Crop Protection Compendium - *Mikania micrantha* Kunth

Updated by **Pierre Binggeli 2005**

NAMES AND TAXONOMY

Preferred scientific name

Mikania micrantha Kunth

Taxonomic position
Domain: Eukaryota
Kingdom: Viridiplantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonae
Order: Asterales
Family: Asteraceae

Other scientific names
Mikania orinocensis Nov.
Mikania alata Prodr. 1836
Mikania subcrenata H. & A., 1836
Mikania umbellifera Gard., 1845
Mikania subcymosa Gard., 1847
Mikania glechomaefolia Sch. - Bip. ex Bak. Mart. Fl., 1876
Mikania scandens var. *subcymosa* (L.) Wild., 1876
Mikania scandens var. *alata* (L.) Wild. Bak. Mart. Fl., 1876
Mikania sinuata Rusby
Kleinia alata Mey. 1818
Willoughbya micrantha Rusby, 1895
Mikania cordata (Burm. f.) B.L. Rob.
Eupatorium cordatum
Mikania volubilis

BAYER code
MIKCO (*Mikania cordata*)
MIKMI (*Mikania micrantha*)

Common names

English:
mile-a-minute
Chinese creeper
American rope
bittervine
African mile-a-minute
Spanish:
wappe
guaco
French:
liane américaine
American Samoa:
fue saina
Fiji:
ovaova
usuvanua
wa bosucu
wa butako
wa mbosuthu
wa mbosuvu
wa ndamele
India:
Japani habi
Niue:
fue saina
Peru:
camotille
Samoa:
fue saina

Notes on taxonomy and nomenclature

M. micrantha is a New World species whose full distribution in the Old World has only recently been fully realised. In much of the earlier literature it was mistakenly referred to as *M. scandens* or *M. cordata*. Although Holm et al. (1977) state that *M. cordata* is "by far the most important weed of the three", this is now known to be incorrect and many of the indications for distribution of *M. cordata* refer to *M. micrantha*.

Studies of karyotypes and chromosome morphology of *M. micrantha*, *M. glomerata*, *M.*

trinervis (from Londrina and Parana, Brazil), and *M. cordifolia*, *M. laevigata*, and *M. viminea* (from Porto Alegre, Rio Grande do Sol, Brazil) have indicated that *M. micrantha* is a tetraploid with 2n=72, *M. viminea* a tetraploid with 2n=68, *M. laevigata* a diploid with 2n=38, and *M. cordifolia* a diploid with 2n=34. The other two species are also diploids. All species except *M. micrantha* had one long pair of chromosomes with a secondary constriction in the long arms, whereas *M. micrantha* had two pairs of such long chromosomes. This suggested an evolutionary trend towards formation of aneuploid series and polyploidy (Ruas and Ruas, 1987).

M. micrantha possesses unique semi-translucent enations between the petioles at the nodes of young vegetative shoots (similar to stipules). These structures are very unusual in Compositae. They wither on older shoots and are not seen on flowering branches (Adams et al., 1972). Differences in the form of these enations can help to distinguish *M. micrantha* from *M. cordata* (see Similarities to Other Species).

HOST RANGE

Notes on host range

M. micrantha is a serious weed of plantation crops including tea, teak, rubber, oil palm and coconut (Holm et al., 1977; Cock, 1982). It is also a weed of bananas, coffee, and other tree crops, especially in moist locations.

List of hosts plants

Major hosts
Bambusa vulgaris (common bamboo), *Camellia sinensis* (tea), *Cocos nucifera* (coconut), *Coffea* (coffee), *Elaeis guineensis* (African oil palm), *Hevea brasiliensis* (rubber), *Musa* (banana), *Polyphagous* (polyphagous), *Tectona grandis* (teak), *Theobroma cacao* (cocoa)

HABITAT

M. micrantha is a tropical vine usually found in damp, lowland clearings or open areas. It also grows along streams and roadsides, in or near forests, forest plantations, pastures, fencelines, tree crops (immature rubber, oil palm and cocoa, and to a lesser extent tea, coffee and fruit trees) and waste areas Parham, 1958, 1962; Adams et al., 1972). It may be common in areas affected by slash and burn agriculture (Rawat, 1997). In Singapore it spreads on coastal reclaimed sand-filled areas (Lee et al., 1997).

Habitat descriptors
Serious weed in: urban areas
Principal weed in: natural forests; managed forests; plantation crops
Present in: rail and roadsides

GEOGRAPHIC DISTRIBUTION

Distribution List

Asia				
Bangladesh	localized			Holm et al., 1979; EPPO, 2005
Bhutan	present			Parker, 1992
Brunei Darussalam	present			Waterhouse, 1993
[China]				
Guangdong	widespread	introduced	invasive	Zhang et al., 2004
Hong Kong	widespread	introduced (1919)	invasive	Zhang et al., 2004
Taiwan	widespread	introduced	invasive	Zhang et al., 2004; EPPO, 2005
India	localized			Muniappan & Viraktamath, 1993; EPPO, 2005
Andhra Pradesh	present	introduced	invasive	Rawat, 1997
Assam	widespread	introduced	invasive	Evans, 1999
Kerala	widespread	introduced	invasive	Sankaran, 1999
Indonesia	localized			Holmes, 1975; Waterhouse, 1993; EPPO, 2005
Malaysia	widespread	introduced	invasive	Holm et al., 1977; Waterhouse, 1993; Ismail, 2001; EPPO, 2005
Peninsular Malaysia	present			Lim et al., 1987
Pakistan	present			Holmes, 1975
Philippines	localized			Gunn & Ritchie, 1982; Waterhouse, 1993; EPPO, 2005
Singapore	present	introduced	invasive	Waterhouse, 1993; Lee et al., 1997
Sri Lanka	widespread	introduced	invasive	Holm et al., 1979; Evans, 1999; EPPO, 2005
Tajikistan	present			Holm et al., 1977
Thailand	localized			Waterhouse, 1993; EPPO, 2005
Vietnam	present			Gunn & Ritchie, 1982
Africa				
Angola	absent, invalid record			EPPO, 2005
Côte d'Ivoire	absent, invalid record			EPPO, 2005
Ethiopia	absent, invalid record			EPPO, 2005
Ghana	absent, invalid record			EPPO, 2005
Guinea	absent, invalid record			EPPO, 2005
Liberia	absent, invalid record			EPPO, 2005
Mauritius	absent, unreliable			Holm et al., 1979; EPPO, 2005

	record			
Nigeria	absent, invalid record			EPPO, 2005
Senegal	absent, invalid record			EPPO, 2005
South Africa	absent, invalid record			EPPO, 2005
Central America & Caribbean				
Costa Rica	present			Cock, 1980a
Dominican Republic	localized			Holm et al., 1979; EPPO, 2005
Jamaica	present			Holm et al., 1977
Panama	present			Cock, 1980a
Puerto Rico	present			Gunn & Ritchie, 1982
Trinidad and Tobago	present			Cock, 1980a
North America				
Mexico	localized			Holm et al., 1979; EPPO, 2005
USA	present			Gunn & Ritchie, 1982
South America				
Bolivia	present			Holm et al., 1977
Brazil	present			Barreto & Evans, 1995
Parana	present			Ruas & Ruas, 1987
Colombia	present			Cock, 1980a
Ecuador	present			Holmes, 1975; Cock, 1981a
Peru	present			Cock, 1981a
Venezuela	present			Cock, 1979
Oceania				
American Samoa	widespread	introduced	invasive	Holm et al., 1977; Meyer, 2000
Australia	localized	introduced		Anon., 2003
Australian Northern Territory	localized	introduced		Anon., 2003
Cook Islands	widespread	introduced	invasive	Holm et al., 1977; Meyer, 2000
Fiji	widespread	introduced	invasive	Meyer, 2000; EPPO, 2005
Niue	localized	introduced	invasive	Meyer, 2000
Papua New Guinea	localized	introduced	invasive	Rogers and Hartemink, 2000; EPPO, 2005
Samoa	widespread	introduced	invasive	Meyer, 2000
Tonga	widespread	introduced	invasive	Meyer, 2000
Vanuatu	widespread	introduced	invasive	Meyer, 2000
Wallis and Futuna	widespread	introduced	invasive	Meyer, 2000

HISTORY OF INTRODUCTION AND SPREAD

M. micrantha originates in South and Central America where it is widespread but not often a significant weed problem (Holm et al., 1977). It has now been introduced in the Asia-Pacific region (though sometimes referred to mistakenly as *M. scandens* or *M. cordata*) (Adams et al., 1972; Holm et al., 1977; Ismail and Mah, 1993). Most of the records in Holm et al. (1977) for *M. cordata* and *M. scandens* in Asia almost certainly refer to *M. micrantha*, while those for *M. cordata* in West Africa are probably correct. Conversely, most of the records for *M. micrantha* in mainland Africa cited in EPPO (2005) probably relate to the indigenous *M. cordata*. The record for Mauritius may be correct but the occurrence of true *M. micrantha* in mainland Africa has yet to be confirmed.

In China it was introduced to Hong Kong in the early 20th century (first herbarium records date from 1919). After a long lag-phase it started to spread in the adjoining Guangdong Province in the early 1980s and rapid economic development of the last two decades appear to have assisted the spread of the weed. By the year 2000 the Chinese authorities recognised the species as a major threat and research projects were initiated. In Taiwan *M. micrantha* was introduced for soil conservation in the 1970s and is now found throughout the island. It was introduced into India and Indonesia as ground cover in the 1940s and then somehow spread to the Pacific Islands, New Guinea and much of South-East Asia (Sankaran, 1999; Zhang et al., 2004). In Malaysia it is believed that the plant was introduced in the early 1950s as non-legume ground cover for rubber plantations due to scarcity of legume seeds (Ismail, 2001). Although *M. micrantha* is widespread in Sri Lanka it does not appear to be posing a serious economic or ecological threat (Evans, 1999). The weed has recently been reported at a number of sites in northern Australia and *M. micrantha* is listed as a Northern Australian Quarantine Strategy target species because it has the potential to become a major weed (Anonymous, 2003).

BIOLOGY AND ECOLOGY

Genetics

Brazilian populations of *M. micrantha* show little morphological variation, however there is much chromosome polymorphism. Of the 12 populations investigated, eight were diploid (2n = 36 and 42) and four tetraploid (2n = 72) (Maffei et al., 1999).

Physiology and Phenology

According to some studies, seedlings of *M. micrantha* reach 1.1 cm and have a leaf surface area of 0.3 cm^2 by 30 days after germination. By 54 days after germination the plants average 6.6 cm high and have a leaf surface area of 17.2 cm^2.

In China the maximum mean weekly growth was 47 cm and occurred in mid Ocotober. The extent of the growing season varies according to climate. In Hong Kong the plant grows throughout the year with a peak between March and August whereas in the Guangdong region the peak growing season was from March to October with senescence occurring from December onwards (Zhang et al., 2004).

In Hong Kong *M. micrantha* takes about 5 days to develop from flower bud to full-flower, 5 days from flower to anthesis, and another 5-7 days to produce mature seed (Hu and But, 1994), but flowering is said to occur from September to October, and seed production is from November to February. In the Dongguan region flowering has been recorded from October to December, and fruiting from November to December (Zhang et al., 2004).

Reproductive Biology

During the period of sexual reproduction the biomass of the flowers is 38.4-42.8% of the total plant biomass. The seeds (achenes) are very small (1000 seeds weigh 0.0892 g) and are extremely suitable for wind dispersal (Hu and But, 1994). Each plant can produce about 40,000 seeds which are spread by wind, water, and animals. In Singapore it germinated from the soil seed bank of lowland rain forest and, in Papua New Guinea, in the fallow soil seed bank (Metcalfe and Turner, 1998; Rogers and Hartemink, 2000). Seed germination rates are high (up to 96%) although percentage germination is affected by temperature, the optimum temperature being 25-30°C. Germination rate of seeds in spring is slightly higher than in autumn (80%, vs 70%) suggesting that *M. micrantha* seeds may have an after-ripening requirement (Zhang et al., 2004).

Reproduction is by seeds, old rootstocks, runners and suckers. Although establishment of seedlings is quite slow, the plant is perennial and does also reproduce by runners and suckers, and can regrow from old rootstocks (Dutta, 1977).

Environmental Requirements

The species has a wide altitudinal distribution as it may grow at an elevation of 2000 m or more. In Bolivia, it has been observed at 3000 m (Holm et al., 1977). In Malaysia it is found between sea level and 1000 m (Ismail, 2001).

In southern China *M. micrantha* can grow in a range of soil types, from acidic to alkaline (pH 4.1-8.3) and from infertile to highly fertile (organic material 2.29-32.85). In China it grows best where the annual average temperature is higher than 21°C and soil moisture is over 15% (Zhang et al., 2004).

Associations

M. micrantha has been noted to grow in association with other weeds, but is often able to suppress or even kill them. In China *M. micrantha* can spread onto ponds to cover or kill aquatic plants including the notorious weed Eichhornia crassipes (Zhang et al., 2004).

Impact of Fire

According to researchers in India, populations of *M. micrantha* are considerably enhanced by fire in 2-, 4- and 8-year-old fallows that develop after slash-and-burn agriculture. The recruitment pattern in burned and unburned sites in each fallow differs. Seedling recruitment is restricted to burned sites in 2- and 4-year-old fallows, whereas it occurs in both burned and unburned sites in 8-year-old fallows (Swamy and Ramakrishnan, 1987c).

Another Indian study showed that peak vigour and maximum seed production of *M. micrantha* was reached in a 3-year-old fallow, followed by a decline in older fallows. Reproduction through ramets arising from rosettes (shoots arising from old rootstocks) was found to exceed that from seeds. The ramet population growth was highest during the monsoon season as a result of high population birth. It was concluded that this ruderal species has an exploitative growth strategy, with weed suppression occurring in older successional fallows dominated by shrubs and trees Swamy and Ramakrishnan, 1986, 1988).

In a study near Shillong, Meghalaya, India, biomass, litter production and above-ground net primary productivity of plant communities increased during secondary succession for up to 12 years after slash-and-burn agriculture, but the contribution by *M. micrantha* reached its maximum in 4-year-old fallow after which there was a drastic decline. During the first 4 years of secondary succession, the above-ground biomass of *M. micrantha* during the growing season was converted to litter due to total death of the above-ground parts of this species, resulting in excessive litter production during this phase (Swamy and Ramakrishnan, 1987a).

During the herbaceous phase of secondary succession after slash-and-burn agriculture, *M. micrantha* played an important role in nutrient cycling by conserving considerable quantities of potassium in its biomass. During the herbaceous community phase of secondary succession, though there was an increase in nutrient uptake by developing vegetation, recycling through litter fall increased at a greater rate. The shift in nutrient cycling properties of the developing vegetation, due to changes in community structure from a predominantly herbaceous type to shrubs and trees predominating, is reflected in various parameters observed in older fallows (Swamy and Ramakrishnan, 1987b).

Climatic amplitude (estimates)
- Altitude range: 1500 - 0 m
- Rainfall regime: summer
- Mean annual temperature: 21 - 23ºC
- Mean maximum temperature of hottest month: 13 - 16ºC
- Mean minimum temperature of coldest month: 27 - 33ºC

Soil descriptors
- Soil texture:
- Soil drainage: free
- Soil reaction: very acid; acid; neutral; alkaline
- Special soil tolerances:

MEANS OF MOVEMENT AND DISPERSAL

Natural Dispersal (Non-Biotic)

Dispersal of *M. micrantha* is mainly by wind, but water dispersal is possible.

Vector Transmission (Biotic)

Not documented, but highly likely that it is dispersal by animals.

Accidental Introduction

Being wind-dispersed, the seeds may be carried on any article that is transported through an area where the weed grows. Vehicles and equipment moving through areas infested with *M. micrantha* are likely carriers that should be cleaned before travelling long distances to avoid spread of the weed.

Transport pathways for long distance movement
- Conveyances (transport Vehicles)
- Soil, Gravel, Water, Etc.
- Travellers And Baggage

NATURAL ENEMIES

During 1988-1989, a survey of the fungi associated with *M. micrantha* was conducted in southern Brazil, a part of its native range. Nine species were identified, including the recently described Basidiophora montana and the previously undescribed Mycosphaerella mikania-micranthae sp. nov. with its anamorph Septoria mikania-micranthae. Asperisporium mikaniae comb. nov., A. mikaniigena comb. nov., Pseudocercospora plunketii comb. nov., and Cercospora mikaniacola are new records for Brazil. Field observations indicate that B. montana has potential as a classical biological control agent of this weed in Old World subtropical or montane climates. However, Mycosphaerella mikania-micranthae and the microcyclic rust Puccinia spegazzinii appear to be equally damaging to the host but to have wider climatic range and thus are highly promising agents for introduction throughout the Palaeotropics (Barreto and Evans, 1995).

In peninsular Malaysia, the fungus Rhizoctonia solani has been found to be pathogenic on *M. micrantha*; however, it should be noted that this is a serious crop pest (Lim et al., 1987).

In exploratory surveys made in Ecuador and Peru in search of natural enemies of Mikania spp., associated taxa included an eriophyiid mite Acalitus sp., the curculionid Pseudoderelomus baridiiformis, a thrips, perhaps Liothrips mikaniae, and a cassid Omoplata marginata. In laboratory feeding preference tests on L. mikaniae, substantial adult feeding occurred only on *M. micrantha* and M. cordifolia. Oviposition occurred on *M. micrantha* and larvae developed normally only on *M. micrantha* and M. vitifolia. L. mikaniae was therefore considered suitable for introduction to South-East Asia. Tests were also made on the flower-feeding species, Apion luteirostre. The results suggested a narrow host range, possibly restricted to *M. micrantha* and M. vitifolia (Cock, 1981a).

In the early 1980s, numerous surveys and experiments were conducted by research workers in Malaysia to investigate the possibility of biological control of *M. micrantha*. A survey of insects and fungal pathogens associated with it indicated that the majority of arthropods and pathogens caused insufficient damage to the weed or had detrimental effects on the crop.

Other studies have confirmed that L. mikaniae is host-specific to *M. micrantha*. Other species which are probably host specific and merit further studies include the eriophiid mite Acalitus sp., the seed-feeding weevil Apion luteirostre, the flower midge Neolasioptera sp., the inflorescence-inhabiting lace bugs Teleonemia spp., the cassids Omoplata spp. and the weevil Pseudoderelomus baridiiformis (Cock, 1981b). Liothrips spp. reduce plant vigour, and produce lesions and leaf distortion. Heavy infestations of Acalitus sp. reduce vigour and internode distance on shoots, and cause leaf distortion (Cock, 1980a).

Waterhouse (1994) has provided a lengthy and detailed review of the natural enemies of *M. micrantha*.

Natural enemies listed in the database

The list of natural enemies has been reviewed by a biocontrol specialist and is limited to those that have a major impact on pest numbers or have been used in biological control attempts; generalists and crop pests are excluded. For further information and reference sources, see About the data. Additional natural enemy records derived from data mining are presented as a separate list.

Natural enemies reviewed by biocontrol specialist	
Natural enemy	**Pest stage attacked**
Pathogens:	
Basidiophora montana	Leaves
Mycosphaerella mikania-micranthae	Leaves
Puccinia spegazzinii	Leaves
Herbivores:	
Acalitus	Leaves, Whole plant
Actinote anteas	Leaves
Apion luteirostre	Inflorescence
Desmogramma conjuncta	Leaves
Liothrips mikaniae	Leaves, Whole plant
Omoplata marginata	Leaves
Omoplata quadristilla	Leaves
Physimerus pygmaeus	Leaves
Pseudoderelomus baridiiformis	Inflorescence
Teleonemia sp. nr. prolixa	Leaves

IMPACT

Economic impact

M. micrantha is widespread throughout South and Central America, but is considered a weed in only a few places. Following its introduction to the Old World from South America, it has become a serious weed of plantation crops including tea, teak, rubber, oil palm and coconut, from India to Oceania (Holm et al., 1977; Cock, 1982). In India, *M. micrantha* is a serious weed of tea plantations, particularly in areas with high soil moisture. As a climbing vine, it quickly covers and smothers other plants, including other weeds (Dutta, 1977). The annual cost of controlling *M. micrantha* was estimated at US$9.8 million for rubber, oil palm and cocoa crops in Malaysia (Teoh et al., 1985).

Impact on Bamboo Plantations

In one study, 54 species of weeds were collected from a 3-month-old bamboo (Dendrocalamus asper) plantation in Lampung, Indonesia, which had been previously planted with cassava. The number of weed species decreased with the age of the bamboo plantation, from 28 at 6 months to 10 under a 1-year-old crop, probably because crowding by the bamboo leaves suppressed weed growth. By the end of one year, *M. micrantha* was the most dominant weed. Its climbing habit enabled it to cover the crop plants, suppressing their growth and in some cases killing them (Widjaja and Tjitrosoedirdjo, 1991).

Impact on Tree Crops

M. micrantha competes with teak, merkus pine (Pinus merkusii) and manila copal (Agathis loranthifolia = A. dammara) for nutrients, space and light and causes mechanical damage to the trees (Suharti and Sudjud, 1978). It is also a serious weed of rubber and oil palm plantations (Teoh et al., 1985).

Environmental impact

M. micrantha has a major impact on forest communities once established. It smothers native vegetation and eventually kills much of the standing vegetation including trees. In southern China it is a considered to be a major threat to the local biodiversity (Xie et al., 2001; Zhang et al., 2004).

Impact on biodiversity

M. micrantha was observed in the Neilingding Island (Shenzhen, Guangdong Province, China) in 1997, yet two years later it has covered 40-60% of the total land killing local plants. The site is famous for its large population of macaques (Macaca mulatta) and these are now under threat (Xie et al., 2001).

Summary of impact

Negative impact on: biodiversity; environment; crop production; forestry production; rare or protected species; native fauna; native flora

PHYTOSANITARY SIGNIFICANCE

M. micrantha is classified as a Federal Noxious Weed in the USA (Westbrooks, 1989). Seeds, seedheads, stem fragments with seeds, and rootstocks may be intercepted in contaminated commodities. High-risk carriers include forest products, timber, etc. Dispersal is mainly by wind, but also on vehicles and equipment moving through infested areas; these should be cleaned before travelling to uninfested areas. Border clearance personnel with the US Department of Agriculture have intercepted *M. micrantha* as a contaminant of medicinal herbs from Mexico. Seeds of Mikania spp. have been intercepted as a hitch hiker on a truck entering the USA from Mexico (Westbrooks, 1989).

SUMMARY OF INVASIVENESS

Mikania micrantha is a neotropical fast growing vine that has become a major weed in SE Asia and the Pacific during the latter part of the 20th century. It is still extending its range but a major effort to find biological control agents is under way. Once established it smothers native vegetation including native trees and is a weed of various crop systems.

Risk and Impact Factors

- invasive in its native range: unknown
- proved to be invasive outside its native range: yes
- highly adaptable to different environments: yes
- high reproductive potential: yes
- highly mobile locally: yes
- its propagules remain viable for more than one year: yes
- tolerates cultivation, browsing pressure, mutilation, fire etc.: yes
- competitive in crops or pasture: yes
- affects ecosystem: unknown
- adversely affects natural communities: yes
- adversely affects community structure: yes
- adversely affect human health: no
- has sociological impacts on recreational patterns, aesthetics, property values: unknown
- harmful to animals: unknown
- produces spines, thorns or burrs: no
- host or vector of pests or diseases: no

- likely to be accidentally transported internationally: yes
- likely to be deliberately transported internationally: no
- difficult to identify or detect as a commodity contaminant: yes
- difficult to identify or detect in the field: yes
- difficult or costly to control: yes

MORPHOLOGY

Plant type: ; woody; herbaceous; vegetatively propagated; seed propagated; perennial.

M. micrantha is a vigorous, fast-growing, perennial, creeping or twining plant with numerous cordate leaves, and numerous large, loose heads of white or cream-coloured flowers that produce many seeds. This weed could climb and smother rubber trees as tall as 25 m.

Much-branched, perennial, scrambling, twining, slender-stemmed vine; stems herbaceous to semi-woody, branched, ribbed, sparsely pubescent or glabrous; leaves simple, opposite, glabrous, thin, broadly ovate, shallowly or coarsely toothed, triangular or ovate, tip acuminate, blade 4-13 cm long, 2-9 cm wide, 3-7 nerved; at the junction of the petioles with the nodes, unusual nodal appendages, membranous, up to 5 mm long; petioles tendriliform, 2-9 cm long; inflorescence a corymbose panicle with subcymose branches, 3-6 cm long by 3-10 cm wide; flowers small, white or cream-coloured, actinomorphic, 4.5-6 mm long, in leaf axils or on terminal shoots; florets white or greenish, fragrant; corolla mostly white, tubular, 2.5-4 mm long; involucral bracts 4, oblong to obovate, 2-4 mm long, acute, green, with one additional smaller bract 1-2 mm long; pappus (calyx) of 32-38 barbellate, capillary bristles, 2-3 mm long; stamens attached by their anthers, these exserted, with a triangular-ovate apical appendage as long as broad or longer, and rounded or rarely emarginate or subsagittate at base; ovary inferior, the style base glabrous; fruit an achene that is somewhat flattened, elliptic, 4-ribbed with short, white hairs along the ribs, with a tuft of white pappus at the summit, glandular, 1.2-1.8 mm long, dark grey to black Parham, 1958, 1962; Adams et al., 1972; Holm et al., 1977; Nair, 1988).

SIMILARITIES TO OTHER SPECIES

Mikania is a genus of vines, with most of the 250 species being native to tropical America. The three most common species are *M. cordata*, *M. scandens* and *M. micrantha*. These species may be generally distinguished by the following characteristics (Holm et al., 1977).

M. micrantha: pappus bristles 32-38, white, corolla white, head length 4.5-6 mm, nodal appendages membranous. Distributed throughout tropical and central America.

M. cordata: pappus bristles 40-45, reddish, corolla white, head length 7-7.5 mm, nodal appendages form furry ridges not membranous. Distributed throughout South-East Asia and Africa.

M. scandens: pappus bristles 30-35, usually whitish, corolla pale purple, head length 5-7 mm. Distribution eastern North America.

In Taiwan *M. micrantha* is difficult to distinguish from the native *M. cordata* and a methodology has been developed to differentiate the two species (Chen et al., 2002).

CONTROL

Mechanical Control

In Malaysia, it was found that the use of Dorset horn sheep to graze infestations of *M. micrantha* and several other weeds resulted in cost savings of 15-25% for the overall weed control programme in rubber plantations (Arope et al., 1985).

In China it is suggested that the establishment of a herb layer in managed orchards, forests, perennial crops (tea and tree plantations), parks and on newly developed areas should somewhat hinder *M. micrantha* seed germination and by increasing understorey shade in forests it should make growing conditions unsuitable for the vine (Zhang et al., 2004).

Mechanical Control

Ismail (2001) reported that traditionally, manual control in newly infested crop areas have been carried out by rolling, drying and burning the plants but this proved to be unsustainable. In India manual methods (sickle weeding or uprooting) have been used but these are more expensive than chemical options (Sankaran, 1999).

When the vines are cut near the ground once a month for three consecutive months in summer and autumn and then in winter and spring, 90% of the plants can be eliminated. Hand-pulling in southern China is most effective before the end of October, i.e. prior to seed maturity, or during the March rainy season. A hand-pulling campaign by thousands of citizens was initiated by the Shenzhen government (Guangdong Province) in 2000 and proved quite effective, as many dying trees damaged by *M. micrantha* subsequently recovered (Zhang et al., 2004).

Chemical Control

Young *M. micrantha* is susceptible to standard post-emergence herbicides, 2,4-D, paraquat and glyphosate, and these are the basis for chemical control in most plantation crops.

In rubber
In Malaysia, field trials were conducted to compare the efficacy of three treatments (grazing by sheep, mechanical slashing and the use of glyphosate+picloram) for the control of *M. micrantha* (and several other weeds) in a 2-year-old rubber plantation. Two months after treatment, over 90% of weeds had regrown in plots that had been grazed or slashed, compared to <10% weed regeneration in chemically-weeded plots (Ahmad-Faiz, 1992).

In oil palms
Preliminary surveys in Malaysia indicated that *M. micrantha* is associated particularly with rubber and oil-palm plantations. Weed competition was greatest in immature crops and declined as rubber and oil palms matured. Applying paraquat and/or 2,4-D amine was the preferred method of control in plantations.

A commercial preparation of a mixture of glyphosate and dicamba was evaluated for several years for weed control in >1-year-old oil palms on two plantations in Malaysia. This treatment resulted in a 90% weed control by 30 days after application and 40% by 120 days. Comparable treatment with a mixture of paraquat + diuron produced 95% control by 7 days and 0% by 120 days (Teng and The, 1990).

Complete eradication of *M. micrantha* from immature oil palm is important to ensure normal growth of the trees. In Indonesia, field experiments were conducted to determine the effectiveness of four translocated herbicides to control *M. micrantha* in immature oil palms. In all cases, the initial application was followed by a second. The best control was observed on plots that received 2,4-D amine, 2,4-D-sodium and ioxynil, applied 6 weeks apart, hexazinone + diuron at 4 weeks apart, and 2,4-D-sodium followed 6 weeks later by glyphosate (Mangoensoekarjo, 1978).

In a similar study of *M. micrantha* in young oil palm plantations in Indonesia, picloram + 2,4-D gave the best results but glyphosate gave only moderate control after 4 weeks. Regrowth of the weed and phytotoxic symptoms on oil palm were not observed on any plots up to 6 weeks after treatment (Hutauruk et al., 1982).

Triclopyr + picloram showed the best results in control trials of the weed in Indian forest plantations (Sankaran, 1999). The use of herbicide in China has been reviewed by Zhang et al. (2004).

Biological Control

In Trinidad, nine insects were identified as potential agents for biological control for *M. micrantha*. These included *Acalitus* sp., *Liothrips mikaniae*, *Teleonemia* sp., *Desmogramma conjuncta*, *Physimerus pygmaeus*, *Omoplata* sp., *Apion luteirostre* and *Pseudoderelomus baridiiformis* (Cock, 1982).

Of these, *L. mikaniae* was recommended as the most promising arthropod natural enemy for introduction into Asia and the Pacific as a biological control agent. The first attempt was made in the Solomon Islands in 1988 and 1989 but it failed to become established (Julien, 1992). Teoh et al. (1985) proposed its introduction into Malaysia. First releases were made at several sites during 1990-1991 but again without success. A further effort was made in 1992 when repeated releases were made at the same site. Field inspections were carried out to monitor the site and it was found that the thrips died out after 8 months as a result of predation by spiders, ants and a native predatory thrips (Ismail, 1996). Further attempts to achieve biological control should concentrate on other potential control agents, including pathogens.

In the early 1980s, numerous surveys and experiments were conducted by research workers in Malaysia to investigate the possibility of biological control of *M. micrantha*. A survey of insects and fungal pathogens associated with it indicated that the majority of pests and pathogens caused insufficient damage to the weed or had detrimental effects on the crops.

In Indonesia the control agent *Actinote anteas* from Costa Rica investigated in the biological control of the related Chromolaena odorata has been found to feed on *M. micrantha* in the field. The young instar caterpillars scrape the epidermis on both sides of the leaf but do not appear to attack the petiole. Instead they bind several leaves together with silk threads to form a shelter that may contain thousands of caterpillars. This insect may prove to become a valuable biological control agent (Desmier de Chenon et al., 2002).

Of the potential agents identified by Barreto and Evans (1995) a strain of the rust *Puccinia spegazzinii* from Trinidad has been identified as having great potential. It was found to be highly pathogenic to all the major weed biotypes and is specific to *M. micrantha*. It attacks not only the leaves but also the petioles and stems, leading to ring-barking and death, whereas other potential agents only cause severe damage to the leaves. A protocol for importation is in progress (Evans et al., 2001).

Detailed and lengthy reviews on the biological control of this weed are provided by Julien (1992), Waterhouse (1994), and Cock et al. (2000).

USES

M.. micrantha has been used as a medicinal herb in different countries. The gum of the leaves is used for treating snake bites by some tribal people. In Fiji, the leaves are applied as a poultice for ant bites and bee stings. In Ecuador, it is reportedly used as a rat poison (Holmes, 1975). The crushed leaves of *M. micrantha* are used as a topical ointment for eliminating discomfort of hornet, bee and ant stings (Parham, 1958).

PESTS

Pests listed in the database

Minor host of:
Phenacoccus madeirensis (cassava mealybug)

Host of (source - data mining):
Asperisporium mikaniae , *Asperisporium mikaniigena* , *Cercospora mikaniicola* , *Pseudocercospora plunketii*

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