

# THE COFFEOIDEAE (RUBIACEAE) OF TENNESSEE<sup>1</sup>

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The family Rubiaceae is divided into two subfamilies which are the Cinchonoideae and Coffeoidae. The writers have followed the criteria used by Fernald (1950) and Gleason (1952) in separating these two subfamilies.

The Cinchonoideae with several to many ovules or seeds in each locule includes the genera *Houstonia* and *Hedyotis* in Tennessee. The Coffeoidae having a single seed or ovule in each locule is represented in Tennessee by *Cephalanthus*, *Diodia*, *Galium*, *Mitchella*, *Sherardia*, and *Spermacoce*.

Gettinger (1901) recorded five genera, 17 species, and two varieties and is our earliest extensive record of plants of the subfamily Coffeoidae in this state. Winston (1939), a graduate student at Peabody College, wrote a thesis on "The Rubiaceae of Middle Tennessee," which is a statement of the Rubiaceae taxa then known from that region.

In this study, keys are presented for the determination of all taxa known to occur or reported to occur in Tennessee. Under each genus the species and varieties are listed with brief notes on distribution. Maps are included to give visual pictures of their occurrences within the state. Physiographic regions in Tennessee referred to below are those described by Safford (1869).

Six genera, 20 species, and three varieties are represented in the approximately 500 collections of Tennessee Coffeoidae examined in this study. Approximately seventy per cent of these came from the Herbarium of the University of Tennessee. The remaining thirty per cent were obtained on loan from the herbaria of Austin Peay State College, East Tennessee State University, George Peabody College, Vanderbilt University, and The University of Chattanooga. The junior author has examined Coffeoid material in the New York Botanical Garden Herbarium, United States National Herbarium, and the Gray Herbarium.

The writers gratefully acknowledge the assistance of officials of the institutions named above. The criticisms of Dr. F. H. Norris and the late Dr. R. E. Shanks of the University of Tennessee Botany Department are appreciated. We are indebted to Dr. F. R. Fosberg who has identified for us certain specimens in the University of Tennessee Herbarium.

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## Key to the Genera of Coffeoidae

- A. Shrub or small tree; flowers in dense, globose, terminal heads; corolla tubular; fruits inversely pyramidal. . . . . 1. *Cephalanthus*
- A. Herbs . . . . . B
  - B. Principal leaves in whorls . . . . . C
  - B. Principal leaves opposite . . . . . D
- C. Sepals triangular; flowers involucrate; corolla funnelform, blue or pink, 4-5 lobed . . . . . 2. *Sherardia*
- C. Sepals obsolete; flowers not involucrate; corolla rotate, white, dull purple, greenish, or yellow . . . . . 3. *Galium*
- D. Stems repent; leaves evergreen; flowers twin, united in pairs by their hypanthia; fruit a fleshy, berry-like, double drupe . . . . . 4. *Mitchella*
- D. Stems ascending or erect; leaves not evergreen; flowers separate; fruits dry, eventually splitting lengthwise. . . . . E
- E. Flowers or fruits 1-3 in an axil; carpels 2 or 3, indehiscent . . . . . 5. *Diodia*
- E. Flowers or fruits more than 3 and crowded into whorled glomerules or dense cymes which are axillary or terminal; carpels 2, one or both dehiscent . . . . . 6. *Spermacoce*

## 1. CEPHALANTHUS

*Cephalanthus* L. Sp. Pl. 95. 1753.

*Cephalanthus occidentalis* L. Sp. Pl. 95. 1753.

This species occurs throughout most of the United States near lakes, swampy areas, streams, and ponds. It is found from Canada to Florida, in the West Indies, and from Maine to California. Although only 48 Tennessee counties are listed for it, sight records by Shanks and Sharp indicate its presence in other counties from which no collection is known.

Some plants possess pubescent branchlets and lower leaf-surfaces, and are therefore recognized by some authorities as var. *pubescens*—the typical variety being glabrous. If the pubescent variety is mapped separately, it would be seen to occur throughout the state as does its glabrous counterpart. One station, Svenson 444A and 44B from Carroll County, had both varieties occurring in the same site. Thus we do not separate the pubescent form as a distinct entity.

## 2. SHERARDIA

*Sherardia* L. Sp. Pl. 102. 1753.

*Sherardia arvensis* L. Sp. Pl. 102. 1753.

This species was introduced from Europe and commonly occurs in waste areas or cultivated fields from Canada to Ohio, North Carolina, and Tennessee. It is known from 11 Tennessee counties which exclude the West Slope and the Mississippi Flood Plains.

## 3. GALIUM

*Galium* L. Sp. Pl. 105. 1753.

### Key to the Species and Varieties

- A. Ovary and fruit bristly or hairy . . . . . B
- A. Ovary and fruit smooth or granulose . . . . . I
  - B. Principal leaves in whorls of 6 or 8; stems weak, leaning, or reclining, their angles more or less retrorsely scabrous. . . . . C
  - B. Principal leaves in whorls of 4; stems erect or ascending, never retrorsely scabrous on the angles . . . . . D

- C. Annual; principal leaves mostly in whorls of 8, linear or narrowly oblanceolate, the cilia at their margins usually divergent or reflexed ..... 1. *G. aparine*
- C. Perennial; principal leaves mostly in whorls of 6, narrowly elliptic, their margins usually with ascending cilia ..... 2. *G. triflorum*
- D. Flowers solitary, reflexed, sessile or subsessile in the axils of foliage leaves; leaves 4-10 mm long ..... 3. *G. virgatum*
- D. Peduncles loosely 3-several-flowered, sessile or pedicellate along the branches of the inflorescence; leaves 1.5-8 cm long ..... E
- E. Mature flowers and fruits on distinct pedicels ..... F
- E. Flowers and fruits mostly sessile along the side of the loosely divergent branches of the peduncles ..... H
- F. Stem glabrous; leaves slightly pubescent ..... 4b. *G. pilosum* var. *laevicaule*
- F. Stem pubescent; leaves rather strongly pubescent ..... G
- G. Stem and leaves more or less pubescent with straight hairs ..... 4a. *G. pilosum* var. *pilosum*
- G. Stem and leaves more or less pubescent with short upwardly-incurved hairs ..... 4c. *G. pilosum* var. *puncticulosum*
- H. Leaves lanceolate, acute or acuminate, broadest below the middle ..... 5. *G. lanceolatum*
- H. Leaves oval or elliptic, obtuse, broadest near the middle ..... 6. *G. circaezans*
- I. Stems erect; flowers purple or white ..... J
- I. Stems weak, matted, reclining or loosely ascending from the base; flowers white or whitish ..... L
- J. Leaves in primary whorls 6 or 8, 1-2 cm long; flowers white ..... 7. *G. mollugo*
- J. Leaves in primary whorls 4, 2-6 cm long; flowers purple ..... K
- K. Leaves 4-6 times as long as wide, lateral nerves obscure or lacking ..... 8. *G. arkansanum*
- K. Leaves 3-4 times as long as wide, with prominent lateral nerves ..... 9. *G. latifolium*
- L. Leaves blunt or rounded at tip, never mucronate or cuspidate ..... M
- L. Leaves sharply acute, cuspidate or mucronate ..... N
- M. Corollas mostly 4-lobed, 2-2.5 mm broad, white; leaves mostly in whorls of 4 on the principal stems ..... 10. *G. obtusum*
- M. Corollas mostly 3-lobed, 1.5 mm or less broad; leaves in whorls of 5-6 on the principal stems ..... 11. *G. tinctorium*
- N. Margins of leaves retrorsely scabrous ..... 12. *G. asprellum*
- N. Margins of leaves smooth or upwardly scabrous ..... O
- O. Leaves spinulose-margined, bristle-tipped, the principal ones 5-8 mm long; corolla lobes .2-.4 mm long ..... 13. *G. parisiense*
- O. Leaves smooth or minutely scabrous on the margin, subulate-tipped, the principal ones 1-2 cm long; corolla lobes .8-1 mm long ..... 14. *G. concinnum*

1. *Galium aparine* L. Sp. Pl. 108. 1753.

This species occurs in a wide variety of habitats. It is found in Newfoundland and Alaska southward to Texas and Florida. It is represented in Tennessee from 22 counties representing all physiographic regions.

A variety *vaillantii* has been separated on the basis of small leaves and fruits 2-3 mm long. The writers are not presently recognizing this variety as a distinct segregate within *G. aparine*.

2. *Galium triflorum* Michx. Fl. Bor. Am. I: 80. 1803.

*G. cuspidatum* Muhl. Cat. ed. I. 16. 1813.

*G. brachiatum* Pursh, Fl. Am. Sept. 103. 1814.

*G. pennsylvanicum* Bart. Comp. Fl. Philad. 83.

This species is characteristically found in woods and thickets and is widely distributed. The northern forms typically have fewer flowers which are borne on pedicels with three flowers each. In the south the flowering branches become elongate and many-flowered (Gleason, 1952). Some authorities recognize the southern variant as var. *asprelliforme*.

This species is reported as occurring in Japan and in the Himalayas; from Greenland and Alaska to Florida

and Mexico including eastern Canada. Although Tennessee specimens exhibit some variation in flowering, only the southern form was observed in collections examined. However, in view of its wide range the northern form probably occurs within the state.

3. *Galium virgatum* Nutt. ex T. & G. Fl. N. A. 2:20. 1841.

From the few specimens collected in Tennessee it might appear that this inhabitant of dry soils is localized in the Central Basin, but since this species occurs westward to Missouri and Texas, our records are probably incomplete.

4a. *Galium pilosum* Ait. Hort. Kew. I: 145. 1789. var. *pilosum*

*G. puncticulosum* Michx. var. *pilosum* DC Prodr. 4: 601. 1836.

4b. *Galium pilosum* Ait. var. *laevicaule* Weath. & Blake, Rhodora 18:194. 1916.

This variety occurs from eastern Texas to Florida and southeastern Virginia. The four Tennessee specimens came from the Cumberland Plateau.

*Galium pilosum* is known to occur in New Hampshire, south to Florida and west to Texas. No Tennessee specimens were observed from the Mississippi Flood Plains. All other regions are represented in scattered localities.

4c. *Galium pilosum* Ait. var. *puncticulosum* (Michx.) T. & G. Fl. N. A. 1: 24. 1841.

*G. puncticulosum* Michx. Fl. Bor. Am. 1: 80. 1803.

The var. *puncticulosum* occurs from Mississippi and Florida northward to Missouri and on the Coastal Plain to parts of New Jersey. It is recorded in eight Tennessee counties including the western, middle, and eastern portions of the state.

5. *Galium lanceolatum* Torr. Fl. U. S. 168. 1824.

*G. circaezans* Michx. var. *lanceolatum* Torr. Cat. Pl. N. Y. 23. 1819.

*G. torreyi* Bigel. Fl. Bost. ed. 2. 56. 1824.

This species is distributed in dry woods from Maine and Quebec to Minnesota and southward to the mountains of North Carolina and Tennessee. The seven specimens examined were mostly from the Unaka Range. One collection was from Falls Creek Falls State Park; the others, from high altitudes in east Tennessee.

6. *Galium circaezans* Michx. Fl. Bor. Am. 1: 80. 1803.

*G. circaeoides* R. & S. Syst. 3:256. 1818.

*G. circaezans* Michx. var. *glabrum* Britton, Bull.

Torr. Bot. Cl. 21: 32. 1894.

*G. circaezans* Michx. var. *glabellum* Britton, Mem. Torr. Bot. Cl. 3: 303. 1894.

This species is distributed from Quebec, Ontario, and Maine to Minnesota; southward to Florida and Texas. It is widely distributed in Tennessee occurring in all physiographic regions.

A more pubescent growth form, var. *hypomalacum* according to Fernald, is found in the northern portions

of the range of this species. This variety is not recognized herein as a distinct entity.

7. *Galium mollugo* L. Sp. Pl. 107. 1753.

This taxon occurs in meadows, along roadsides and in fields from Tennessee northward to Vermont, Quebec, and Newfoundland. The only record we have of its occurrence in this state is a collection by F. Lamson-Scribner made in Knox County, May 30, 1890. This specimen is in the New York Botanical Garden Herbarium.

8. *Galium arkansanum* Gray, Proc. Am. Acad. 19:80. 1883.

Dry woods of Missouri, Arkansas, and Oklahoma are typical habitats of this species. In his work on Tennessee plants, Gattinger (1901) reported *G. arkansanum* from Johnsonville in west Tennessee. No other record has been encountered for this species in the state.

9. *Galium latifolium* Michx. Fl. Bor. Am. I:79. 1803.

Another inhabitant of dry woods is *G. latifolium* which is found in the mountains of Pennsylvania, Virginia, Kentucky, and southward to Alabama. All specimens examined came from mountainous areas of east Tennessee. Similarities in gross morphology as well as similarities in ecological requirements are evidences of very close relationship between this and the preceding species.

10. *Galium obtusum* Bigel. Fl. Bost. ed. 2. 55. 1824.

*G. tinctorium* L. Sp. Pl. 106. 1753.

*G. trifidum* Pursh var. *latifolium* Torr. Fl. N. & Mid. States. 78. 1826.

The complete range of this species includes Florida and westward to Arizona; northward to South Dakota, Minnesota, Michigan, parts of New England, Ontario, and southwestern Nova Scotia. No explanation is known for the apparent scarcity of *G. obtusum* in east Tennessee where it is limited to Meigs and Blount counties. Intensive collecting might indicate a more generalized distribution.

11. *Galium tinctorium* Bigel. Fl. Bost. ed. 2. 54. 1824.

*G. claytoni* Michx. Fl. Bor. Am. I: 78. 1803.

*G. trifidum* Pursh, Fl. Am. Sept. 103. 1814.

This is a wide-spread species occurring from Newfoundland to Nebraska, Texas, and as far south as Kentucky and South Carolina. It grows in swamps, bogs, and damp areas. It appears to be widely distributed in east Tennessee but is not known from the Central Basin or the Mississippi Flood Plains.

Peduncles bearing fewer than 3 flowers were termed var. *subbiflorum* by Fernald. This variety was not recognized for purposes of this study.

12. *Galium asprellum* Michx. Fl. Bor. Am. I: 78. 1803.

*G. pennsylvanicum* Muhl. Cat. 15. 1813.

*G. spinulosum* Raf. Prec. Decouv. 40. 1814.

*G. micranthum* Pursh, Fl. Am. Sept. 103. 1814.

The known range of this species is from Newfoundland to Minnesota, south to Missouri and North Caro-

lina, Illinois, and Nebraska. All Tennessee collections were from Johnson or Carter County.

13. *Galium parisiense* L. Sp. Pl. 108. 1753.

*G. anglicum* Huds. Fl. Angl. ed. 2. 69. 1778.

Although a native of Europe, this species seems to be established on the Atlantic and Pacific coasts. It is listed as occurring in Virginia, West Virginia to Indiana, North Carolina, and Tennessee. Several specimens examined collected in close association with roadsides and glades—its characteristic habitat. It is known from seven central and east Tennessee counties.

14. *Galium concinnum* T. & G. Fl. N. A. 2: 23. 1841.

This species grows in dry woods and thickets from New Jersey to Minnesota; south to Virginia and Tennessee, and westward to Arkansas and Kansas. It is especially abundant in the western part of its range (Cleason, 1952). In Tennessee it is not common being known from Cheatham, Campbell and Sevier counties.

#### 4. MITCHELLA L.

*Mitchella* L. Sp. Pl. 111. 1753.

*Mitchella repens* L. Sp. Pl. 111. 1753.

In the southern limits of its United States range, *M. repens* occurs from Florida to Mexico and Guatemala. The northern boundaries include southwestern Newfoundland, southern Quebec, and Ontario. This species shows a disjunct distribution between eastern Texas and northern Mexico—a distance of 550 to 700 miles by land (cf. fig. 12, Miranda and Sharp, 1950) and is one of the species which indicate a relationship between the floras of eastern United States and of Mexico and Guatemala.

Approximately 70 specimens from Tennessee were examined and these came from 34 counties which exclude the Central Basin.

#### 5. DIODIA L.

*Diodia* L. Sp. Pl. 104. 1753.

##### Key to the Species

- A. Corolla filiform, 7-10 mm long; style cleft into 2 linear stigmas; fruits 7-10 mm long; stem angular. . . . . 1. *D. virginiana*  
A. Corolla funnelform, 4-6 mm long; style undivided with a capitate stigma; fruits 2.9-5 mm long; stem more or less rounded. . . . . 2. *D. teres*

1. *Diodia virginiana* L. Sp. Pl. 104. 1753.

This species is quite variable. Torrey and Gray (1838-1840) recognized three varieties which can be distinguished only with difficulty.

*Diodia virginiana* is found on wet or muddy ground from Florida to Texas, north to parts of New Jersey, southern Illinois, and Missouri. It occurs widely throughout Tennessee. All seven physiographic regions are represented from collections examined. This species is commonly called the larger buttonweed.

2. *Diodia teres* Walt. Fl. Carol. 87. 1788.

*Spermacoce diodina* Michx. Fl. Bor. Am. I: 82. 1803.

*Diodelia teres* (Walt.) Small, in Small and Carter, Fl. Lanc. County, 271. 1913.

Although there are varieties which are sufficiently contrasting, the Tennessee specimens of *D. teres* examined are sufficiently alike that the writers have been unable to delimit with confidence the varieties on the basis of any set of characters presently known to them.

Unlike *D. virginiana* which occurs in wet or muddy areas, *D. teres* grows on sandy soils. It occupies much of the same general range as *D. virginiana* and in addition occurs in Virginia, Maryland, North Carolina, and westward to Texas and New Mexico. In Tennessee *D. teres* has been collected in all physiographic regions and would appear to be as widespread as *D. virginiana*. Common names for this species are rough buttonweed, poverty-, or poor-land-weed, and poor joe.

6. SPERMACOCE L.

*Spermacoce* L. Sp. Pl. 102. 1753.

*Spermacoce glabra* Michx. Fl. Bor. Am. I: 82. 1803.

This species grows on river banks, in swamps, and low woods. Its range includes southern Ohio to Florida, Texas and southeastern Kansas, Missouri, southern Illinois and Indiana. Collections are known from eight Tennessee counties which are mostly west of the Cen-

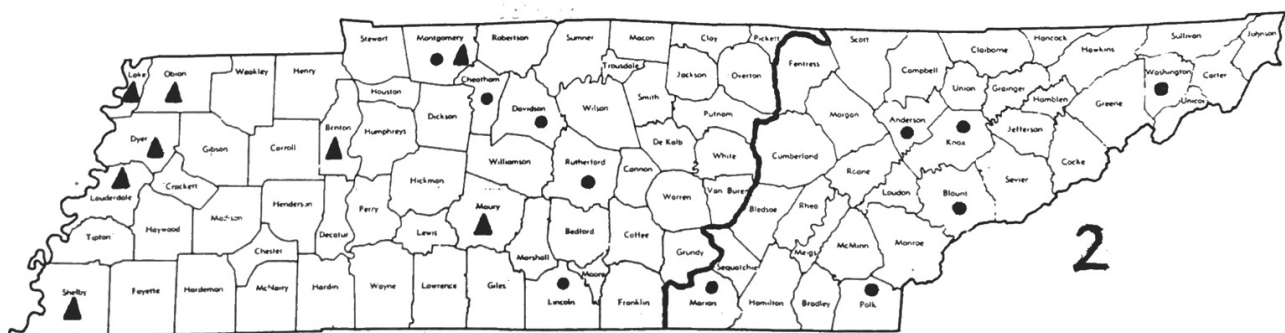
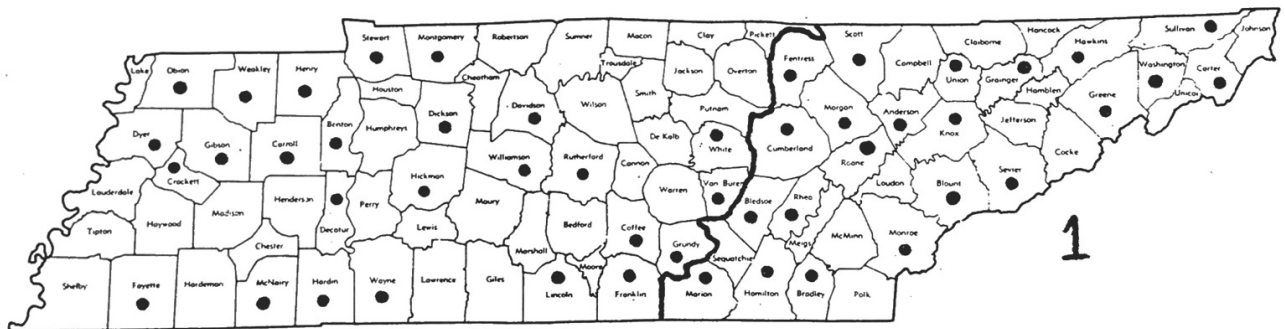
tral Basin. Members of this genus also are often called buttonweed.

SUMMARY

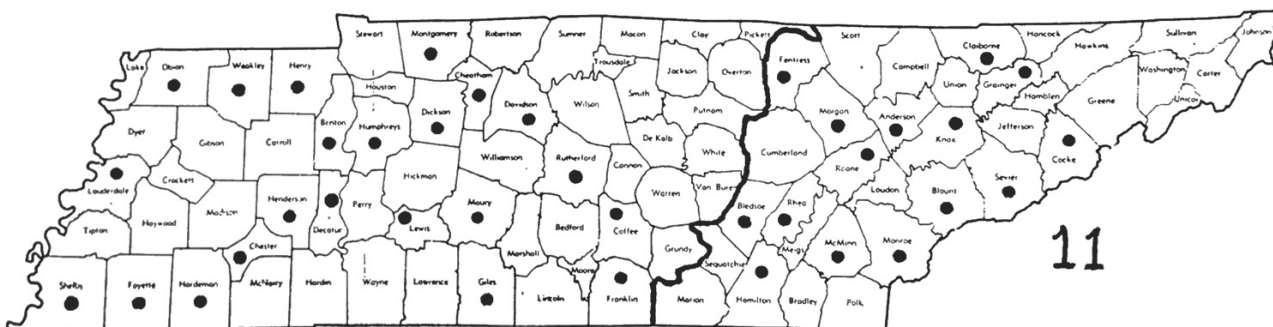
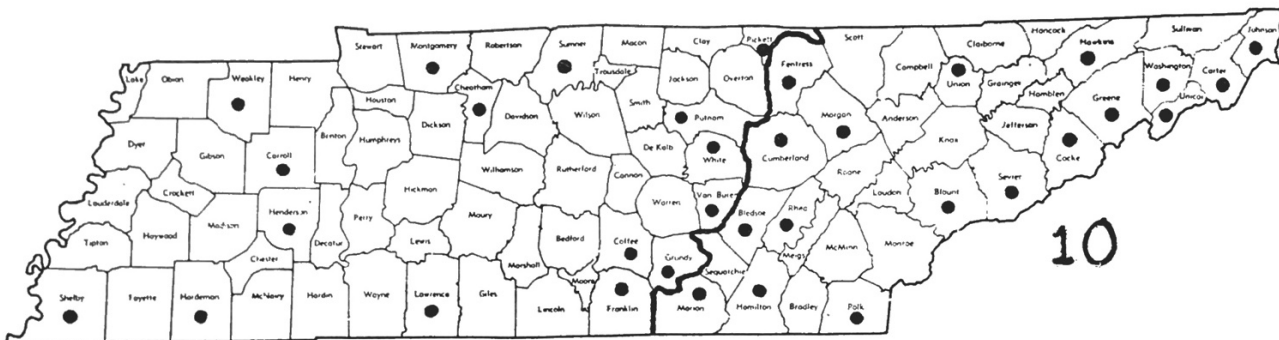
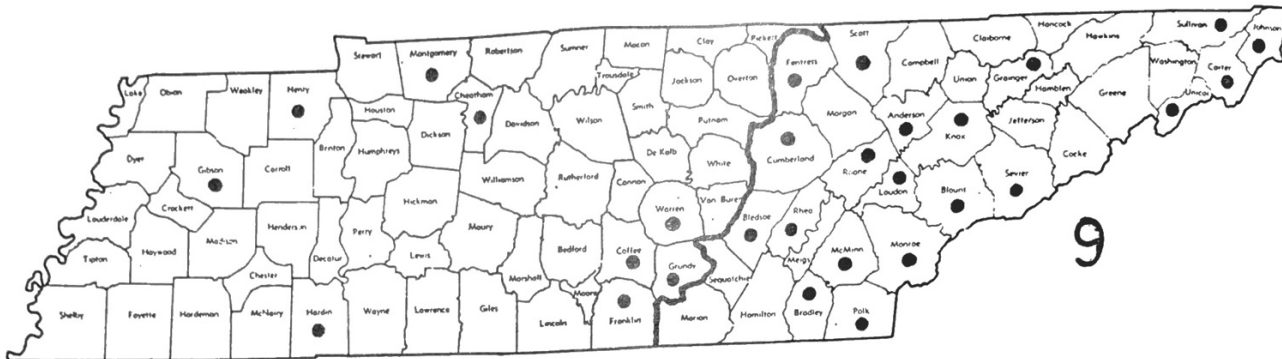
The subfamily Coffeoidae as known from Tennessee includes six genera, 20 species, and three varieties. Their general ranges and distributions within Tennessee are mapped and discussed. No specimens of the Coffeoidae were encountered from 15 Tennessee counties; Cannon, Clay, Hamblen, Hancock, Jackson, Jefferson, Macon, Marshall, Moore, Overton, Perry, Sequatchie, Smith, Stewart, and Trousdale, indicating a serious need for further collecting.

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- Fig. 1 *Cephalanthus occidentalis* L.
- Fig. 2 ▲ *Spermacoce glabra* Michx.  
● *Sherardia arvensis* L.
- Fig. 3 *Galium aparine* L.
- Fig. 4 *Galium triflorum* Michx.
- Fig. 5 ● *Galium parisiense* L.  
▲ *Galium virgatum* Nutt.  
● *Galium concinnum* T. & G.  
♣ *Galium lanceolatum* Torr.
- Fig. 6 ● *Galium pilosum* Ait. var. *pilosum*  
▲ *Galium pilosum* Ait. var. *laevicaule* Weath. & Blake  
● *Galium pilosum* Ait. var. *puncticulosum* (Michx.) T. & G.
- Fig. 7 *Galium circaezans* Michx.
- Fig. 8 ● *Galium obtusum* Bigel.  
▲ *Galium latifolium* Michx.  
● *Galium asprellum* Michx.
- Fig. 9 *Galium tinctorium* L.
- Fig. 10 *Mitchella repens* L.
- Fig. 11 *Diodia virginiana* L.
- Fig. 12 *Diodia teres* Walt.