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The Genus *Crotalaria* (Fabaceae) in Alabama

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ABSTRACT The primary objectives of this project were to determine which species of *Crotalaria* (Fabaceae) occur in Alabama and the county distribution of each species. *Crotalaria*, known commonly as rattlebox, is recognized as consisting of seven species in Alabama. The most common species are *Crotalaria sagittalis*, *C. rotundifolia*, and *C. spectabilis*. The less common species are *C. purshii*, *C. lanceolata*, *C. pallida*, and *C. ochroleuca*. In Alabama, introduced species of *Crotalaria* (*C. lanceolata*, *C. ochroleuca*, *C. pallida*, and *C. spectabilis*) generally have showier inflorescences and reach greater maximum heights than native species (*C. purshii*, *C. rotundifolia*, and *C. sagittalis*). The dichotomous key and descriptions we present are modifications from earlier authors; however, all measurements are based on morphological features of the vegetative and reproductive structures of the more than 460 specimens studied during this project. Data for the county-level distribution maps were compiled entirely from herbarium vouchers.

Key words: Alabama, *Crotalaria*, Fabaceae, floristics, systematics.

INTRODUCTION *Crotalaria* consists of approximately 600 species worldwide (Isely 1990). Twenty species have been reported from the United States, and 16 species have been reported from the southeastern United States (NatureServe 2012). Seven of these species have been reported from the state of Alabama (Kral et al. 2012).

The genus *Crotalaria* is a member of the legume family (Fabaceae, Leguminosae), subfamily Papilionoideae, and tribe Crotalarieae (Polhill 1981). Tribe Crotalarieae is monophyletic (Boatwright et al. 2008) and thought to have evolved from the southern African tribe Liperieae (Goldblatt 1981). Crotalarieae is sister to tribe Genisteae (Käss and Wink 1995, Boatwright et al. 2008). In addition to *Crotalaria*, Crotalarieae also contains the genera *Aspalathus*, *Lotononis*, and *Rafnia* (Käss and Wink 1997).

Plitmann (1981) suggested that the genus *Crotalaria* is a direct ancestor of *Lupinus* (tribe Genisteae). Alternatively, Polhill (1981) considered the similarities in the biology and

distribution of the two genera to have resulted from convergent evolution; this was later supported by molecular and phytochemical data (Käss and Wink 1997).

Crotalaria is closely related to the genus *Bolusia* (tribe Crotalarieae). Although *Bolusia* was originally suggested to be a local derivative of *Crotalaria* (Polhill 1981, van Wyk 1991), recent work using both morphological observations and nucleotide sequence analyses indicates that the two genera are sister groups (Boatwright et al. 2008).

Several species of *Crotalaria* were introduced with other legumes into the southeastern Coastal Plain of the United States during the 1940s and 1950s for soil improvement, erosion control, and forage. After some of these introduced species of *Crotalaria* were found to be poisonous, their use in agriculture was abandoned. Most of the introduced species are now established, often outnumbering the native species, and are subsequently regarded as weeds (Isely 1990).

Two species of *Crotalaria* that occur in Alabama, native *C. sagittalis* L. and introduced *C. spectabilis* Roth., have been documented as containing the poisonous alkaloids monocrotaline and retusamine of the pyrrolizidine group. These alkaloids are concentrated pri-

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marily in the seeds of the plant, but are also located in the leaves, stems, and roots; thus, the entire plant is considered poisonous (Gibbons et al. 1990). While cases of poisoning from *Crotalaria* typically appear in livestock and fowl, some cases have been observed in humans. These cases are usually the result of food contamination (Westbrooks and Preachers 1986).

The primary objectives of this study were to determine which species of *Crotalaria* occur in Alabama and report the county-level distribution of each. Additional goals included providing a dichotomous key, species descriptions, and illustrations for the taxa of *Crotalaria* found in Alabama.

MATERIALS AND METHODS Data for the distribution maps were gathered from more than 460 plant specimens deposited in the herbaria of Troy University (TROY), J.D. Freeman (AUA), The University of Alabama (UNA), the University of South Alabama (USAM), Anniston Museum of Natural History (JSU), University of North Alabama (UNAF), and Southern Methodist University (SMU) and Vanderbilt University (VDB), both of which are housed at the Botanical Research Institute of Texas (BRIT) in Fort Worth.

The dichotomous key is a modification of that of Isely (1990) and Weakley (2007); however, all measurements are based on morphological features of the vegetative and reproductive structures of the plants examined during this project. Descriptions for each taxon are based on those of Isely (1990), with modifications incorporating measurements taken from the specimens studied. Illustrations are by the second author. The lists of specimens examined are limited to one record from each county.

Herbarium specimens were initially divided into groups based on overall morphological similarity and the species concept established by Isely (1990). Morphological measurements were then made from selected specimens of each group. Field studies were also conducted to observe the species in their natural habitats and make personal collections.

RESULTS Seven species of *Crotalaria* occur in Alabama, three native species—*C. purshii* DC.,

C. rotundifolia J.F. Gmelin, and *C. sagittalis* L.—and four introduced species—*C. lanceolata* E. Meyer, *C. ochroleuca* G. Don, *C. pallida* Aiton, and *C. spectabilis* Roth. The most common species of *Crotalaria* in the state is *C. sagittalis*, represented in 40 counties. *Crotalaria rotundifolia* and *C. spectabilis* are also relatively common, each represented in 36 counties. Less common species are *C. purshii* (15 counties), *C. lanceolata* (7 counties), *C. pallida* (3 counties), and *C. ochroleuca* (3 counties).

Taxonomic Treatment of Crotalaria

Crotalaria Linnaeus, Sp. Pl. 714. 1753, nom. cons.

Herbs. Stems prostrate, ascending or erect, strigose or pilose. Leaves palmately trifoliolate or unifoliolate, petioled or sessile; leaflets entire, estipellate, broadly ovate to linear; stipules obsolescent or conspicuous, decurrent on stem in some species. Inflorescence usually exserted, leaf-opposed racemes that appear terminal or axillary; bracteoles usually present. Calyx lobes often subequal, longer or shorter than tube; corolla papilionaceous, usually yellow, commonly dark-striate, sometimes partly red- or orange-suffused, keel slenderly porrect-tipped, often exserted and conspicuous; androecium monadelphous; style barbellate. Fruits shortly stipitate, dehiscent, inflated or turgid, ovoid to oblong, usually subterete, papery or subcoriaceous, commonly black at maturity. Seeds several to numerous.

Key to the Alabama Species of *Crotalaria*

- 1. Leaves unifoliolate 2
- 1. Leaves trifoliolate 5
 - 2. Corolla 1.7–3.0 cm long; leaflets 4–15 cm long, 1.5–4.0 times longer than wide; stipules obsolescent or 4–7 mm long, not decurrent 1. *C. spectabilis*
 - 2. Corolla 0.7–1.4 cm long; leaflets 1–8 cm long, if exceeding 4 cm, 5–15 times longer than wide; stipules obsolescent or conspicuous on upper leaves, decurrent 3
- 3. Plant annual, erect; stems pilose, the longer hairs 1–2 mm long; upper leaflets 4–8 times longer than wide 2. *C. sagittalis*
- 3. Plant perennial, decumbent, sprawling or erect; stems strigose or pilose, the longer hairs less than 1.2 mm long; upper leaflets 1.5–4.0 times longer than wide 4
 - 4. Plant erect or ascending; stems inconspicuously strigose; leaflets glabrous above,

medial blades oblong-lanceolate to linear, 3–10 cm long, 5–15 times longer than wide 3. *C. purshii*

- 4. Plant decumbent to low-ascending; stems pilose or strigose; leaflets strigose above, medial blades broadly ovate or elliptic-oblong, 1–5 cm long, 1.5–4.0 times longer than wide 4. *C. rotundifolia*
- 5. Leaflets obovate, 1.5–3.5 times longer than wide; legumes puberulous 5. *C. pallida*
- 5. Leaflets lanceolate to linear, 3.5–20.0 times longer than wide; legumes strigose 6
- 6. Corolla 8–10 mm long; legumes 4–6 mm in diameter, apically curved ... 6. *C. lanceolata*
- 6. Corolla 14–20 mm long; legumes 14–16 mm in diameter, straight 7. *C. ochroleuca*

1. *Crotalaria spectabilis* Roth., Nov. Pl. Sp. 341. 1821 (Figure 1a).

Crotalaria sericea Retzius, Observ. Bot. 5: 26. 1788 (“1789”), non Burman f. 1768.

Crotalaria macrophylla Weinmann, In: Schrank, Syll. Pl. Nov. 2: 26. 1828, non Willdenow 1802.

Crotalaria leschenaultii de Candolle, Prodr. 2: 125. 1825.

Crotalaria retzii Hitchcock, Annual Rep. Missouri Bot. Gard. 4: 74. 1893.

Herbs. Stems erect, to 1.5 m tall, of glabrous appearance, but stems strigulose. Leaves unifoliate, shortly petioled or subsessile; leaflets obovate to elliptic, 4–15 cm long, 1.5–4.0 times longer than wide, somewhat glaucous, strigulose below; stipules obsolescent or ovate to curved-lanceolate, flap-like, circa 4–7 mm long, semipersistent. Inflorescence racemose, terminal, apically clustered and exserted, or intercalary, 1–5 dm long, bearing usually numerous crowded flowers more than one-half of axis length; bracts 5–8 mm long, persistent. Calyx 10–15 mm long, glabrous; corolla 1.7–3.0 cm long. Fruits 3.0–4.5 cm by 1–2 cm, usually pendent, inflated, ovoid, subterete, glabrous. Seeds numerous.

Native of south Asia, now pantropical; introduced in southern United States.

Habitat and distribution in Alabama: ruderal, agricultural, and disturbed sites, roadsides, old fields and margins, waste areas; widely scattered throughout the state, more abundant in southern half (Figure 1b).

Specimens Examined. **Autauga County:** W.G. Dupree 35, 27 September 1975 (AUA). **Baldwin County:** Gerould Wilhelm 11904, 20 November 1983 (VDB). **Barbour County:** Kaleb K. Dyess 7, 17 July 2008 (TROY). **Butler**

County: Harold D. Moore 781, 20 August 1970 (AUA). **Calhoun County:** D.D. Spaulding 6747, 21 November 1994 (JSU). **Chambers County:** C.J. Hansen 2000–63, 13 September 2000 (AUA). **Choctaw County:** Harold D. Moore 973, 8 September 1970 (VDB). **Clarke County:** Nancy S. Henley 40, 8 September 1971 (AUA). **Coffee County:** Kaleb K. Dyess 82, 6 October 2008 (TROY). **Colbert County:** Robert Daly s.n., 4 October 1983 (UNAF). **Conecuh County:** A.R. Diamond 1524, 17 August 1985 (AUA). **Covington County:** A.R. Diamond 19683, 2 August 2008 (TROY). **Crenshaw County:** A.R. Diamond 12629, 25 August 2001 (TROY). **Dale County:** A.R. Diamond 8463, 20 September 1992 (AUA). **Elmore County:** L.L. Bozeman 37, 30 September 1980 (AUA). **Fayette County:** R. Kral 29453, 6 October 1967 (VDB). **Geneva County:** A.R. Diamond 6500, 6 October 1989 (AUA). **Hale County:** Harold D. Moore 899, 8 September 1970 (VDB). **Henry County:** Kaleb K. Dyess 38, 24 July 2008 (TROY). **Houston County:** Gretchen Haynes 49, 31 October 1980 (AUA). **Lauderdale County:** Vincent Grosso s.n., 10 October 1989 (UNAF). **Lee County:** J. Beutler s.n., 16 September 1982 (AUA). **Lowndes County:** Harold D. Moore 1139, 10 September 1970 (AUA). **Macon County:** Patrick D. Hagan 22, 21 September 1972 (AUA). **Marengo County:** J. Kevin England 1210, 24 September 2008 (TROY). **Marion County:** Robert Daly s.n., 14 September 1983 (UNAF). **Mobile County:** Tad M. Zebryk 8153, 25 December 2002 (UNA). **Monroe County:** A.R. Diamond 17196, 31 October 2006 (TROY). **Montgomery County:** James R. Owens s.n., 15 July 1969 (AUA). **Pike County:** Clint Green 9, 17 October 2000 (TROY). **Russell County:** Daniel D. Spaulding 12161, 12 September 2004 (TROY). **St. Claire County:** Jackie Little 2, 30 August 1971 (AUA). **Sumter County:** R. Kral 32990, 8 September 1968 (VDB). **Tuscaloosa County:** e.g. Patton s.n., 6 November 1958 (UNA). **Washington County:** Harold D. Moore 1015, 9 September 1970 (AUA). **Wilcox County:** Harold D. Moore 1123, 10 September 1970 (VDB).

2. *Crotalaria sagittalis* Linnaeus, Sp. Pl. 1753 (Figure 1c).

Herbs. Stems erect, 0.5–4.0 dm tall, pilose with stiff, irregularly spreading or ascending hairs 1–2 mm long. Leaves unifoliate, sub-

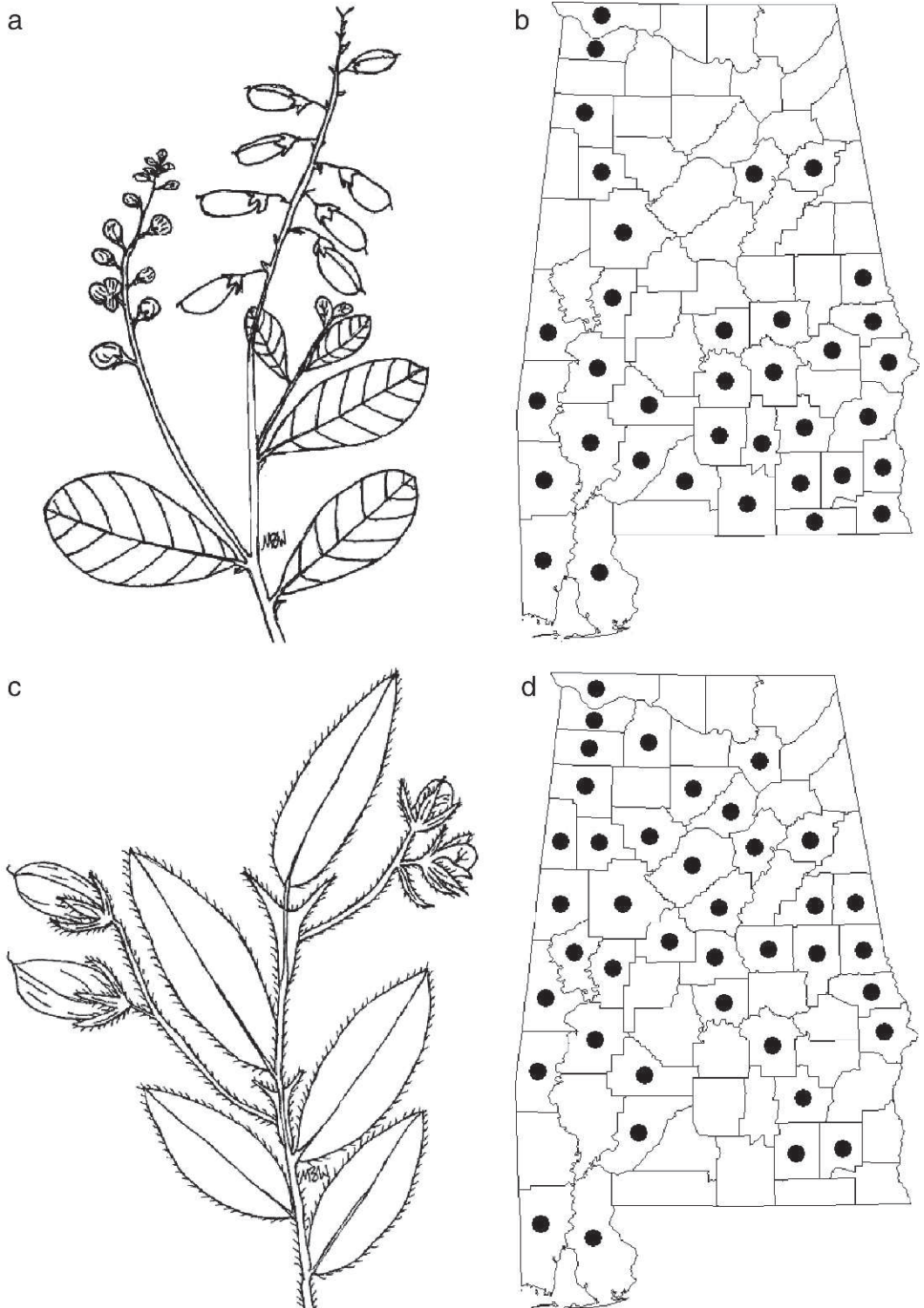


Figure 1. a) Illustration of *Crotalaria spectabilis*; b) distribution of *C. spectabilis*; c) illustration of *C. sagittalis*; d) distribution of *C. sagittalis*.

sessile; lower leaflets elliptic to oblong, 1–5 cm long, approximately 2.5–4.0 times longer than wide, medial and upper leaflets elliptic-oblong to linear-lanceolate, 1–8 cm long, 4–8 times longer than wide, pubescent both surfaces; stipules of lower leaves obsolescent, those of upper leaves well developed, tapering-decurrent, and with ascending lobes 0.5–1.5 cm long. Raceme(s) intercalary or shortly exserted, 2–8 cm long, with 2–5 flowers variously distributed along axis. Calyx 10–12 mm long, pilose; corolla 7–14 mm long. Fruits 1.0–2.5 cm long, 5–10 mm wide, usually obliquely furrowed, glabrous. Seeds several to numerous.

Native of southeastern United States.

Habitat and distribution in Alabama: sandy, open, dry or mesic disturbed areas, old fields and roadsides; scattered throughout the state (Figure 1d).

Specimens Examined. **Autauga County:** A.R. Diamond 6175, 29 July 1989 (AUA). **Baldwin County:** Jackie Edwards s.n., 6 June 1958 (UNA). **Bibb County:** A.R. Diamond 14050, 27 July 2003 (TROY). **Blount County:** Brian R. Keener 1624, 6 September 1998 (UNA). **Calhoun County:** C.L. Lawler 1462, 1 November 1986 (JSU). **Chambers County:** Carole A. Corsby 115, 15 July 1975 (AUA). **Chilton County:** R. Kral 51147, 11 August 1973 (VDB). **Choctaw County:** Ann S. Causey 2005, 23 June 1980 (VDB). **Clay County:** D.W. Rutland 496, 23 June 1975 (AUA). **Coffee County:** Brian H. Martin 730, 26 May 2000 (TROY). **Colbert County:** Jim Trimble s.n., 25 June 1973 (UNAF). **Coosa County:** David L. Lentz 118, 30 August 1980 (UNA). **Cullman County:** W. Wolf s.n., 1 August 2003 (AUA). **Dale County:** Hannelore Rundell 161, 10 May 1997 (TROY). **Fayette County:** D.D. Spaulding 12017, 3 August 2003 (TROY). **Franklin County:** Jonathan Mitchell s.n., 8 July 1990 (UNAF). **Greene County:** Brian R. Keener 4518, 27 May 2008 (UWAL). **Hale County:** A.R. Diamond 14008, 9 July 2003 (TROY). **Jefferson County:** J.C. Roboski 25, 2 July 1972 (AUA). **Lamar County:** Brian R. Keener 2342, 2 August 2002 (UNA). **Lauderdale County:** R. Kral 69503, 20 July 1982 (VDB). **Lee County:** Wendy Hallmark 77, 20 June 1972 (AUA). **Lawrence County:** Robert Pitcock s.n., 15 July 1973 (UNAF). **Marengo County:** J. Kevin England 942, 21 August 2008 (TROY). **Marion County:** Adina Stone s.n., 23

June 1991 (UNAF). **Marshall County:** Joab L. Thomas 155, 20 July 1956 (UNA). **Mobile County:** D.L. Scott 202, 17 May 1968 (USAM). **Monroe County:** A.R. Diamond 17750, 23 June 2007 (TROY). **Montgomery County:** A.R. Diamond 19880, 1 September 2008 (TROY). **Pickens County:** R. Kral 35460, 12 July 1968 (UNA). **Pike County:** A.R. Diamond 19715, 7 August 2008 (TROY). **Randolph County:** C.F. Nixon 3479, 8 July 1986 (UNA). **Russell County:** A.R. Diamond 14865, 31 October 2004 (TROY). **Shelby County:** R. Kral 47862, 28 July 1972 (VDB). **St. Clair County:** Brian R. Keener 3861, 17 September 2007 (TROY). **Sumter County:** James E. White B-158, 25 June 1998 (UWAL). **Tallapoosa County:** Thomas D. Eichlin s.n., 7 August 1967 (AUA). **Tuscaloosa County:** Barbara Y. Youngblood 13, 6 September 1980 (UNA). **Walker County:** Robert R. Haynes 10277, 15 June 2002 (TROY). **Wilcox County:** S.C. Gunn 649, 20 May 1982 (VDB).

3. *Crotalaria purshii* de Candolle, Prodr. 2: 124. 1825 (Figure 2a).

Crotalaria laevigata Pursh, Fl. Amer. Sept. 369. 1814, non Lamarck 1786.

Crotalaria sagittalis Linnaeus var. *linearis* Michaux, Fl. Bor.-Amer. 2: 55. 1803.

Crotalaria cuneifolia Rafinesque, New Fl. 2: 55. 1837 ("1836"), nom. illegit. et non (Forsskål) Schrank 1828.

Crotalaria linearis (Michaux) Rafinesque, New Fl. 2: 54. 1837 ("1836").

Crotalaria longipes Rafinesque, New Fl. 2: 54. 1837 ("1836").

Crotalaria purshii de Candolle var. *bracteolifera* Fernald, Rhodora 49: 149, t. 1075 (23). 1947.

Herbs. Stems erect or ascending, 1–5 dm tall, inconspicuously strigose. Leaves unifoliate, shortly petioled or sessile; leaflets of lower leaves elliptic or spatulate to obovate-oblong, 2–5 cm long, 2.5–4.0 times longer than wide, those of medial leaves usually oblong-lanceolate to linear, 3–10 cm long, 5–15 times longer than wide, glabrous above; stipules of medial and upper leaves conspicuous, tapering, decurrent, with ascending free lobes. Raceme moderately or strongly exserted, 6–15 cm long, loosely 2–5 flowered approximately one-half of axis length. Calyx 9–12 mm long, strigose; corolla 8–12 mm long. Fruits ellipsoid, inflated, 1.5–3.0 cm long

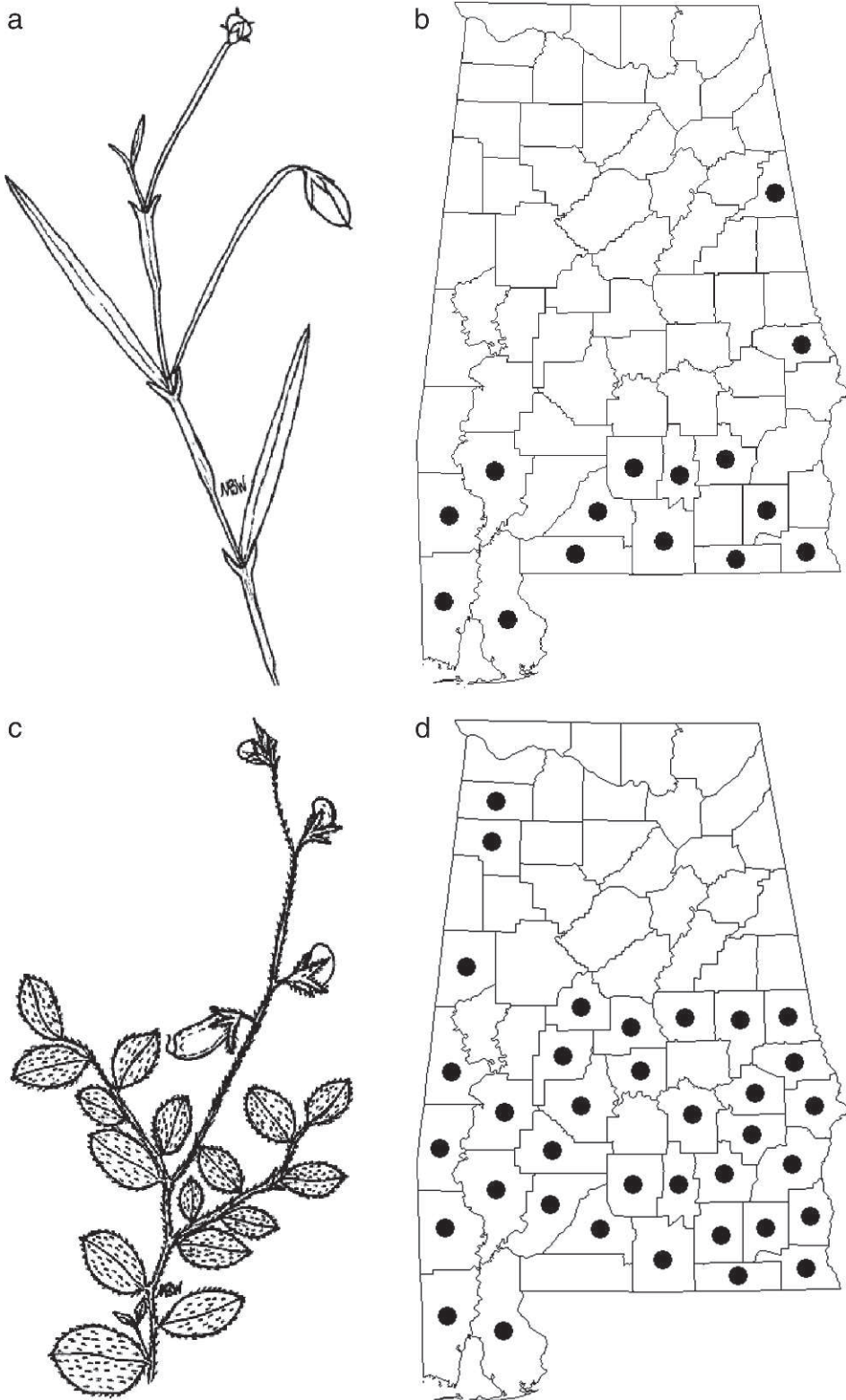


Figure 2. a) Illustration of *Crotalaria purshii*; b) distribution of *C. purshii*; c) illustration of *C. rotundifolia*; d) distribution of *C. rotundifolia*.

by 8–10 mm wide, usually obliquely furrowed, glabrous. Seeds several to numerous.

Endemic to southeastern United States.

Habitat and distribution in Alabama: moist pine flatwoods, savannahs, and pocosins; scattered primarily throughout southern tier of the state, some distributed along eastern perimeter (Figure 2b).

Specimens Examined. **Baldwin County:** *R. Kral* 86023, 9 June 1996 (VDB). **Butler County:** *A.R. Diamond* 15729, 10 September 2005 (TROY). **Clarke County:** *R. Kral* 39691, 4 June 1970 (VDB). **Cleburne County:** *W.H. Adams s.n.*, 5 June 1957 (AUA). **Conecuh County:** *R. Kral* 37475, 22 September 1969 (VDB). **Covington County:** *John R. MacDonald* 10563, 18 May 1997 (VDB). **Crenshaw County:** *A.R. Diamond* 11070, 6 August 1997 (AUA). **Dale County:** *John R. MacDonald* 10800, 24 June 1997 (VDB). **Escambia County:** *Gerould Wilhelm* 10112, 30 May 1982 (VDB). **Geneva County:** *R. Kral* 53460, 25 June 1974 (VDB). **Houston County:** *John R. MacDonald* 9831, 4 August 1996 (VDB). **Lee County:** *Allison Boone* 110, 4 October 1971 (VDB). **Mobile County:** *Michel G. Lelong* 9148, 23 April 1976 (USAM). **Pike County:** *A.R. Diamond* 13227, 26 May 2002 (TROY). **Washington County:** *R. Kral* 39583, 3 June 1970 (VDB).

4. *Crotalaria rotundifolia* J.F. Gmelin, *Syst. Nat.* 2: 1095. 1792 (Figure 2c).

Crotalaria sagittalis Linnaeus var. *ovalis* Michaux, *Fl. Bor.-Amer.* 2: 55. 1803.

Crotalaria ovalis (Michaux) Pursh, *Fl. Amer. Sept.* 469. 1814.

Crotalaria hookeriana Alph. de Candolle, *Mém. Soc. Phys. Genève* 9: 97. 1841.

Crotalaria leptoclona Schauer, *Linnaea* 20: 737. 1847.

Crotalaria maritima Chapman, *Fl. South. U.S.*, ed. 2. 614. 1883.

Crotalaria rotundifolia J. F. Gmelin var. *brachytricha* Sprague & L. Riley, *Bull. Misc. Inform. Kew* 1923: 334. 1923.

Crotalaria linaria Small, *Man. S.E. Fl.* 679, 1505. 1933.

Crotalaria maritima Chapman var. *linaria* (Small) H. Senn, *Rhodora* 41: 347. 1939.

Crotalaria rotundifolia J. F. Gmelin var. *linaria* (Small) Fernald & B. G. Schubert, *Rhodora* 50: 203. 1948.

Crotalaria rotundifolia J. F. Gmelin var. *vulgaris* Windler, *Phytologia* 21: 264. 1971.

Herbs. Stems prostrate, decumbent, or low-ascending, 1–7 dm long, either pilose with hairs less than 1.2 mm long or strigose with some hairs to 1 mm long. Leaves unifoliolate, subsessile; leaflets broadly ovate to elliptic-oblong, but ranging to linear, 1–5 cm long, 1.5–4.0 times longer than wide, apices rounded to apiculate, strigose above; when present, stipules evident as narrow, decurrent wings terminated by short, free tips. Raceme(s) long-exserted, 4–20 cm long, loosely 2–5 flowered on upper one-half of axis. Calyx 8–12 mm long, villosulous or strigose; corolla 8–13 mm long. Fruit 7–12 mm long, usually obliquely furrowed, glabrous. Seeds numerous.

Native of southeastern United States.

Habitat and distribution in Alabama: open, usually dry, sandy areas, disturbed woodlands; southern half of the state, some distributed along northwestern perimeter (Figure 2d).

Specimens Examined. **Autauga County:** *S.C. Gunn* 525, 12 May 1982 (AUA). **Baldwin County:** *Mark Fishbein* 5222, 27 July 2003 (UNA). **Barbour County:** *A.R. Diamond* 19192, 4 May 2008 (TROY). **Bibb County:** *Ann Sessler* 1846, 24 August 1977 (AUA). **Bullock County:** *A.R. Diamond* 13540, 12 August 2002 (TROY). **Butler County:** *A.R. Diamond* 12117, 9 September 2000 (TROY). **Chambers County:** *E.P. Simonds* 11, 11 July 1969 (AUA). **Chilton County:** *J.D. Freeman* 713, 20 May 1971 (VDB). **Choctaw County:** *R. Kral* 28363, 15 April 1967 (VDB). **Clarke County:** *T. Henderson* 35, 5 May 1981 (AUA). **Coffee County:** *Brian H. Martin* 58, 23 June 1999 (TROY). **Conecuh County:** *A.R. Diamond* 811, 11 June 1985 (AUA). **Coosa County:** *D.W. Rutland* 1098, 2 September 1975 (AUA). **Covington County:** *R. Kral* 84574, 8 May 1995 (VDB). **Crenshaw County:** *A.R. Diamond* 11798, 9 July 2000 (TROY). **Dale County:** *A.R. Diamond* 19674, 31 July 2008 (TROY). **Dallas County:** *Delzie Demaree* 50603, 27 June 1964 (SMU). **Franklin County:** *T. Henderson* 336, 4 August 1981 (AUA). **Geneva County:** *R. Kral* 61135, 18 October 1977 (VDB). **Henry County:** *A.R. Diamond* 19616, 24 July 2008 (TROY). **Houston County:** *John R. MacDonald* 5410, 6 September 1992 (VDB). **Lee County:** *D.L. Kirkland* 141, 24 July 1971 (VDB). **Macon**

County: *M.K. Dooley 177*, 18 May 1972 (VDB). **Marengo County:** *R. Kral 55595*, 20 May 1975 (VDB). **Marion County:** *James Pharr s.n.*, 8 July 1992 (UNAF). **Mobile County:** *R. Kral 55645*, 21 May 1975 (VDB). **Monroe County:** *A.R. Diamond 16789*, 12 August 2006 (TROY). **Montgomery County:** *A.R. Diamond 14600*, 12 August 2004 (TROY). **Perry County:** *C. Mohr s.n.*, 26 April 1884 (UNA). **Pickens County:** *Sidney McDaniel 7684*, 21 August 1966 (VDB). **Pike County:** *A.R. Diamond 16480*, 5 June 2006 (JSU). **Russell County:** *G. Gil 2001-152*, 2 May 2002 (AUA). **Sumter County:** *Brian R. Keener 3607*, 14 May 2007 (TROY). **Tallapoosa County:** *Charles R. Claybrook 151*, 30 April 1974 (AUA). **Washington County:** *R. Kral 26506*, 8 May 1966 (VDB). **Wilcox County:** *S.C. Gunn 649*, 20 May 1983 (UNA).

5. *Crotalaria pallida* Aiton var. *obovata* (G. Don) Polhill, *Kew Bull.* 22: 265. 1968 (Figure 3a).

Crotalaria obovata G. Don, *Gen. Hist.* 2: 138. 1823.

Crotalaria falcata Vahl ex de Candolle, *Prodr.* 2: 132. 1825.

Crotalaria striata Schumacher, *Beskr. Guin. Pl.* 336. 1827, non de Candolle 1825.

Herbs. Stems erect, to 2 m tall, strigulose. Leaves trifoliolate, well petioled; leaflets obovate, 2–7 cm long, 1.5–3.5 times longer than wide, strigulose below; stipules minute, semipersistent. Raceme(s) shortly or well exserted, 1.0–2.5 dm long, flowering usually one-half of axis length; bracts caducous. Calyx 6–8 mm long, strigulose; corolla 11–15 mm long. Fruits narrowly oblong-oblancheolate, often moderately upwardly falcate, turgid, 3–4 cm long by approximately 5–6 mm wide, puberulous. Seeds numerous.

Native of Old World tropics, now widely established in both hemispheres; introduced in southern United States.

Habitat and distribution in Alabama: agricultural land, old fields, and borders, disturbed roadsides, and ruderal sites; southern tier of counties in the state (Figure 3b).

Specimens Examined. **Dale County:** *A.R. Diamond 8490*, 20 October 1992 (AUA). **Henry County:** *A.R. Diamond 15750*, 11 September 2005 (TROY). **Mobile County:** *Michel G. Lelong 12262*, 1 September 1981 (USAM).

6. *Crotalaria lanceolata* E. Meyer, *Comm. Pl. Afr. Austrl.* 24. 1836 (Figure 3c).

Crotalaria mossambicensis Klotzsch, In: *Peters, Naturw. Reise Mossambique* 60, t. 10. 1861.

Herbs. Stems erect, 0.5–1.5 m tall, strigulose. Leaves trifoliolate, well petioled; leaflets lanceolate to linear or all linear, 4–10 cm long, approximately 3.5–10.0 times longer than wide, strigulose below; stipules obsolescent. Raceme(s) exserted, 1.0–3.5 dm long, with numerous contiguous flowers mostly on upper one-half of axis; pedicels strigulose. Calyx 3.0–3.5 mm long, initially strigulose, often glabrate at anthesis; corolla 8–10 mm long. Fruits scarcely inflated, narrowly cylindrical, apically curved, 2–4 cm long by 4–6 mm wide, strigulose. Seeds several to numerous.

Native of Africa; introduced in southeastern United States.

Habitat and distribution in Alabama: disturbed and ruderal sites, roadsides, ditches, old fields; southern half of the state (Figure 3d).

Specimens Examined. **Baldwin County:** *Brian R. Keener 3952*, 13 October 2007 (TROY).

Concuh County: *A.R. Diamond 12677*, 25 September 2001 (TROY). **Covington County:** *John R. MacDonald 12017*, 19 September 1998 (TROY).

Geneva County: *John R. MacDonald 12446*, 4 October 1998 (VDB). **Houston County:** *John R. MacDonald 12353*, 24 October 1998 (UNA).

Mobile County: *Michel G. Lelong 9525*, 22 September 1976 (USAM). **Montgomery County:** *A.R. Diamond 8759*, 3 September 1993 (AUA).

7. *Crotalaria ochroleuca* G. Don., *Gen. Hist.* 2: 138. 1832 (Figure 4a).

Crotalaria canabina Schweinfurth ex Baker f., *J. Bot. J. Linn. Soc.* 42: 329. 1914.

Herbs. Stems erect, to 1.5 m tall, strigulose. Leaves trifoliolate, well petioled; leaflets linear-lanceolate to linear, 5–15 cm long, 8–20 times longer than wide, strigulose below; stipules obsolescent. Raceme(s) exserted, 1.5–3.5 dm long, loosely 5–10 flowered above middle or for most of axis length; bracts semipersistent. Calyx 4–6 mm long, glabrous; corolla 14–20 mm long. Fruits oblong, inflated, 3–5 cm long by 14–16 mm wide, strigulose. Seeds several to numerous.

Native of Africa; introduced in southeastern United States.

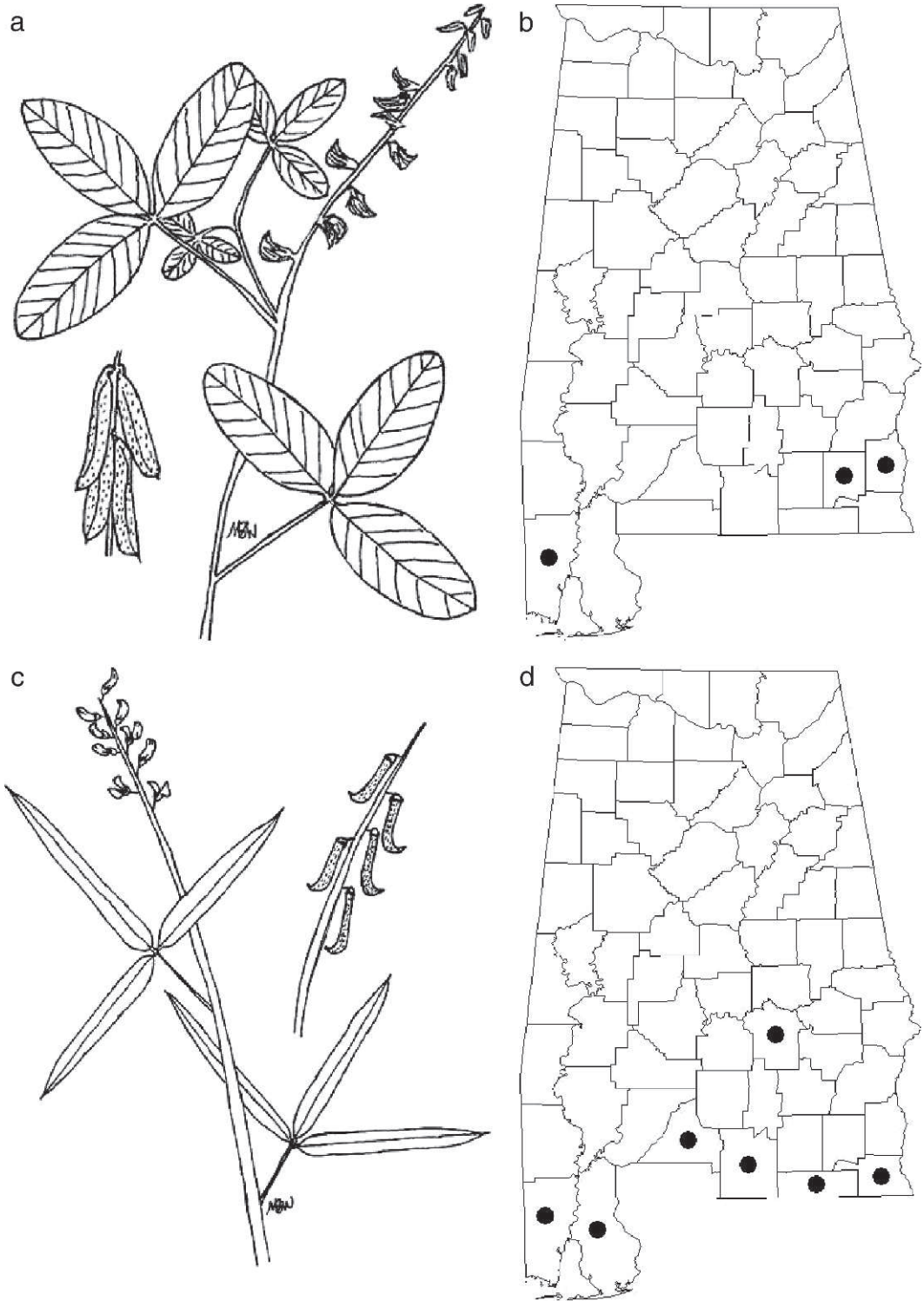


Figure 3. a) Illustration of *Crotalaria pallida*; b) distribution of *C. pallida*; c) illustration of *C. lanceolata*; d) distribution of *C. lanceolata*.

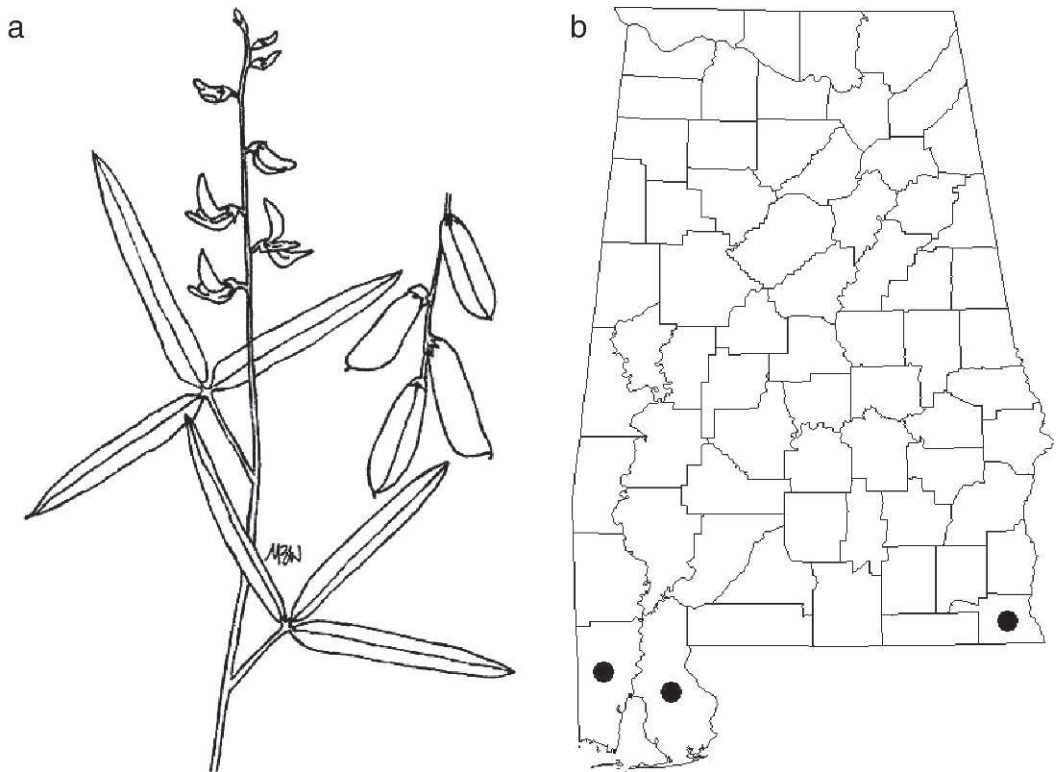


Figure 4. a) Illustration of *Crotalaria ochroleuca*; b) distribution of *C. ochroleuca*.

Habitat and distribution in Alabama: rural sites, roadsides, old fields; extreme southern tier of counties in the state (Fig. 4b).

Specimens Examined. **Baldwin County:** Michel G. Lelong 3970, 19 November 1967 (USAM). **Houston County:** John R. MacDonald 7897, 9 October 1994 (TROY). **Mobile County:** Michel G. Lelong 7309, 26 September 1973 (USAM).

DISCUSSION In Alabama, *Crotalaria* is a conspicuous taxon of roadsides, ditches, old fields, and agricultural land. The native species also may be associated with disturbed woodlands.

The seven taxa of *Crotalaria* in this treatment are a combination of native and introduced species. *Crotalaria purshii*, *C. rotundifolia*, and *C. sagittalis* are native species, with *C. purshii* being endemic to the southeastern United States (Isely 1990). *Crotalaria lanceolata*, *C. ochroleuca*, *C. pallida*, and *C. spectabilis* are introduced species.

The introduced species of *Crotalaria* in the state of Alabama are showier and have a

greater maximum height range than the native species (1.5–2.0 m versus 0.4–0.7 m, respectively). Two of the introduced species—*Crotalaria lanceolata* and *C. ochroleuca*—are similar in morphology, with trifoliate leaves and narrow, linear leaflets; however, the difference in corolla length of *C. lanceolata* and *C. ochroleuca* (8–10 mm vs. 14–20 mm, respectively) is useful in separating the two species. *Crotalaria spectabilis* is distinguished from the other Alabama species by its showy raceme, large, unifoliolate leaves, and large, inflated legumes. *Crotalaria pallida* is recognized by its trifoliate leaves with broad, ovate leaflets and upwardly falcate legumes. In Alabama, *Crotalaria pallida* is represented by *C. pallida* var. *obovata*.

A combination of morphological traits can be used to differentiate the three native species of *Crotalaria* in Alabama. *Crotalaria sagittalis* is characterized by conspicuous foliolate stipules, abundant pilose pubescence, and erect growth. The stipules of the other two

natives—*Crotalaria purshii* and *C. rotundifolia*—are typically smaller and scale-like, but some foliolate stipules may be present; therefore, additional clarification may be necessary. *Crotalaria purshii* is distinguished from *C. sagittalis* by its glabrate or strigose pubescence. *Crotalaria rotundifolia* is easily separated from the other natives by a decumbent, prostrate growth.

Crotalaria incana L. has been reported from ballast grounds in Mobile County, Alabama, based on an 1891 collection (Senn 1939). Another taxon, *C. brevidens* Benth. var. *intermedia* (Kotschy) Pohill (= *C. intermedia* Kotschy), is included by Kral et al. (2011). However, based on the herbarium vouchers studied and field observations conducted during our study, there is no evidence to support the occurrence of *C. incana* or *C. brevidens* var. *intermedia* in Alabama.

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