

A COMPARISON OF VEGETATIVE CHARACTERISTICS OF SEVERAL GENERA WITH THOSE OF THE GENUS *CIMICIFUGA* (RANUNCULACEAE)

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ABSTRACT

Cimicifuga is frequently confused with *Actaea*, *Aruncus*, and *Astilbe*, when only vegetative structures are present. A chart is presented comparing and contrasting the subtle morphological features existing between these four genera, *Thalictrum*, *Caulophyllum*, and *Trautvetteria* are also sometimes misidentified as *Cimicifuga*. Photographs of the leaf or most terminal leaflets from herbarium specimens of all seven genera accompany the discussion and illustrate their diagnostic vegetative differences. A simple key is offered as a tool for the possible field identification of vegetative specimens.

INTRODUCTION

Cimicifuga and *Actaea* (Ranunculaceae), *Aruncus* (Rosaceae), and *Astilbe* (Saxifragaceae), are often misidentified when only vegetative parts are available for observation. If inflorescences or fruits are present, one should have little or no difficulty in distinguishing these genera with the use of present-day keys. However, identification mistakes do occur with unusually high frequency even when reproductive structures are present.

Statements in the literature are few regarding the conspicuous vegetative similarities of genera discussed in this paper. Lawrence (1951) states that "generic distinctions are admittedly weak in the Ranunculaceae", but he does not limit this statement solely to vegetative characteristics. Gleason (1963) includes the statement under the description of *Astilbe biternata* (Vent.) Britt., "our plant bears a surprising superficial resemblance to species of *Aruncus*." Gleason and Cronquist (1963) state under the description of *Astilbe biternata*, "Habitally much like *Aruncus*." Voss (1985) indicates under the description of *Cimicifuga*, "the foliage is quite similar to that of *Actaea*."

MATERIALS AND METHODS

During the past twenty-five years I have studied the genus *Cimicifuga* (Ramsey 1965), including the examination of thousands of herbarium

specimens and living specimens in natural populations. It has been observed that *Cimicifuga* is often misidentified for one of the other genera mentioned and vice versa. Comparative morphological notes concerning these genera have been made, and their differences and similarities are summarized in Table I. From herbarium specimens, photographs have been made of the terminal leaflets of the central division of the compound leaves of all genera mentioned with the exception of *Trautvetteria* which has a simple leaf. Also, a simple bracketed key, based primarily on terminal leaflet characteristics, has been prepared which may serve as an additional aid for the possible field identification of vegetative specimens.

OBSERVATION AND DISCUSSION

Aruncus (Table I) can be distinguished from the other three genera (Table I) by the prominent pinnate venation of the terminal leaflet, since the other genera have at least three prominent palmately arranged veins arising at the base of their terminal leaflets. Of all the genera mentioned in this paper, only *Aruncus* has leaflets with prominent, doubly serrate margins throughout.

Aruncus (Fig. 1), *Astilbe* (Fig. 2), and *Cimicifuga* (Fig. 3) have terminal leaflets possessing serrations to the apex terminus, whereas in *Actaea* (Fig. 4) the serrations are absent from the apex terminus resulting in a rather long, entire, apical tooth. The terminal leaflets of *Astilbe* (Fig. 2) are comparatively thin dorsiventrally, shiny, scabrous, with acute-acuminate, serrate, stout lobes, while in *Aruncus* (Fig. 1) the terminal leaflets are comparatively thicker dorsiventrally, less shiny or dull, smooth, and have thin, acuminate-caudate lobes. Of all the genera mentioned in this paper, only *Astilbe* has scabrous leaflets.

Cimicifuga (Fig. 3) and *Actaea* (Fig. 4) are extremely difficult to distinguish in the herbarium or in the field in the absence of reproductive structures even by the professional taxonomist. It is just as difficult to describe the subtle differences by which the experienced eye may differentiate between these two genera on the basis of leaf and stem morphology. The habit of *Actaea* is generally smaller and more delicate in comparison to that of *Cimicifuga*. Moreover, the teeth of the terminal leaflets of *Actaea* are usually more nearly at right angles to the apex; there is a higher frequency of shallow sinuses; leaflet apices tend to be long acuminate-caudate without serrations; the branching habit is not strongly monopodial since the erect stem bearing the inflorescence arises on one side of the central axis of the plant, and the first cauline leaves are more distant from the base of the plant. In *Cimicifuga* the teeth are generally more serrate and extend farther toward the base of the terminal leaflet and are pointed more toward

TABLE I. A comparison of vegetative characteristics of three genera with those of the genus *Cimicifuga*.

CHARACTERISTIC	<i>CIMICIFUGA</i>	<i>ACTAEA</i>	<i>ASTILBE</i>	<i>ARUNCUS</i>
Family	Ranunculaceae	Ranunculaceae	Saxifragaceae	Rosaceae
No. of terminal leaflet lobes	0-7 (mostly 3) acute-acuminate	0-3 stoutly, acuminate-caudate	0-3 acute-acuminate	0 weakly accuminate-caudate
Venation of terminal leaflet	3-7 prominent veins arising basally	3 prominent veins arising basally	3 prominent veins arising basally	pinnate venation
Terminal leaflet pubescence	glabrous to densely pubescent	glabrous to scarcely pubescent	scabrous	glabrous
Terminal leaflet margin	serrate and incised, teeth oriented more toward apex, few shallow sinuses	strongly dentate- serrate, teeth more at right angles to apex, many shallow sinuses	sharply serrate to doubly serrate, few shallow sinuses	coarsely doubly serrate throughout, no sinuses
Color of petiole nodes	darker color than petiole	darker color than petiole	no color difference	no color difference
Usual method of branching	strongly monopodial	not strongly monopodial	strongly monopodial	strongly monopodial
Usual position of the first cauline leaf	near base	distant from base	near base	near base
Habit	relatively large, coarse	relatively small, delicate	relatively large, coarse	relatively large, coarse

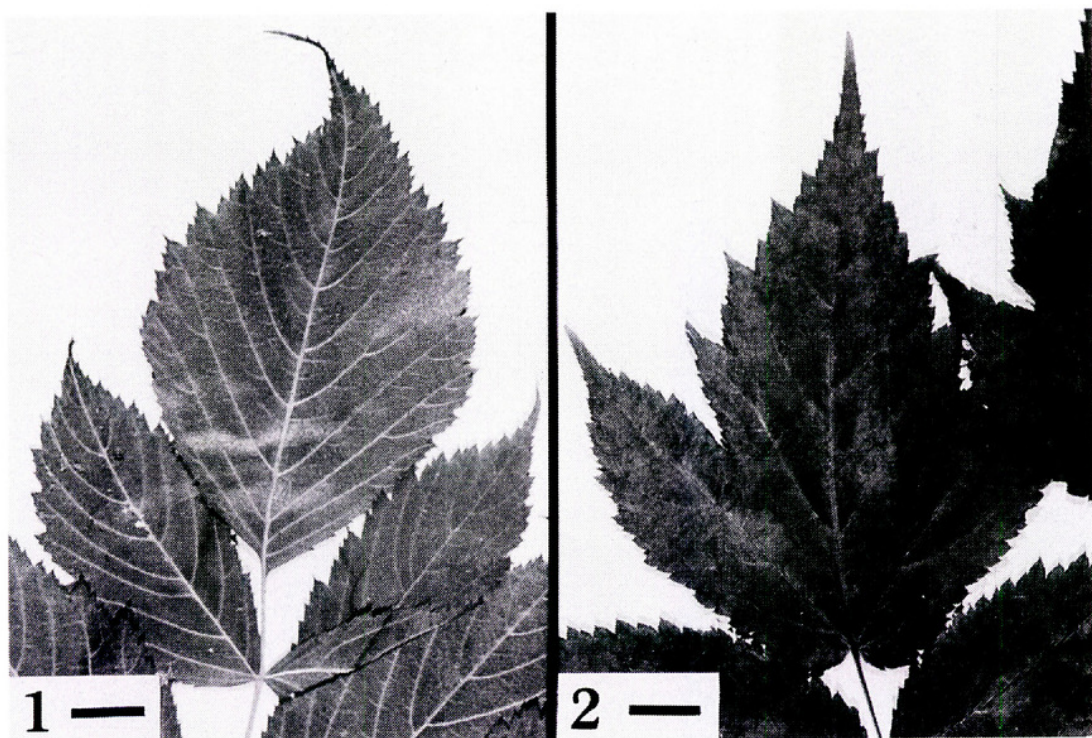


FIG. 1. Terminal leaflets of *Aruncus dioicus* (Rosaceae). Scale = 1.1 cm.

FIG. 2. Terminal leaflet of *Astilbe biternata* (Saxifragaceae). Scale = 1.1 cm.

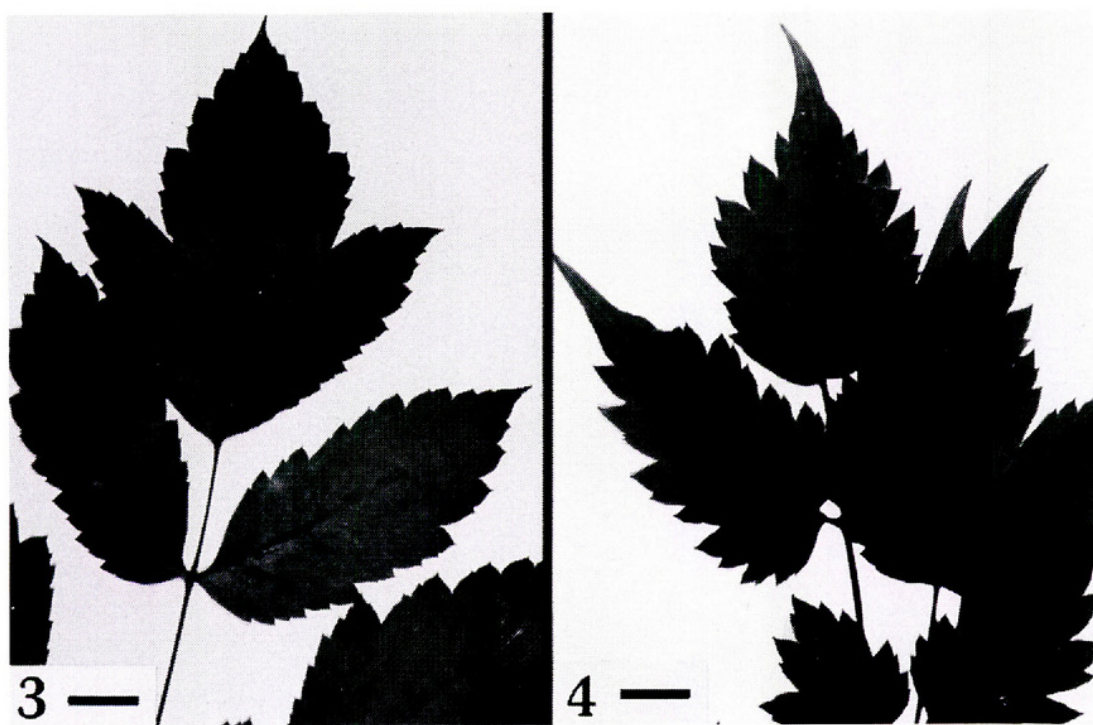


FIG. 3. Terminal leaflets of *Cimicifuga racemosa* (Ranunculaceae). Scale = 1.1 cm.

FIG. 4. Terminal leaflets of *Actaea pachypoda* (Ranunculaceae). Scale = 1 cm.

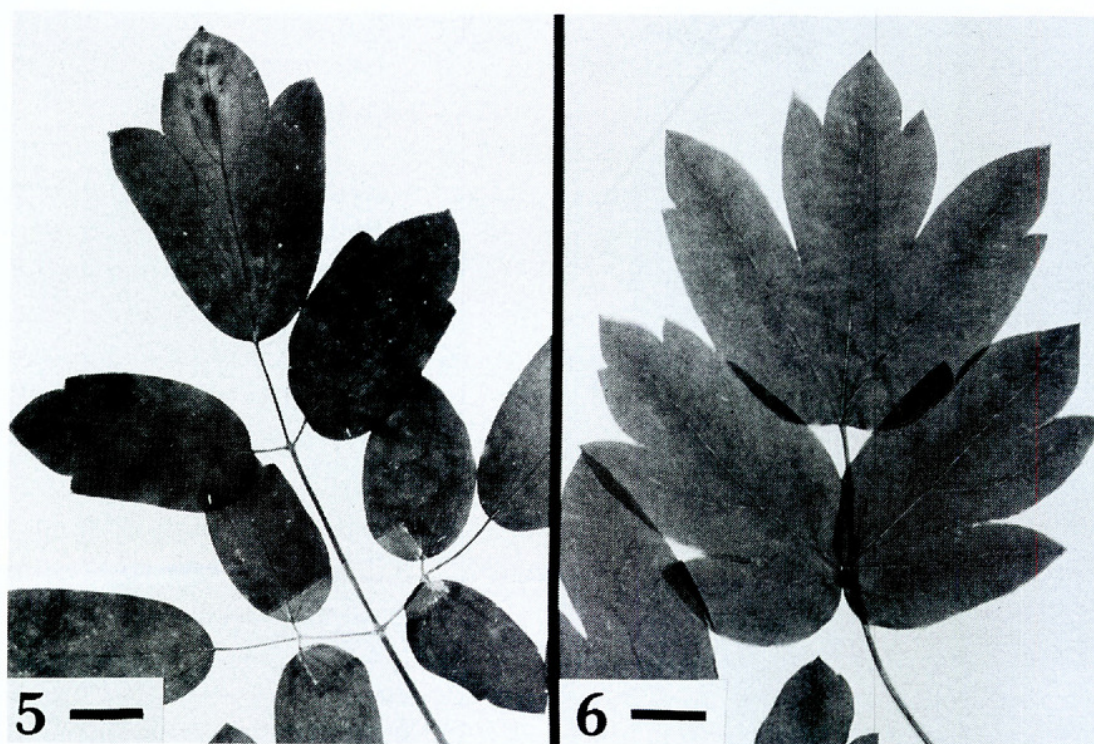


FIG. 5. Terminal leaflets of *Thalicttrum pubescens* (Ranunculaceae). Scale = 1.1 cm.

FIG. 6. Terminal leaflets of *Caulophyllum thalictroides* (Berberidaceae). Scale = 1 cm.



FIG. 7. Simple leaf of *Trautvetteria carolinensis* (Ranunculaceae). Scale = 3 cm.

the leaflet apex; there is a low frequency of shallow sinuses; leaflet apices tend to be shortly acute-acuminate with serrations; the branching habit is strongly monopodial, since the erect stem bearing the inflorescence forms the central axis, and the first cauline leaves are near the base of the plant. In *Actaea*, the bracts at the junction of the aerial stem and the rhizome are larger in relation to the size of the aerial stem than those of *Cimicifuga*.

Although the leaflets pictured (Fig. 3, 4) are typical, the terminal leaflet morphology of *Cimicifuga* and *Actaea* may be more strikingly similar than shown by these examples. Because distinctions in vegetative morphology are subtle between *Cimicifuga* and *Actaea*, it is hoped that future anatomical investigations will yield even more positive discriminating characteristics than those offered here.

Other genera which are occasionally misidentified as *Cimicifuga* are: *Thalictrum* (Ranunculaceae), *Caulophyllum* (Berberidaceae), and *Trautvetteria* (Ranunculaceae). When only vegetative material is available, both *Thalictrum* (Fig. 5) and *Caulophyllum* (Fig. 6) can be distinguished from *Cimicifuga* by their smaller, entire leaflets which have rounded lobes. *Trautvetteria* (Fig. 7) has large, simple, palmately or pedately incised, broadly reniform and rounded leaves, while the leaves of *Cimicifuga* are ternately decompose.

VEGETATIVE KEY TO GENERA

- 1a. Leaf simple 1. *Trautvetteria*
- 1b. Leaf compound 2
 - 2a. Terminal leaflet margins entire 3
 - 2b. Terminal leaflet margins serrate or doubly-serrate 4
- 3a. Terminal leaflets with mostly 4 or more small lobes, not glaucous, green; erect stem bearing more than 2 well-developed leaves *Thalictrum*
- 3b. Terminal leaflets with mostly 2–5 large lobes, glaucous, blue-green; erect stem bearing 1 well-developed leaf 3. *Caulophyllum*
- 4a. Terminal leaflet margin doubly-serrate, no lobes, major venation pinnate 4. *Aruncus*
- 4b. Terminal leaflet margin serrate, 3-more lobes, major venation palmate 5
- 5a. Terminal leaflet upper epidermis scabrous 5. *Astilbe*
- 5b. Terminal leaflet upper epidermis slightly pubescent or smooth 6
 - 6a. Terminal leaflet margins strongly dentate-serrate, teeth oriented more at right angles to apex, many shallow sinuses, lobes acuminate-caudate; stalk of inflorescence arises off center from a leaf petiole; plants only around 2 feet tall, not strongly monopodial 6. *Actaea*
 - 6b. Terminal leaflet margins serrate-incised, teeth oriented more toward apex, few shallow sinuses, lobes acute-acuminate; stalk of inflorescence arises centrally (axillary) from base of plant; plants 3–8 feet tall, strongly monopodial 7. *Cimicifuga*

ACKNOWLEDGEMENTS

This paper is a revised portion of a dissertation by the author submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at the University of Tennessee, Knoxville. I am indebted to Dr. A.J. Sharp for suggesting the problem and to both him and Dr. Walter Herndon for directing the study. Grateful appreciation is extended to Lynchburg College for supporting the cost of publication and to Betty June Ramsey and Katherine Holmes for preparing the manuscript. Sincere thanks are extended to curators of herbaria listed in my recent publication (Ramsey, 1987). I thank also the anonymous reviewers of the manuscript for several valuable suggestions.

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Ramsey, Gwynn W . 1988. "A COMPARISON OF VEGETATIVE CHARACTERISTICS OF SEVERAL GENERA WITH THOSE OF THE GENUS CIMICIFUGA (RANUNCULACEAE)." *SIDA, contributions to botany* 13, 57–63.

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