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Which *Mikania*: Native Vine or Noxious Weed?[1]

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INTRODUCTION: Several species of *Mikania* (hempvine) that grow in Florida are very similar in appearance. These include native species that can be difficult to distinguish from the invasive weed, *Mikania micrantha* Kunth, a serious pest plant, particularly in the Old World tropics. It is included on the Noxious Weed Lists of the USDA and several states, including Florida. Outbreaks of this weed have been found within disturbed areas such as roadsides, woodlots and in plant nurseries in a swath through the Redlands area of Homestead, Florida. (See DPI Pest Alert [http://www.FreshFromFlorida.com/Divisions-Offices/Plant-Industry/Plant-Industry-Publications/Pest-Alerts/Pest-Alerts-The-Chinese-Creeper-Bittervine-Or-Mile-a-minute-Mikania-Micrantha] for additional information about this species.)

Confusion about the identity of *Mikania* species can be a problem for controlling the noxious weed without mistakenly removing the native species. The genus *Mikania* has distinctive characteristics that separate it from other genera in the family Compositae (or Asteraceae), but identification of species within the genus usually depends on flowers or inflorescence characters that can only be seen during the flowering season. However, waiting for flowers to appear can increase the likelihood that seeds will be produced and spread before control measures can be completed.

In this circular, we will discuss the potential use of vegetative characters to identify *Mikania* species in Florida. The native species include *Mikania cordifolia* (L.f.) Willd. and *Mikania scandens* (L.) Willd., as well as a third species recognized by some taxonomists, *Mikania batatifolia* DC., which is quite similar to *M. scandens*, but has leathery to somewhat fleshy leaves. Following Wunderlin and Hansen (2011), we include *M. batatifolia* as a synonym of *M. scandens*. The most common and widespread native *Mikania* species is the climbing hempvine, *M. scandens*, found throughout the state. The Florida Keys hempvine, *M. cordifolia*, is common in the central and southern peninsula, but less so in the northern part of the state.

DISTRIBUTION: *Mikania micrantha* is native to Mexico, Central and South America and the West Indies, but is seldom a weed in those areas. It has become naturalized widely in the Old World tropics and is a problem in tropical Asia and the Pacific Islands. It is a serious weed of newly planted plantation crops such as tea, coffee, cacao, coconuts and oil palms, but it can be found as a weed in mature plantings as well (Holm *et al.* 1977). The potential range of this species in the United States is not known, but it survived experimental planting in China as far north as 28° N (Holm *et al.* 1977; Zhang *et al.* 2004) which is comparable to Orlando (28.5383355 N) in Florida. A study based on records from herbaria in 22 countries found that most observations of this species are below 600 m, but one was over 1,200 m above sea level, suggesting that the species could survive in colder areas (Day *et al.* 2012).

Mikania scandens is native to the eastern United States from Maine to Florida and westward to Texas and Michigan as well as Mexico and the West Indies, but it has likely been extirpated from the northernmost extremes of its range. In Hawaii and other Pacific Islands, it has become weedy. Even in Florida, this species can exhibit unrestrained growth in disturbed locations, given ideal light and moisture conditions. In moist, shady, natural habitats, *M. scandens* can climb over other vegetation, but does not tend to form dense mats. It is most often found along stream banks and swamps to 500 m elevation.

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Mikania cordifolia is native to the southeastern United States (Alabama, Florida, Georgia, Louisiana, Mississippi, Texas), Mexico, the West Indies, and Central and South America. It grows in wetlands and moist areas to 100 m elevation.

IDENTIFICATION: *Mikania* is a genus of about 430 species of perennial, herbaceous or semi-woody, twining vines, or less commonly shrubs, widely distributed in the tropics and subtropics, with all but nine native to the New World (Mabberley 2008). It is a member of the tribe Eupatorieae, and the inflorescence is similar in general aspect to Eupatorium and its segregates (qualities that unite this group include generally whitish flowers, with dark anthers and long style branches). The leaves are opposite or rarely whorled, three to seven-nerved from the base, with membranous, stipule-like nodal appendages, called laciniate enations or pseudostipules, growing on the stem between the petiole bases in some species (Adams 1972; Acevedo-Rodriguez 2005). Stipules are leaf-like structures at the base of leaves in some plants; these outgrowths on *Mikania* are not true stipules, as indicated by the term "pseudostipule." These pseudostipules may be deciduous or eventually wither on older stems (Holmes 1993). The inflorescences are variable within the genus, in arrays including corymbs, panicles, racemes, spikes and thyrses, but most often having terminal and axillary, long-stalked, panicles or complex intergradations of panicles with other forms. The heads (capitulae) consist of four white or pinkish disk florets, subtended by four subequal phyllaries (involucral bracts) and usually a fifth, distinct subinvolucral bract. The achenes (cypselae) have four to ten ribs, crowned with a pappus of numerous barbellate bristles that allow the seeds to be dispersed by wind (Liogier 1997; www.efloras.org).

VEGETATIVE CHARACTERS FOR IDENTIFICATION: *M. cordifolia* is readily distinguished from the other species by its hexagonally ridged stem (Holmes 1993). Vegetative characters that might be used to differentiate *M. micrantha* from *M. scandens* include leaf color and shape, stem color, rampant or restrained growth habit, and the pseudostipules between the petiole bases of the leaves. In some species of *Mikania,* the pseudostipules are 1 cm or more in length--Florida species have smaller, but still visible, interpetiolar pseudostipules.

Leaf shape, color and growth habit have not proven to be reliable characters. Since *M. micrantha* was discovered in South Florida, we have seen dozens of samples of *Mikania* species with variations in leaf and stem color and received reports of rampant growth in full sun for both *M. scandens* (listed as a noxious weed in Hawaii) and *M. micrantha.* Although some differences in leaf shape of *M. micrantha* and *M. scandens* have been described (*e.g., M. scandens* leaves are described as triangular in outline, with long, tapering apices, while *M. micrantha* is more ovate in outline with acute to acuminate apices), the leaves of specimens we have received vary considerably in overall shape and length of the leaf tip. In addition, we have observed *M. micrantha* specimens with reddish stems and petioles in spite of descriptions indicating they are always green in color. However, we have found the pseudostipule structure a more reliable diagnostic character.

This pseudostipule differs consistently for the two species. In *M. micrantha,* it is a membranous flap with incised lobes while in *M. scandens,* the pseudostipule is a low ridge with narrowly awl-shaped projections (Figs. 1-2). Although many descriptions of the native *M. scandens, M. cordifolia* and a complex of similar species mention the pseudostipules or interpetiolar enations, few use them as a means of separating the species. This is perhaps because characters of the flowers or inflorescences are thought to be more reliable (Figs. 3-4) or because the pseudostipules start to wither when flowering begins (Holmes 1990). Moreover, these delicate structures can be difficult to see on preserved specimens which are usually collected when these species are flowering. The pseudostipules have been described as deciduous, but in Florida, they appear to be more or less marcescent (withering, but remaining attached as the stem ages). *M. cordifolia* also has interpetiolar pseudostipules, consisting of a low ridge with a fringe of tomentose outgrowths (Fig. 5).

***MIKANIA* SURVEY:** In an effort to verify the utility of the pseudostipule for distinguishing the noxious weed, *M. micrantha,* from the native species, *M. scandens,* we carried out a project comparing determinations made using this

character and those made from analysis of genomic DNA from the two species. This assessment of DNA and morphology allows us to provide recommendations for identifying both species with only vegetative plant material.

In the fall of 2011, fresh material was collected from plants thought to be *M. micrantha*, based on their rampant growth in locations where previous infestations had been observed. Two DPI botanists identified the 49 samples, using inflorescence and pseudostipule characters to determine the species, then pressed and dried vouchers from each sample. Leaf material from the vouchers was used for DNA sequencing, following standard procedures. (Details of the methods used are available on request.) In addition to ITS sequence data produced in this analysis, some ITS data were downloaded from GenBank as additional references. Sequence data were manually aligned and phylogenetic analyses were performed using PAUP*4.0b10 (Swofford 2003). In all cases, the DNA analysis confirmed the species identification based on morphological characters of the 45 *M. micrantha* and 4 *M. scandens* specimens. (See Fig. 6 for a diagrammatic representation of the DNA analysis.)

KEY TO *MIKANIA* SPECIES IN FLORIDA: The three species of concern may be distinguished by means of the following key:

1. Stems distinctly 6-angled; flower heads 7-10 mm long; achenes pale brown, without glandular dots, about 4 mm long**……..……..…….....** ***Mikania cordifolia***

1. Stems terete or obscurely angled; flower heads 4-6 mm long; achenes dark brown or black, with at least a few glandular dots, about 2 mm long**……2**

2. Leaves usually pale green or yellow green; flowers white, 2.5-3 mm long; the phyllaries glabrous or nearly so; inflorescence branches glabrous or nearly so; pseudostipule a membranous flap with incised lobes**……** ***Mikania micrantha***

2. Leaves usually medium green; flowers pinkish, 3.5-4 mm long; the phyllaries hairy with segmented hairs; inflorescence branches hairy; pseudostipule a low ridge with narrowly awl-shaped projections**...** **……*Mikania scandens***

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Fig. 1: *Mikania micrantha*--pseudostipule a membranous flap with incised lobes (mm scale). Photography credit: P. J. Anderson, DPI.

Fig. 2: *Mikania scandens*--pseudostipule a low ridge with narrowly awl-shaped projections). Photography credit: P. J. Anderson, DPI.

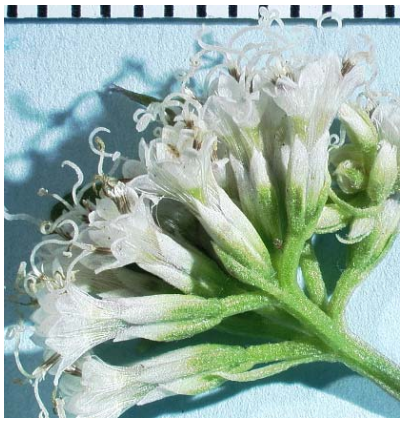

Fig. 3: *Mikania micrantha*--glabrous inflorescence. Photography credit: P. J. Anderson, DPI.

Fig. 4: *Mikania scandens*--pubescent inflorescence. Photography credit: P. J. Anderson, DPI.

Fig. 5: *Mikania cordifolia*--pseudostipule a low ridge with a fringe of tomentose outgrowths. Photography credit: P. J. Anderson, DPI.

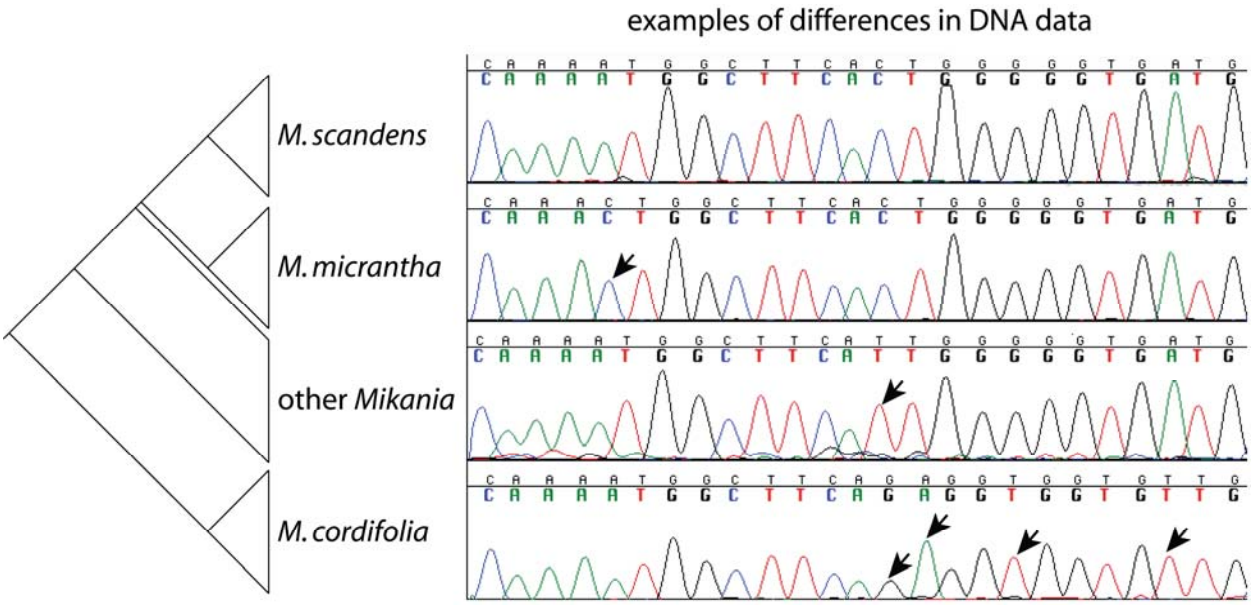

Fig. 6: A diagrammatic representation of a gene tree generated from DNA data for *Mikania*. Arrows indicate variable sites within the DNA, compared to other sequences shown. This variation allows for DNA-based identification techniques.

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