYSIPHALES

Erysiphe cichoracearum DC., Powdery mildew on various hosts including *Papaver somniferum*, *Papaver* sp., *Chelidonium majus*, and *Eschscholzia californica* (cosmopolitan *)

Erysiphe polygoni DC., Powdery mildew on *Eschscholzia californica* (Calif.), on *Papaver somniferum* (Ore.)

Microsphaera alni DC., Powdery mildew on *Menispermum canadense* (Iowa, Mich., N.Y., Ohio)

Phyllactinia corylea Pers., Powdery mildew on *Berberis vulgaris* (Mass., Vt.)

SPHAERIALES

Diaporthe beckhausii Nits. (= *Diaporthe menispermii* Dearn. & House), on *Menispermum canadense* (N.Y. **)

Diaporthe detrusa (Fries) Fuckel, on *Berberis vulgaris* (Mass.)

Glomerella cingulata (Ston.) Spauld. & Schrenk, on *Podophyllum peltatum* (Del., Tex.)

Valsa menispermii Ellis & Holw., on *Menispermum canadense* (Iowa)

HELOTIALES

- Botryotinia fuckeliana* (de Bary) Whetzel [= *Peziza fuckeliana* de Bary, *Sclerotinia fuckeliana* (de Bary) Fuckel], Gray-mold blight, [perfect state of *Botrytis cinerea* Pers.: Fries (Monilales) which see for host information]
Discohainesia oenotherae (Cooke & Ellis) Nannf., on *Podophyllum peltatum* (Va.)
Orbilia caulophylli Ellis & Everh. [= *Calloria caulophylli* (Ellis & Everh.) Rehm; this species belongs in the genus *Laetinaevia* but apparently the combination has not been made], on *Caulophyllum thalictroides* (N.Y.**)
Sclerotinia sclerotiorum (Libert) de Bary, on *Papaver somniferum* (Wash.)
Septotinia podophyllina Whetzel ex Groves & Elliott [= *Gloesporium podophyllina* Ellis & Everh., *Septogloeum podophyllinum* (Ellis & Everh.) Sacc.], on *Podophyllum peltatum* (Del., Md., Mo., N.J., N.Y., Pa., Va., W. Va.)

PLEOSPORALES

- Cucurbitaria berberidis* (Pers.) S. F. Gray, on *Berberis vulgaris* (Maine, N.Y.** , S.C.)
Leptosphaeria berberidis Richon, on *Berberis vulgaris* (Iowa)
Pleospora media Niessl., on *Papaver nudicaule* (Alaska)

DOTHIDEALES

- Dothidea berberidis* (Wahlenb.) de Not., on *Berberis vulgaris* (Mass.)
Mycosphaerella berberidis (Auersw.) Lindau, on *Berberis thunbergii* (N.Y.)

USTILAGINALES

- Entyloma eschscholtzia* Harkn., on *Eschscholzia californica* (Calif.)
Entyloma fuscum Schröt (= *Entyloma fuscum* Rabenh., *Entyloma glaucii* Dang.), Leaf smut on *Papaver dubium* (La.), on *Papaver nudicaule* (Iowa, Maine), on *Papaver orientale* (Ont.), on *Papaver rhoeas* and *Papaver somniferum* (cosmopolitan)
Entyloma menispermii Farlow & Trel. (= *Ramularia contexta* Ellis & Everh.), on *Menispermum canadense* (N.Y.** to Va., west to Minn. and Kans.)

UREDINALES

- Aecidium plenum* Arthur, on *Argemone mexicana* (Tex.)
Cerotelium dicentrae (Trel.) Mains & F. W. Anderson, a rust with 0, I on *Dicentra cucullaria* (N.Y.** to Md., Ill., Iowa, Kans., S. Dak.) II, III on *Laportea canadensis*
Puccinia aristidae Tracy, a rust with 0, I on *Corydalis aurea* and *Corydalis* sp. (Colo., Kans., Nebr.) II & III on *Aristida* and *Distichlis*
Puccinia brandegei Peck, on *Corydalis aurea* (Kans.)
Puccinia graminis Pers., a rust of enormous commercial importance, 0, I on *Berberis vulgaris* ** and *Berberis canadensis*** (generally distributed) II, III on Cereals and grasses
Puccinia podophylli Schw., 0, I, III on *Podophyllum peltatum* (Generally distributed **)

APHYLLOPHORALES

- Poria punctata* (Fries) Karst., on *Berberis vulgaris* (Md.)
Thanatephorus cucumeris (Fries) Donk (= the perfect state of *Rhizoctonia solani* Kuhn. which see for host information)

MONILIALES

- Alternaria alternata* (Fries) Keissler, on *Papaver rhoeas** (the fungus is both cosmopolitan and common)
Alternaria lancipes Ellis & Everh., on *Argemone mexicana* (Tex.)
Alternaria sp., on *Eschscholzia californica* (Tex.)
Botrytis cinerea Pers. ex Fries, imperfect state of *Botryotinia fuckeliana* (de Bary) Whetzel, on *Berberis vulgaris* (Calif.), on *Eschscholzia californica* (Alaska), on *Papaver nudicaule* (Alaska), on *Papaver orientale* (Md., Wisc.), on *Papaver rhoeas* (Alaska), on *Podophyllum peltatum* (N. J.)

Botrytis streptothrix (Cooke & Ellis) Sacc., on *Caulophyllum thalictroides* (N.J., N.Y.**), on *Sanguinaria canadensis* **

Botrytis sp., on *Sanguinaria canadensis* (N. Y.)

Cercospora caulophylli Peck, on *Caulophyllum thalictroides* (Vt., N.Y.** to Va., Mo., Wisc.)

Cercospora menispermi Ellis & Holw., on *Menispermum canadense* (N.Y.** to Va., Kans., Wisc.)

Cercospora podophylli Tehon & Daniels, on *Podophyllum peltatum* (Ill.)

Cercospora sanguinariae Peck, on *Sanguinaria canadensis* (Md., Mo., N.Y.** , Pa., Tex., Wisc.)

Cercospora whetzelii Chupp, on *Argemone mexicana* (Puerto Rico)

Heterosporium eschscholtziae Harkn., on *Eschscholzia californica* (Calif.)

Oidium sp., on *Papaver somniferum* ("U. S. A.")

Phymatotrichum omnivorum (Shear) Dug., on *Argemone mexicana* (Tex.), on *Berberis canadensis* (Tex.), on *Berberis thunbergii* (Tex.), on *Berberis vulgaris* (Tex.), on *Chelidonium majus* (Tex.)

Verticillium albo-atrum Reinke & Berth. on *Berberis thunbergii* (Conn. to Va., Ill., Mich.), on *Berberis vulgaris* (Conn.), on *Eschscholzia californica* (Calif.), on *Papaver orientale* (N. Y.)

SPHAEROPSIDALES

Coniothyrium insitivum Sacc., on *Berberis vulgaris* (Nebr., Wisc.)

Coniothyrium hellebori Cooke & Massee, on *Heleborus niger* (N. C.)

Diplodia berberidina Sacc., on *Berberis vulgaris* (N. Y.)

Diplodia sarmentorum Fries, on *Menispermum canadense* (N. Y.)

Phoma berberina Sacc. & Roum., on *Berberis thunbergii* (Mass.), on *Berberis vulgaris* (Iowa)

Phomopsis menispermi (Peck) Grove, on *Menispermum canadense* (Kans.)

Phyllosticta abortiva Ellis & Kellerm., on *Menispermum canadense* (Iowa)

Phyllosticta berberidis Ranenh., on *Berberis vulgaris* (Ky)

Phyllosticta japonica Thüm., on *Berberis thunbergii* (Alaska), (=?conidial state of *Mycosphaerella berberidis*)

Phyllosticta menispermicola Tehon & Daniels, on *Menispermum canadense* (Ill.)

Phyllosticta podophylli (Curtis) Wint., on *Podophyllum peltatum* (N.Y.** to Ala., Ark., Wisc.)

Phyllosticta podophyllina Tehon & Stout, on *Podophyllum peltatum* (Ill.)

Phyllosticta sanguinariae Wint., on *Sanguinaria canadensis* (Mo., Tex., W. Va.)

Septoria abortiva (Ellis & Kellern.) Tehon & Daniels, on *Menispermum canadense* (Ill., Kans., Ky.)

Septoria argemonis Tharp, on *Argemone alba* (Okla.), on *Argemone mexicana* (Okla.)

Septoria chelidonii Desm., on *Argemone mexicana* (Puerto Rico), on *Chelidonium majus* (Tex.)

Septoria corydalis Ellis & J. J. Davis, on *Corydalis aurea* (Wisc.)

Septoria podophyllina Peck, on *Podophyllum peltatum* (N.Y.** to Miss., Mo., Wisc.)

Sphaeropsis menispermi Peck (=?conidial state of *Physalorporia obtusa*), on *Menispermum canadense* (N.Y.** to Va., Kans., Mich.)

Stagonospora berberidina Sacc., on *Berberis vulgaris* (N. Y.)

MELANCONIALES

Colletotrichum circinans (Berk.) Arx, experimental infection on *Eschscholzia californica* (Calif.)

Colletotrichum sordidum J. J. Davis, on *Menispermum canadense* (Wisc.)

Cylindrosporium circinans Wint., on *Sanguinaria canadensis* (Md., Mo., Wisc.)

Gloeosporium argemonis Ellis & Everh., on *Argemone mexicana* (Fla., Tex.)

Gloeosporium berberidis Cooke, on *Berberis vulgaris* (Mass., Minn., Ohio, Wisc.)

Vermicularia hysteriiformis Peck, on *Caulophyllum thalictroides* (N.Y.**)

Vermicularia podophylli Ellis & Dearn., on *Podophyllum peltatum* (Tex., Va.)

MYCELIA STERILIA

Rhizoctonia solani Kühn., on *Berberis vulgaris* (Conn.), on *Papaver nudicaule* (Maine, N.Y.), on *Papaver orientale* (Ind., N. J.), on *Papaver rhoeas* (Kans., N. J.), on *Papaver somniferum* (Idaho)

Rhizoctonia sp., on *Podophyllum peltatum* (Mo.)

APPENDIX II

A List of Some Insects Associated with Plant Species in this Treatment:

HEMIPTERA

Miridae

Horcias dislocatus (Say) on *Caulophyllum thalictroides*

Aphididae

Aphis fabae Scopoli on *Papaver orientale* and *Papaver rhoeas*

Aphis gossypii Glover on *Papaver rhoeas*

Liosomaphis berberidis (Kaltenbach) on *Berberis thunbergii*

Macrosiphon euphorbiae (Thomas) on *Corydalis sempervirens* and *Dicentra* sp.

Rhopalosiphum berberidis (Kaltenbach) on *Berberis thunbergii* and *Berberis vulgaris*

Coccidae

Lecanium persicae (Fabricius) on *Berberis*

LEPIDOPTERA

Pieridae

Artogeia napi (L.) on *Berberis vulgaris*

Artogeia rapae (L.) Cabbage Butterfly on *Berberis vulgaris*

Lycaenidae

Satyrrium liparops (Boisduval & LeConte) on *Podophyllum peltatum*

Nymphalidae

Speyeria aphrodite (Fabricius) on *Podophyllum peltatum*

Euptoieta claudia (Cramer) Variegated Fritillary on *Podophyllum peltatum*

Hesperiidae

Achalarus lyciades Abbot & Smith on *Corydalis sempervirens*

Saturniidae

Hyalophora cecropia (L). Cecropia Moth on *Berberis vulgaris*

Samia cynthia (Drury) on *Berberis vulgaris*

Lymantriidae

Orgyia leucostigma (Abbot & Smith) White-marked Tussock Moth on *Berberis canadensis* and *Berberis vulgaris*

Lymantria dispar (L.) Gypsy Moth on *Berberis vulgaris*

Lasiocampidae

Malacosoma americana (Fabricius) Apple Tree Tent Caterpillar on *Berberis vulgaris*

Agaristidae

Alypia octomaculata (Fabricius) Eight-spotted Forester on *Berberis vulgaris*

Noctuidae

- Trichoplusia ni* (Hubner) on *Eschscholzia californica*
Crocigrapta normani (Grote) on *Caulophyllum thalictroides*
Pseudaletia unipunctata (Haworth) Army Worm on *Papaver somniferum*
Mamestra curialis Smith on *Dicentra spectabilis*
Papaipema cerina (Grote) on *Podophyllum peltatum*
Papaipema mereikata Bird on *Podophyllum peltatum*
Prodenia eridania (Cramer) on *Sanguinaria canadensis*

Arctiidae

- Hyphantria cunea* (Drury) Fall Webworm on *Berberis canadensis*

Pyrilidae

- Omphalocera dentosa* Grote on *Berberis* sp.

DIPTERA

Cecidomyiidae

- Bremia podophyllae* Felt on *Podophyllum peltatum*
Mycodiplasis alternata Felt on *Podophyllum peltatum*
Youngomyia podophyllae Felt on *Podophyllum peltatum*

HYMENOPTERA

Tenthredinidae

- Bivena quattrodecimpunctata* (Nort) larva on *Podophyllum peltatum*

Hylaeidae

- Hylaeus mesillae* Cressoni (Cockerell) on *Eschscholzia californica*

Adrenidae

- Andrena carlini carlini* Cockerell on *Sanguinaria canadensis*
Andrena forbesii Robertson on *Berberis vulgaris*
Andrena hippotes Robertson on *Berberis* sp.
Andrena miranda Smith on *Argemone* sp.
Andrena miserabilis Cresson on *Berberis* sp.

Halictidae

- Augochlora pura pura* (Say) on *Caulophyllum thalictroides*
Augochlorella striata (Provancher) on *Caulophyllum thalictroides*
Augochloropsis metalica metalica (Fabricius) on *Caulophyllum thalictroides*

Megachilidae

- Osmia lignaria lignaria* Say on *Dicentra* sp.
Synhalonia hamata (Bradley) on *Podophyllum peltatum*

Xylocopidae

- Ceratina calcarata* Robertson on *Dicentra cucullaria* and *Sanguinaria canadensis*

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