

THE GENUS *MEDICAGO* (FABACEAE) IN ALABAMA

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ABSTRACT

Seven species of *Medicago* (Fabaceae) are documented to occur in Alabama and the county distribution of each is mapped. The most common species are *M. lupulina*, *M. polymorpha*, *M. arabica*, and *M. sativa*. The less common species are *M. littoralis*, *M. orbicularis*, and *M. minima*. A dichotomous key and descriptions are modifications from earlier authors; all measurements, however, are based on morphological features of more than 350 specimens studied during this project. Data for the county-level distribution maps were compiled entirely from herbarium vouchers.

The genus *Medicago* was established in *Species Plantarum* (Linnaeus 1753). The name is derived from the Greek “Media,” which is a land east of Greece and thought to be the area where alfalfa (*M. sativa* L.) originated. The common name “medic” or “medick” is derived from the same source (Wilbur 1963). The genus consists of 83 species of shrubs and herbs, which have a geographical distribution from the Mediterranean region to central Asia (Lackey 1981). Of these, 19 taxa have been introduced to the USA (Kartesz 2015), 7 species in the southeastern USA (Isely 1990), and 6 species in Alabama (Kral et al. 2011).

Medicago is a member of the legume family Fabaceae (Leguminosae), subfamily Papilionoideae, tribe Trifolieae, subtribe Trigonellinae (Small 1989). The evolutionary history of *Medicago* remains unresolved because of conflicting published gene phylogenies (de Sousa 2014). However, six of these gene phylogenies were compared and hybridization was found between several of the taxa within *Medicago*. Therefore, the phylogenetic history of the genus is better understood in the context of complex reticulate evolution instead of a standard dichotomous tree” (de Sousa et al. 2016).

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

Materials and methods

Data for the distribution maps were gathered from personal collections and more than 350 plant specimens deposited in the herbaria of Troy University (TROY), Anniston Museum of Natural History (AMAL), Botanical Research Institute of Texas (BRIT), John D. Freeman Herbarium at Auburn University (AUA), Jacksonville State University (JSU), Samford University (SAMF), University of Alabama (UNA), University of North Alabama (UNAF), University of South Alabama (USAM), and University of West Alabama (UWAL).

The dichotomous key is a modification of Wilbur (1963), Isely (1990), and Weakley (2015); 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) and Afonin et al. (2008), with modifications incorporating measurements taken from the specimens studied. 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) and Weakley (2015). Morphological measurements were 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

Based on the results of this study, the dispersion of *Medicago* species in the state is represented by these figures: *M. lupulina* (41 counties), *M. polymorpha* (21 counties), *M. arabica* (16 counties), *M. sativa* (11 counties), *M. orbicularis* (7 counties), *M. littoralis* (2 counties), and *M. minima* (1 county).

TAXONOMIC TREATMENT OF *MEDICAGO* IN ALABAMA

Medicago L., Sp. Pl. 778. 1753, nom. cons.

Annual or perennial herbs or low shrubs. **Stems** prostrate, ascending, decumbent or erect, 0.3–8 dm, glabrous, strigose, pilose or villous. **Leaflets** elliptical to obovate or obcordate, 0.2–3 cm long, 0.2–3.2 cm wide, apically dentate or notched, lanate or villous beneath; stipules entire or dentate to lacerate or laciniate. **Inflorescence** racemes, ovoid to capitate or oblong, 1–25 flowers. **Calyces** 1–6 mm long; corolla 2–6 mm long, yellow, glabrous, pilose, lanate or villous. **Fruits** reniform or coiled 2–6 turns, 2–2.5 mm wide, 1.5–2 mm long, spiny or spineless, tan, brown or black at maturity, glabrous or pubescent. **Seeds** 1 to several.

KEY TO THE ALABAMA SPECIES OF *MEDICAGO*

1. Fruits 1-seeded, reniform, black at maturity; corolla 2–3 mm long **Medicago lupulina**
1. Fruits several seeded, spirally coiled, tan or dark brown; corolla 3–11 mm long.
 2. Plants perennial, ascending to erect (-prostrate), 2–8 (–10) dm tall; corolla 6–11 mm long, violet, yellow, or varicolored; fruits spineless **Medicago sativa**
 2. Plants annual, prostrate or ascending, 1–6 dm tall; corolla 3–6 mm long, yellow; fruits spiny (lacking spines in *M. orbicularis*).
 3. Stipules entire or slightly dentate; stems villous **Medicago minima**
 3. Stipules lacerate or laciniate; stems glabrous or strigose.
 4. Fruits spineless; stipules deeply lacerate, the sinuses extending nearly to the base **Medicago orbicularis**
 4. Fruits spiny; stipules shallowly or deeply lacerate or laciniate.
 5. Leaflets appressed lanate below; calyces 4–6 mm, appressed lanate ... **Medicago littoralis**
 5. Leaflets glabrous beneath; calyces 2–3.5 mm long, glabrous or strigose.
 6. Stipules not divided beyond the middle, teeth 0.5–2 mm long; leaflets 0.7–1.1 times as long as wide, usually with a central dark spot, apex strongly notched **Medicago arabica**
 6. Stipules divided beyond the middle, teeth 2–6 mm long; leaflets 1–2 times as long as wide, central dark spot absent, apex shallowly notched **Medicago polymorpha**

1. **Medicago lupulina** L., Sp. Pl. 779. 1753.

Medica lupulina (L.) Scop. Fl. Carniol., ed. 2. 2: 88. 1772.

Medicula lupulina Medik., Vorles. Churpfaelz. Phys.-Oecon. Ges. 2: 386. 1787.

- Melilotus lupulinus* Trautv., Bull. Sci. Acad. Imp. Sci. Saint-Petersbourg 8:271. 1841, non Lam. 1779.
- Medicago lupulina* var. *glandulosa* Koch, in Sturm, Deutschl. Fl. 5:324. 1806.
- Medicago willdenowii* Boenn., Prodr. Fl. Monast. Westphal. 226. 1824, non Merat. 1812
- Medicago lupulina* var. *corymbosa* Ser., in de Candolle, Prodr. 2:172. 1825.
- Medicago lupulina* var. *polystachya* Ser., in de Candolle, Prodr. 2: 172. 1825.
- Medicago lupulina* var. *unguiculata* Ser., in de Candolle, Prodr. 2: 172. 1825.
- Medicago corymbifera* Schmidt ex Schldtl., Linnaea 4: 74. 1829
- Medicago lupulina* var. *vulgaris* Koch, Syn. Fl. Germ. Helv. 161. 1835, nom. inadmiss.
- Medicago lupulina* var. *willdenowiana* Koch, Syn. Fl. Germ. Helv. 161. 1835.
- Lupulina aurata* Noulet, Fl. Bass. Sous-Pyren. 157. 1837.
- Medicago stipularis* Wallr., Erst. Beitr. Fl. Hercyn. 260. 1840.
- Medicago cupaniana* Guss., Fl. Sicul. Syn. 2: 362. 1844.
- Lupularia parviflora* Opiz, Seznam 61. 1852, nom. illegit.
- Medicago lupulina* var. *willdenowii* Asch., Fl. Brandenburg 1: 139. 1867, nom. illegit.
- Medicago lupulina* var. *cupaniana* (Guss.) Boiss., Fl. Orient. 2:105. 1872-1873
- Medicago lupulina* var. *typica* Urb., Berh. Bot. Vereins Prov. Brandenburg 15: 52. 1873. nom. inadmiss.
- Medicago lupulina* var. *stipularis* (Wallr.) Hallier, in W. D. J. Koch, Syn. Fl. Germ. Helv., ed. 3. 534. 1891.
- Medicago lupulina* var. *perennans* Grossh., Fl. Kavk. 2: 260. 1930.

Annual herb. **Stems** prostrate or ascending, 4-angled, 0.5–8 dm, glabrous to pilose. **Leaflets** broadly to narrowly cuneate-obovate, 0.8–1.5 cm long, 0.25–0.75 cm wide, apically denticulate, villous or sparsely pubescent beneath; stipules entire or toothed. **Inflorescence** racemes, ovoid, 10–25 ascending flowers. **Calyces** 1.5 mm long; corolla 2–3 mm long, yellow, glabrous. **Fruits** reniform-incurved, 1.5–2 mm wide, spineless, black at maturity, glabrous (-pubescent). **Seeds** 1. Figure 1.

Specimens examined. Baldwin Co.: 23 Mar 2006, *Diamond 16183* (TROY). Bibb Co.: 1 Apr 1999, *Brodeur, Whetstone & Hobson 1631* (JSU). Bullock Co.: 31 Jan 2013, *Dykes 1487* (TROY). Butler Co.: 7 Jan 2007, *Diamond 17276* (TROY). Calhoun Co.: 4 Mar 1992, *Clearman & Spaulding 31* (JSU). Chilton Co.: 10 Apr 2005, *Diamond 15079* (BRIT). Coffee Co.: 10 Apr 2000, *Martin 543* (TROY). Colbert Co.: 26 Jun 2014, *England 5000* (TROY). Concuh Co.: 24 Mar 1986, *Diamond 2208* (AUA). Coosa Co.: 30 May 2013, *Diamond 24145* (TROY). Covington Co.: 25 Mar 2005, *Diamond 15032* (TROY). Crenshaw Co.: 30 Apr 2000, *Diamond 11677* (TROY). Cullman Co.: 20 Apr 1975, *Whetstone 4785* (JSU). Dale Co.: 15 May 1993, *Austinhirst 45* (TROY). Dallas Co.: 9 May 1966, *Basms s.n.* (AUA). Etowah Co.: 27 May 1994, *Hodge & Spaulding 1332* (JSU). Fayette Co.: 6 Apr 2002, *Spaulding 11161* (TROY). Franklin Co.: 17 May 1968, *Kral 30581* (BRIT). Geneva Co.: 25 Jan 2007, *Diamond 17285* (TROY). Greene Co.: 5 Jun 1968, *Kral 31080* (BRIT). Houston Co.: 13 Dec 2013, *Diamond 24704* (TROY). Jackson Co.: 27 Jun 1998, *Brodeur, Whetstone, & Hoffman 938* (JSU). Jefferson Co.: 2 Apr 1976, *Whetstone, Atkinson & Hinton 7995* (JSU). Lamar Co.: 6 Apr 2002, *Spaulding 11174* (TROY). Lawrence Co.: 19 Jan 2000, *England 101* (UNA). Lee Co.: 20 Apr 1969, *Burton 153* (AUA). Limestone Co.: 26 May 1996, *Spaulding 8938* (AMNH). Macon Co.: 24 Apr 2006, *Diamond 16281* (TROY). Madison Co.: 11 May 1996, *Spaulding & Threlkeld 8343* (JSU). Marengo Co.: 4 Jun 2010, *England 2481* (UWAL). Marshall Co.: 3 Apr 1992, *Spaulding 1265* (JSU). Mobile Co.: 4 Mar 2007, *Keener 3338* (TROY). Montgomery Co.: 21 Dec 2005, *Diamond 16090* (TROY). Morgan Co.: 4 Apr 1969, *Nee & Peet 1631* (BRIT). Pike Co.: 19 Mar 1997, *Evers 15* (TROY). Randolph Co.: 12 Aug 1972, *Pounders 189* (AUA). Shelby Co.: 29 Apr 1978, *Harding 8119* (UNA). Sumter Co.: 10 Jul 2006, *Keener & England 3184* (TROY). Talladega Co.: 1 Mar 2008, *Keener 4036* (TROY). Tallapoosa Co.: 17 Mar

2002, *Spaulding 11117* (TROY). Tuscaloosa Co.: 4 Apr 1981 *Meigs & Horn 200* (UNA). Walker Co.: 17 Apr 1982, *Whetstone & Whetstone 9489* (UWAL). Wilcox Co.: 20 May 1982, *Gunn 650* (AUA).

Native of Europe. Habitat and distribution in Alabama: clay soils of roadsides, railroad right-of-ways, vacant lots; throughout Alabama.

2. ***Medicago sativa*** L., Sp. Pl. 778. 1753.

Medica sativa (L.) Lam., Fl. Franc. 2: 584. 1779 (“1778”).

Medica legitima Greene, Man. Bot. San Francisco 101. 1894, nom. illegit

Medicago pauciflora Ledeb., Fl. Ross. 1: 526. 1843.

Medicago sativa var. *pilifera* Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 57. 1873.

Medicago sativa subsp. *macrocarpa* Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 57. 1873, nom. inadmiss.

Medicago sativa var. *falcata* Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 57. 1873, non. inadmiss.

Medicago sativa var. *grandiflora* Grossh., Obs. Dr.-Kavk. *Medicago* 28. 1919.

Medicago sativa var. *parviflora* Grossh., Obs. Kr.-Kavk. *Medicago* 28. 1919.

Medicago agropyretorum Vassilcz., Bot. Zurn. SSSR 26 (1): 32. 1941.

Medicago caerulea var. *pauciflora* (Ledeb.) Grossh., in Komarov, Fl. URSS 11: 151. 1945.

Medicago grandiflora (Grossh.) Vassilcz., Vol. Sci. Works Leningrad 1941-1943: 101. 1946.

Medicago mesoptamica Vassilcz., Bot. Zurn. SSSR 31 (3): 27. 1946.

Medicago rivularis Vassilcz., Vol. Sci. Works Leningrad 1941-1943: 101. 1946.

Medicago sogdiana Vassilcz., Vol. Sci. Works Leningrad 1941-1943: 101. 1946.

Medicago transoxiana Vassilcz., Vol. Sci. Works Leningrad 1941-1943: 101. 1946.

Medicago caucasica Vassilcz., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk. SSSR 13: 141. 1950.

Medicago lavrenkoi Vassilcz., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 13: 141. 1950.

Medicago praesativa Sinskaya, Kulturnaja Fl. SSSR 13(1): 51. 1950.

Medicago asiatica Sinskaya, Fl. Cult. Pl. USSR 13: 70. 1951.

Medicago karatschaica Latschaschv., Not. Syst. Geogr. Inst. Bot. Tibilissi 21: 29. 1959.

Perennial herb. **Stems** prostrate or ascending, 2–8 dm, glabrous to villous. **Leaflets** obovate to oblong-oblongate, 1–2.5 cm long, 0.2–1.7 cm wide, apically denticulate, villous beneath; stipules entire or proximally dentate. **Inflorescence** racemes, ovoid to oblong, 8–25 ascending flowers. **Calyces** 4–5.5 mm long; corolla 2–3 mm long, purple or varicolored 8–11 mm long, glabrous or villous. **Fruits** coiled 2–3 turns, 4–6 mm wide, spineless, tan at maturity, glabrous or pubescent. **Seeds** several. Figure 2.

Specimens examined. Baldwin Co.: 14 May 1983, *Wilhelm 11329* (BRIT). Cherokee Co.: 5 May 1994, *Ballard & Ballard 7303* (BRIT). Covington Co.: 22 Dec 2007, *Diamond 18692* (TROY). Cullman Co.: 1 Aug 1903, *Wolf 877* (AUA). Dekalb Co.: 26 Jul 1975, *Wayner & Wayner 549* (JSU). Etowah Co.: 7 May 1995, *Hodge & Spaulding 4241* (JSU). Jackson Co.: 26 May 1999, *Brodeur, Whetstone & Spaulding 1847* (JSU). Lee Co.: 15 May 1922, *Simmons s.n.* (TROY). Montgomery Co.: 12 May 1963, *Elkins s.n.* (AUA). Pike Co.: 4 Feb 2013, *Diamond 23720* (TROY). St. Clair Co.: 13 Jul 1969, *Day s.n.* (TROY).

Native of Europe and west Asia. Habitat and distribution in Alabama: dry, sandy roadsides, railroad right-of-ways, pastures; northeast, east-central and south Alabama.

3. **Medicago minima** (L.) Bartal., Cat. Piante Siena 61. 1776.
Medicago polymorpha var. *hirsuta* L., Sp. Pl. 780. 1753.
Medicago polymorpha var. *minima* L., Sp. Pl. 780. 1753.
Medicago hirsuta Bartal., Cat. Piante Siena 61. 1776.
Medicago mollissima Roth, Catal. Bot. 3:74. 1806.
Medicago graeca Hornem., Hort. Bot. Hafn. 728. 1815.
Medicago minima var. *longiseta* DC. ex Ser., in de Candolle, Prodr. 2: 178. 1825.
Medicago lineata Tausch, Flora 14: 210. 1831.
Medicago minima var. *brevispina* Benth., in Smith, Engl. Bot. Suppl. 1: t. 2635. 1831.
Medicago minima var. *brachydon* Bartal., Fl. Germ. Excurs. 502. 1832.
Medicago minima var. *brachydon* Bartal., var. *brachyodon* Reichenb., Fl. Germ. Excurs. 502. 1832.
Medicago minima var. *mollissima* (Roth) Koch, Syn. Fl. Germ. Helv. 164. 1835.
Medicago minima var. *viscida* Koch, Syn. Fl. Germ. Helv. 164. 1835.
Spirocarpus minimus (L.) Opiz, Seznam 93. 1852.
Medicago pulchella Lowe. Trans. Cambridge Philos. Soc. 6 (reimpt.): 25. 1858.
Medicago minima var. *pulchella* (Lowe) Lowe, Man. Fl. Madeira 1: 166. 1862.
Medicago meyeri Gruner, Bull. Soc. Imp. Naturalistes Moscou 40(2): 416. 1867.
Medicago brachyacantha Kerner, Oesterr. Bot. Z. 18: 386. 1868.
Medicago minima forma *mollissima* (Roth) Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 79. 1873.
Medicago minima var. *vulgaris* Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 78. 1873, nom. inadmiss.
Medicago minima forma *viscida* (Koch) Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 78. 1873.
Medicago sessilis Peyr. ex Post, Fl. Syria 10. 1896.
Medica hirsuta Bubani, Fl. Pyren. 2: 477. 1899.
Medicago inconspicua Navski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1 Fl. Sist. Vyss. Rast. 4: 250. 1937.
Medicago minima subsp. *brevispina* Ponert, Feddes Repert. 83: 639. 1973 (“1972”), nom. inadmiss.

Annual herb. **Stems** procumbent or ascending, 1–4 dm, villous. **Leaflets** obovate-cuneate to elliptic 0.4–1.2 cm long, 0.2–1.0 cm wide, toothed toward apex, notched, lanate beneath; stipules entire or slightly dentate. **Inflorescence** racemes, subcapitate, 3–6 flowers. **Calyces** 2–2.5 mm long; corolla 3–5 mm long, yellow, lanate. **Fruits** commonly clustered, 3–5 per peduncle, coiled 3–4 turns, 6–8 mm wide, spiny, tan at maturity, pubescent. **Seeds** several. Figure 3.

Specimens examined. Mobile Co.: 4 Apr 2010, *Barger & Holt* 256 (AMNH).

Native of Mediterranean region. Habitat and distribution in Alabama: disturbed areas, ballast soils; Mobile County.

4. **Medicago orbicularis** (L.) Bart., Cat. Piante Siena 60. 1776.
Medicago polymorpha var. *orbicularis* L. 1753.
Medicago polymorpha var. *orbicularis* L., Sp. Pl. 779. 1753.
Medicago inermis Lam., Fl. Franc. 2: 586. 1779
Medica orbicularis Medik., Vorles. Churpfaelz. Phys.-Oecon. Ges. 2:386. 1787.
Medicago marginata Willd., Enum. Pl. 2:802. 1809.
Medicago orbicularis var. *microcarpa* Rouy, Fl. France 5: 18. 1899, non Seringe 1825.
Medicago orbicularis var. *marginata* (Willd.) Benth., Cat. Pl. Pyrenees 100. 1826.
Medicago cuneata Woods, Tourist’s Fl. 84. 1850.

Annual herb. **Stems** prostrate, sometimes mat forming, 1–4 dm, glabrous. **Leaflets** cuneate-obovate, 0.7–1.5 cm long, 0.4–1.5 cm wide, apically dentate, glabrous beneath; stipules deeply lacerate, sinuses extending more than halfway or nearly to base, glabrous to strigose. **Inflorescence** racemes, subcapitate, 1–2 loosely spaced flowers. **Calyces** 2.5–3 mm long; corolla 3–5 mm long, yellow, ephemeral, strigose. **Fruits** coiled 3–5 turns, 1–1.5 mm wide, spineless, tan at maturity, glabrous. **Seeds** several. Figure 4.

Specimens examined. Calhoun Co.: 1 Jun 1998, *Tucker s.n.* (JSU). Franklin Co.: 25 May 1970, *Kral 39114* (BRIT). Jackson Co.: 26 May 1999, *Brodeur, Whetstone & Spaulding 1875* (JSU). Lee Co.: 19 Jul 1966, *Rogers s.n.* (AUA). Marshall Co.: 28 Apr 1998, *Spaulding 10507* (JSU). Mobile Co.: 1 Aug 1892, *Mohr s.n.* (UNA). Morgan Co.: 13 May 2011, *England 2875* (UWAL).

Native of Mediterranean Eurasia and North Africa. Habitat and distribution in Alabama: dry, sandy roadsides, railroad right-of-ways, limestone glades; north Alabama, east-central Alabama and extreme southwest Alabama.

5. *Medicago littoralis* Rohde ex Loisel., Not. Pl. Fl. France 118. 1810.

Medicago truncatula subsp. *littoralis*: Rohde ex Loisel., Feddes Repert. 83: 639. 1973.

Annual herb. **Stems** prostrate or ascending, multiple branching from base, cylindrical, 0.3–3 dm, glabrous toward base, pubescent upper part. **Leaflets** obtrullate to widely obovate, 0.2–0.9 cm long, 0.4–1.1 cm wide, dentate to serrate, apically notched, appressed lanate beneath, stipules lacinate. **Inflorescence** racemes ovoid, 1–6 ascending flowers. **Calyces** 4–6 mm long; corolla 4–6 mm long, yellow, appressed lanate. **Fruits** coiled 2–6 turns, 2–6 mm wide, spiny, tan at maturity, glabrous. **Seeds** several. Figure 5.

Specimens examined. Baldwin Co.: 26 Mar 2014, *Spaulding 13900* (UWAL). Mobile Co.: 14 May 2013, *Horne 2176* (UWAL).

Native of Mediterranean coasts. Habitat and distribution in Alabama: disturbed dunes, sand patches; extreme southwest Alabama.

6. *Medicago arabica* (L.) Huds., Fl. Angl. 288. 1762.

Medicago polymorpha var. *arabica*: L., Sp. Pl. 708. 1753

Medica echinata: Lam., Fl. Franc. 2: 587. 1779 ("1778"), nom. illegit.

Medica arabica: (L.) Medik., Vorles. Churpfaelz. Phys.-Oecon. Ges. 2: 386. 1787.

Medicago cordata: Desvaux., in Lam., Encycl. 3: 636. 1792, nom. illegit.

Medicago maculata: Sibth., Fl. Oxon. 232. 1794, nom. illegit.

Medicago arabica subsp. *inermis* (L.) Huds. subsp. *inermis* Ricker, U.S.D.A. Bur. Pl. Industr. Bull. 267: 33. 1913.

Annual herb. **Stems** decumbent to erect, 0.3–5 dm, glabrous or pilose. **Leaflets** cuneate-obovate or obcordate, denticulate or undulate-margined, 0.8–3 cm long, 0.8–3.2 cm wide, emarginated, usually medially maculate, glabrous or with some persistent pubescence below most with a dark spot, stipules shallowly lacerate, sinuses extending less than half of their length, glabrous or occasionally appressed villous beneath. **Inflorescence** racemes, subcapitate, 2–4 contiguous flowers. **Calyces** 2–2.5 mm long; corolla 4–5 mm long, yellow, glabrous. **Fruits** coiled 4–6 turns, 9–14 mm wide, spiny, tan at maturity, glabrous. **Seeds** several. Figure 6.

Specimens examined. Bullock Co.: 22 Feb 2012, *Dykes 305* (TROY). Calhoun Co.: 6 Apr 1968, *O'Neal s.n.* (TROY). Colbert Co.: 30 Apr 1944, *Isely 3180* (BRIT). Conecuh Co.: 17 Mar

1986, *Diamond 2108* (AUA). Coosa Co.: 24 Apr 1972, *Lochamy 95* (AUA). Dallas Co.: 21 Mar 1972, *Kral 45363* (BRIT). Hale Co.: 23 Apr 1996, *Williams 226* (UNA). Houston Co.: 29 Mar 1991, *MacDonald 1243* (BRIT). Jefferson Co.: 11 Apr 2013, *Davenport 5426* (SAMF). Lee Co.: 17 Mar 2002, *Spaulding 11113* (TROY). Macon Co.: 9 Apr 1967, *Raukin 55* (AUA). Marengo Co.: 12 Apr 2009, *England 1946* (TROY). Mobile Co.: 27 Mar 1965, *Deramus 310* (UNA). Montgomery Co.: 16 Mar 1977, *Harvey 91* (UNA). Pike Co.: 1 Apr 1989, *Blanton s.n.* (TROY). Sumter Co.: 10 Apr 2010, *Keener 5759* (UWAL). Tuscaloosa Co.: 12 Apr 1959, *Edwards s.n.* (UNA).

Native of Mediterranean region. Habitat and distribution in Alabama: sandy soil in vacant lots, railroad right-of-ways; throughout Alabama.

7. ***Medicago polymorpha*** L., Sp. Pl. 779. 1753.

- Medicago polymorpha* var. *ciliaris* (Seringe) Shinnery, Rhodora 58: 9. 1956, non L. 1753.
Medicago polymorpha var. *nigra* L., Mant. Pl. 454. 1771.
Medicago polymorpha (L.) Scopoli, Fl. Carnoli., Ed. 2. 2: 89. 1772
Medicago nigra (L.) Krock., Fl. Siles. 2(2): 244. 1790.
Medicago hispida Gaertn., Fruct. Sem. Pl. 2: 349. 1791, nom. illegit.
Medicago lappacea Desr. in Lamarck, Encycl. 3: 637. 1792, nom. illegit.
Medicago apiculata Willd., Sp. Pl. 3: 1414. 1802.
Medicago pentacycla DC., Cat. Pl. Horti Monsp. 124. 1813.
Medicago denticulata var. *ciliaris* Seringe, in de Candolle, Prodr. 2: 176. 1825.
Medicago reticulata Benth., Cat. Pl. Pyrenees 101. 1826.
Medicago denticulata var. *brevispina* Benth., Cat. Pl. Pyrenees 103. 1826.
Medicago denticulata var. *lappacea* Benth., Cat. Pl. Pyrenees 103. 1826, nom. illegit.
Medicago pentacycla var. *vulgaris* Benth., Cat. Pl. Pyrenees 104. 1826, nom. inadmiss.
Medicago denticulata var. *vulgaris* Benth., Cat. Pl. Pyrenees 103. 1826, nom. inadmiss.
Medicago sardoa Moris ex G. Don, Gen. Hist. 2: 170. 1832
Medicago apiculata var. *confinis* Koch, Syn. Fl. Germ. Helv. 164. 1835.
Medicago denticulata var. *macracantha* Webb & Berth., Hist. Nat. Iles Canaries 3(2(2)): 64. 1842.
Medicago lappacea var. *pentacycla* (DC.) Godr., Fl. France 1: 390. 1849.
Medicago lappacea var. *tricycla* Godron, in Gren. & Godr., Fl. France 1: 390. 1849, nom. illegit.
Medicago polycarpa var. *tuberculata* Godr., in Gren. & Godr., Fl. France 1: 390. 1849, nom. illegit.
Medicago polymorpha var. *tricycla* (Godr.) Shinnery, Rhodora 58: 8. 1856.
Medicago lappacea var. *macracantha* (Webb & Berth.) Lowe, Man. Fl. Maderia 1: 158. 1862.
Medicago hispida forma *tuberculata* Urb., App. Observe. Bot. 4. 1873.
Medicago hispida forma *apiculata* Urb., App. Observe. Bot. 4. 1873.
Medicago hispida forma *inermis* Urb., App. Observe. Bot. 4. 1873.
Medicago hispida var. *oligogyra* Urb., App. Observe. Bot. 4. 1873.
Medicago hispida var. *pentacycla* (DC.) Urb., Verh. Bot. Vereins Prov. Brandenburg 15: 75. 1873.
Medicago hispida var. *polygyra* Urb., App. Observe. Bot. 4. 1873.
Medicago hispida var. *tricycla* (Godr.) Urb., App. Observe. Bot. 3. 1873.
Medicago apiculata (Willd.) Greene, Man. Bot. San Francisco 102. 1894.
Medicago denticulata (Willd.) Greene, Man. Bot. San Francisco 102. 1894
Medicago hispida var. *apiculata* (Willd.) Burnat, Fl. Aples Marit. 2: 106. 1896.
Medicago hispida var. *confinis* (Koch) Burnat, Fl. Apes Marit. 2: 106. 1896
Medicago reticulata (Benth.) Bubani, Fl. Pyren. 2: 480. 1899.
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- Medicago hispida* var. *reticulata* (Benth.) Asch. & Graebn., Syn. Mitteleur. Fl. 6(2): 431. 1907.
Medicago polymorpha forma *apiculata* (Willd.) Shinnery, Rhodora 58: 11. 1956.
Medicago polymorpha forma *tuberculata* (Urb.) Shinnery, Rhodora 58: 11. 1956.
Medicago polymorpha var. *polygyra* (Urb.) Shinnery, Rhodora 58: 9. 1956.
Medicago polymorpha var. *vulgaris* (Benth.) Shinnery, Rhodora 58: 310. 1956.
Medicago polymorpha var. *brevispina* (Benth.) Heyn., Scripta Hierosolymitana 12: 77. 1963.

Annual herb. **Stems** prostrate or ascending, commonly mat forming, 0.5–5 dm, glabrous. **Leaflets** cuneate-obovate to obovate, 0.8–2 cm long, 0.6–2 cm wide, apically dentate, emarginated, not maculate, glabrous or appressed villous beneath, medial and upper stipules deeply lacerate, sinuses usually more than halfway. **Inflorescence** racemes, subcapitate, 2–5 contiguous flowers. **Calyces** 3–3.5 mm long; corolla 3.5–6 mm long, yellow, glabrous. **Fruits** coiled 2–6 turns, 7–12 mm wide, spiny, brown to black at maturity, glabrous. **Seeds** several. Figure 7.

Specimens examined. Baldwin Co.: 4 Mar 2007, *Keener 3342* (TROY). Barbour Co.: 16 Mar 2002, *Spaulding 11103* (TROY). Butler Co.: 4 Mar 2007, *Diamond 17296* (TROY). Chilton Co.: 15 Apr 2007, *Spaulding 12578* (TROY). Choctaw Co.: 24 Apr 1994, *Crouch 897* (BRIT). Coffee Co.: 3 May 2000, *Martin 673* (TROY). Conecuh Co.: 10 Mar 2009, *Diamond 20508* (TROY). Covington Co.: 10 Mar 2008, *Diamond 18744* (TROY). Crenshaw Co.: *Diamond 12379*, 22 Apr 2001 (TROY). Dale Co.: *Rundell 689*, 23 Feb 1999 (TROY). Geneva Co.: 6 Mar 2008, *Diamond 18735* (TROY). Greene Co.: 6 May 1967, *Naugle 279* (UNA). Henry Co.: 13 Jan 2013, *Diamond 23647* (UWAL). Houston Co.: 13 Dec 2013, *Diamond 24703* (TROY). Lee Co.: 28 Mar 1964, *Bozarth s.n.* (JSU). Macon Co.: 29 Mar 2012, *Barger 488* (AUA). Marengo Co.: 20 Apr 2013, *England, England & Keener 4141* (UWAL). Mobile Co.: 11 Apr 1980, *Lelong 11047* (USAM). Montgomery Co.: 8 Feb 2009, *Diamond 20492* (TROY). Morgan Co.: 1 Apr 1883, *Mohr 303* (UNA). Pike Co.: 23 Mar 1989, *Rutledge s.n.* (TROY). Sumter Co.: 18 May 1973, *Kral 50132* (BRIT).

Native of Mediterranean region and southern Europe. Habitat and distribution in Alabama: sandy and clay soils in vacant lots, roadside, railroad right-of-ways; southern one-half of Alabama.

DISCUSSION

In Alabama, plants of *Medicago* grow in sandy and clay soils of vacant lots, roadsides, railroad right-of-ways, and pastures. All seven taxa of *Medicago* in the state are introduced from Europe, West Asia, and the Mediterranean region. None of these taxa is considered invasive.

A combination of reproductive and morphological characteristics is used to differentiate the species of *Medicago* in Alabama. *Medicago lupulina* is the most easily recognized taxon with one-seeded, reniform fruits. The remaining taxa have spirally coiled fruits with several seeds. *Medicago arabica* is also easily recognized by a central dark spot on most of the leaflet. Both *M. sativa* and *M. orbicularis* have spineless fruits, whereas, the remaining three taxa have fruits with spines. *Medicago sativa* and *M. orbicularis* are distinguished from one another by their inflorescence. The inflorescence of *M. sativa* has between 8–25 flowers, whereas, *M. orbicularis* inflorescence has 1–2 loosely spaced flowers. Of the remaining three taxa, *M. minima* is recognized by entire or slightly dentate stipules and villous stems. The stipules of *M. littoralis* and *M. polymorpha* are lacerate or lacinate and the stems are glabrous or strigose. *Medicago polymorpha* has leaflets 0.8–2 cm long and calyces 3.0–3.5 mm long, whereas, *M. littoralis* has leaflets 0.2–0.9 mm long and calyces 4–6 mm long.

In the most recent checklist of the vascular plants of Alabama, six species of *Medicago* were reported (Kral et al. 2011). The seventh species reported in this treatment, *M. littoralis*, is based on collections from Baldwin and Mobile Counties in March of 2013. Small (1933) reported *Trigonella*

monspeliaca L. (*Medicago monspeliaca* (L.) Trautv. from dry soils, fields and hillsides in the coastal plain of Alabama, but he did not give a specific locality. The report of this taxon occurring in Alabama on the USDA, NRCS website (2017) is likely based on the report by Small (1933). Kartesz (2015) reported *M. monspeliaca* as introduced into the northeastern USA and the closest location to Alabama is Maryland. Since no vouchers of this taxon were found and attempts to locate it in the field were unsuccessful, it is excluded from this study and is considered extirpated from the state, or else the previous report was based on misidentified material.

Medicago sativa (alfalfa) is the most economically important species in the genus. It is considered one of the world's primary crop plants with an annual value as high as a trillion dollars (Small 2011). In the USA, it is one of the most widely grown crops for pasture, or for hay, silage, or green chop. Although it has been grown in the southeastern USA since the late 19th century, it has not attained the status that it has in other parts of the nation (Lacefield et al. 2009). In Alabama, *M. sativa* has been cultivated in the Black Belt and the northern part of the state but seldom in south Alabama (Harper 1944). One of the main reasons for its lack of cultivation in south Alabama is that frequent rainfall and high humidity are not conducive to harvesting alfalfa as hay (Ball 2017).

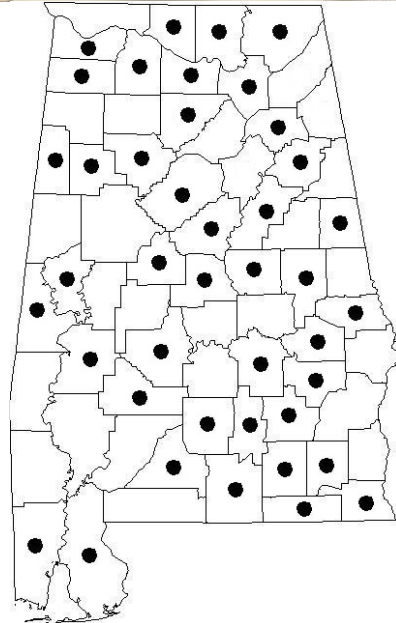


Figure 1. *Medicago lupulina*, distribution.

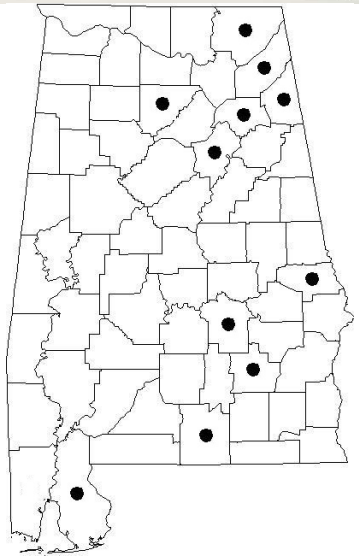


Figure 2. *Medicago sativa*, distribution.



Figure 3. *Medicago minima*, distribution.

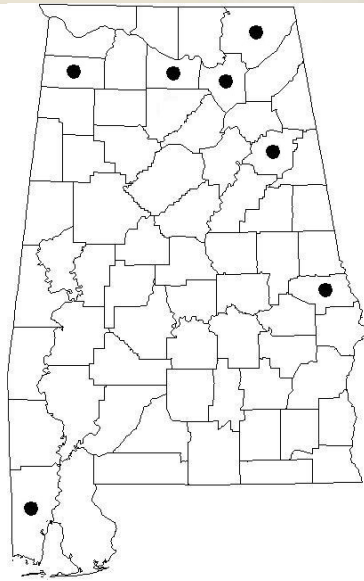


Figure 4. *Medicago orbicularis*, distribution.



Figure 5. *Medicago littoralis*, distribution

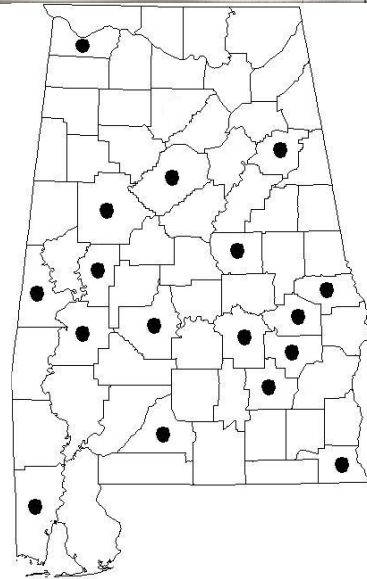


Figure 6. *Medicago arabica*, distribution

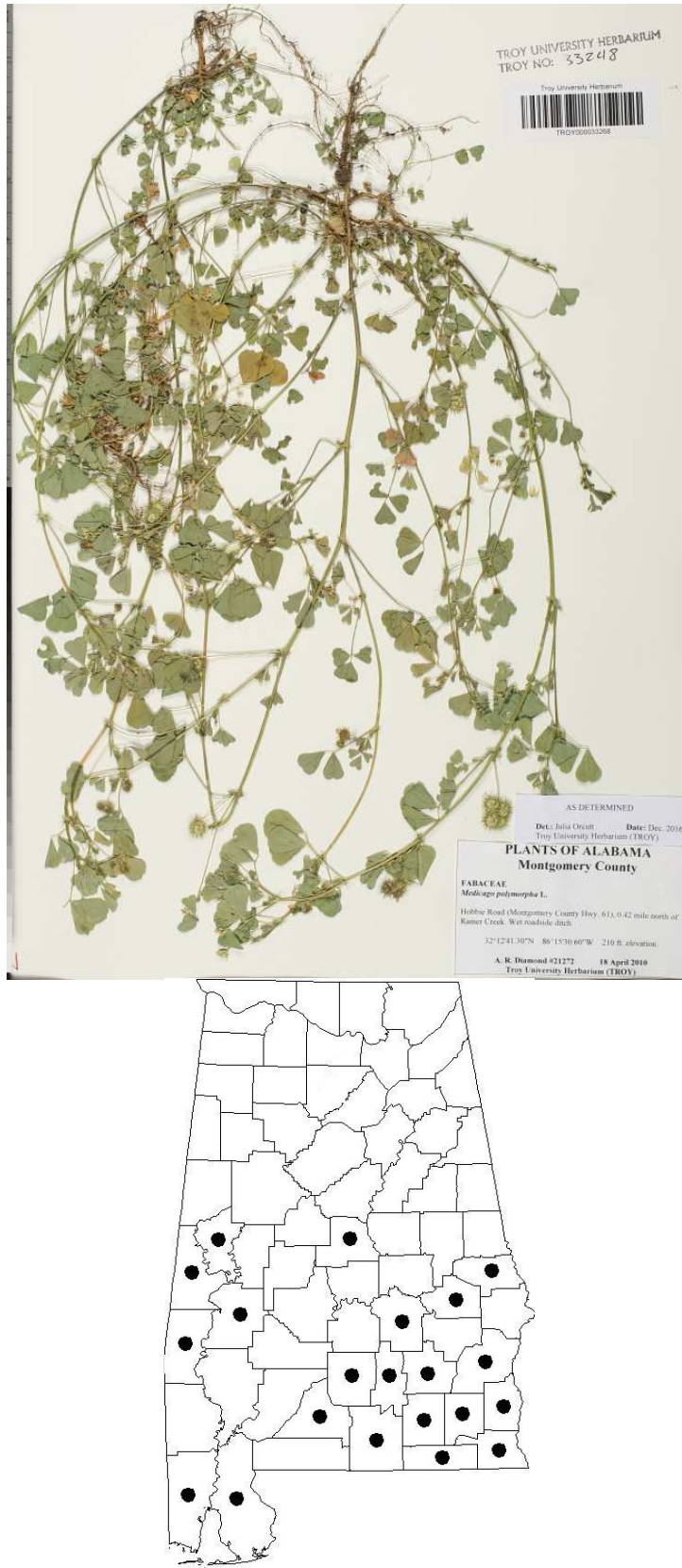


Figure 7. *Medicago polymorpha*, distribution.

ACKNOWLEDGEMENTS

The authors thank the curators of the herbaria who loaned specimens for this study. We are grateful to Drs. Alvin Diamond, Brian Keener, and Guy Nesom for reviewing the manuscript and providing helpful suggestions.

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