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## Native Crab Apples and Their Cultivated Varieties

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not hesitate to make use of such processes for the adulteration of butter.

Almost any person using butter can easily be imposed upon with such a product. These facts naturally cause one to realize the possibilities of adulteration of butter in other ways besides the addition of fats which are not butter fats, and force us to the conclusion that our states should have laws preventing the excessive amount of water in butter, as well as adulteration by other means.

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## NATIVE CRAB APPLES AND THEIR CULTIVATED VARIETIES.

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JOHN CRAIG AND H. HAROLD HUME.

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Indigenous to North America there are several species of *Pyrus* belong to the *Malus* or apple group. Sargent, in his *Silva of North America*, gives three species and one variety. These are *P. rivularis* Doug., found west of the Rocky mountains from northern California to Alaska; *P. angustifolia* Ait., ranging from Pennsylvania to Tennessee and Florida; *P. coronaria* L., in the region from New York to Michigan, southward and westward to Missouri and Kansas; *P. coronaria* var. *Iowensis*, Wood, confined to the prairie states. In the *American Garden*, XII, 473, 1891, Professor Bailey raised var. *Iowensis* to specific rank, basing his decision upon fruit and leaf characteristics, and in the same article described the Soulard crab as a species. Later, however, he expressed it as his opinion that the latter is a hybrid, so according to the present classification, we have the four species, *P. rivularis*, *P. angustifolia*, *P. coronaria*, and *P. Iowensis*.

These four are generally looked upon as good species. Centuries of in and in-breeding and adaptation to environments have for the most part stamped their work upon their forms and characteristics, though on the borders of their geographical limits they doubtless blend into one another. Some writers have wondered that hybrids have not more commonly occurred between these species and the common apple. There are many things to be considered; the time of flowering, the adaptability of sexual elements, etc., and again, it is a well known fact in the breeding of animals an old and fixed

type is hard to break up; that those having behind them centuries of unbroken strains of pure blood are hard to modify. So, too, in the vegetable world, and in the case of crosses between the unvarying native crab and the varying *Pyrus malus*, the chances are altogether in favor of the crab's stamping its characteristics upon the offspring. *P. Iowensis* is an extremely variable species and so far as known it is only with it that natural cross-fertilization has taken place in America. The laws of correlation, of atavism, of prepotency, all the uncertainties of heredity have yet to be explained in relation to the vegetable kingdom, and until that is done, artificial hybridization will be but a haphazard piece of work. More attention must be given to the individual.

## PYRUS FUSCA RAFIN.

*Pyrus fusca Rafin.* Med. Fl. 11: 254: 1828-1830.

*Pyrus rivularis Dougl.* in Hook. Fl. Bor. Am. 1: 213t. 68. America South. 1833.

*Pyrus diversifolia Bongerd.* Mem. Acad. Petersb. Ser. VI. 11: 133, 1833.

*Pyrus subcordata. Ledeb.* Fl. Ross. 11: 95. 1844-46.

Sometimes occurring as a shrub, usually a tree thirty to forty feet in height, bark one-fourth of an inch thick, having the surface broken into large, thin, loose, light brown scales; leaves ovate to ovate-lanceolate, acute or acuminate at the apex, pointed or rounded at the base, finely and sharply serrate, often obscurely and occasionally distinctly three-lobed; mature leaves thick, firm, dark green, glabrous, or slightly pubescent above, pubescent below, one inch to four inches long, one-half inch to one and three-fourth inches wide, borne on rigid slightly grooved petioles one-half inch to one and one-half inches long. The young leaves are covered both above and below with long white tomentum. The flowers which are borne in many flowered cymes are one-half inch in diameter, calyx, densely tomentose on both inner and outer surfaces, dropping before the fruit matures, in which respect it resembles *P. baccata*. Petals orbicular, undulately margined, remotely inserted; ovary three-celled, pedicel, slender, terete, one and one-half inches to two inches long; the fruit "oblate-oblong" one-half inch to three-fourths inch in length, greenish-yellow or reddish when ripe; flesh dry, acid to the taste. Description made from specimens received from A. H. Aiken, Doe Bay, Washington.

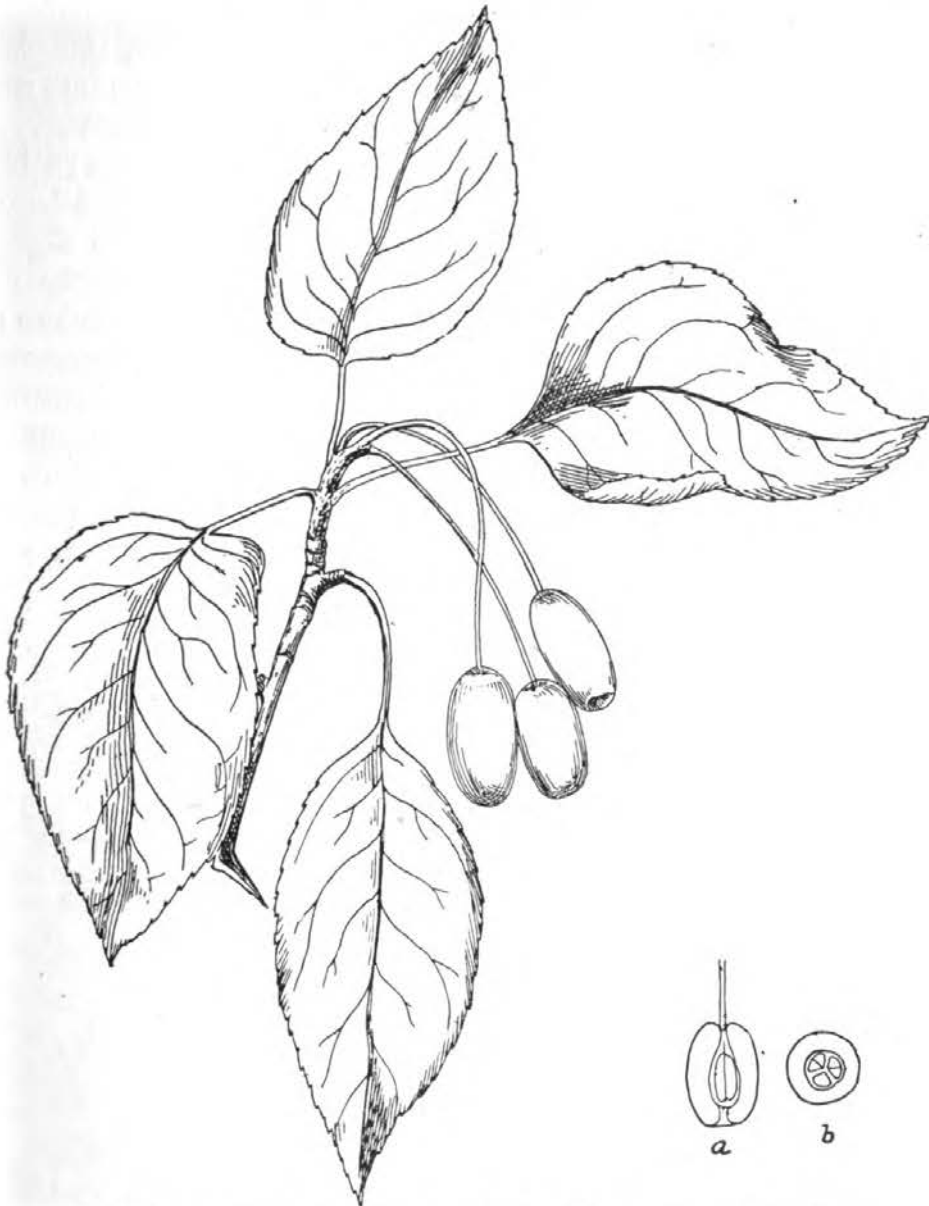


Figure 3. *P. fusca* Rafin. a—longitudinal section. b—cross section.

PYRUS ANGUSTIFOLIA AITON.

- Pyrus angustifolia* Art. Hort. Kew ed. 1. 11:176 America. 1789.  
*Pyrus coronaria* Wangend. Nord. Am. Holzart 61. t. 21. f. 47.  
 1787.  
*Pyrus sempervirens* Willd. Enum. Hort. Berol. Suppl. 35.  
 1813.

A tree about twenty-five feet in height, stem six to eight inches in diameter; bark thin, scales small, dark brown; branchlets at first sparingly pubescent, brown, becoming lead-colored; leaves lanceolate obovate to narrow oval, apex acute or

slightly rounded; base acute or oblique, upper surface smooth, dark green and shining, lighter and smooth below, one and one-half inches to three inches long, one-half inch to one and one-half inches wide; young leaves at first pubescent or slightly tomentose, more so on the lower side; borne on rather slender pedicels one-half inch to one and one-half inches long. Flowers one inch across, borne in umbels of four to eight; calyx lobes tomentose within, smooth without or nearly so; petals inserted remote obovate or rounded, undulate or approaching serrate; pedicels slender or slightly tomentose, three-fourths inch to one and one-half inches long (Suwanee river, Columbia Co., Fla., May 13, 1900); fruit depressed globose or sometimes slightly pyriform, and is from three-quarters of an inch to an inch in diameter, pale yellow green, and very fragrant when fully ripe, with hard acid flesh. (Sargent, North Am. Silva IV: 76.)

## PYRUS CORONARIA L.

*Pyrus coronaria* Linn, Sp. pl. 480. Am. Bor. 1753.

*Pyrus suaveolens* Winder. in Linnaea. v. Litt. 55. 1830.

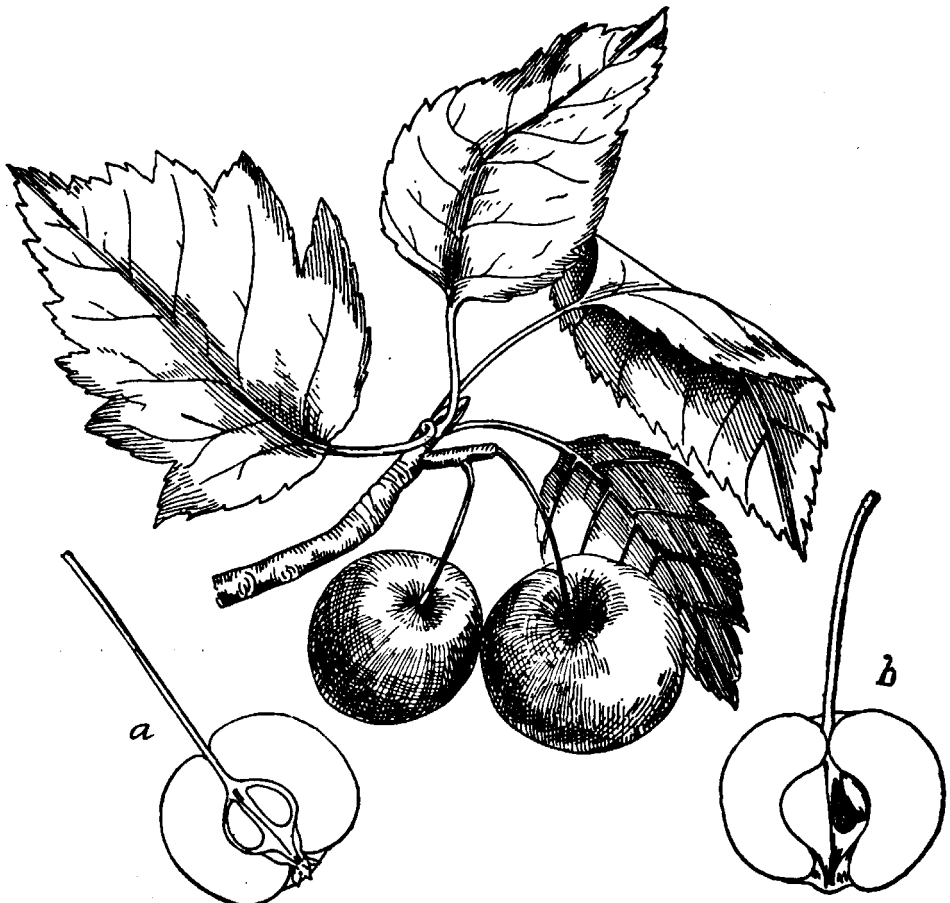


Figure 4. *P. coronaria* L. (Reduced  $\frac{1}{2}$ .)

Varies from a shrub-like tree, to a tree upward of twenty feet in height; bark one-fourth inch thick, obliquely or longitudinally fissured, the outer layer separating in long brownish-red scales; bark of the younger branches smooth, thin, grayish-brown, lenticles small, scattered; the branchlets at first densely coated with fine white tomentum, which, however, soon disappears; mature leaves ovate or triangular, sometimes distinctly three-lobed, sharply serrate, acute at the apex or occasionally rather blunt; base truncate to subcordate, glabrous above and slightly puberulent or glabrous below; one and one-half to three and one-half inches long, three-fourths to two inches wide; borne on short, slender petioles, one-half to one and one-half inches long; young leaves are bronze in color, tomentose on both



Figure 5. *P. Coronaria*, from Michigan.

surfaces; spines thick, stout, blunt; one-half to two inches long, formed from aborted or unproductive fruit spurs. Flowers appearing after the leaves, borne in bunches of from four to six, on slender, terete pedicels three-fourths to one and one-half inches long, and measuring one to one and one-half inches in diameter when opened fully; petals, inserted remote, ovate, crenately serrate or undulate at the base, and somewhat dentate toward the claw; calyx sparsely without, and densely tomentose within; fruit, five-eighths to one and one-sixteenth inches; form oblate or roundish oblate, color not as deep yellowish-green as *Iowensis*; skin thin, smooth, greasy, specks large and fewer than in *Iowensis*, cavity shallow and irregular with occasional protuberances, lined with heavy tomentum, stem three-fourths to one and three-eighths inches; slender throughout, glandular,

basin irregularly corrugated, sometimes marking core divisions, lined with tomentum; calyx prominent, closed; flesh hard, moderately juicy; flavor acid, markedly astringent, slightly bitter; texture breaking; core small, separating easily from flesh; seed smaller than *Iowensis*, season, winter. In character of seed it closely resembles *Iowensis*. The character of flesh is rather more astringent than *Iowensis*, with a little more juice. Description made from specimens received from Dr. Murrell, Ithaca, N. Y.

PYRUS IOWENSIS BAILEY.

*Pyrus coronaria* var. *Iowensis* Wood, Class-book. 333. 1860.

*Pyrus Iowensis* Bailey. Am. Gard. 12:473. 1891.

A small tree, three to eight inches in diameter, ten to twenty-five feet in height, growing singly or in thickets; when growing singly a spreading tree branched to the ground, when growing in thickets it is more slender, taller and not branched down as when growing singly; bark one-fourth of an inch thick, the outer layer fissured, longitudinally or obliquely, into long, narrow, loose, brownish scales; the branchlets are grayish or brownish in color and quite stout, so differing from those of *coronaria* which are quite slender; young twigs densely covered with white tomentum, which persists toward the tips

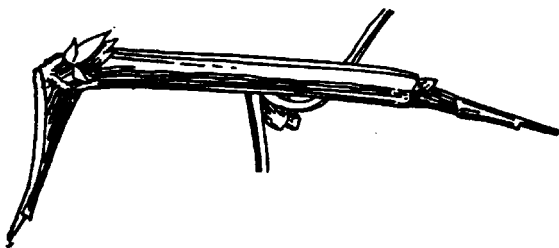


Figure 6. Fruit spur and spine. P. *Iowensis*.

until the following year; mature leaves, thick, firm, ovate, ovate lanceolate to ovate oblong and triangular-ovate, apex obtuse or acute, base acute, rounded or oblique, margin coarsely and bluntly toothed, often deeply cut in young growth and frequently toothed at right angles to the mid-rib, glabrous above, densely white tomentose below, one to five inches long, one-half to two and one-half inches wide and borne on stout terete slightly grooved, densely tomentose petioles, one-half to two inches long; young leaves thickly covered with tomentum.

Exceedingly variable in all leaf characters, differing from *coronaria* in being usually acute at the base, which is scarcely ever or never found in *coronaria*, tomentose beneath, thicker in texture, bluntly toothed and borne on decidedly stouter petioles. The flowers differ little from those of *coronaria* except that the

pedicels are much stouter, tomentose, and the calyx is densely tomentose on the outside.

Fruit collected and described at Ames, Iowa. Size variable, large type one and three-eighths inches by one and three-eighths inches or one and one-half inches, small type five-eighths of an inch by seven-eighths of an inch; form exceedingly variable, spherical-pyriform, spherical to oval, usually markedly truncate at calyx end; color green, turning to a light yellow, sometimes slightly flushed on sunny side; skin slightly roughened, greasy, thickly dotted with small gray spots; cavity most constant character of all, small, narrow, shallow, stem three-eighths of an inch to one and one-eighth of an inch, slender, thickened at base and extremely tomentose; basin, well marked corrugations, sometimes deep and broad, sometimes scarcely concave, lined with dense tomentum; calyx prominent, closed; flesh greenish-white, hard, brittle; flavor sharp, astringent, acid; texture fine grain but fibrous; core rather large, clearly separated from flesh; seed plump, dark, or light brown; with or without a slight beak, oval in outline, flat on side of contact; season winter. General notes: Fruit

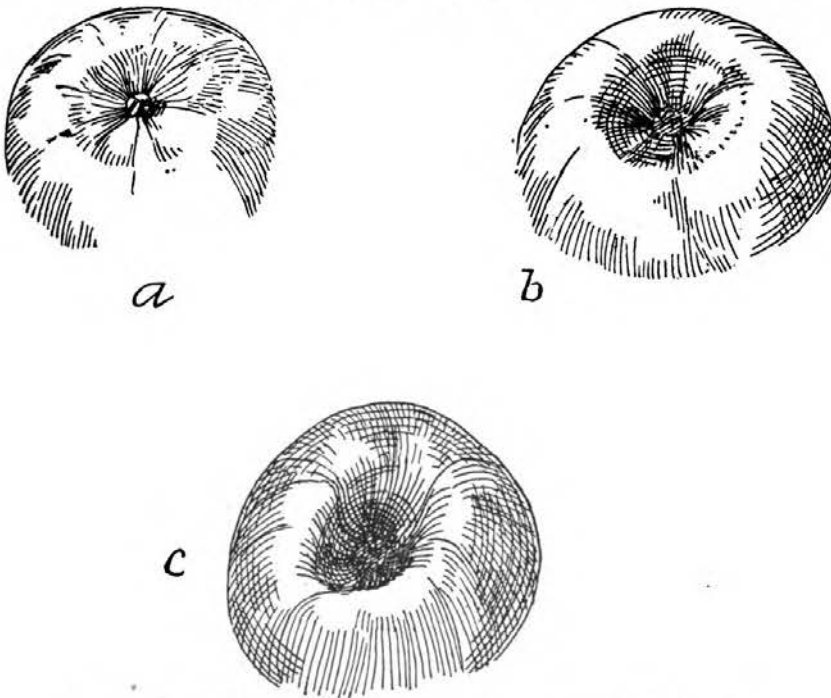


Fig. 7. Fruit of *P. lowensis*, showing variation in form of basin.  
a, shallow; b, medium; c, broad, deep.

shows remarkable variations in form but the character of the flesh and seed cavities seem to be constant throughout.



The fruit inclines more toward an oblong shape than does that of *coronaria* which is quite compressed from cavity to basin, both species very fragrant.

## HYBRIDS—SOULARD CRAB.

*Pyrus Soulardi* Bailey. Am. Gard. 12:473. 1891.

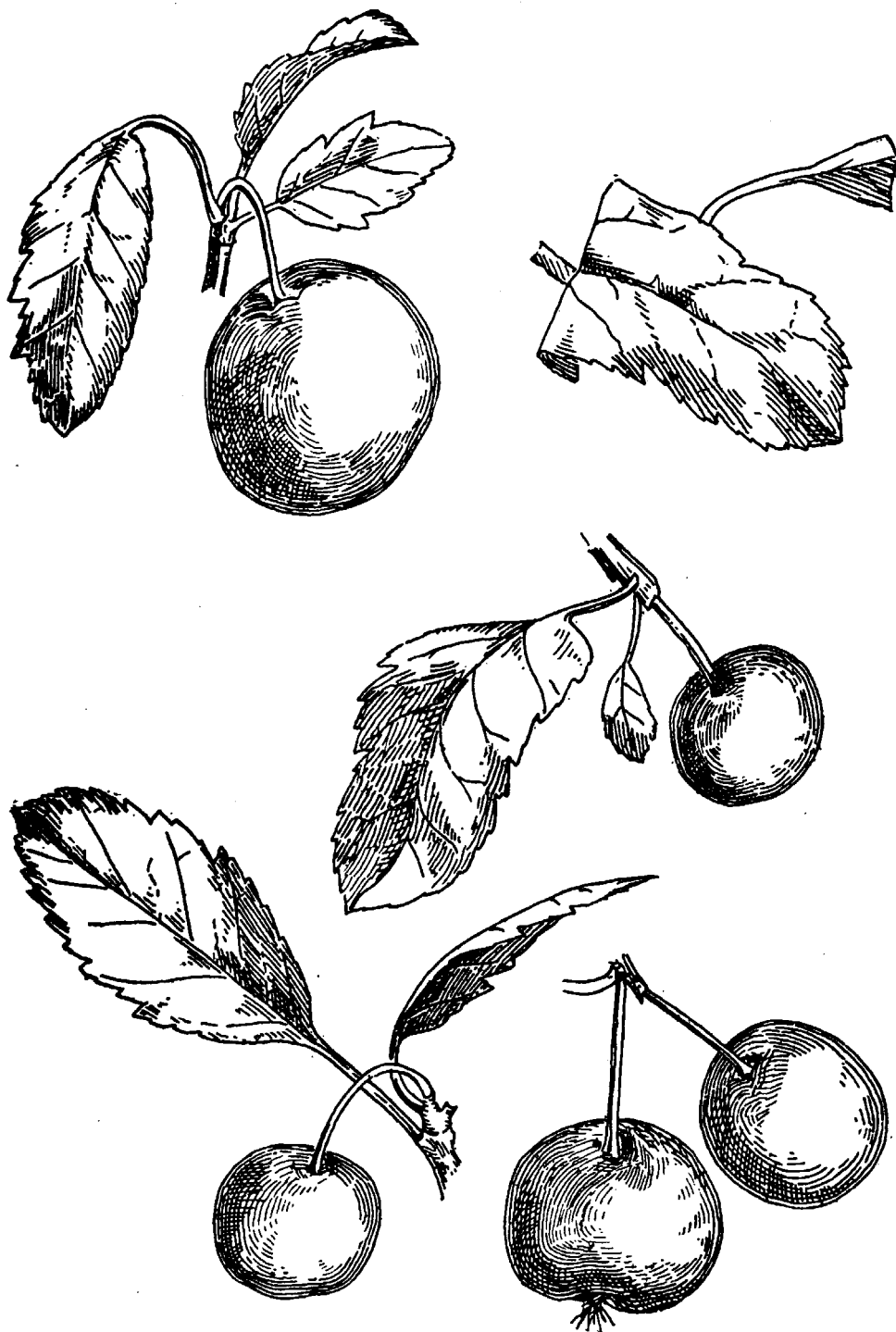
*P. Iowensis* x *P. Malus*. Bailey. Ev. Nat. Fr: 189. pl 11. 1898.

A tree upwards of thirty-five feet in height with wide spreading top; trunk six inches to fourteen inches in diameter; bark dark, rough, differing in the nature of its scales from that of the wild crab (*Iowensis*), the outer layer breaking into short, longitudinal scaly ridges; the older branches smooth, a dark grayish-brown in color, the one-year-old twigs covered with a dense grayish-brown tomentum like those of the common apple. Mature leaves, broadly oval or approaching oblong, margin irregularly grossly serrate, sometimes deeply cut. A very common peculiarity in the margin is to find one side regularly serrate like those of the common apple while the other side is almost lobed. Base rounded or oblique, apex obtuse or rounded, the upper surface wrinkled, rugose in appearance owing to the depression of the veins, dark green, lighter and densely tomentose below; leaves borne on stout wooly petioles one-fourth inch to one inch long; young leaves thickly tomentose. The flowers are borne in clusters like those of the common apple, pinkish-white in color, rather smaller than those of *P. Iowensis*, one inch to one and one-fourth inches in diameter.

Regarding its botanical relationship, there has been a great diversity of opinion. It has been held to be a variation of *P. coronaria*, a hybrid of *P. Iowensis*, and a distinct species. Sargent, in his *Silva of North America*, inclines to the first view. Soulard, took it to be a hybrid. He said, "It is to me conclusive that this crab is the offspring of an accidental hybridization of the wild crab by our common apple." Professor Bailey in the August number of the *American Garden*, 1891, described it as *Pyrus soulardi*, n. sp. In his "Evolution of Our Native Fruits," however, he says, "I now confess to a belief that *P. soulardi* is not a true species but a hybrid between *Pyrus iowensis* and the common apple, *Pyrus malus*. The chief considerations which led me to this conclusion are the facts that the plant, in a wild state seems to have no connected or normal range, and that various specimens which I have had an oppor-

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Plate viii.



*P. Iowensis*, showing variation of fruit and foliage.

tunity to examine during the past few years have shown almost complete gradations from one of those species to the other. I cannot now define *Pyrus soulardi* by any characters which are not also common to one or both of the other species, *Pyrus Iowensis* or *P. malus*."

After a critical study of flower, leaf, fruit and general characteristics of the Soulard crab, we agree with Professor Bailey's later opinion.

In the fruit of the Soulard there is a very decided lessening of normal seed reproduction. For instance twenty well developed apples selected at random from a tree gave an average of only three seeds to the apple. The leaves also show intermediateness of character. It is totally different from *P. Iowensis* in the character of fruit spurs; the thorny aborted spurs of *P. Iowensis* are not present, while the characters of *P. malus* are quite noticeable. The Soulard is a remarkably vigorous tree, one specimen on the college grounds measuring fourteen inches in diameter close to the base, is thirty-five feet in height and forty feet in spread of branches. It bears freely every year.

The Soulard crab, according to Hon. James Soulard, of Galena, Ill., originated on a farm about twelve miles from St. Louis, Mo., where stood an American crab thicket, not enclosed, near a farm house, about 1844. The thicket was cut down, and the ground cultivated. Later, cultivation was discontinued, and a second thicket sprang up in which this crab was found. (Synopsised from a letter dated, Galena, February 13, 1869, written by James G. Soulard, and presented before the State Horticultural Society of Illinois, held at Bunker Hill, December 15-18, 1869.) The crab was propagated and disseminated by Mr. Soulard.

Its fruit has been looked upon as good, bad and indifferent, some claiming for it most excellent qualities, others relegating it to the same category of bitterness, sourness and uselessness as the common crab.

Mr. James G. Soulard says of it: "I consider it the most desirable of all crabs that I have seen. Adding sweetness, it is delicious baked. It makes excellent preserves, being large enough to be quartered, and unsurpassed by any crab for jams, jellies, etc., imparting its delicate taste and rich crab aroma. I have made some cider as clear as wine, with sugar, or a quarter part of sweet apples."

Professor Budd, in "Rural Life," speaks of it as follows: "The only value of the Souldard crab, known to the writer, is for mixing sparingly with good cooking apples for sauce, to which it imparts a marked quince flavor, which most persons like. It is also said to make a jelly superior to that of the Siberian crabs."

D. B. Wier, a fruit grower of Illinois, says: "The fruit, like the type generally, is very fragrant, and cooked with plenty of sugar, it makes a most delicious preserve or sweetmeat, highly prized by the pioneer housewife."

J. S. Harris, La Crescent, Minn., gives these notes on it: "The fruit is used, to some extent, in our western cities as a substitute for the quince for preserves, and mixing with better fruit, to which it imparts its aroma, but it never has had a 'boom,' and hence the demand for the fruit is limited, and its commercial value not great."

The "Farmer's Union," of Minneapolis, published in 1873 the following: "The Souldard crab, of all other crabs, is the most valuable. It cannot be used as an eating apple. It is bitter, worse than a quince, but for preserves it is quite equal, if not superior, to the quince. We consider it to-day the most valuable fruit grown in the northwest."

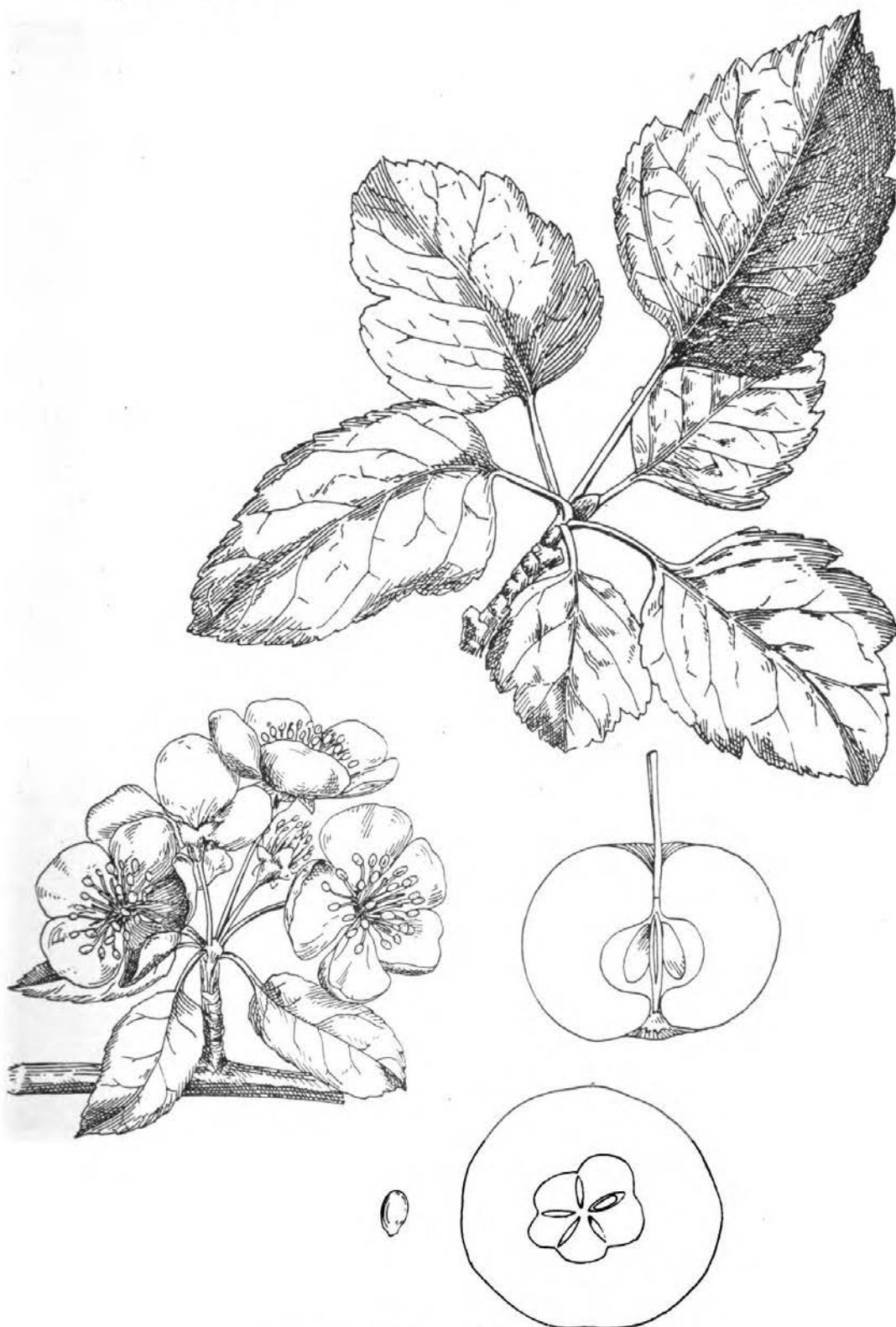
#### HOWARD (HAMILTON.)

Branchlets, one year old, brown in color, slightly tomentose; lenticels small, few; older bark, brownish-gray. Mature leaves oval, apex acute; base acute or oblique, margin grossly and sharply serrate or finely and bluntly, with several serrations larger than the rest, veins very prominent, brownish in color, leaves smooth, rugose above, slightly tomentose below; one and one-half to three and one-half inches long, one-half to two inches wide, borne rather stout, rigid, slightly tomentose, petioles three-fourths to one and one-half inches long.

The young leaves are densely white tomentose above and below. The flowers have not been examined. The stems of the young fruit are quite stout, three-fourths to one and one-half inches long, and together with ovary and calyx are densely white tomentose. A striking peculiarity is noticed in the greatly elongated fruit spurs. Spines are absent. Fruit received from E. L. Hayden, Oakville, Iowa. Size, two and one-fourth by two and one-half inches or larger; form roundish or oblique, conical, sometimes oblate; color, dark green, yellow ground when ripe; skin slightly roughened, not

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Plate ix.



Soulard. Foliage, flowers and fruit.

greasy when green; cavity medium, sloping gradually; stem five-eighths to one inch, stout; basin broad, wide at bottom; calyx closed; flesh firm, meaty; quality brisk acid without astringency; texture pithy, but juicy; core small, ovate; seed small, dark, plump; season probably midwinter. General notes.

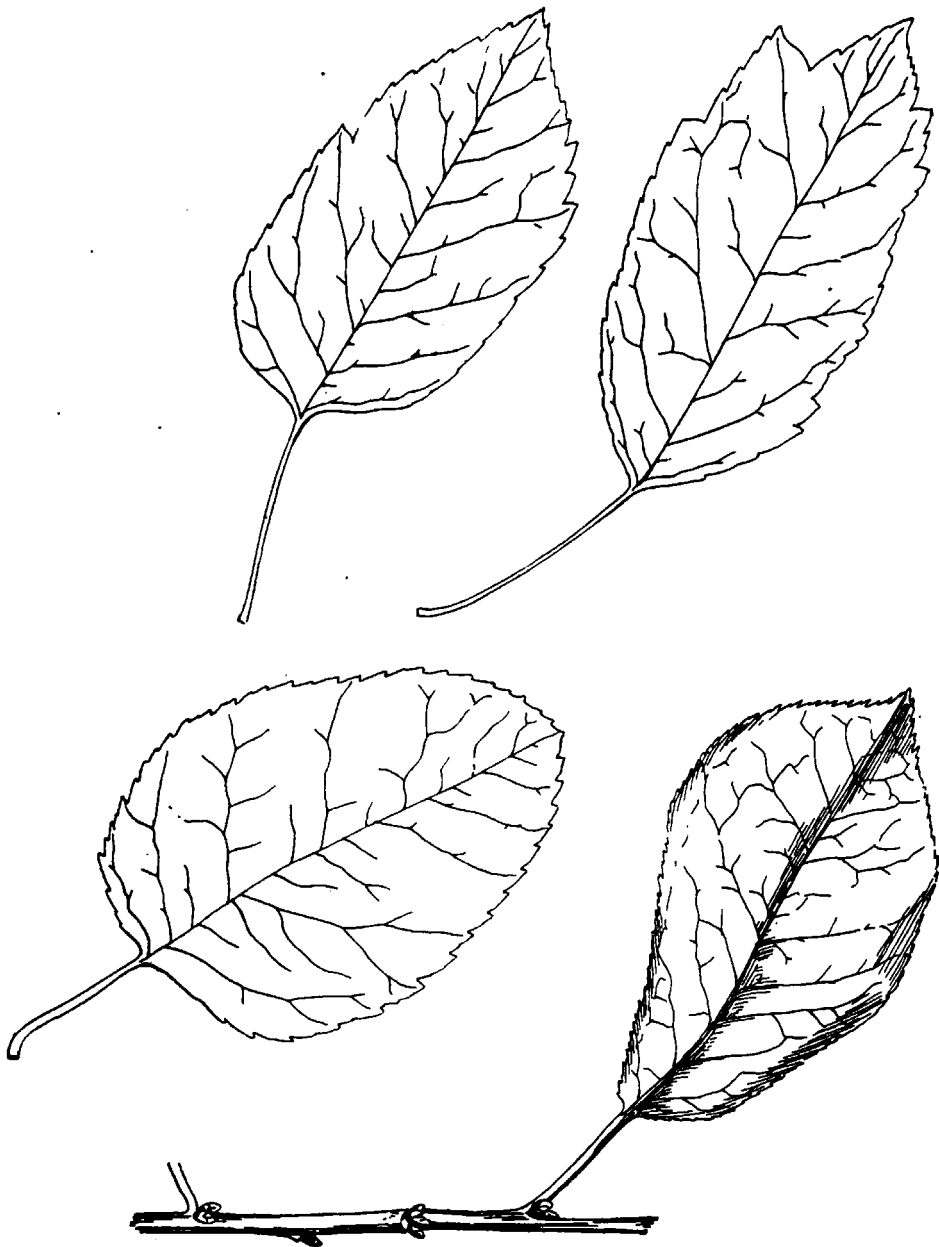


Fig. 8. Variations in leaves of Howard.

The Howard crab is, in all probability, the result of a cross between *P. Iowensis* and *P. malus*. The leaves resemble those of *P. Iowensis* in serrations, but leaves are also present, reg-

ularly serrate and oval closely resembling those of *P. malus*. The leaves are very much smoother than those of *P. Iowensis* with more prominent venations, the fruit spurs are exactly intermediate in characteristics between *Iowensis* and *Malus*. The fruit resembles *Malus* in shape, character of core, length of stem, absence of greasiness, and has lost, in some degree, the astringent properties of *Iowensis*. The tree is a vigorous grower, and seed production is very greatly reduced. This last must be accounted for in some other way than by increase of size, for *Pyrus Iowensis*, in its native state, though varying greatly in size, does not vary greatly in the number of seeds. The average number of seeds in the Howard crab is greatly reduced, six apples giving in all twenty developed seeds. The seeds are light brown, quite beaked and plump.

The following letter from Mr. E. L. Hayden, of Oakville, Iowa, explains the synonymy of the variety. "I send you by mail, to-day, a box of wild crabapples. They originated ten or twelve miles south of Oakville, and were first brought to the nursery of the late Benj. Luckenbill by a Mr. Howard, and called, after him, the 'Howard' crab. Afterward they came to the notice of the Iowa State Horticultural society as the 'Hamilton' crab, from the orchard of Jesse Hamilton, of Morning Sun, Iowa."

#### MERCER COUNTY CRAB.

*Mercer county Crab.*

*Fluke Crab.*

The bark of the large branches is smooth, *Malus* like, brownish-gray in color. One-year-old twigs, smooth, shining grayish, sparingly provided with small circular, slightly yellowish lenticels, young twigs lighter in color, slightly tomentose near the tips. Mature leaves, large ones oval, smaller are almost orbicular, finely and sharply serrate, often with large irregular serrations near the apex. Smaller leaves bluntly serrate or almost crenate. Apex obtuse, usually tipped with a single large serration, base acute or more usually strikingly oblique. Upper surface smooth, dark green, slightly rugose, lower puberulent lighter in color, veins prominent, reddish. When young the leaves are bronze in color and densely tomentose on both surfaces. One-half inch to three inches long, one inch to two inches wide, borne on rather stout tomentose, grooved petioles, one-half inch to two inches long. Flowers light pink, one inch to one and one-fourth inches in diameter, petals obovate, remotely inserted, slightly crenulate, calyx tomentose, pedicels stout, tomentose, one and one-half

inches long. The fruit spurs are decidedly like those of *Malus* and thorns do not occur.

Irregularities in leaf characteristics, vigorous growth, diminution of reproductiveness, all indicative of hybridity, are present, and we give it as our opinion that this crab is the result of a cross of *Malus* and *Iowensis*. The seeds average 3.1 to the apple.

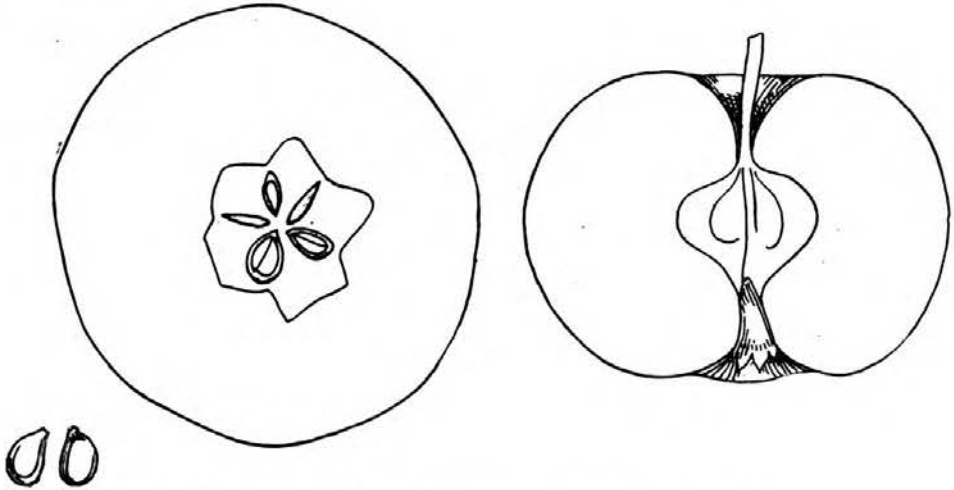


Fig. 9. Section of Mercer, showing seeds. Reduced  $\frac{1}{4}$ .

Size two by two, form oblate, color green, turning to yellow, skin smooth, greasy, cavity broad at mouth, sloping gradually, calyx small, closed, basin abrupt, corrugated, stem slender, one-half inch to five-eighths inch, flesh greenish-white, crisp,



Fig. 10. Mercer. Foliage, fruit spur and fruit.



slightly fibrous, quality poor, texture very firm, core small, seed large, short and plump, season midwinter or later.

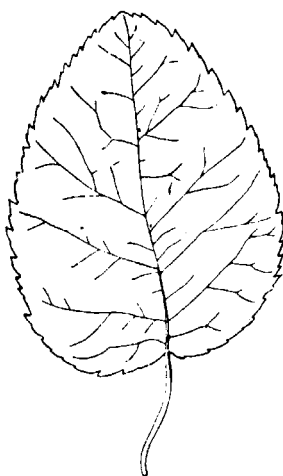
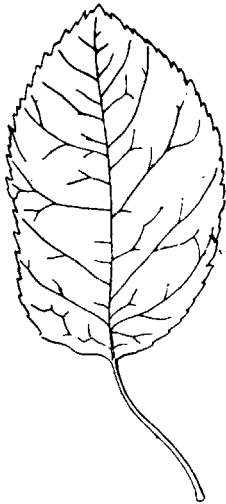
This crab originated in Mercer county, Ill., and was introduced by N. K. Fluke, of Davenport, Iowa.

W. H. Guilford, Dubuque, Iowa, in the Iowa State Horticultural Report for 1898, page 231, says of the fruit: "I can also speak favorably of the Mercer county crab. It will run about as large as Fameuse. It is delightfully fragrant, with quince flavor; keeps all winter; in bloom it has all the loveliness and fragrance of the wild crab; it is a fine, erect growing tree. When better known it will be largely planted, both for use and ornament."

KENTUCKY MAMMOTH CRAB.

*Mathew's Crab.*

Leaves two and one-fourth inches by one and one-half inches; three-fourths inches by three-fourths inches. Orbicular or broadly oval in shape, apex mucronate; base rounded, margin varying from entire at the base to finely serrate toward the apex. Upper surface smooth, dark green or shiny, the lower lighter and sparsely tomentose. The pedicel one-fourth inch to one inch in length, slender and tomentose.



The flowers are produced in cymes, four or five in a cluster, rose pink in color, one inch in diameter; the petals inserted rather remote from each other and slightly crenulate. The calyx is densely tomentose, the peduncle slender, tomentose, one inch long. In fruit, however, the peduncle elongates, varying from one to two inches. The twigs are essentially smooth and grayish-brown in color.

*Fruit.*—Size, medium to small; form, roundish, sometimes oblate; color, yellowish-green; skin, thick dotted with russet spots; cavity, narrow, regular; stem, three-fourths inch to one inch; basin, moderately deep, slightly wrinkled; calyx, prominent, closed; flesh, firm, crisp, sharp acid; quality, fair; season, later winter.

Fig. 11. Kentucky mammoth.

This differs in a general way from Mercer in being lighter green in color and more oblate in form.

If we take the market as a criterion of the value of the fruit, the Kentucky Mammoth is certainly a superior crab. Mr. B. A. Mathews (Evolution of Native Fruits, Bailey p. 270), says that in 1890 he had fruit of this tree "which sold at \$1 per bushel while good fruit of Grimes Golden, Roman Stem, and others was selling for 50 to 75 cents."

Regarding the introduction of this crab, B. A. Mathews in a letter to Professor Craig, dated Knoxville, October 20, 1898, says: "I got the Kentucky Mammoth of Charles Downing about twenty-five years ago. Don't know where he obtained it." The name as given to it by Downing would, however, indicate that it came originally from Kentucky. In connection with further study of this crab it would be advisable to obtain specimens of wild crabs from Kentucky. It has been suggested that it is a hybrid; the greasiness of the skin of the fruit, the astringency of flesh and character of flowers strengthen this assumption.

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## THE GENUS SALIX IN IOWA.

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CARLETON R. BALL.

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The genus *Salix* has long and justly been considered a difficult one to study. It is not that the genus is so large, there being only some 200 living species known, or that these species are so variable in themselves, although a few of them are known to be very much so. The chief difficulty lies in the dioecious character of the plants, and the fact that in the majority of the species the flowers are produced before the leaves appear, or at least before they are large enough to become characteristic.

A complete specimen of any one species of *Salix* should include the winter twigs, the flowers, and the mature foliage from both the staminate and pistillate plants, as well as a nearly mature fruiting branch. Not only this, but all the specimens of each sex should be taken from the same individual. When, however, we bear in mind that the majority of specimens in our herbaria, both large and small, present but two of the seven important parts mentioned above, and these