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Keys to the Species of Ribes Occurring in the Great Lakes Region

H. T. DARLINGTON and L. B. CULVER

Ontonagon Co. Agr'l Agent
EWEN, MICH.

MICHIGAN STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION

SECTION OF BOTANY

East Lansing

KEYS TO THE SPECIES OF RIBES OCCURRING IN THE GREAT LAKES REGION

HENRY T. DARLINGTON AND LAWSON B. CULVER

Where plants belonging to the genus *Ribes* occur in regions close enough to standing white pine so as to prove a menace as alternate host to the blister rust (*Cronartium ribicola* Fischer), efforts have continued, through a number of years, to effect their eradication. Extensive investigations have shown that practically all *Ribes* species in this region are susceptible to the disease, but with marked differences in the degree of susceptibility.¹ *Ribes nigrum* is known to be very susceptible, while *Ribes reclinatum* (*grossularia*) has a relatively low degree of susceptibility. Under ordinary conditions, susceptibility of other species probably lies between these extremes.

The field worker is interested not only in distinguishing plants of the genus *Ribes* from those of certain other shrubby genera which may be somewhat similar, especially in their younger stages, but also in separating the various species of *Ribes* both in their summer and winter aspect. Adequate keys for the determination of the species occurring in the Great Lakes region should be helpful to the student of woody plants as well as to the blister rust worker. Two keys have been prepared, one based on characters observable during the non-growing season, the other on those seen during the growing season. It has been convenient to call these the winter and summer key respectively.

Thirteen species are included in the keys. These are all native except for *R. nigrum*, *R. sativum* and *R. reclinatum*, cultivated species introduced from Europe.² It was originally planned to publish only the winter key to these species, but later it was felt that the addition of a key based on leaves, flowers and fruits would add to the value of the bulletin.

The winter key is based on material furnished by the Division of Orchard and Nursery Inspection, Department of Agriculture, Lansing, Mich., over a period of about two years. It is based almost entirely on stem and twig characters, including buds, leaf-scars, spines, prickles, resin-glands, and occasionally outer bark. Measurements of buds, length of spines, color and

¹In this connection, H. N. Putnam says "we consider such species as *Ribes glandulosum*, *R. triste*, *R. hirtellum* and *R. lacustre* less dangerous to white pine because in this region these species usually occur in swamps where the associated vegetation is dense and as high or higher than the *Ribes*. It has been suggested that the screening effect of swamp vegetation and the layer of cold air which usually covers these swamps may tend to prevent the spread of the rust from *Ribes* in swamps to nearby white pines. Upland species such as *R. cynosbati*, *R. missouriense* and *R. oxycanthoides* grow under site conditions which make them more effective as a source of inoculum of pine infection". He says, however, "the degree of infection on practically all our species of wild *Ribes* varies greatly according to site, weather conditions, abundance of the rust and relative susceptibility of the different species".

²The keys do not include *Ribes alpinum*, but the plant is noted under the description of species at the end of the bulletin.

pubescence of stems, refer to typical plants or those having an average rate of growth. Fast-growing shoots, especially those from the base of the plant, are often beset with longer spines and more numerous prickles. A distinction is made between spines and prickles, the former being larger and usually more or less definite in number at each node, while the latter are usually small, needle-like outgrowths along the internodes. Since a few berries or dead leaves may sometimes be present even in the non-growing season, these have been noted and may aid as a check. This may overlap to a certain extent, similar points brought out in the summer key. If dry leaves are put in water, they will assume their natural shape. At the end of the bulletin there is a brief summary of the essential features of each species, which will serve as a further check. This was added for ready reference and necessarily repeats some of the information given in the keys.

The drawings of twigs and leaves are believed to represent accurately the essential technical characters emphasized in the keys. All twig drawings were originally made twice natural size. For the study of all essential features, either in winter or summer conditions, a good lens of about 15 diameters magnification is sufficient. Measurements are recorded in the metric system. (SEE METRIC SCALE ON PAGE 24.)

The summer key is based largely on leaves, flowers, and fruits, though certain permanent characters, such as thorniness or lack of thorns, size, habit of growth and habitat are also included. In making this key, the writers have had herbarium specimens before them and have also consulted Gray's *MANUAL OF BOTANY* ed. 7, *ILLUSTRATED FLORA* by Britton and Brown and *A TAXONOMIC REVIEW OF CURRANTS AND GOOSEBERRIES* by Alwin Berger. The organization of the key is original.

There are a few genera which may be confused with *Ribes* in the leafless condition. Among these are the spiny genera *Berberis*, *Rubus*, and *Rosa*. *Physocarpus opulifolius* (ninebark) has leaves somewhat resembling those of *Ribes*. Seedlings of maple and *Viburnum* may easily be distinguished from *Ribes* on account of their opposite leaves. The genus *Berberis* (barberry) is easily separated by the yellow inner bark and wood. In *Ribes*, terminal buds are normally present, stipule-scars are lacking, there are 3 bundle-scars, pith is usually pale (not brown) and decurrent ridges are usually conspicuous at the extremities of the leaf-scars. Old leaves may sometimes be found, either on the bush or underneath it. In *Ribes* these are simple and of the palmate type, readily distinguishing the genus from *Rosa* or *Rubus*, which might be confused with the prickly species of the genus. Ninebark has shreddy bark and palmate leaves like *Ribes*, but in mature plants the presence of the dry fruit (follicles) throughout the winter is distinctive. The following key may be found useful in separating these five genera, all of which have alternate leaves or leaf-scars in the dormant condition:

1. Inner bark and wood yellow; twigs mostly grooved (sulcate) . . . *Berberis*.
1. Inner bark and wood not bright yellow; twigs not distinctly grooved— 2.
 2. Fruit consisting of small follicles, usually present during the winter; bundle-scars 5; bark shredding longitudinally *Physocarpus*.
 2. Fruit otherwise; bundle-scars 3 3.
 3. Pith meager, white or greenish-white; usually well-developed decurrent lines from extremities of leaf-scars; bark peeling easily and in a spiral direction *Ribes*.

3. Pith brownish; decurrent lines from extremities of leaf-scars none or inconspicuous; leaves compound; bark tight, not peeling readily4.
4. No distinct leaf-scars present (i.e. petiole-bases persistent as short stubs); pith abundant*Rubus*.
4. Leaf-scars distinct; reddish fruit ("hips") often present.*Rosa*.

WINTER KEY

- A. Plants armed with spines, bristles or both, at least on the older wood; buds light or dark brown in winter, more or less fusiform and sharp-pointed; bud-scales glabrous, but margins sometimes ciliate.....B.
- B. Nodal spines stout (8—15 mm. long, 1.5—2.5 mm. wide at base), usually occurring in 3's or 2's; prickles none, or small and localized; bark of young twigs light gray; buds 4—6 mm. long, ovoid or oblong-ovoid, slightly divergent; leaves usually pubescent beneath....C.
- C. Larger nodal spines grayish-yellow or tan, usually in 3's, at least the lower surface of spines nearly the same color as surface of the nearly terete twigs; inconspicuous decurrent lines from ends of leaf-scars not exceeding internodes in length; lower bud-scales distinctly darker than the upper; an introduced species, escaping from gardens in places.....1. *R. reclinatum*.
- C. Larger nodal spines dark brown, strongly contrasting in color with the twigs, often 2 or 1 only at the upper nodes; raised decurrent lines from the ends of the leaf-scars extending the entire length of the internodes; buds light brown, usually axillary, but sometimes terminal on short spurs; lower bud-scales nearly the same color as the upper; leaves more or less pubescent beneath, with rather blunt teeth2. *R. missouriense*.
- B. Nodal spines slender (usually less than 10 mm. long and not exceeding 1 mm. wide at base), the larger often solitary; young twigs slender, light or grayish-brown; buds usually axillary but sometimes terminating short shoots.....D.
- D. Young twigs usually light gray, slightly angled, the older with exfoliating epidermis, exposing the dark brown surface beneath; spines or prickles usually present on some part of the plant (often few or lacking above); buds light brown, fusiform, pointed, 3—5 mm. long; bud-scales with finely ciliate margins, dark-keeled near the top; leaf-scars U-shaped or narrowly lunate, with decurrent ridges extending down from the extremities; somewhat spreading shrubs with oldest wood at base of plant usually dark brown....E.
- E. Usually 0.6—1.2 m. tall; young branches mostly devoid of bristles, but plant often armed with short prickles (2—3 mm. long) at base; nodal spines usually lacking; leaves glabrous (occasionally pubescent) beneath, cuneate at base on younger shoots.....3. *R. hirtellum*.

- E. Lower and more spreading than the preceding species; nodal spines usually present, 2—3 at a node, the short prickles scattered or lacking; leaves glabrescent beneath, slightly cordate at base; petioles usually beset with a few branching hairs.....4. *R. oxyacanthoides*.
- D. Young twigs light brown; older epidermis not conspicuously ex-foliating, often thickly covered with slender acicular prickles.....F.
- F. Epidermis smooth-glossy, covered with numerous internodal prickles (averaging 2—3 mm. long) very similar to the nodal spines, both less numerous or absent on the oldest wood; terminal buds distinctly longer than the axillary, dull lemon-yellow, with only 2—3 non-ciliate bud-scales visible, the outer more than half the length of the inner; leaf-scars about the same color as the twigs; leaves cut more than half-way to the center, nearly glabrous beneath.....5. *R. lacustre*.
- F. Epidermis dull brown on young twigs, slightly gray-puberulent, especially at the nodes; nodal spines slender, usually light brown, very variable in length, distinctly larger than the prickles, the latter numerous on the oldest wood, but occasionally absent on young twigs; terminal buds dull brown, about the same length as the axillary, with usually 5—6 bud-scales visible, the lower less than one-half the length of the upper; leaves softly pubescent beneath.....6. *R. cynosbati*.
- A. Plants unarmed; buds ovate or ovate-oblong (generally not fusiform) and blunt at apex; bud-scales often gray-puberulent. Note. *R. hirtellum* (often unarmed above) may be sought here.....G.
- G. Bud-scales and sometimes younger internodes with minute yellowish resin-glands; lateral buds often stalked or terminating short spurs; leaf-scars comparatively broad.....H.
- H. Young twigs light gray, rather sharply 3-angled, not fetid when broken; leaf-scars acute or subacute at base, with strong decurrent ridges extending down from center and extremities; leaves with numerous resin-glands, especially on under surface.....7. *R. americanum*.
- H. Young twigs brown or brownish-gray, not sharply 3-angled, the wood fetid; leaf-scars rounded at base, with no conspicuous decurrent ridge from center.....I.
- I. Twigs usually exceeding 3 mm. in diameter, light brown or brownish-gray, the internodes mostly devoid of resin-glands; buds grayish-pink, often distinctly purple-tinged, ovate-oblong, 4—7 mm. long (exclusive of the short stalks); median bundle-scars averaging more than 0.5 mm. across; leaves mostly glabrous beneath or pubescent along the veins and with amber-colored resin-glands; a cultivated species occasionally escaping from gardens.....8. *R. nigrum*.
- I. Twigs usually less than 3 mm. in diameter, more slender than the preceding, the young internodes often puberulent, the uppermost thickly covered with resin-glands; buds much smaller and relatively narrower, 2—4 mm. long, with bud-scales faintly pink-tinged; median bundle-scars averaging less than 0.5 mm. across; leaf-lobes coarsely dentate.....9. *R. hudsonianum*.

- G. Bud-scales devoid of resin-glands; leaf-scars narrowly lunate (broader and straighter in *R. sativum*).....J.
- J. Terminal buds conspicuously reddish-purple, 6—8 mm. long; lateral buds mostly few or poorly developed; outer bud-scales 3—4, minutely white-ciliate; plants of wet ground with fetid wood; old leaves red-tinted.....10. *R. glandulosum*.
- J. Terminal buds grayish-puberulent or brownish, less than 6 mm. long; lateral buds nearly as well developed as the terminal.....K.
- K. Buds small, appressed, not conspicuously clustered at the ends of the terete twigs; young twigs light brown, with the upper internodes puberulent; no distinct decurrent lines present; leaves firm, the smaller often 3-lobed and cuneate at base.....
.....11. *R. odoratum*.
- K. Buds often two or more together at the summit of the more or less grayish, slightly-angled twigs; upper internodes glabrous; decurrent lines extending down from extremities of leaf-scars..L.
- L. Bark on young twigs brown, loosely exfoliating, exposing the gray bark beneath; lateral buds slightly flattened, pointed, sub-appressed; leaf-scars distinctly lighter in color than surface of twig; leaves with short, broad, dentate lobes...12. *R. triste*.
- L. Bark on young twigs gray, not exfoliating; lateral buds ovate, divergent, minutely gray-puberulent, on short, dark-brown stalks, often 4—5 in a cluster near end of twig; leaf-scars little higher than surface of twig; a cultivated species occasionally escaping from gardens.....13. *R. sativum*.

SUMMER KEY

- A. Plants without spines or bristles (sometimes present in *R. hirtellum*, which may be sought here).....B.
- B. Leaves cordate or subcordate, with or without minute resinous dots beneath (visible with a lens); fruit finally disarticulating from the pedicelsC.
- C. Leaves with yellow or amber-colored resinous dots; fruit black, smooth or glandular; erect shrubs.....D.
- D. Twigs light gray, distinctly angled, not fetid when broken; resinous dots plainly visible on both upper and under sides of leaf; terminal lobe of leaf subdeltoid, mostly less than half the length of blade; pedicels usually with a few plumose hairs near base; fruit smooth; a shrub of alluvial soil, 0.5—1.0 m. tall.....
.....*R. americanum*.
- D. Twigs brownish, not distinctly angled, emitting a somewhat fetid odor when broken; resinous dots distinct on under side of leaf, obscure or invisible on upper surface; leaves cordate or subcordate at base.....E.

- E. Racemes erect or spreading; flowers white, broadly campanulate, with spreading calyx-lobes longer than the tube; ovary more or less resinous-dotted; fruit glabrous, 6—10 mm. in diameter; a northern shrub of swampy ground. *R. hudsonianum*.
- E. Racemes drooping; bracts short-ovoid; petioles usually with plumose hairs at base; flowers campanulate-urceolate, with purplish calyx-lobes equaling the tube; fruit glandular, with a strong odor; a cultivated shrub, 1—2 m. tall, sometimes escaping.....*R. nigrum* and varieties.
- C. Leaves without resinous dots; flowers rotate; fruit red or reddishF.
- F. Leaves 3-lobed, shallowly cordate, the basal portion of the blade tapering to the channeled petiole, the upper portion cut less than half way to middle; flowers purplish; fruit glabrous, with firm texture, 6—8 mm. in diameter; a straggling shrub of wet ground, the grayish-brown branches often rooting.....*R. triste*.
- F. Leaves cordate or subcordate at base.....G.
- G. Leaves 5—7-lobed, the terminal lobe about one-third the width of the blade; petioles with glandular hairs; pedicels, ovary and fruit glandular; a low, spreading, ill-smelling shrub of boggy ground.....*R. glandulosum*.
- G. Leaves 3—5-lobed, the terminal lobe being less than half the length of blade; petioles widened and ciliate at base; flowers greenish; ovary and fruit smooth, the latter 6—10 mm. in diameter; cultivated shrubs 1—2 m. tall. *R. sativum (vulgare)*.
- B. Leaves cuneate to truncate at base, without resinous dots; flowers either greenish or golden-yellow.....H.
- H. Young shoots gray, glabrous; petioles pubescent, often with plumose hairs; peduncles 2—4-flowered; (see further description under L)*R. hirtellum*.
- H. Young shoots light brown; leaves firm, glabrous, 3—5-lobed; racemes 5—8-flowered; flowers yellow, tubular, 12—15 mm. long; an erect shrub of alluvial soil, 2—2.5 m. tall; native of the plains region, often cultivated.....*R. odoratum*.
- A. Some part of the plant more or less armed with spines or prickles, the former occurring at the nodes.....I.
- I. Nodal spines slender (not exceeding 1 mm. in diameter at base), sometimes few or wanting; internodal prickles numerous, few or wanting; shrubs of woodlands or low ground.....J.
- J. Surface of young shoots brown, smooth-glossy, densely covered with prickles nearly as long as the 4—8 nodal spines; leaves cordate, deeply 5-lobed, the terminal lobe exceeding half the length of the blade and tapering towards base; petioles puberulent with scattered glandular hairs; flowers creamy-white, 7—8 mm. long; fruit glandular-bristly, purplish-black; a plant of swamps and low woodlands, 1—1.3 m. tall.....*R. lacustre*.

- J. Surface of young shoots dull gray (often dull brown in *R. cynosbati*); internodal bristles, if present, more or less scattered (not dense); nodal spines not more than 3, usually solitary (rarely present in *R. hirtellum*); pedicels not jointed.....K.
- K. Branches with 1—3 nodal spines and few to many, slightly reflexed internodal prickles, especially on the older wood; twigs dull brown, finely puberulent; leaves truncate to subcordate at base, soft-pubescent beneath; petioles pubescent and glandular-hairy; flowers greenish, 6—8 mm. long; ovary bristly; fruit purplish-red, 8—12 mm. in diameter, beset with prickles; a woodland plant up to 1.5 m. tall, but often lower.....*R. cynosbati*.
- K. Nodal spines often solitary or none (sometimes 2—3 at a node in *R. oxycanthoides*); twigs usually dull gray, glabrous; leaf-bases truncate to cuneate; petioles pubescent and usually with a few plumose hairs; flowers greenish or greenish-white.....L.
- L. Internodal prickles often numerous, sometimes few or wanting; leaves suborbicular, truncate or broadly cuneate at base, at least the younger pubescent beneath; flowers 2.5—3.5 mm. long; stamens about the length of the petals; fruit smooth, reddish-purple, 10—13 mm. in diameter; a spreading shrub of low, wet ground.....*R. oxycanthoides*.
- L. Nodal spines (when present) 10—12 mm. long, often lacking; leaves mostly cuneate at base, with terminal lobe about half the length of the blade and tapering below; flowers greenish, 5—7 mm. long; stamens twice as long as the petals; fruit purplish-black, smooth, 8—10 mm. in diameter; a plant of swamps and wet woods, 0.6—1.2 m. tall.....*R. hirtellum*.
- I. Nodal spines stout (1.5—2.5 mm. wide at base), usually 2—3 at a node; prickles none or small; petioles pubescent, mostly shorter than the blade, with plumose hairs near the base; pedicels not jointed; up-land plants of more or less dry soil, 1—2 m. tall.....G.
- M. Nodal spines usually clustered in 3's; peduncles short, usually 1-flowered; flowers greenish or reddish; sepals oval, 3—4 mm. long, reflexed; stamens shorter than the calyx-lobes; berry often glandular-bristly; a cultivated species, sometimes escaping from cultivation.....*R. reclinatum* (*grossularia*).
- M. Spines 1 (sometimes 2) at a node; leaves pubescent beneath at least when young; peduncles slender, drooping, 2—3-flowered; sepals whitish, linear-oblong, 6—7 mm. long; stamens long, much exserted; fruit smooth, purplish; native of the plains region.....*R. missouriense*.

BRIEF DESCRIPTIONS OF THE SPECIES

1. *Ribes reclinatum* L. (*R. grossularia* of Gray's Man., ed. 7). EUROPEAN OR GARDEN GOOSEBERRY. Stout spreading shrub from 1—1.5 m. high, with firm, light-gray twigs of the current year's growth; bark on the older wood exfoliating. Introduced from Europe.

2. *Ribes missouriense* Nutt. (*R. gracile* of Britton & Brown's Flora). MISSOURI GOOSEBERRY. An erect, much-branched shrub of dry open ground, usually with prominent nodal spines; berries smooth, purplish, 10—15 mm. in diameter.
3. *Ribes hirtellum* Michx. SMOOTH GOOSEBERRY. A light gray shrub of moist woodlands and open low ground, usually not exceeding about 1.0 m. in height; older canes brown or grayish-brown at base; berry purple or black at base, usually smooth.
4. *Ribes oxycanthoides* L. HAWTHORN-LEAVED GOOSEBERRY. A shrub of wet or moist ground with primary canes gray or grayish-purple below; younger wood lighter in color, with whitish spines; berries reddish-purple, smooth, about 10 mm. in diameter. According to Berger, the range of this species is farther north than *R. hirtellum*, with which it is often confused.
5. *Ribes lacustre* (Pers.) Poir. SWAMP GOOSEBERRY. An erect, very spiny plant of wet ground, usually not exceeding 1.0 m. in height; older wood grayish-brown, often more or less devoid of prickles; younger shoots light-brown, densely prickly; berry reddish, covered with small glandular bristles.
6. *Ribes cynosbati* L. WILD GOOSEBERRY. A common woodland species, very variable in size and development of prickles. This plant, in contrast with *R. lacustre*, often has the old canes beset with numerous prickles to the base, while the lighter-colored branches may be nearly or quite devoid of prickles; older twigs grayish, often marked with longitudinal fissures; berries wine-red, usually covered with soft prickles.
7. *Ribes americanum* Mill. WILD BLACK CURRANT. Erect shrub of woods and thickets, usually not exceeding 1.5 m. in height; the older canes varying from grayish to purplish-brown, strongly angled; fruits smooth, black, about 8 mm. in diameter.
8. *Ribes nigrum* L. EUROPEAN BLACK CURRANT. Typically an upright shrub (1.0—1.5 m. tall), but occurring in various garden forms; broken wood with distinct odor; berries black, with a strong odor; both this species and *R. americanum* have slightly pink buds. Introduced from Europe.
9. *Ribes hudsonianum* Richards. NORTHERN BLACK CURRANT. An erect shrub of swampy ground, ranging from the northern states through Canada far north; older canes brownish-purple below, with strong odor when broken; fruit black, about 7—8 mm. in diameter. In the winter condition, this species is distinguished from the preceding mainly by the more slender twigs, smaller buds, lighter color and more resinous internodes.
10. *Ribes glandulosum* Grauer. (*R. prostratum* of Gray's Man., ed. 7). FETID CURRANT. Skunk Currant. A low, spreading, ill-smelling shrub of boggy ground, the procumbent branches sometimes rooting; fruit red, glandular-bristly, about 6 mm. in diameter.
11. *Ribes odoratum* Wendl. GOLDEN CURRANT. Tall, erect, native shrub 2—2.5 m. high, of moist open ground; this or its varieties often grown as ornamentals; berries black, about 10 mm. in diameter.

12. *Ribes triste* Pall. AMERICAN WILD RED CURRANT. A low, straggling shrub of wet woods and swamps, usually less than 1.0 m. high; older canes brown or brownish-purple in winter, often creeping or assurgent, the branches occasionally rooting; berries shining-red, about 7 mm. in diameter.
13. *Ribes sativum* Syme. (*R. vulgare* of Gray's Man., ed. 7). RED GARDEN CURRANT. Shrub up to 1.5 m. tall, occasionally escaping from gardens; fruit shining and subtransparent, about 8 mm. in diameter. Introduced from Europe.
14. *Ribes alpinum* L. ALPINE CURRANT. Native of Europe. Occasionally planted. An upright shrub with spreading branches, the older stems with strongly-shredding bark; buds light brown, fusiform, 10—13 mm. long, mostly divergent or terminal on the twigs or short spurs, not clustered; bud-scales rounded at top, minutely apiculate; conspicuous decurrent lines extending down from extremities of leaf-scars; new bark often lustrous, chestnut-brown; berries bright scarlet.

ACKNOWLEDGMENT

This bulletin is the outcome of a request made in 1933 by E. C. Mandenberg, Orchard and Nursery Inspector, State Department of Agriculture, Lansing, Mich., for a winter key to the species of *Ribes* occurring in the region. Shortly afterward Mr. Mandenberg and Robert I. Thompson, Assistant Pathologist, Blister Rust Control, Newaygo, Mich., furnished specimens for study, gathered both in summer and winter. Henry N. Putnam, Senior Pathologist in charge of the Blister Rust Control Program in this region, with headquarters at Milwaukee, Wis., and F. C. Strong, Assistant Professor of Plant Pathology, Michigan State College, have kindly furnished information regarding the relative susceptibility of the various species of *Ribes* to blister rust. To all these gentlemen the writers express appreciation for their interest and advice.

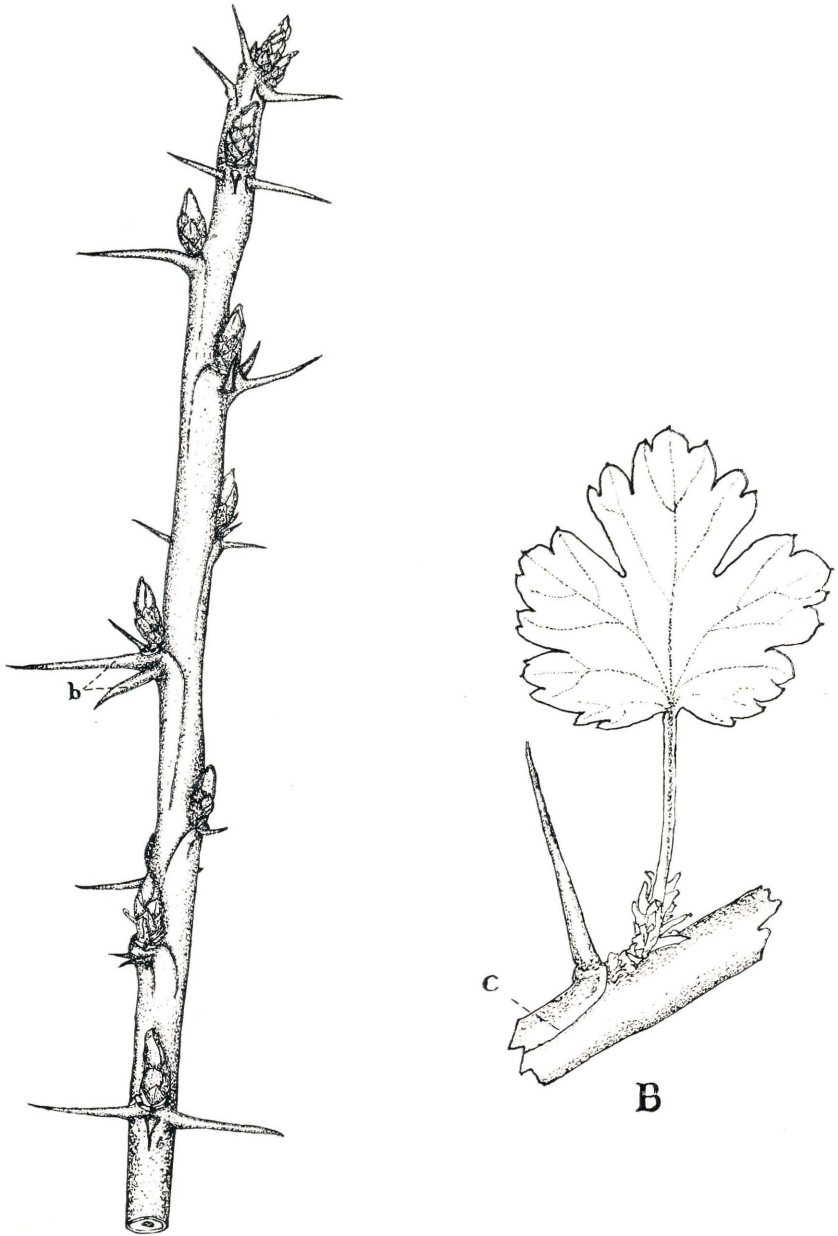


Fig. 1. *Ribes reclinatum*, $\times 1\frac{1}{2}$; *b*, nodal spines. B, one node and leaf, $\times 3$; *c*, decurrent line from leaf-scar.



Fig. 2. *Ribes missouriense*, $\times 2$; a, large nodal spines; b, raised decurrent line. B, node with leaf, $\times 2$; c, underside of leaf.

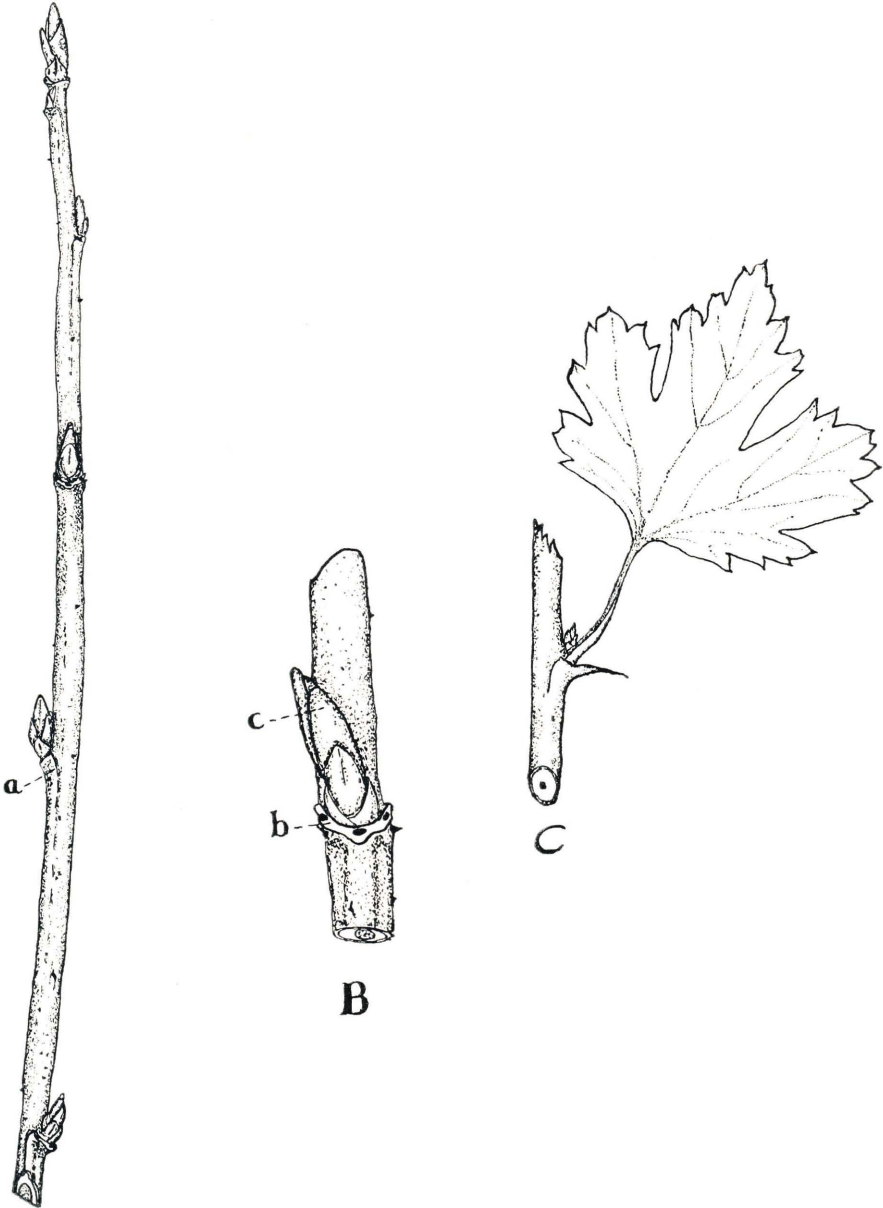


Fig. 3. *Ribes hirtellum*, $\times 1\frac{1}{2}$; a, short decurrent ridge. B, node, $\times 4$; b, lunate leaf-scar; c, bud-scales; C, node with leaf, $\times 1$.

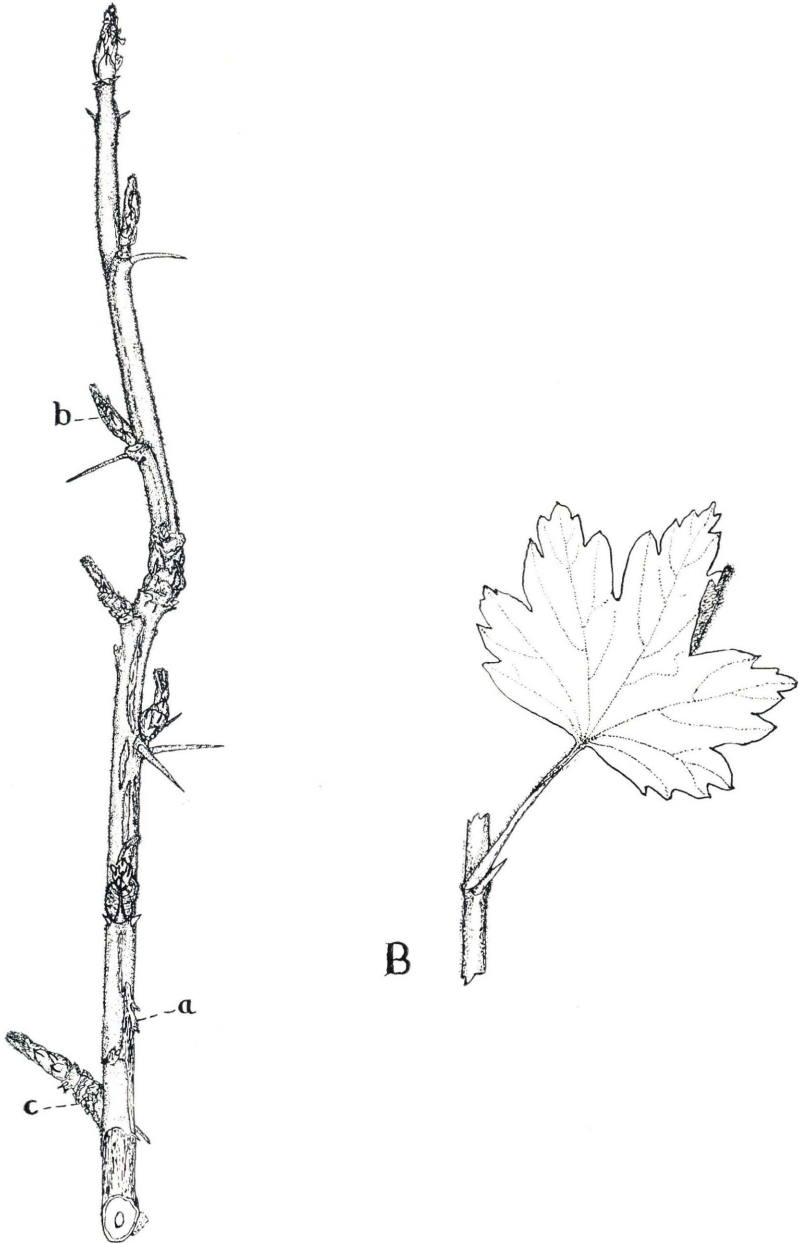


Fig. 4. *Ribes oxycanthoides*, $\times 1\frac{1}{2}$; a, exfoliating surface; b, fusiform, pointed bud; c, spur. B, leaf, $\times 1$.

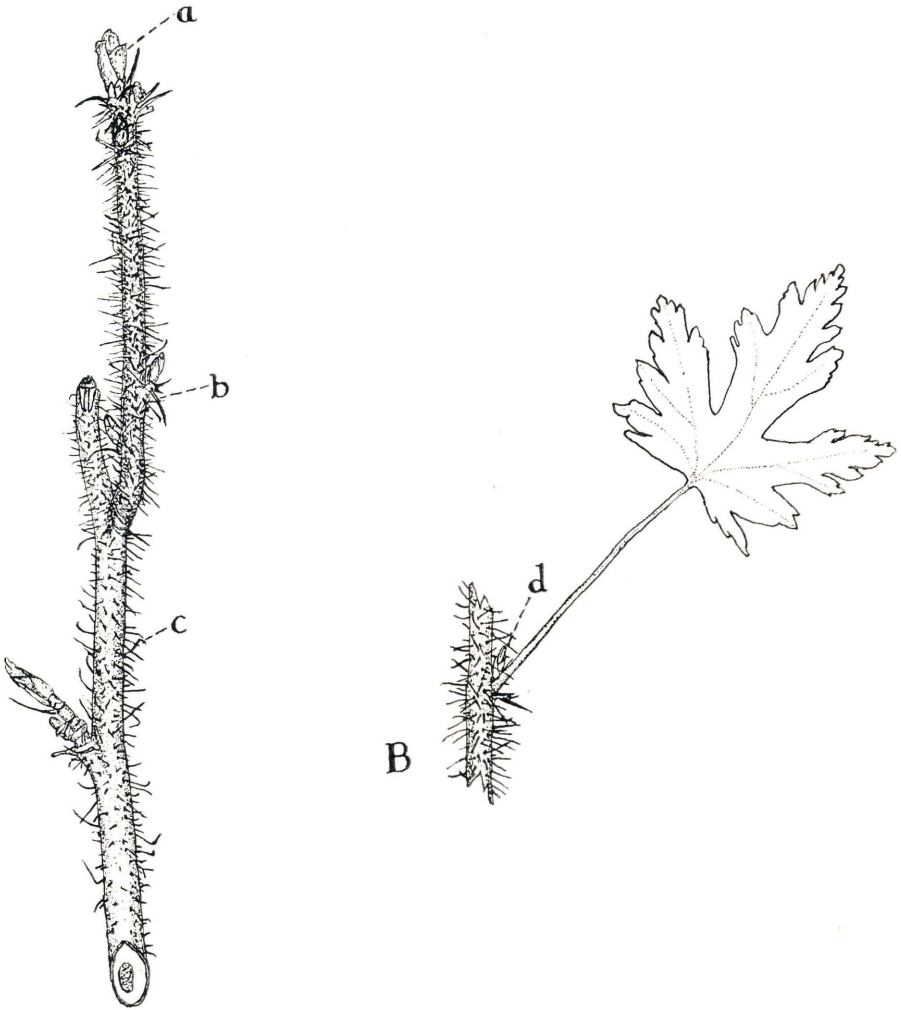


Fig. 5. *Ribes lacustre*, $\times 2$; *a*, terminal bud; *b*, nodal spine; *c*, internodal prickles. B, leaf with axillary bud *d*, $\times 1$.

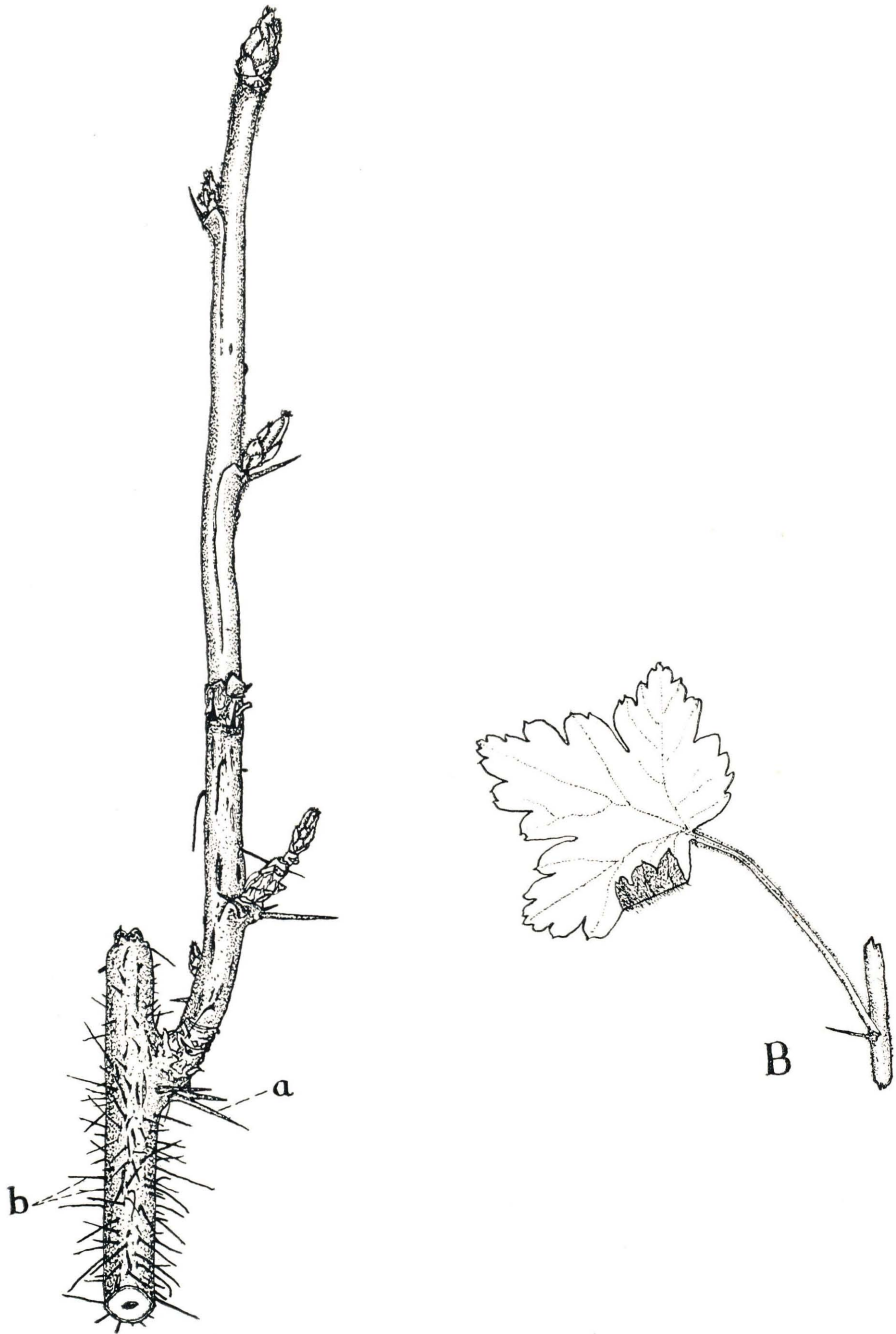


Fig. 6. *Ribes cynosbati*, $\times 2$; a, slender nodal spines; b, acicular prickles. B, node and leaf, $\times 1$.

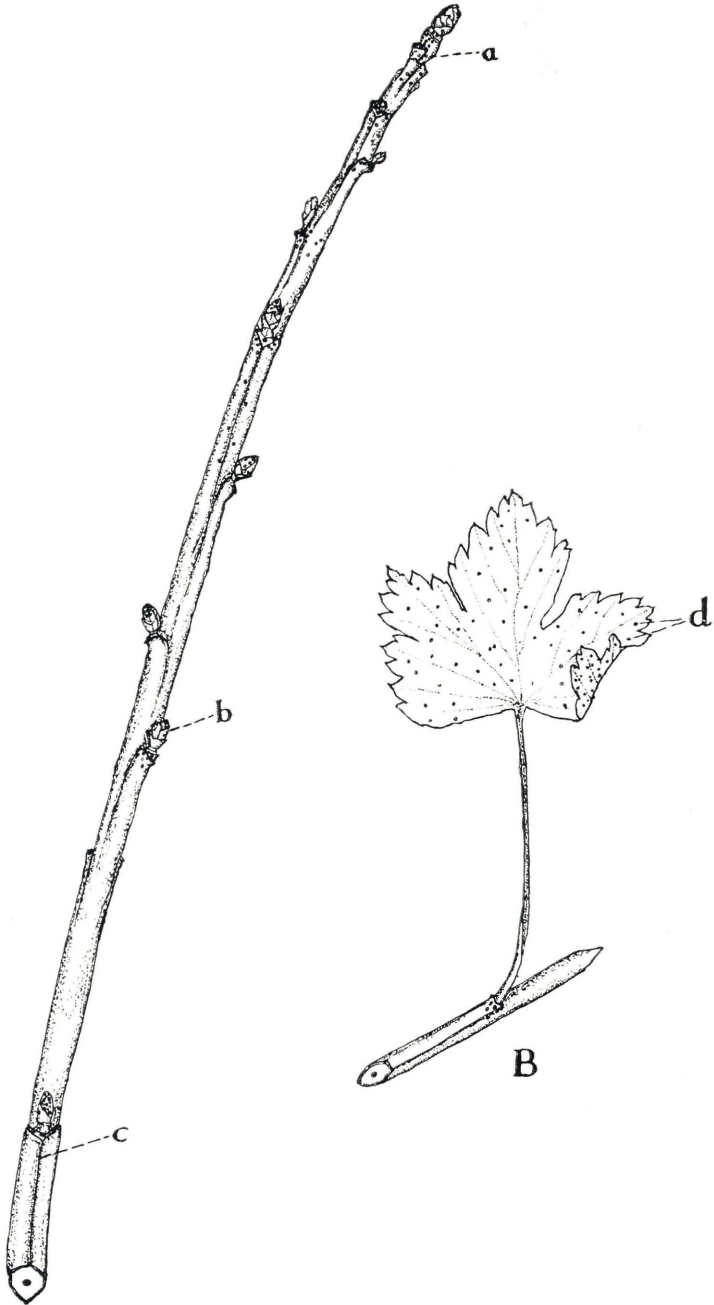


Fig. 7. *Ribes americanum*, $\times 1\frac{1}{2}$; *a* and *d*, yellowish resin-glands; *b*, stalked lateral bud; *c*, characteristic ridge below leaf-scar. B, portion of stem with leaf, $\times 1$.

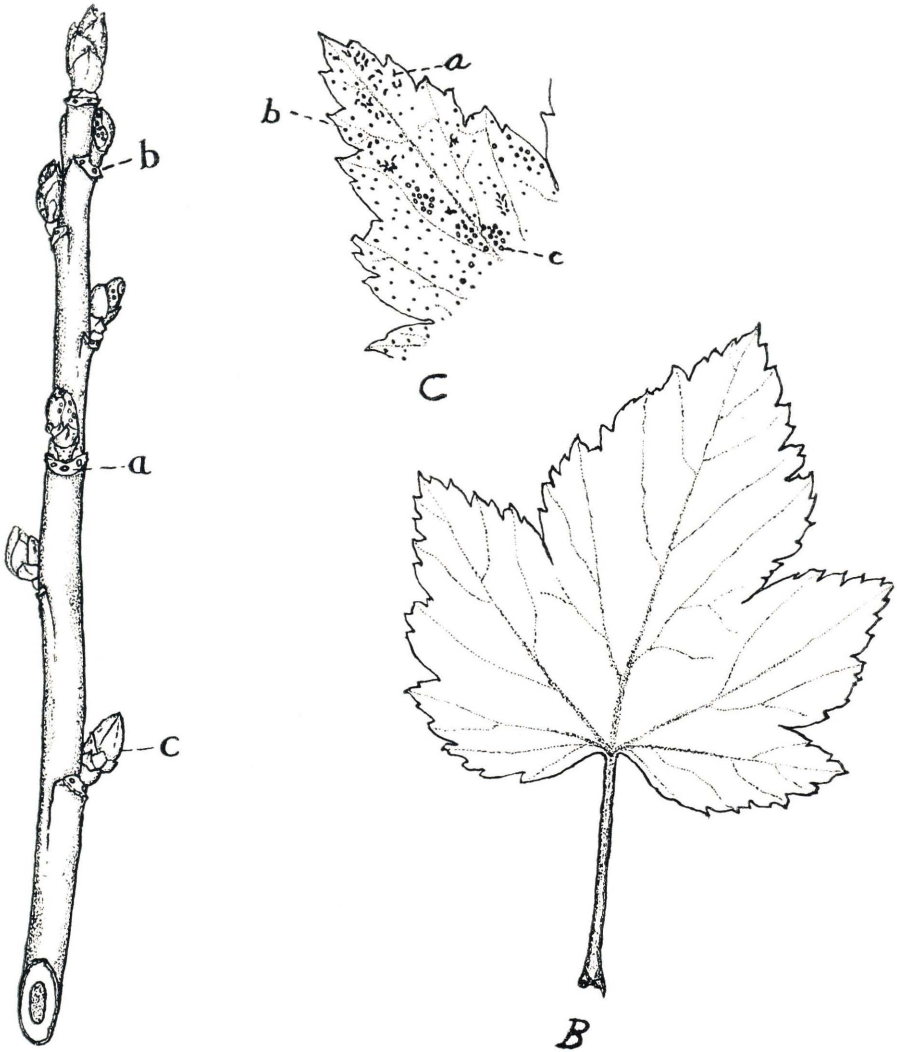


Fig. 8. *Ribes nigrum*, $\times 2$; a, leaf-scar; b, bundle-scar; c, stalked bud. B, leaf, $\times 1$. C, portion of leaf showing infection by blister-rust, $\times 2$; a, telial column; b, resin-gland; c, uredinium.

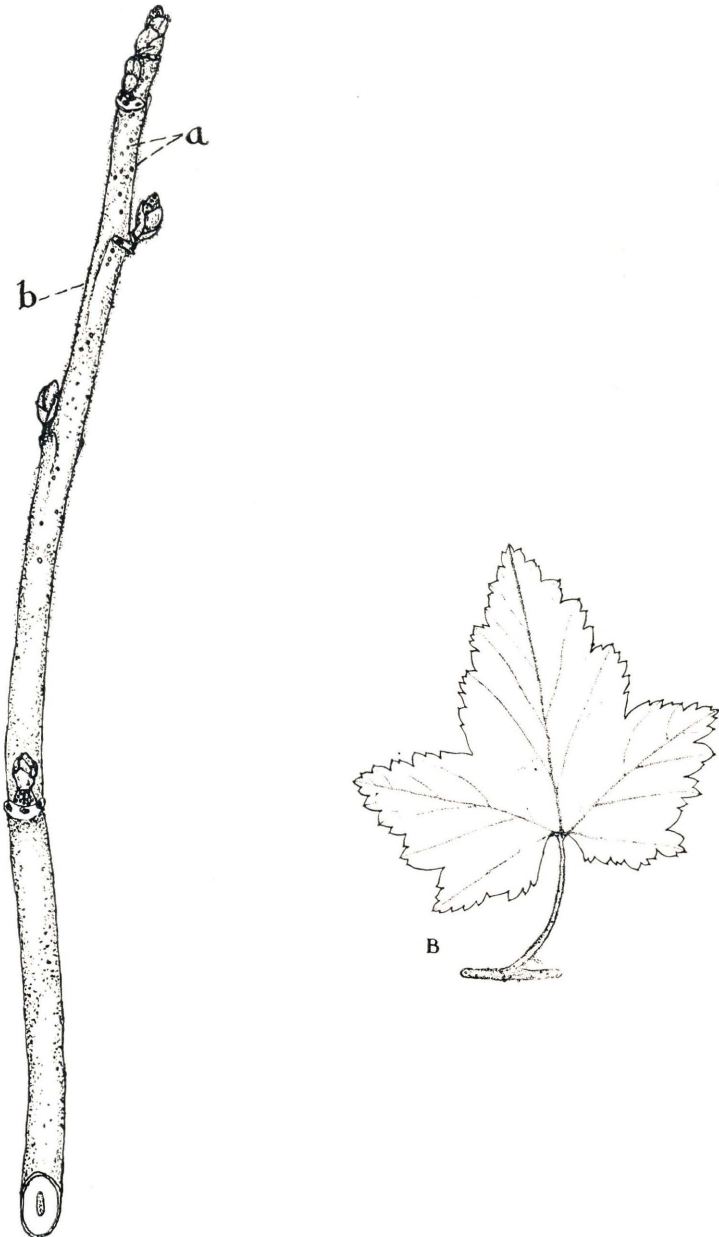


Fig. 9. *Ribes hudsonianum*, $\times 2$; a, resin-glands; b, puberulence on young internodes. B, leaf, $\times 1$.

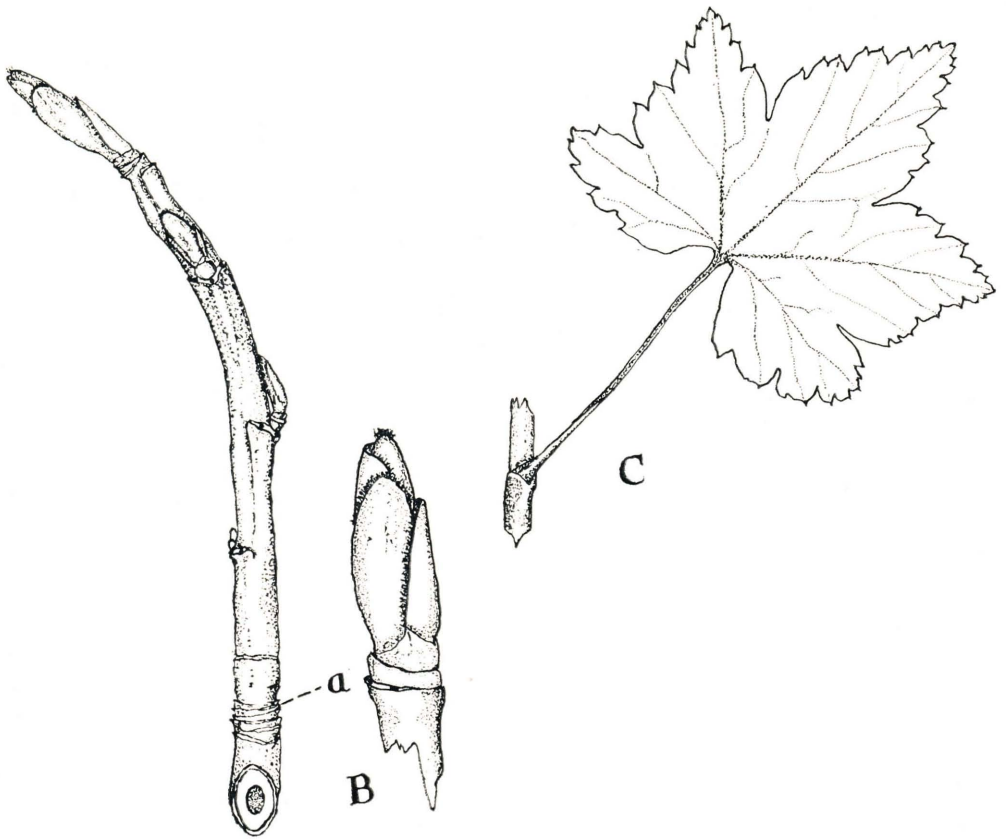


Fig. 10. *Ribes glandulosum*, $\times 2$; a, bud-scale scars. B, terminal bud, $\times 4$. C, leaf, $\times 1$.

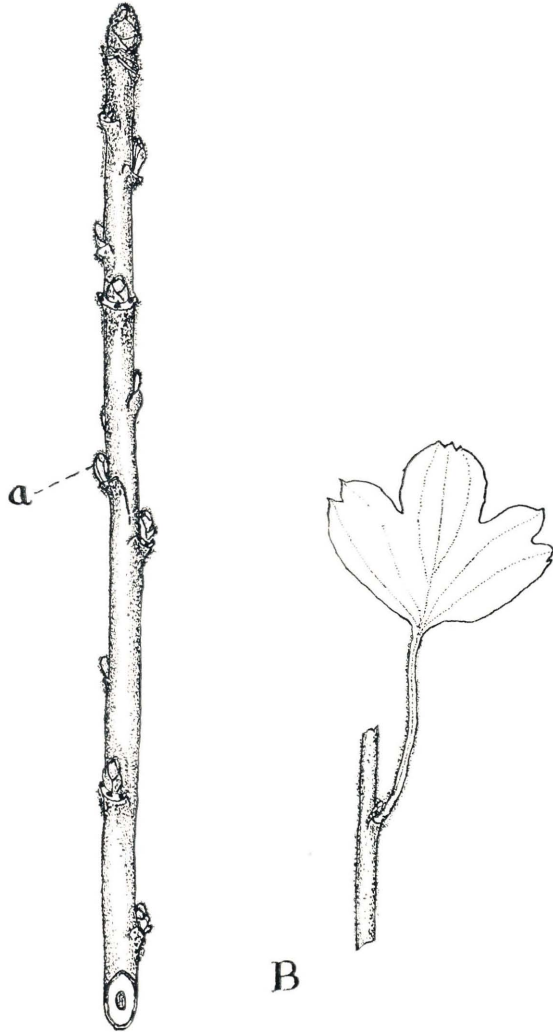


Fig. 11. *Ribes odoratum*, $\times 2$; a, appressed lateral bud. B, leaf, $\times 1$.

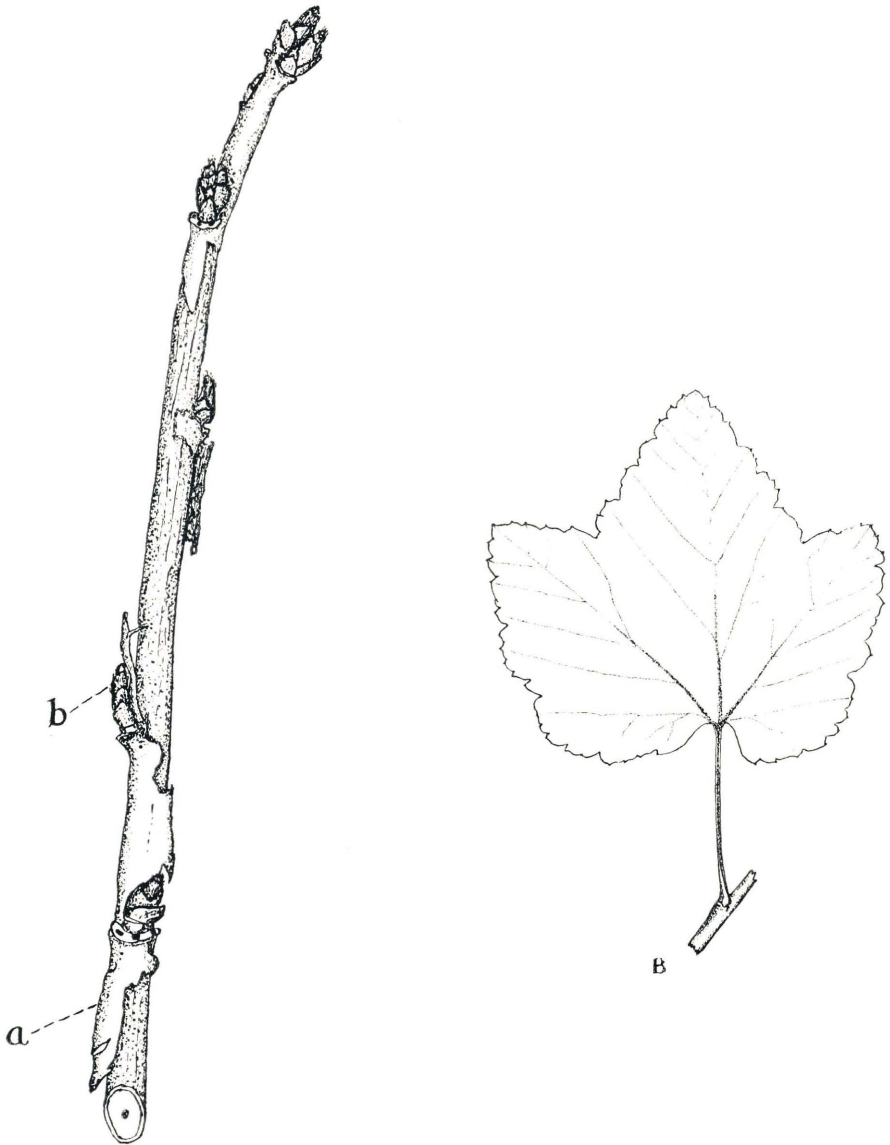


Fig. 12. *Ribes triste*, $\times 2$; *a*, exfoliating epidermis; *b*, subappressed lateral bud. B, leaf, $\times 1$.

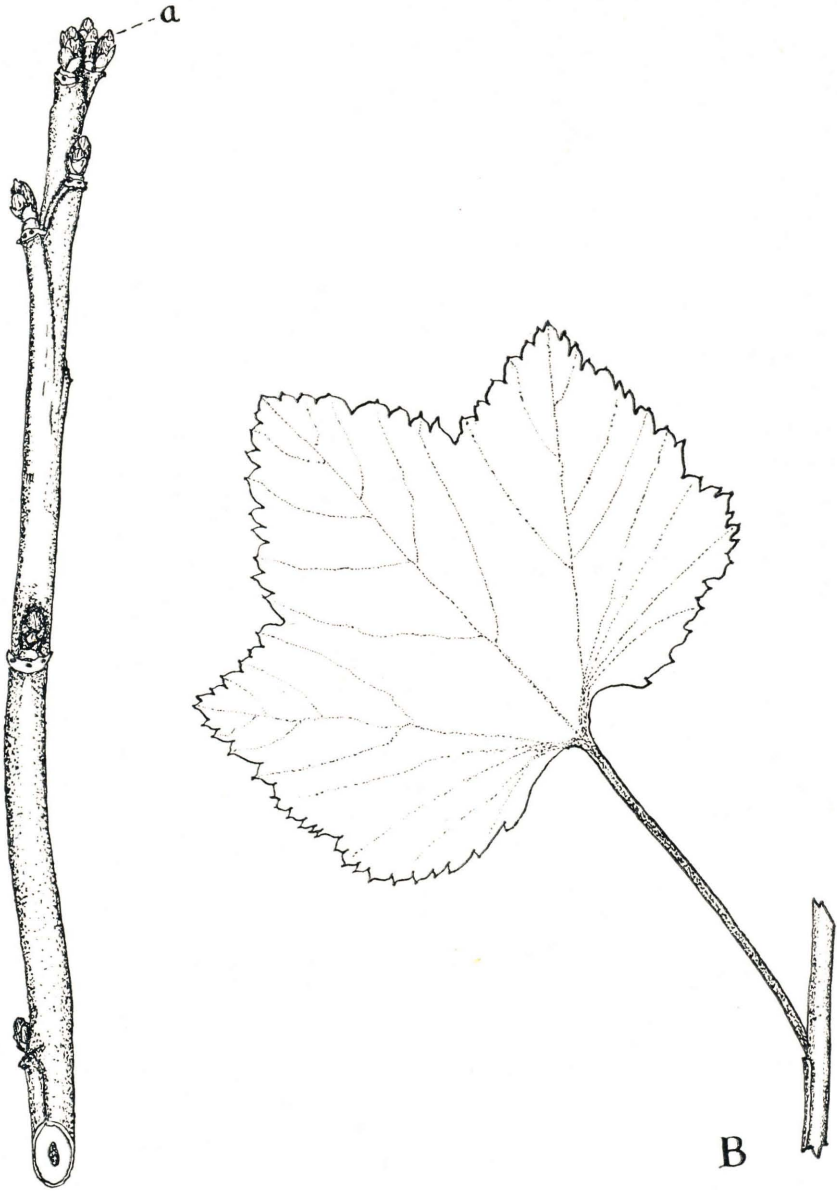


Fig. 13. *Ribes sativum*, $\times 2$; a, showing cluster of buds. B, leaf, $\times 1$.

