

TAXONOMIC REVIEW OF *SYMPHYOTRICHUM PATENS* (ASTERACEAE: ASTEREAE)

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ABSTRACT

The eastern North American *Symphotrichum patens* has been treated by Jones (1983, 1992) and other botanists to include var. *patens*, var. *patentissimum*, and var. *gracile*. These taxa have been distinguished primarily by habit, involucre size and vestiture, and phyllary orientation. Morphological distinctions between var. *patens* and var. *gracile* have been viewed as overlapping and the two taxa have been interpreted as sympatric over a wide region; the present study concludes that it is not possible to distinguish them in an unarbitrary or evolutionarily meaningful way, and var. *gracile* is not recognized. Variety *patens* sensu lato apparently comprises two diploid and three or four tetraploid population systems. Variety *patentissimum* is morphologically distinct and consistently tetraploid, and it intergrades with tetraploid var. *patens* where their ranges are contiguous or overlapping. A county-level map shows the distribution of the two infraspecific taxa of *S. patens*, as interpreted in the present study. A similar map shows ploidal distribution within the species, based on data available from previous studies.

RESUMEN

Symphotrichum patens del este de Norte América ha sido tratado por Jones (1983, 1992) y otros botánicos para incluir las var. *patens*, var. *patentissimum*, y var. *gracile*. Estos taxa han sido distinguidos principalmente por el hábito, tamaño involucral y pubescencia, y la orientación de los filarios. Las distinciones morfológicas entre var. *patens* y var. *gracile* ha sido vista como solapada y los dos taxa han sido interpretados como simpátricos en una región amplia; el presente estudio concluye que no es posible distinguirlos de un modo que no sea arbitrario o en una línea evolutiva significativa, y la var. *gracile* no se reconoce. La variedad *patens* sensu lato comprende aparentemente dos sistemas de poblaciones diploides y tres o cuatro tetraploides. La variedad *patentissimum* es morfológicamente diferente y constantemente tetraploide, y se intergrada con la var. *Patens*, que es tetraploide, allí donde sus áreas son contiguos o se solapan. Un mapa a nivel de condado muestra la distribución de los dos taxa infraespecíficos de *S. patens*, tal como se interpretan en el presente estudio. un mapa similar muestra la distribución ploidal de la especie, basado en datos disponibles de estudios previos.

The eastern North American *Symphotrichum patens* (Aiton) G.L. Nesom has been treated (especially in detail by R.L. Jones 1983, 1992, as *Aster patens*) to include var. *patens*, var. *gracile* (Hook.) G.L. Nesom, and var. *patentissimum* (Lindl.) G.L. Nesom. Infraspecific taxa have been distinguished primarily by habit, involucre size and vestiture, and phyllary orientation. Morphological differences, however, especially between var. *patens* and var. *gracile*, have been construed as overlapping and those taxa have been viewed as broadly sympatric.

Differences among the varieties have been characterized as in the key below, which is amalgamated mostly from contrasts and comments by Cronquist (1980), A.G. Jones (1992), Jones (1983), and Brouillet et al. (2006).

1. Involucres broadly turbinate, 8–12 mm long; phyllaries often in 5–7 series, appressed, obtuse, mid phyllaries ovate-lanceolate, 1.2–1.7 mm wide, densely strigillose to sericeous-strigose, eglandular to sparsely and minutely sessile-glandular _____ var. **patentissimum**
1. Involucres campanulate or slenderly turbinate, 5.0–7.5 mm long; phyllaries in 4–5(–6) series, often at least somewhat squarrose, acute to acuminate, mid phyllaries linear-lanceolate, 0.7–1.2 mm wide, sparsely to densely strigillose, sparsely to densely sessile- or stipitate-glandular.
2. Plants slender, branches long, conspicuously and minutely bracteate; principal cauline leaves

- 1–3(–4) cm long, 0.5–1(–1.5) cm wide; involucre 5.5–6.5(–7.5) mm long; phyllaries sparsely glandular and densely strigillose, mid 0.7–1 mm wide _____ var. **gracile**
2. Plants more robust, branches shorter, with fewer and larger bracts; principal cauline leaves 3–6(–8) cm long, 1–2 cm wide; involucre 6–7.5 mm long; phyllaries densely glandular and sparsely strigillose, mid 1–1.2 mm wide _____ var. **patens**

Variety *patentissimum* occupies a geographic range in the Interior Uplands west of the Mississippi River, except for populations in southern Illinois. Jones (1983) mapped scattered collections of var. *patentissimum* from Texas and Louisiana; Cronquist (1980) included Mississippi in the range. Variety *patens* has been recorded from Maine (Magee & Ahles 1999), New Hampshire, and Massachusetts south to Florida, thence westward to Texas, Oklahoma, and Kansas (Jones 1983). Variety *gracile* was recorded by Jones (1983) in Texas, Oklahoma, Kansas, Missouri, Arkansas, Louisiana, Mississippi, and Alabama — sympatric in each state with var. *patens* and sympatric in Missouri, Arkansas, and Oklahoma with var. *patentissimum*. A.G. Jones (1992) viewed all three taxa as present in Oklahoma. Brouillet et al. (2006, Flora of North America treatment) presented an expanded geographic concept of var. *gracile*, following Cronquist (1980), both of whom recognized its occurrence in Florida, Georgia, South Carolina, North Carolina, Virginia, Tennessee, and Maryland, far into the range of var. *patens*. In the view of both R.L. Jones and of Brouillet et al., the range of var. *gracile* is completely sympatric with that of var. *patens*. Variety *patens* in the concept of Brouillet et al. occurs alone from New Jersey and Delaware northward to Maine and westward from Pennsylvania and New York to Indiana and Illinois.

All chromosome number reports of var. *patentissimum* have been tetraploid ($2n = 20$). Many populations of var. *patens* (sensu Jones 1983) have been reported as tetraploid (counts from Massachusetts, Illinois, Indiana, New Jersey, Kentucky, Tennessee, Virginia, North Carolina, South Carolina, Georgia, Alabama, and Mississippi); diploids have been reported from western Alabama (Jones 1983; Semple 1984). Variety *gracile* has been recorded at diploid level ($2n = 10$) in Alabama, Mississippi, Louisiana, Texas, and Oklahoma. Tetraploid counts of var. *gracile* have been reported from Louisiana and Texas (Jones 1983; Semple 1984).

Artificial intervarietal crosses between tetraploids (var. *patens* x var. *patentissimum*) “produced good seed sets, and the hybrid offspring were intermediate in morphology” (Jones 1983, p. 60). Crosses between var. *patens* and *Symphyotrichum phlogifolium* (both tetraploid) were as successful as intervarietal crosses. In contrast, “only a few crosses were attempted between diploid and tetraploid *S. patens*, and none of these were successful” (p. 60).

The concept of *Symphyotrichum patens* in earlier literature has included *S. georgianum* (Alexander) Nesom and *S. phlogifolium* (Muhl. ex Willd.) Nesom, but Jones (1983) elevated these taxa to specific rank, and most later authors, including Brouillet et al. (2006), have followed these concepts, with Cronquist (1980) and Gleason and Cronquist (1991) being notable exceptions. Neither *S. georgianum* nor *S. phlogifolium* intergrades morphologically with other taxa; *S. georgianum* is a decaploid ($2n = 50$) while *S. phlogifolium* is a tetraploid ($2n = 20$), and both occur mostly within the geographic range of tetraploid *S. patens* var. *patens*. Another distinct but closely related species, *S. grandifolium* (L.) Nesom, is known only as a dodecaploid ($2n = 60$). The chromosome counts for these three taxa were first reported by R.L. Jones and A.G. Jones (1979).

The present study reexamines the taxonomic distinctions and geographic distributions of the infraspecific taxa of *Symphyotrichum patens*. The study is primarily based

on specimens examined from BRIT-SMU, MISS, MO, NCU, TEX-LL, and VDB (including many of the collections made by R.L. Jones in his Vanderbilt dissertation study). The collection localities of these are mapped in Figure 1.

Semple (1984) mapped chromosome number reports for *Symphyotrichum patens*, as similarly done here, but the present map (Fig. 2) is more precisely represented and the modified taxonomy gives it a different perspective. Chromosome counts have been made by various botanists but mostly by Semple and Brouillet (1980), Jones (1983), and Semple (1984), as summarized by Semple (1984), with an addition by Jones and Smogor (1984). Several chromosome counts, vouchered by collections by John Semple in 1991 and deposited at TEX and MO, apparently have not been reported in literature: Kentucky, Whitley Co., $2n = 20$ (MO); North Carolina: Wilkes Co., $2n = 20$ (MO); Ohio: Scioto Co., $2n = 20$ (MO); Texas: Harrison Co., $2n = 10$ (TEX) and Fort Bend Co., $2n = 20$ (TEX); West Virginia: Pendleton Co., $2n = 20$ (MO).

RESULTS AND DISCUSSION

Observations of Jones (1983) and of Brouillet et al. (2006) are confirmed here: plants referable to var. *patens* (using criteria as in the key above) occur essentially throughout the range of var. *gracile*, and plants referable to var. *gracile* occur through part of the range of var. *patens*. Map 14A of Jones (1983) indicates that the eastern extension of var. *gracile* is abruptly demarcated along the Mississippi-Alabama border, but the present study has not confirmed this. Typical var. *gracile*-like plants occur northeastward at least into North Carolina. Similarly, collections from Texas and Louisiana resemble plants identified as var. *patens* in Atlantic states. There appears to be a weak east-to-west trend in increase of nonglandular involucre vestiture and, beginning in Alabama westward, development of longer and more bracteate branches, but the present study has not found any geographic zone of morphological discontinuity that would enable or justify the recognition of two taxa. Continued formal recognition of var. *gracile* perpetuates a typological definition. In the present view, recognition of broadly sympatric varieties (as var. *gracile* with var. *patens*) would imply either that the two were reproductively isolated (thus each better treated at specific rank) or else that they represent populational variants (thus not justifiably treated at varietal rank).

Variety *patentissimum* is a distinctive entity. It overlaps in distribution (Fig. 1) with tetraploid var. *patens*, and putative hybrids and introgressants apparently occur in the region of sympatry: Arkansas, Oklahoma, the southwest corner of Kansas, and (east of the Mississippi River) southern Illinois and extreme western Kentucky (intermediates not represented on map). Some measure of reproductive isolation may be active, as typical plants of both taxa have been collected in relatively close proximity in their region of sympatry. Typical var. *patentissimum* occurs as far south as Cleburne and Dallas counties in south-central Arkansas and Sevier and Little River counties in the southwest corner of the state; var. *patentissimum* and var. *patens* and intermediates occur in Craighead and Poinsett counties near the northeast corner of the state.

Plants and populations of var. *patens* sensu lato of different ploidy level do not appear to be intermixed. More counts, of course, might reveal that diploids and tetraploids occur in sympatry, but based on current evidence, diploid populations within var. *patens* apparently occur in two geographic groups, as hypothesized in Fig. 2. Tetraploids apparently occur in four groups (or three groups, if tetraploidy has been derived only once on the east and west sides of the Mississippi River) (Fig. 2). More counts might reveal that

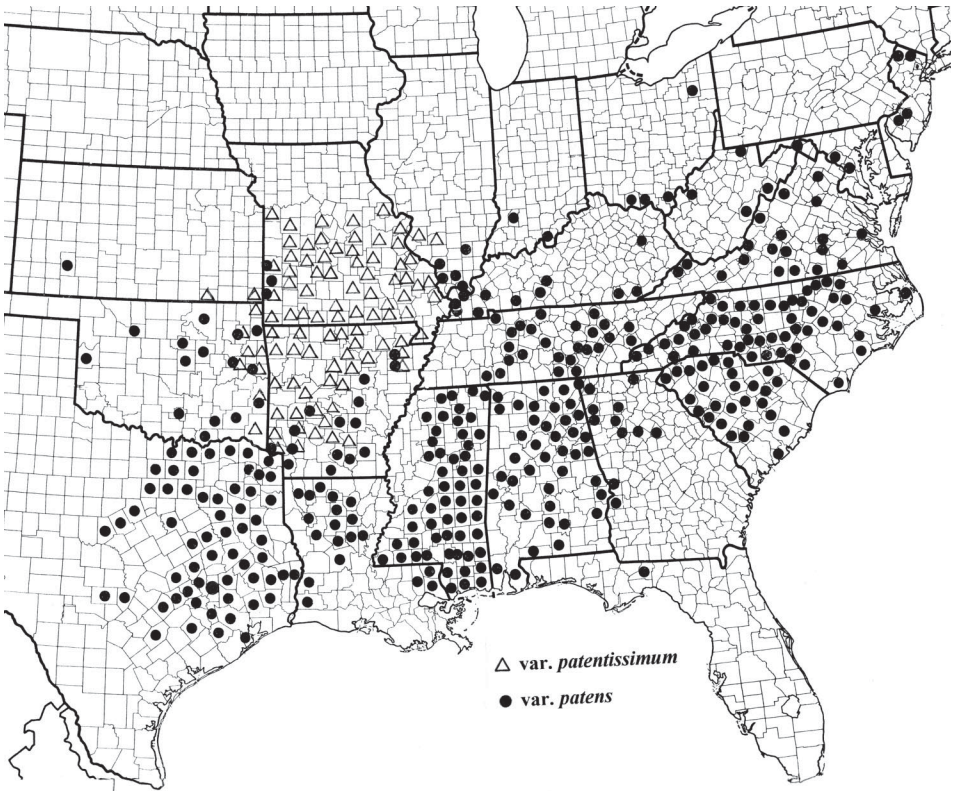


FIG. 1. Distribution of *Symphyotrichum patens* var. *patens* and var. *patentissimum*. Symbols indicate counties from which specimens have been examined in the present study. The record for var. *patens* in Gray Co., Kansas, is fide R.L. Jones (1992); that for var. *patens* in Portage Co., Ohio, is fide Fisher (1988). The range continues northward into Pennsylvania, New York, Rhode Island, Connecticut, New Hampshire, Massachusetts, and Maine.

diploids are continuously distributed along the outer coastal plain.

The nomenclatural type (lectotype) of var. *gracile* was collected in Washington Parish, Louisiana, a region where tetraploids, but not diploids, have been found. Morphological or ecological features that might be diagnostic of these population systems of different ploidy level are not apparent. Diploid and tetraploid plants of var. *patens* in Mississippi, for example, as well as in Texas, show similar ranges of morphological variability. Even so, it may be assumed that the ploidal systems within var. *patens* are isolated from adjacent ones by production of triploid hybrids or some other incompatibility (Jones noted that experimental $2x-4x$ crosses were not "successful").

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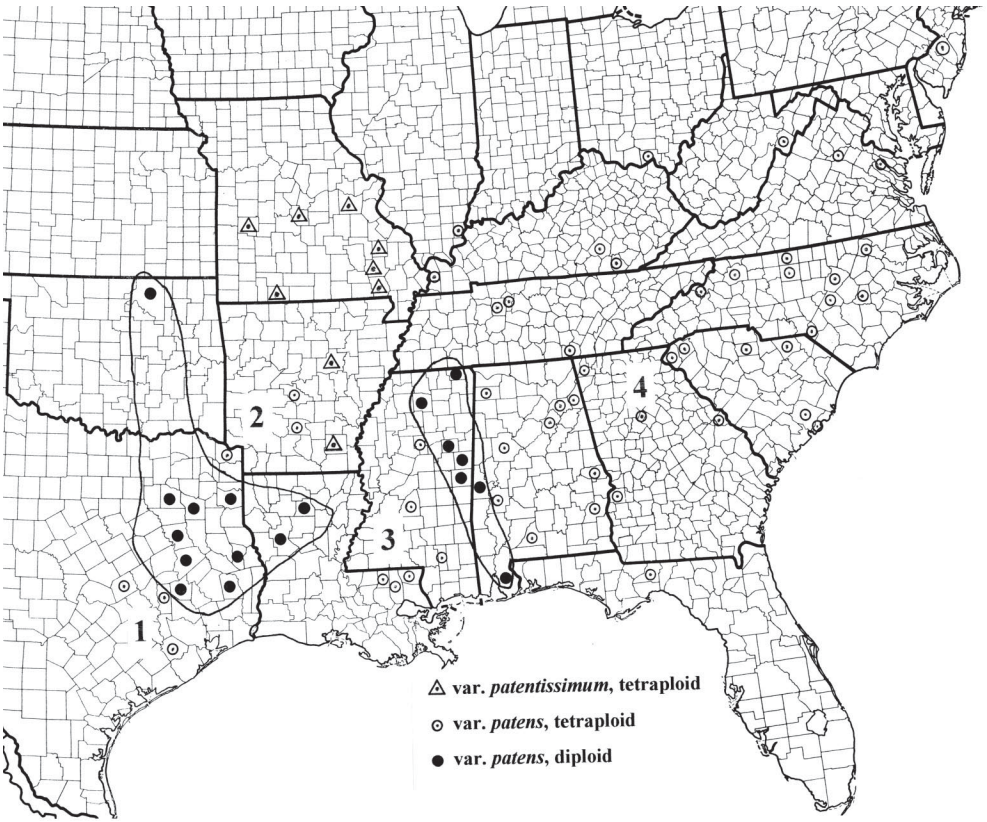


FIG. 2. Distribution of ploidy levels in *Symphyotrichum patens*. Lines enclosing diploid populations indicate the hypothesis that diploids occur in two groups. Tetraploids of *var. patens* thus would be seen as three or four separated population systems (see text).

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