GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Pueraria montana var. lobata***

Pueraria montana var. lobata 简体中文 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae

Common name

gan ge teng (Chinese), Kudzu-Kletterwein (German), vine-that-ate-the-South (English), kudzu vine (English), kuzu (Japanese), kudzu (English), vigne japonaise (French), aka (Tongan), aka (English, Wallis and Futuna), wa yaka (English), wa yaka (Fijian), foot-a-night vine (English), fen ge (Chinese), Ko-hemp (German), aka fala (Niuean), Kopoubohne (German), shan ge teng (Chinese), nepalem (French), gan ge (Chinese), Japanese arrowroot (English), acha (English), fen ke (Chinese), aka (Niuean), akataha (Tongan), kudzu común (Spanish)

Synonym

Pueraria montana , (Lour.) Merr. var. *lobata* (Willd.)
Pueraria lobata , (Willd.) Ohwi
Dolichos lobatus , Willd.
Pueraria hirsuta , (Thunb.) C. Schneider
Pueraria thunbergiana , (Sieb. & Zucc.) Benth.
Pueraria lobata , var. *thomsonii* (Benth.) Maesen
Dolichos hirsutus , Thunberg
Pachyrrhizus thunbergianus , Siebold & Zuccarini

Similar species

Summary

Kudzu (Pueraria montana var. lobata) roots can eventually comprise over 50% of the plant's biomass, serving as an organ for carbohydrate storage for recovery after disturbance and making it difficult to control with herbicides. Only in the eastern United States is kudzu considered a serious pest, although it is also established in Oregon in the northwestern USA, in Italy and Switzerland, and one infestation on the northern shore of Lake Erie in Canada. Kudzu is considered naturalized in the Ukraine, Caucasus, central Asia, southern Africa, Hawai, Hispaniola, and Panama. Impacts of kudzu in the southeastern USA include loss of productivity of forestry plantations (estimated at about 120 USD per hectare per year), smothering and killing of native plants and denying access to lands for hunting, hiking, and bird watching.

view this species on IUCN Red List

Species Description
Kudzu is a leguminous, aggressive, stoloniferous and climbing semi-woody perennial vine with deciduous foliage. Semiwoody tuberous roots and vines originate in older plants from a knot- or ball-like root crown on top of the soil surface. Vegetative growth can be very rapid (up to 26 centimeters per day or 15 meters per growing season) with frequent unswollen nodes that root when on the ground to form new plants. Connective vines die within about 3 years. Stems are herbaceous becoming woody, 10 to 30 meters long, up to 30 centimeters thick; young vines are covered with tan to bronze hairs. Leaves are alternate with three leaflets (brown hairy above and silver hairy below) eight to 20 centimeters long and five to 19 centimeters wide, usually slightly lobed (unless in shade). Margins are thin membranous and fine golden hairy. Leafstalks are 15 to 30 centimeters long with long hairs, swollen bases, and deciduous stipules. Leaves have the ability to reorient rapidly in relation to the sun to optimize photosynthesis and decrease temperature and water loss (Forseth & Teramura, 1986). Flowers are pea-like, pink to purple with yellow centres, borne in compactly-flowered hanging or erect racemes (10 to 25 centimeters long) and have the fragrance of Concord grapes (*Vitis* sp.). Flowers commonly occur in pairs (or threes) from a given raised node (Godfrey, 1988). Flowers are produced on plants exposed to direct sunlight and pollination is by insects. Flowers and fruits are produced only on vertically twining and hanging vines. The four to seven centimeter long seed pods are relatively flat and bulging above the seeds, hairy and mature in early fall becoming dry and tan to split on one or both sides to release three to 10 seeds or detach intact. The pods produce only a few viable seeds in each pod cluster. The compressed kidney-shaped seeds are nearly round and about three to four millimeters long (Frankel, 1989; USDA, 1976; Uva *et al*., 1997; Virginia Native Plant Society, 1999 in Mitich, 2000). Seeds are dispersed by wind, animals, and water. Kudzu also possesses large root tubers up to two meters long and 18 to 45 centimeters wide that can weigh as much as 180 kilograms on old plants and can reach a depth of one to five meters with high starch and water contents (EPPO, 2007). Roots can comprise over 50% of the plant's biomass (Wechsler, 1977 in Newton *et al*. 2007), serving as a storage organ for carbon and water (Forseth & Innis, 2004) and nodules contain nitrogen fixing cyanobacteria. This description was taken from Mitich (2000), Miller (2003), and EPPO (2007) except where stated.

Notes
Climate Change: Jarnevich and Stohlgren (2009) examined how the potential distribution of kudzu will be affected by changing climate and created habitat suitability models that indicate that *P. montana* may increase its distribution particularly in the Northeast United States with climate change and may decrease in other areas. Predictions of global warming include increases of 3°C to 5°C in mean global temperatures (IPCC 2001, in Forseth and Innis 2004). These trends should favor the spread of *P. montana* (Forseth and Innis 2004). Kudzu has recently showed northward and westward migration patterns in the United States that correlate with warmer winters and higher CO^2 levels (Ziska *et al*. 2009).\r\n
Related Species: *P. montana* var. *lobata* is the variety that has been introduced into the United States and South America. The range of this variety overlaps with that of *P. montana* var. *montana* in China south of the Yangtze River to Hong Kong. The distribution of *P. montana* var. *montana* also includes Vietnam, Burma, Laos and Thailand. In these countries, and in southern China, *P. montana* var. *montana* shares its distribution with *P. montana* var. *thomsoni* and and *P. montana* var. *chinensis*. Specimens from northeast India were identified as *P. montana* var. *thomsoni* (van der Maesen 1985, in Britton *et al*. 2002).\r\n
This profile pertains to *Pueraria montana* var. *lobata*. Characteristics that had been used previously to differentiate *P. montana* from *P. lobata* and *Pueraria thomsoni* (Benth.) are lobed leaflets, and the size of wing and keel petals, all of which can be quite variable. For information on the taxonomy of *P. montana* please see Ward (1998).

Lifecycle Stages
Seedlings develop a woody root crown, with multiple runners and extensive tuberous roots (Britton *et al*. 2002).

Uses
Kudzu's greatest potential today may be the powdery extract derived from the plant's roots used as cooking starch. Kudzu leaves, shoots, and flowers are used in salads, soups, sauteed dishes and casseroles. Kudzu has medicinal properties and has been used for millennia in China and Japan to cure a wide range of common ailments (Shurtleff and Aoyagi 1977. In Japan, young kudzu vines are harvested to provide supple waterproof fibers for weaving sturdy wicker baskets or trunks. The cellulose fiber from large vines and roots is used as the basic raw material for making fine traditional paper. The fiber is also used to stuff cushions, beds, and chairs. When burned, it acts as a mosquito repellent (Shurtleff and Aoyagi 1977, in Mitich 2000). Kudzu has been used to produce an unusually fragrant, flavorful honey. Its leguminous roots host nitrogen-fixing bacteria that enrich the soil (Shurtleff and Aoyagi 1977). Kudzu has also been successfully used in the experimental production of methane and gasohol (Hipps 1994, in Mitich 2000). The main uses of kudzu in the United States have been for erosion control and as a forage crop; while kudzu is still valued as a soil-conserving plant for erosion control on steep slopes and embankments, less invasive species are now available for stabilization purposes (Birdsall and Hough-Goldstein 2004).

Habitat Description
The typical natural habitats of kudzu are open lands or shrub lands adjacent to broad-leaved or mixed forests, but it readily invades managed habitats such as road and rail embankments, abandoned pastures, and banks of inland water bodies (EPPO 2007). It colonises a wide variety of natural and semi-natural habitats (EPPO 2007), for example forest edges, disturbed areas or scrub vegetation (van der Maesen 1985 1994 2002; Halim 1992, in Heider *et al*. 2007). While tropical kudzu (*P. phaseoloides*) thrives in humid and low altitude habitats, kudzu prefers warm to temperate zones or higher altitudes (van der Maesen 1985 1994 2002; Halim 1992, in Heider *et al*. 2007). Kudzu thrives in full sun habitats; growth rates and survival are reduced in shaded stands of trees (Abramovitz 1983; Forseth and Teramura 1987, in Forseth and Innis 2004; Carter and Teramura 1988). \r\n
Kudzu grows well with annual precipitation of 1000 to 1500 millimeters on sand or clay soil (Sun*et al*. 2006). Because of its large roots which act as water reservoirs, kudzu can also withstand fairly dry climates (Shurtleff and Aoyagi 1977, in Mitich 2000; Zhang and Ye 1990, in Sun *et al*. 2006). It prefers high summer temperatures (over 27°C) and deep, well-drained loamy soils. However the plant is able to survive in frosted and shallow soils even though its roots cannot develop fully (Pron 2006, in EPPO 2007). It is relatively indifferent to soil pH; according to soil analyses the plant can grow in soils with a soil pH from 3 to 8 (EPPO 2007). \r\n
In Japan kudzu ranges in latitude from 44°N to 30°N. It grows abundantly in mountainous areas up to an elevation of 1000 m; it is also found in lowland areas and on many of the small islands. In Korea it grows in areas where the temperature drops to -30°C (Shurtleff and Aoyagi 1977, in Mitich 2000).

Reproduction
The mating system of *P. lobata* includes both sexual reproduction through bee pollination and asexual reproduction through rhizome spread (Sun *et al*. 2005).\r\n
Sexual: The large purple flowers of *Pueraria* are produced in relative abundance with a sweet aroma; its corolla (petals) is papilionaceous (shaped like a butterfly) and 14 to 20 mm long (Sun *et al*. 2005). Kudzu is insect-pollinated, and the extremely low viability of seeds in its introduced range is assumed to be due to a lack of suitable pollinators (EPPO 2007). Thornton (2001, in Forseth and Innis 2004) reported visitation by several native and naturalized pollinators, the most prominent being native Hymenoptera. Insect predation of seeds has been reported to average over 80% for populations in North Carolina, and reports of successful seedling establishment remain rare (Kidd 2002, in Forseth and Innis 2004).\r\n\r\n
Asexual: Kudzu roots easily from nodes and has a large tuberous root system, producing extensive clonal spread (Pappert Hamrick and & Donovan 2000). Little biomass is allocated for structural support, allowing kudzu to invest its resources into vine expansion and increased photosynthetic area (Sasek and Strain, 1988, in Pappert Hamrick and Donovan 2000).

Nutrition
Kudzu can be found growing in a wide range of soil types with little to no special nutrient requirements.

General Impacts
For a detailed account of the environmental impacts of *P. montana* var *lobata* please read: *Pueraria montana* (Kudzu) Impacts Information. The information in this document is summarised below.
Kudzu is widely believed to drastically reduce biodiversity because of its ability to smother other vegetation and develop large-scale monocultures (Alderman 1998; Forseth and Innis 2004, in Sun *et al*. 2006). It can climb overtop and subsequently kill new seedlings or mature trees (Berisford, Bush andand Taylor 2006). Forestry problems associated with aggressive vines such as kudzu include mortality of edge trees, exclusion of native plant species, and potential to increase fire hazard during winter (Putz 1991, in Harrington Rader-Dixon & Taylor 2003). \r\n\r\n
Kudzu constrains urban, suburban, and rural development in highly infested areas (Blaustein 2001). Eradication and clearing must occur to safeguard open space, parks, structures, and buildings. \r\n\r\n
Ecosystem Change: Few plants can survive once smothered by kudzu and small ecosystems can be radically altered. Infestations quickly spread in open habitats, rapidly covering the soil and low growing vegetation, and only slowed by adjoining forests. Kudzu can affect indigenous plants and completely modify the structure of the ecosystem (Clabassi *et al*. 2003, in EPPO 2007). Kudzu may have a disproportionate effect on animals with specific mutualisms or feeding relationships with trees or shrubs suppressed by its growth (Forseth and Innis 2004). \r\n\r\n\r\n
Reduction in Native Biodiversity: Kudzu is invading National Parks in the USA and when it does encroach on natural areas it kills trees and plants by growing over them (EPPO 2007). Pron (2006, in EPPO 2007) found that there was a reduction in the number of species in invaded places: while 20 to 25 species grew in 4 m² of non-invaded meadow or forest, only 6 to 9 species grew in 4 m² invaded by kudzu. \r\n\r\n\r\n\r\n\r\n\r\n\r\n\r\n\r\n\r\n\r\n
Competition: Key traits of kudzu that contribute to its ability to spread rapidly and dominate natural communities are its high allocation to extension growth and leaf area instead of support structures; frequent rooting of stems at nodes in contact with the soil, rapid leaf movements, high leaf level photosynthetic rates accompanied by high leaf area indices, large hydraulic capacitance in roots and rhizomes, and the ability to fix atmospheric N2 (Forseth and Innis 2004). This unique combination of traits makes *P. montana* an extremely aggressive competitor in the eastern deciduous and southeastern USA mixed pine forest biomes (Forseth and Innis 2004).). Kudzu vines can tie trees together and the twining of vines on vines exhort tension to pull trees down (Miller and True 1986).\r\n\r\n\r\n\r\n
Disease Transmission: Kudzu is a reservoir for soybean rust and *Phytophthora* species (EPPO 2007). \r\n\r\n\r\n
Modification of Nutrient Regime: *Pueraria montana* forms an initial interconnected ground cover of stolons and annually produces a thick leaf litter layer with high leaf nitrogen due to its nitrogen-fixing properties (Forseth and Innis, 2004). Kudzu has a symbiotic relationship with nitrogen-fixing bacteria (*Rhizobium* spp.) in root nodules and can almost double the concentration of nitrogen compounds in the topsoil (1 to 6 cm deep) (Pron 2006, in EPPO 2007).
Economic/Livelihoods:\r\nAs a rapidly growing vine, kudzu can cover and smother orchard and plantation crops, including young forest plantations. Where productive forest land has been overtaken, lost productivity is estimated at about 120 USD per hectare per year (EPPO 2007). Lost productivity in forests has been estimated at anywhere between $100 to 500 million per year (Blaustein 2001, Quimby *et al*. 2003, in Forseth and Innis 2004).

Management Info
Please follow this link for detailed information on *Pueraria montana* var. *lobata* Management Information. The information in this document is summarised below.
Preventative Measures: Collaborative strategies and programs for spread prevention should be enacted through: (1) improved laws, policies, and public education; (2) promotion of new corporate and personal ethics to not sell, buy, and plant invasive plants; (3) sanitization of personnel, equipment, and animals that move from or among infested sites; and (4) prohibitions against the sale and transport of contaminated products such as extracted native plants, potted plants, hay, pine straw, fill dirt and rock, and mulch.\r\n
A Risk assessment of *Pueraria montana* var. *lobata* for Australia and the Pacific was prepared by Pacific Island Ecosystems at Risk (PIER); the result is a score of 9 and the plant is considered likely to be a pest in the Pacific. \r\n
Physical Control: Burning and grazing may be effective in some cases but are impractical in most heavily infested areas such as urban areas and near highways (Everest *et al*. 1994, in Boyette Walker and Abbas 2002). Heavy grazing by cows, pigs, horses or goats (Rhoden *et al*. 1991, in EPPO 2007) can remove kudzu. However animals cannot eat vines growing over trees or in steep areas, watering holes must be provided and there must be enough livestock to ensure 80% of the plant is continuously consumed (Ball *et al*. 1979, Miller and Edwards 1983, in EPPO 2007). Bulldozing vines and roots into piles and then burning them can be used to eradicate kudzu. A variety of tools can be used to surgically remove root crowns, which effectively kills the plant.\r\n
Chemical Control: Clopyralid, picloram, triclopyr, metsulfuron and tebuthiuron exert various degrees of control, depending on soil type, meteorological conditions, herbicide formulation, seasonal application, characteristics of the kudzu stand, and frequency and number of herbicide applications (Kay and Yelverton 1998, Miller 1996, in Berisford Bush and Taylor 2006). When used as part of a forest regeneration program, the relative potentials of the herbicides to move into shallow groundwater were: tebuthiuron > picloram > metsulfuron > clopyralid > triclopyr (Berisford, Bush and Taylor 2006). \r\n
Biological Control: Biological control is potentially an important element of an integrated management system for kudzu, but is only at the experimental stage so far (EPPO 2007). A three-year survey in China of phytophagous insects of kudzu was conducted to establish basic information about their abundance, diversity of damage caused.A total of 116 phytophagous insect species in 31 families and five orders were collected in six feeding guilds: foliage, sap, stem, terminal, seed and root feeders. Several of these species have potential as biological control agents for kudzu in the USA (Sun *et al*. 2006). For a full list of phytophagous insects collected from kudzu in China between 1999 and 2001 please see Sun *et al*. (2006). \r\n
A number of pathogens may also be useful in controlling kudzu, including *Pseudomonas savastanoi* pv. *phaseolicola*.\r\n
Integrated Pest Management (IPM): The application of polyethylene sheeting as a thermal covering is a non-herbicidal method of controlling and eradicating kudzu (Newton *et al*. 2007). This type of thermal treatment is an effective method in an Integrated Pest Management programme used to restore these areas to their native vegetation (Newton *et al*. 2007). \r\n
For information about the potential use of kudzu as an agricultural and industrial resource see Tanner *et al*. (1979).

Pathway
The main potential pathway for entry of the plants into new areas is the movement and sale of plants for horticulture and agriculture (EPPO 2007).. After its introduction in the USA in 1876, *P. montana* was marketed as an ornamental plant and shade for porches in hot southern summers (Miles and Gross 1939, Edmisten and Perkins 1967, Blaustein 2001, in Forseth and Innis 2004). It is no longer available for sale in the USA.The main potential pathway for entry of the plants into new areas is the movement and sale of plants for horticulture and agriculture (EPPO 2007).

Principal source:

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ALIEN RANGE

[3] AMERICAN SAMOA
[1] EUROPE
[4] FRENCH POLYNESIA
[1] ITALY
[1] MEDITERRANEAN AREA
[1] NEW ZEALAND
[1] NORFOLK ISLAND
[2] SAMOA
[1] SWITZERLAND
[1] UKRAINE
[2] AUSTRALIA
[5] FIJI
[1] GREATER ANTILLES
[1] KIRIBATI
[1] MEXICO
[1] NIUE
[1] PANAMA
[1] SOUTHERN AFRICA
[8] TONGA
[42] UNITED STATES

Red List assessed species 6: CR = 1; VU = 1; LR/nt = 1; LR/lc = 3;

Sarracenia alata **LR/nt**
Sarracenia leucophylla **VU**
Sarracenia oreophila **CR**
Sarracenia flava **LR/lc**
Sarracenia minor **LR/lc**
Sarracenia psittacina **LR/lc**

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La lista de especies del Sistema de informaci–n sobre especies invasoras de m–xico cuenta actualmente con informaci–n aceca de nombre cient–fico, familia, grupo y nombre com–n, as– como h–bitat, estado de la invasi–n en M–xico, rutas de introducci–n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p–gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci–n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci–n novedades, para conocer los cambios.
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