

The genus *Liatris* in Indiana

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The *Butler University Botanical Studies* journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology. The papers contain valuable historical studies, especially floristic surveys that document Indiana's vegetation in past decades. Authors were Butler faculty, current and former master's degree students and undergraduates, and other Indiana botanists. The journal was started by Stanley Cain, noted conservation biologist, and edited through most of its years of production by Ray C. Friesner, Butler's first botanist and founder of the department in 1919. The journal was distributed to learned societies and libraries through exchange.

During the years of the journal's publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor's degrees and 75 master's degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner, included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daudenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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THE GENUS LIATRIS IN INDIANA

By CARL O. KELLER

In checking over specimens of *Liatris* Schreb. from the herbaria of Dr. Chas. C. Deam and of Butler University, it was found that a considerable degree of confusion and uncertainty has existed with regard to the classification of these plants. This was to be expected, since this genus is one of unusual complexity with many variables and intergradations existing among the various species. Some attempts at classification have been somewhat superficial, placing a number of different types under one species name, while others have drawn the line too closely and made separate species and varieties out of plants which were merely mutations or impoverished individuals.

Another difficulty has been that of detecting the characters which show a sufficient and regular degree of difference to justify separation into separate species. Such characters as pubescence of stem and leaves, or the color of the pappus or the phyllaries, are of little value in determining differences, since these qualities do not run true. They may vary with the age and maturity of the plant or with the conditions under which it grew.

There are four species of *Liatris* found in Indiana which even the amateur taxonomist can learn to identify at sight, without any minute examination of flowers, phyllaries, etc. These are: *Liatris spicata* var. *typica*, *L. pycnostachya*, *L. cylindracea*, and *L. squarrosa*. The distinguishing characteristics of these four are quite obvious. The other species, however, run into the *L. scariosa* complex and are more difficult to classify. Gaiser¹ has produced a valuable piece of work which simplifies the classification of this group for the North American continent generally, but since many of the species described in this study are not found in Indiana, or even in the mid-western states, there seems to be a need for a simpler key to serve particularly beginning students of taxonomy in this area.

The key presented in this study is based on the minute examination of some three hundred specimens which were collected within

¹ Gaiser, L. O., *The Genus Liatris*, *Rhodora* 48, Aug.-Dec. 1946.

the boundaries of Indiana, together with careful comparisons between the data thus derived and the data presented in Gaiser's study. Of the rarer varieties, only a few specimens were available for study, but for the more common types the characters of forty or fifty specimens were charted and summarized. The following specimens were isotypes of some reported in Gaiser's study: Deam 1243, 5408, 20900, 20918, 20934, 21038, 21084, 21342, 21889, 22429, 22432, 22461, 23994, 24374, 56936; Butler 40697, 50591, 56319, 62289, 67717, 67718, 70431, 70434, 70436, 70439, 70440, 70444, 70450.

The following factors were considered in seeking clues for classification of these plants and for constructing the simplified key: rootstock, habitat, height and thickness of stem, appearance of stem, length and width of leaves, structure and appearance of leaves, length and type of inflorescence, size and shape of heads, number of flowers per head, length and appearance of corolla, length of achene, length and appearance of pappus bristles, size and shape of involucre, size and shape of phyllaries, and the general appearance of the phyllaries. The difference between the barbellate and plumose pappus divides the genus into two sections, *Suprago* and *Euliatris*. Of the latter section only two species occur in Indiana, viz., *L. cylindracea* and *L. squarrosa* var. *typica*. The other species with the barbellate pappus are of the *Suprago* section. Of these, eleven species and varieties have been found in the state.

KEY TO SPECIES AND VARIETIES OF LIATRIS IN INDIANA

1. Pappus barbellate, with lateral cilia on seta scarcely visible to the naked eye 2
1. Pappus plumose, its feathery appearance obvious to the naked eye. 6
 2. Heads 5-25-flowered. Phyllaries mostly erect. Inflorescence a thickly crowded spike of small, somewhat cylindrical heads. Corolla tube non-pilose within 3
 2. Heads 15-75-flowered, turbinate-cylindrical to sub-globose in shape. Phyllaries erect, puckered, or partially recurved, with obtuse or rounded tips. Corolla tube pilose within 4
3. Leaves linear-lanceolate; heads 10-18-flowered; phyllaries obtuse and erect *spicata* v. *typica* (1)
3. Leaves definitely lanceolate; heads 20-25-flowered; phyllaries obtuse and erect *X Steelei* (2)
3. Leaves linear; heads 5-12-flowered; phyllaries acute to acuminate and recurved at tips. Usually colored. *L. pycnostachya* (3)

4. Heads short cylindrical to globose, 18-34 flowered (mostly 20-30). Phyllaries mostly erect, herbaceous, and appressed, never puckered and erose *L. scabra* (4)
4. Heads globose to hemispheric, 24-75 flowered. Phyllaries erect and loosely appressed, herbaceous and somewhat cinereous, mostly green to margins X *L. Nieuwlandii* (5)
4. Heads campanulate, 15-25 flowered. Phyllaries mostly herbaceous and light green with very narrow margins *L. Earlei* (6)
4. Heads sub-globose, 18-52 flowered (mostly 20-30). Phyllaries thin, glabrous, scarious, erose, and distinctly puckered 5
5. Stem rough above or throughout. Leaves asperous. Phyllaries strongly crisped *L. aspera v. typica* (7)
5. Stem glabrous below with appressed hairs on the upper part. Leaves glabrous or with few scattered hairs. Phyllaries strongly crisped *L. aspera v. intermedia* (8)
5. Stem glabrous or asperous. Leaves glabrous or somewhat pubescent or asperous. Phyllaries only slightly puckered..... X *L. sphaeraidea* (9)
6. Phyllaries erect and appressed..... *L. cylindracea* (10)
6. Phyllaries recurved or loosely spreading with sharp, stiff tips.....
..... *L. squarrosa v. typica* (11)

DESCRIPTION OF SPECIES

1. *LIATRIS SPICATA* (L.) Willd. var. *TYPICA* Gaiser. (*Liatris spicata* of Deam's *Flora of Indiana*). **HABITAT:** Mostly wet, boggy or marshy places; ditches and ravines. Also found along railroads, on sand dunes, in open fields and clearings, and along roadsides. **ROOTSTOCK:** Globose to enlarged and shallow, depending on the age of the plants. In older plants much vegetative reproduction takes place due to the separation of the parts of the rootstock. **STEM:** Tall and sturdy, 6-13 dm. high, 3-6 mm. thick just above the ground, entirely glabrous with few exceptions. **LEAVES:** Lower cauline leaves linear to lanceolate, 10-35 cm. long, 3-16 mm. wide, becoming smaller as they ascend the stem; glabrous above, glabrous to pubescent below. **INFLORESCENCE:** 7-60 cm. long, in most cases a dense spike. **HEADS:** 9-15 mm. long, 5-10 mm. wide; cylindrical in shape. **FLOWERS:** 5-11 per head. **COROLLA:** 5-7 mm. long, phlox-purple, sometimes white; non-pilose within the tube. **ACHENE:** 3-5 mm. long. **PAPPUS:** 5-7 mm. long; barbellate, 30-50 setae. **INVOLUCRE:** 6-12 mm. long, 4-8 mm. wide; appressed and sometimes adherent. **PHYLLARIES:** 2-10 mm. long, 1-3 mm. wide; glabrous, mostly green at time of flowering; margins narrow and scarious; tips erect and obtuse. **DISTRIBUTION:**

New York to Florida and westward to the Mississippi River; Ontario and upper Michigan to the Gulf of Mexico. Indiana counties: Lake (D, B); Porter (B); LaPorte (B); Elkhart (D); Steuben (B); Starke (D, B); Marshall (D); Noble (D), B); Pulaski (B); Allen (D); Newton (B); Jasper (B); White (B); Greene (B); Cass (D, B); Tippecanoe (D, B); Montgomery (B); Henry (B); Randolph (D, B); Clay (B); Clarke (D); Crawford (D); Posey (B); Perry (B). Also reported from Tipton Co. (D).

2. X *LIATRIS STEELEI* Gaiser (*L. spicata* x *sphaeroidea*) (*L. spicata*, in part, of Deam's *Flora of Indiana*.) HABITAT: Sandy dunes. ROOTSTOCK: compressed, 3 cm. wide, 2 cm. high. STEM: erect, 8-11 dm. high, glabrous. LEAVES: lower cauline leaves 9-20 cm. long, 7-15 mm. wide; linear to lanceolate, becoming abruptly reduced as they ascend the stem. INFLORESCENCE: loose spike; 12-40 cm. long. HEADS: sub-turbinate; 10-17 mm. long, 9-12 mm. wide. FLOWERS: 12-25 per head. COROLLA: phlox-purple; 5-7 mm. long. ACHENE: 4-5 mm. long. PAPPUS: 6-7 mm. long; barbellate, 36-38 setae. INVOLUCRE: 10-13 mm. long, 10-11 mm. wide; appressed. PHYLLARIES: 2-10 mm. long, 1-4 mm. wide; glabrous, somewhat herbaceous, ovate to oblong in shape; margins narrow and scarious. DISTRIBUTION: Northern limit of the range of *L. spicata* var. *typica*. Indiana—Lake Co. (D, B). Also reported from Porter Co. by E. S. Steele.

3. *LIATRIS PYCNOSTACHYA* Michx. (*L. Bebbiana* of Deam's *Flora of Indiana*.) HABITAT: prairie lands, along railroads and roadsides, open wooded hillsides, sandy, peaty soil. ROOTSTOCK: enlarged and woody, up to 1 dm. in width. (Globose in young plants.) STEM: stiff and striate; usually hairy to hirsute, sometimes glabrous; 7-15 dm. tall, 4-6 mm. thick at base. LEAVES: lower cauline linear, 9-20 cm. long, 3-12 mm. wide; mostly glabrous, some hairy to hirsute; reducing to subtending bracts as they reach the top of the stem. INFLORESCENCE: dense, crowded spike; 6-20 cm. long. HEAD: 6-13 mm. long, 3-8 mm. wide; cylindrical. FLOWERS: 5-12 per head. COROLLA: 6-9 mm. long; pilose or hairy within the tube. ACHENE: 3-7 mm. long. PAPPUS: 6-8 mm. long; barbellate, 32-50 setae. INVOLUCRE: 6-11 mm. long, 4-7 mm. wide; spreading. PHYLLARIES: 2-8 mm. long, 1-2 mm. wide; squarrose or reflexed, with tips ciliate or crisped, acute to acuminate. DISTRIBUTION: Indiana and South Dakota to Louisiana and Texas. Indiana counties: Newton (D, B);

Benton (D, B); Vigo (D, B); Bartholomew (B). Also reported from Jasper Co. by T. N. Coulter.

Regarding the matter of dividing this species into two groups, *L. pycnostachya* and *L. Bebbiana*, Gaiser, (p. 243) states: "Rydberg (Brittonia 1; 99 (1931) described *L. Bebbiana* from Illinois, stating 'it was related to *L. pycnostachya* but the outer bracts are ovate and merely acute, not lanceolate and long acuminate.' A detailed study of this type specimen (M. S. Bebb, Fountaindale, Winnebago Co., Ill., (NY), has failed to disclose how this or any other fundamental character can separate it from *L. pycnostachya* Michx."

4. LIATRIS SCABRA (Greene) K. Schum. (*L. scariosa*, in part, of Deam's *Flora of Indiana*). HABITAT: Old fields, rocky slopes, sparsely wooded knobs. ROOTSTOCK: rounded; 2 cm. or more in diameter. STEM: scabrous; 6-12 dm. high, 4-7 mm. thick toward base. LEAVES: scabrous on both surfaces; lower cauline oblanceolate, 9-25 cm. long, 11-40 mm. wide. INFLORESCENCE: open spike or raceme, rarely a panicle; 10-60 cm. long. HEADS: cylindrical, turbinate, or globose; 15-18 mm. long, 14-16 mm. wide. FLOWER: 18-34 per head. COROLLA: 8-12 mm. long; pilose within the tube. ACHENE: 4-5 mm. long. PAPPUS: 7-10 mm. long; barbellate, 28-36 setae. INVOLUCRE: 8-12 mm. long, 10-15 mm. wide. PHYLLARIES: herbaceous; pubescent or scabrous; with erect, obtuse and ciliate tips; 2-10 mm. long, 1-3 mm. wide. DISTRIBUTION: Ohio to Illinois south to Alabama and west to Arkansas and Oklahoma. Indiana counties: Kosciusko (D, B); Vigo (D, B); Franklin (B); Sullivan (B); Brown (D); Washington (D, B); Clarke (D, B); Perry (B); Spencer (B); Crawford (D, B); Harrison (D, B). Also reported from Cass Co. by C. M. Ek, and from Jackson Co. by Kriebel.

5. X LIATRIS NIEUWLANDII (Lunell) Gaiser. (*L. scariosa*, in part, of Deam's *Flora of Indiana*.) HABITAT: sandy, gravelly soil along roadsides, railroads, and hillsides. ROOTSTOCK: rounded, somewhat shallow. STEM: glabrous or slightly pubescent below, densely pubescent above; 8-14 dm. tall, 4-8 mm. thick toward base; very stiff. LEAVES: more or less pubescent on both surfaces, sometimes glabrous; lower cauline 12-20 cm. long, 10-30 mm. wide. INFLORESCENCE: few to numerous large heads; usually pedicellate; 6-45 cm. long. HEADS: 13-25 mm. long, 12-26 mm. wide; globose to hemispheric. FLOWERS: 24-75 per head. COROLLA: 7-11 mm. long; generally non-pilose, though sometimes having a few hairs within the tube. ACHENE: 5-6

mm. long. PAPPUS: 7-10 mm. long; barbellate, 26-34 setae. INVOLUCRE: 10-15 mm. long, 14-24 mm. wide. PHYLLARIES: 2-14 mm. long, 1-4 mm. wide, erect; mostly green to the margins which are finely ciliate. DISTRIBUTION: Indiana to Missouri and north to Wisconsin and Michigan. Indiana counties: Porter (B); LaGrange (D); Steuben (D, B); Noble (D, B); Kosciusko (D, B); Allen (D); Cass (B); Marshall (B).

6. *LIATRIS EARLEI* (Greene) K. Schum. (*L. scariosa*, in part, of Deam's *Flora of Indiana*.)

Gaiser reports only one specimen of this species from Indiana, namely Deam-22429, from Harrison Co. She also lists this same specimen number under *L. scabra*. An examination of an isotype of this plant did not reveal any characters which would justify separating it from the *scabra* group. Having no other specimens available for examination, and since it is quite likely that this species might be found in the state, we quote Gaiser's description:

"*Liatris Earlei* (Greene) K. Schum. Corm small, sub-globose, ca. 2 cm. in diameter; stem usually single, 4-9 dm. high, often somewhat virgate, softly and densely pubescent, or asperous with short white hairs, or even almost glabrous; leaves glabrous, softly pubescent and rough on the margins only, or more rarely scabrous, the basal sharply lanceolate, 10-20 cm. long, 5-15 cm. wide, subpetiolate, narrowing to a short- or longer-winged petiole from one third to one half the length of the blade, the upper rigid, sharp-pointed, narrowly lanceolate or linear, reduced from 6-8 cm. long to narrow bracts less than 1 cm. subtending the heads; inflorescence narrowly racemose, of 20-50 subsessile heads on erect or depressed pedicels about as long as the heads, or more rarely branched and paniculate by the elongation of the pedicels into slender peduncles bearing several heads each; heads of 15-25 flowers, somewhat turbinate or campanulate, 1-1.5 cm. long and ca. 1 cm. wide when flowers are open; phyllaries appressed or sometimes recurved, herbaceous, green and softly pubescent, with ciliate but almost non-scarious margins; outer phyllaries subovate; middle and inner ones oblong-spatulate, 7-4 mm. long and 2-3 mm. wide, herbaceous and usually finely pubescent, sometimes with purplish ciliate margin; corolla-tube 7-9 mm. long, scantily to moderately pilose at the base of the tube; mature achene 3-4 mm. long; pappus about 6 mm. long, barbellate." DISTRIBUTION: Abundant

from Tennessee to Alabama. Occasionally found North Carolina to Florida and Indiana to Louisiana and Texas.

7. *LIATRIS ASPERA* var. *TYPICA* Gaiser (*L. scariosa*, in part, of Deam's *Flora of Indiana*.) **HABITAT**: sandflats; along railroads and roadsides. **ROOTSTOCK**: sub-globose to irregular, 2-5 cm. in diameter. **STEM**: 4-11 dm. high; single or several; stout, rough-puberulent above, usually hairy throughout. **LEAVES**: linear-lanceolate, asperous; 10-15 cm. long and 1-2 cm. wide along lower part of stem, reducing upward. **INFLORESCENCE**: a long, loose spike; 30-50 cm. long. **HEADS**: 15-25 mm. long, 15-20 mm. wide; globose. **FLOWERS**: 25-40 per head. **COROLLA**: 8-10 mm. long; usually purple, sometimes white; pilose within tube. **ACHENE**: 4-6 mm. long. **PAPPUS**: 7-8 mm. long; barbellate, 25-40 setae. **INVOLUCRE**: 10-14 mm. long, 10-13 mm. wide; having a puckered appearance. **PHYLLARIES**: glabrous; 3-10 mm. long, 1-3 mm. wide; oblong-spatulate to rounded; decidedly bullate or puckered; tips rounded with broad scarious margins. **DISTRIBUTION**: central states, Ohio to Minnesota south to Louisiana and Texas. Indiana: Jasper Co. (B). Also reported from Porter Co. by E. S. Steele.

8. *LIATRIS ASPERA* var. *INTERMEDIA* (Lunell) Gaiser. (*L. scariosa*, in part, of Deam's *Flora of Indiana*.) **HABITAT**: dunes, sandy clearings and lake borders, along railroads and roadsides. **ROOTSTOCK**: rounded, irregular. **STEM**: glabrous below with appressed hairs above; 4-11 dm. high, 4-7 mm. thick toward base. **LEAVES**: glabrous with few exceptions; 9-30 cm. long, 6-32 mm. wide at lower part of stem, becoming smaller upward. **INFLORESCENCE**: long open spike, 10-60 cm. long. **HEADS**: somewhat globose; 13-20 mm. long, 11-20 mm. wide. **FLOWERS**: 18-40 per head. **COROLLA**: 7-10 mm. long; usually purple, rarely white; pilose within the tube. **ACHENE**: 4-8 mm. long. **PAPPUS**: 5-8 mm. long; barbellate, 32-42 setae. **INVOLUCRE**: 10-14 mm. long, 10-17 mm. wide; puckered in appearance. **PHYLLARIES**: 3-12 mm. long, 1-4 mm. wide; glabrous with broad rounded tips and scarious margins, loose and strongly bullate or puckered. **DISTRIBUTION**: from the Mississippi River eastward to North Carolina and south to Florida, also westward from Missouri to Texas. Indiana counties: Lake (D, B); Porter (D, B); LaPorte (B); Elkhart (D, B); LaGrange (D, B); Steuben (D, B); Starke (D, B); Marshall (D); Newton (D, B); Jasper (B); Pulaski

(B); Benton D, B); White (B); Cass (B); Crawford (D); Harrison (B).

9. X *LIATRIS SPHAEROIDEA* Michx. (*L. scariosa*, in part, of Deam's *Flora of Indiana*.) ROOTSTOCK: irregular to sub-globose. STEM: one to several; 4-11 dm. tall, 4-6 mm. thick at base. LEAVES: glabrous, pubescent or asperous; linear to lanceolate; 10-15 cm. long, 8-12 mm. wide on lower part of the stem, reducing upwards. INFLORESCENCE: raceme or panicle. HEADS: barely globose; 13-25 mm. long, 12-24 mm. wide. FLOWERS: 25-40 per head. COROLLA: usually purple, sometimes pink, rarely white; pilose within the tube. ACHENE: 4-6 mm. long. PAPPUS: 7-8 mm. long; barbellate. PHYLLARIES: loosely erect; slightly puckered, with narrow scarious margins. DISTRIBUTION: Michigan to Nebraska southward to Tennessee and Arkansas. Indiana counties: Steuben (D); Lake (D); also reported from Porter Co. by E. S. Steele.

10. *LIATRIS CYLINDRACEA* Michx. HABITAT: sand ridges, dunes and prairies. ROOTSTOCK: rounded, up to 3 cm. in diameter. STEM: 3-6 dm. tall, 2-4 mm. thick at base; usually glabrous, sometimes with few hairs. LEAVES: linear; mostly glabrous, lower cauline 15-30 cm. long, 3-6 mm. wide. INFLORESCENCE: loose raceme; 5-20 heads; 7-20 cm. long (rarely occurring with single heads). HEADS: cylindrical; 18-20 mm. long, 8-10 mm. wide. FLOWERS: 20-60 per head, seldom more than 35. COROLLA: 10-14 mm. long; purple, rarely white; inner surfaces hairy. ACHENE: 4-6 mm. long. PAPPUS: 8-10 mm. long; plumose, 18-24 setae. INVOLUCRE: 12-18 mm. long, 8-10 mm. wide; herbaceous; appressed. PHYLLARIES: 4-12 mm. long, 1-4 mm. wide; glabrous; ovate and rounded at top with acuminate or mucronate tips. DISTRIBUTION: western New York to Minnesota and Missouri. Indiana counties: Lake (D, B); Porter (D, B); LaPorte (B); Elkhart (B); LaGrange (D); Starke (D); Newton (B); Tippecanoe (D, B).

11. *LIATRIS SQUARROSA* (L.) Michx. var. *TYPICA* Gaiser. (*L. squarrosa* of Deam's *Flora of Indiana*.) HABITAT: roadsides, dry knobs and fields. ROOTSTOCK: rounded; up to 4 cm. in diameter. STEM: 4-10 dm. tall, 3-7 mm. thick at base; pubescent with short dense white hairs. LEAVES: linear and rigid; usually pubescent though sometimes glabrous; 12-20 cm. long, 4-10 mm. wide. INFLORESCENCE: 10-40 cm. long; one or a few heads to a many-headed

raceme. HEADS: cylindrical to turbinate; 20-25 mm. long, 12-20 mm. wide. FLOWERS: 20-40 per head (terminal head up to 60). COROLLA: 10-18 mm. long; phlox-purple; inner surface hairy. ACHENE: 4-6 mm. long. PAPPUS: 12-14 mm. long; plumose, 16-26 setae. INVOLUCRE: broad and squarrose; 15-18 mm. long, 12-15 mm. wide. PHYLLARIES: 9-18 mm. long, 1-3 mm. wide; glabrous to hairy, with ciliate-membranous margins and acute to acuminate squarrose tips. DISTRIBUTION: Delaware to Florida westward to Alabama and Missouri. Indiana counties: Daviess (D); Clark (D, B); Perry (D); Crawford (D); Harrison (D, B); Floyd (B).