

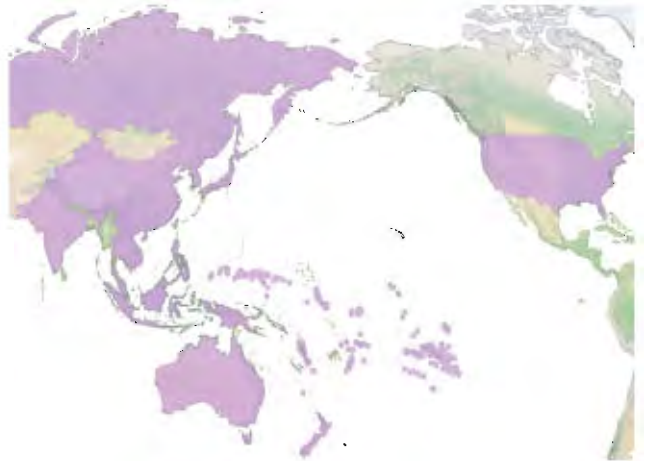
***Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Maesen & S. Almeida**

- Family** : Fabaceae
- Synonyms** : *Dolichos hirsutus* Thunberg
D. lobatus Willd.
- Common names** : Foot-a-night vine, Japanese arrowroot, kudzu, kudzu vine

Pueraria montana var. *lobata* is a highly aggressive vine that has spread to several countries in the tropics and subtropics posing a threat to native flora and fauna. It was introduced to many countries as a cover crop in rubber and other plantations crops and eventually escaped from these habitats. The vegetative growth is very rapid which adversely impacts the productivity of invaded plantations, if not managed. The beautiful purplish flowers appear in late summer and perfume the air. The plant root comprises over 50 percent of the plant's biomass, serving as an organ for carbohydrate storage for recovery after disturbance. The main mode of reproduction is vegetative.

Description : Gregarious woody climbers, roots thickened or tuberous, covered with long, yellow-brown hairs, tubers 1.8 m x 15 cm. Leaves alternate, 3-foliolate, 8-20 x 5-19 cm, slightly lobed, margins thin, fine golden hairy, leaf stalks 15-30 cm long with long hairs, swollen bases, and deciduous stipules. Flowers in many-flowered axillary racemes, 15-40 cm long. Flowers pea-shaped, violet, purple, blue or pink with a yellow spot near the centre, 1.4-2 cm long. Fruit a pod, densely brown-hairy, flat, oblong-linear, 9-12 cm long, 8-12 seeded. Seeds compressed, kidney-shaped, 3-4 mm long.

Habitat : The plant grows well under a wide range of conditions and most soil types. It is common in disturbed areas, natural and planted forests, agricultural areas, grasslands, abandoned fields and on roadsides and forest ridges. It grows best where winters are mild and the summer temperature is above 27° C. The plant cannot survive in very cold climates (below -15° C) but the roots may send up new growth in the spring. Spread is through runners and rhizomes and vines that root at nodes. Because of its large roots, which act as water reservoirs, kudzu can also withstand fairly dry climates. Kudzu can survive in both sunlit and shaded habitats, but it does best on sunny forest ridges.



Distribution : American Samoa, Australia, Bhutan, Cambodia, China, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, French Polynesia, Hong Kong S.A.R., India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, New Caledonia, New Zealand, Niue, Norfolk Island, Pakistan, Palau, Papua New Guinea, Philippines, Republic of Korea, Russian Federation, Samoa, Solomon Islands, Thailand, Tonga, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.



Threat and damage : The plant displaces or kills other plants by growing over them under a solid blanket of leaves. Once established, kudzu can conquer large areas within a short span of time. It causes mortality of forest-fringe trees and also increases the fire hazard during winter. Kudzu grows fast in invaded areas, rapidly covering the soil, affecting native plants and modifying the structure of the affected ecosystems. The plant can act as a reservoir for soybean rust and *Phytophthora* species.

Uses : The powdery extract derived from the plant root is used as cooking starch. The leaves, shoots and flowers are used in salads, soups and sautéed dishes. In China and Japan, the plant is used to cure a wide range of common ailments. The fibre from the vines is

used for weaving baskets and for paper-making. As the plant can fix atmospheric nitrogen, its growth will enrich the soil.

Management : Burning, grazing and cutting the vine just above ground level are practised. Herbicides such as clopyralid, picloram, triclopyr, metasulfuron and tebuthiuron are used to control kudzu. These are either applied at the cut end of the stem or sprayed on the foliage. Studies on biocontrol of kudzu using native pathogens like *Pseudomonas syringae* pv. *phaseolicola* (Burk.) Young *et al.*, *Myrothecium verrucaria* (Alb. & Schwein.) Ditmar and *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. are currently underway in the United States.



Rhamnus alaternus L.

Native : South Europe, Northwest Africa and West Asia

- Family** : Rhamnaceae
Synonyms : *Alaternus angustifolia* Mill.
A. balearica DuRoi ex Steud.
Common names : Alaternes, evergreen buckthorn,
Italian buckthorn

Rhamnus alaternus is a hardy evergreen ornamental that can grow in a wide variety of soil types including sand dunes and riparian environments. It develops dense leafy canopies under which native plants fail to thrive.

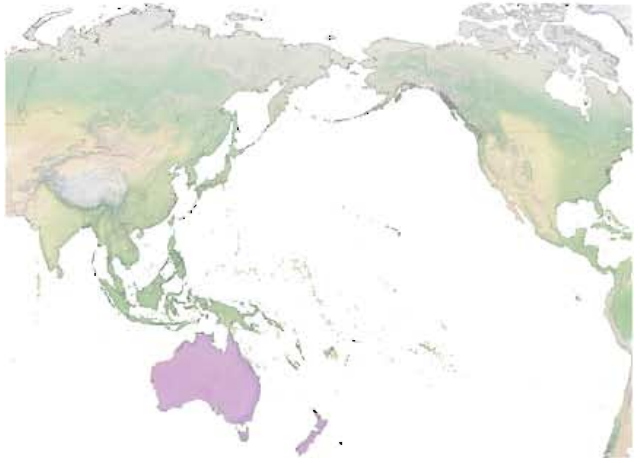
Description : Shrubs or small trees, to 5 m tall, dioecious, young shoot reddish, hairy. Leaves simple, alternate, glabrous except for bearding in the axils of the veins beneath, ovate to elliptic, 3-7 x 2-3 cm, acute, margin horny-serrate; petiole to 0.8 cm long. Flowers in condensed panicles, pentamerous, pale green, fragrant, 3-4 mm in diameter. Fruit a drupe, glossy, dark red, turning black at maturity, egg-shaped, to 7 mm across, 3 seeded, surrounded by endocarp.

Habitat : It grows in areas with a Mediterranean climate and is commonly found in agricultural areas, natural forests, riparian zones, waste areas, open woodlands and near watercourses. The plant tolerates salt, wind, poor soils, frost and heat. Seedlings tolerate deep shade and grow quickly when a light gap appears.

Threat and damage : The shrub is fast growing and resprouts vigorously from the base after damage. Its dense canopy affects the growth of native flora and prevents regeneration of trees and shrubs. The plant also alters the composition of vegetation associations impacting upon local fauna.

Uses : As a windbreak, hedge or as an ornamental plant. Also used for reforestation programmes in the Mediterranean region.

Management : Pull or dig small plants with roots. Cut down larger trees and treat with picloram in combination with 2,4-D and metsulfuron methyl. Biological control is unknown.



Distribution : Australia, New Zealand.



Robinia pseudoacacia L.

Native : Southeast United States

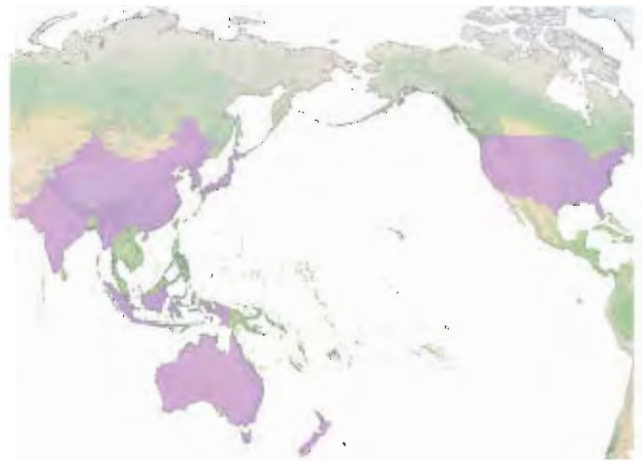
- Family** : Fabaceae
Synonyms : *Robinia pringlei* Rose
R. pseudoacacia var. *inermis* DC.
Common names : Black locust, false acacia,
post locust, yellow locust

Robinia pseudoacacia is a leguminous tree widely planted in temperate climates around the world to reclaim land and also for ornamental purposes. The genus *Robinia*, with its four species, is native to temperate regions of north America. It reproduces vigorously through root suckers and stump sprouting to form groves of trees interconnected by a common root system.

Description : Medium-sized trees, deciduous, bark grey brown to dark brown, longitudinally fissured, rarely smooth, branchlets grey brown, sparsely hairy, glabrescent; stipulate spines to 2 cm. Leaves pinnate, 10-40 cm, rachis adaxially grooved; petiole 0.1-0.3 cm, stipel acicular. Leaflets 2-12 pairs, opposite or subopposite, oblong, elliptic, or ovate, 2-5 x 1.5-2.2 cm, abaxially greyish-green with appressed pubescence when young, adaxially green, base rounded to broadly cuneate, apex rounded, margin entire, retuse and apiculate. Inflorescence an axillary raceme, 10-20 cm, pendulous, many flowered, fragrant, bracts caducous; pedicel 7-8 mm. Flowers pea-shaped, white with yellow spots, stipitate, to 1.5 x 2 cm across. Fruit a legume, brown or with reddish-brown stripes, linear-oblong, 5-10 x 1-1.7 cm, compressed, calyx persistent, apex volute and mucronate, carpopodium short, narrow wings along ventral suture, 2-15 seeded. Seeds brown to dark brown, slightly glossy, sometimes with stripes, subreniform, 5-6 x 3 mm, hilum rounded, oblique to one end.

Habitat : Grows in agricultural areas, natural forests, planted forests and disturbed areas. It easily adapts to environmental extremes such as drought, air pollutants, frost and high light intensities. Rapid growth rate, dense wood and the ability to fix nitrogen makes this plant ideal for greening degraded sites.

Threat and damage : The tree aggressively shades out other native vegetation and averts growth. The fragrant blossoms compete with native plants for pollinating bees.



Distribution : Australia, Bhutan, China, Democratic People's Republic of Korea, India, Indonesia, Japan, Myanmar, Nepal, New Zealand, Pakistan, Republic of Korea, United States.

Uses : The seeds and pod pulp are used as food. A strong narcotic and intoxicating drink is made from the skin of the fruit. Piperonal, a vanilla substitute is extracted from the plant. The fragrant flowers are used to make jams and pancakes. The wood is hard, rot resistant, durable and used for furniture and panelling. Flavonoids in the heartwood allow the wood to last over 100 years in soil.

Management : Seedlings can be pulled out. Treatments with herbicides like glyphosate, picloram or triclopyr are effective. Biological control is unknown.



Rubus discolor Weihe & Nees

Native : North Africa and Western Europe

- Family** : Rosaceae
Synonyms : *Rubus armeniacus* Focke
R. fruticosus L.
Common names : Armenian blackberry,
Himalayan blackberry

Rubus discolor is basically an ornamental plant but it is also cultivated for its fruits. It escaped from cultivated areas and became invasive. The thorny stems and bushy growth of the plant obstruct the movement of humans, wildlife and waterways. Mature plants form a tangle of dense arching stems with the branches rooting from the node tip when they reach the ground. The asexual mode of reproduction includes rooting at cane apices, through root suckers and root and cane fragments. Seeds are dispersed by birds and animals. Thickets of *Rubus* can produce up to 13,000 seeds per m² and each seed contains two ovules. The seeds can remain viable for several years.

Description : Scandant shrubs, rooting at nodes, young shoots pilose-pubescent, glabrous with age, stem angled and furrowed, bearing well-spaced, heavy, broad-based, straight or curved prickles, 0.6 - 1 cm long. Leaves 3-5 foliolate, pubescent beneath, glabrous above when mature, hooked prickles on petioles and petiolules, leaflets are large, broad, oblong, 6-13 cm long, dentate, upper surface bright green and smooth, lower surface greyish, hairy. Flowers, white or rose, 2-2.5 cm across, in large terminal clusters with branches in the lower axils; peduncles and pedicels tomentose, prickly. Fruit a drupe, roundish, black and shiny when ripe, to 3 cm across, succulent. Seeds light brown, triangular or irregular, surface deeply pitted, 2-3 mm long.

Habitat : The plant colonizes disturbed areas, planted forests, agricultural areas and near watercourses. It prefers full sunlight and light forest cover and can grow well in a wide range of soil types up to 1500 metres in elevation. The plant can tolerate flooding and it vigorously re-sprouts after fire.

Threat and damage : The plant forms large thorny thickets and dense shade, which affect native species diversity; such thick growth limits the movement of animals in gaining access to water. The thickets and leaf litter pose a potential fire hazard. Controlling the



Distribution : Australia, Japan, New Zealand, United States.

plant is very difficult as it can regenerate from small sections of root stock. The thorns injure the nasal passages of livestock during grazing. The plant has the potential to hybridize with native species of *Rubus*.

Uses : The fruits, buds and leaves are eaten by birds and small mammals. Fruits, roots and stems have medicinal properties.

Management : Digging up or hand-pulling small seedlings will help to control the weed. Cut stump and basal stem treatment using glyphosate or triclopyr is effective. Biological control is unknown.



Rubus niveus Thunb.

Native : South and Southeast Asia

- Family** : Rosaceae
- Synonyms** : *Rubus albescens* Roxb., *R. bonatii* H. Lévl., *R. boudieri* H. Lévl., *R. distans* D. Don
- Common names** : Ceylon raspberry, hill raspberry, Mysore raspberry

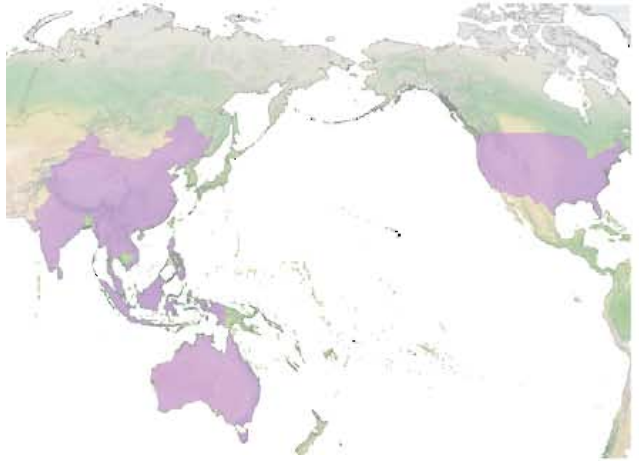
Rubus niveus has been introduced and cultivated in several tropical countries for its edible fruit. It can thrive well in a wide range of environmental conditions. The plant is propagated through seeds and cuttings. Seeds are dispersed by birds and animals.

Description : Scandent scrambling shrubs, to 4.5 m tall, stem prickly, glabrous, covered with whitish bloom, prickles 0.4 - 0.7 cm long. Leaves palmately compound, 5-7, terminal leaflets 5 - 17 x 4 - 8 cm, green above and white tomentose beneath. Leaflets ovate, dentate; petioles 1.5-5 cm long. Flowers pink or mauve, 1-1.5 cm in diameter, borne in dense clusters, 2 - 5 cm long. Fruit a berry, ovoid-globose, white, pink or deep purplish, 10 - 15 mm in diameter. Seeds small, irregular in shape, surface deeply pitted.

Habitat : The plant occupies natural forests, slopes, agricultural areas and riverbanks below 3 000 metres. The plant prefers wet habitats and well-drained acidic soils. It cannot tolerate drought.

Threat and damage : The plant can grow into dense bushes due to the arching and intertwining stems. These thickets with sharp thorns are a menace in wildlife habitats. Its invasion in agricultural land poses problems to farming and harvesting activities. Regeneration of native flora is also affected by *Rubus* invasion.

Uses : The edible fruit is juicy with a sweet and rich raspberry flavour. A purple or dull blue dye is obtained from the fruit.



Distribution : Australia, Bhutan, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, United States, Viet Nam.

Management : Mechanical control is difficult due to the sharp thorns and dense thickets. Isolated shrubs can be dug out. Drizzle application of triclopyr ester in a crop oil carrier is effective. Goats have been effective in controlling the shrub via grazing.



Saccharum spontaneum L.

Native : Tropical Africa and Asia

Family : Poaceae

Synonyms : *Imperata klagia* Jungh.
I. spontanea (L.) P. Beauv.

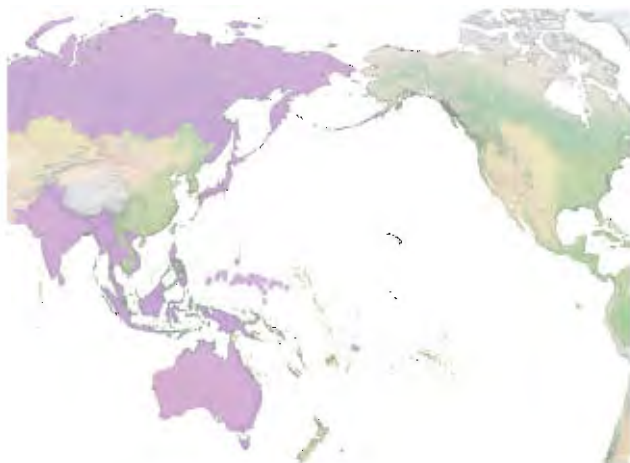
Common names : African fodder cane, Asian fodder cane, fodder cane, wild sugar cane

Saccharum spontaneum is a species of grass that grows in areas with moderate but prolonged dry periods. The extensive network of rhizomes and allelopathic effects of the plant impede growth of other plants. There are three distinct biotypes of *S. spontaneum*; plants found in dry areas are xerophilous, those in wetlands and swamps are hygrophilous and an intermediate type is found on loamy soils. The plant can propagate vegetatively via rhizomes and stem fragments. Seed dispersal by wind is aided by callus hairs in a parachute mechanism. Seed production is variable from around 3,000 to 12,800 seeds/plant.

Description : Perennial grass, to 3 m tall, erect, rhizomatous, nodes waxy. Leaves 45-110 x 0.6-1.2 cm, linear-lanceolate, base rounded, margins serrulate, apex acuminate, involute, glaucous; sheath to 40 cm in length, silky villous at the collar, ligules 4 - 5 mm long, ovate, membranous. Inflorescence of panicles, 20 - 32 cm long, densely silky white. Spikelets paired, one sessile and the other pedicelled, similar, 3 - 4 mm long, lanceolate, reddish-brown; callus densely long, villous, lower glume 3 - 4 x 1 mm, ovate-lanceolate, subcoriaceous, margins hyaline, ciliate. Upper glume 3-4 x 1mm, ovate-lanceolate, dorsally-keeled, margins ciliate. Lower floret empty. Pedicelled spikelets similar to the sessile ones. Caryopsis ca. 1.5 mm long.

Habitat : *S. spontaneum* is common in fallow fields, wastelands, riverbanks, roadsides and railroads. It is found in areas up to 1 500 metres in elevation and can withstand different soil types and moisture levels. The plant prefers rainfall that exceeds 1 500 mm. It has a high degree of tolerance to drought and flood.

Threat and damage : *S. spontaneum* is a serious weed of cultivated land and heavy infestation necessitates abandoning the area. In India, the plant affects the productivity of crops like tea, sugar cane, cotton and sorghum. It is a major weed in sugar cane crops in Bangladesh. In Indonesia, it affects the productivity of rubber and tea. The leachates from rhizomes and



Distribution : Australia, Bangladesh, Federated States of Micronesia, Guam, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Caledonia, Pakistan, Palau, Papua New Guinea, Philippines, Russian Federation, Samoa, Solomon Islands, Sri Lanka, Thailand, Viet Nam.



roots inhibit the growth of wheat varieties. The plant contains hydrocyanic acid and is toxic to livestock while green. It acts as an alternative host of many pests like the sugar cane top borer (*Scirpophaga excerptalis* Walker), Asian corn borer (*Ostrinia furnacalis* Guenee) and the white mite of sugar cane (*Schizotetranychus* spp.). *Saccharum* quickly colonizes disturbed soil.

Uses : It is a good fodder for goats and camels. The plant is used for thatching roofs or fencing vegetable

gardens in Nepal. The extensive rhizome network helps to bind soil and prevent soil erosion. Its roots are medicinal. Aqueous extract of the plant is reported to have mild antipsychotic activity.

Management : Deep ploughing and mulching are effective. Pre-emergence application of oxyfluorfen followed by oxyfluorfen + paraquat, bromacil, dalapon, amitrole and glyphosate are effective. Biological control is unknown.



Salix cinerea L.

Native : Europe, Russian Federation and West Asia

Family : Salicaceae

Synonyms : *Salix aquatica* Sm.
S. deserticola Goerz ex Pavl.

Common names : Grey sallow, grey willow, pussy willow

Salix cinerea, an aggressive shrub, common in wetlands and tolerant to a wide range of environmental conditions, is invasive in the Asia-Pacific region. It can divert stream flow and invade shallow water by layering of branches. The short-lived seeds are dispersed by wind and water.

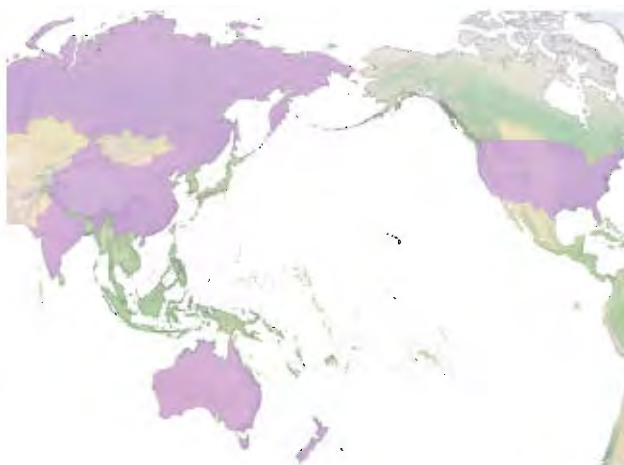
Description : Shrubs or small trees, bark dull grey, branchlets densely grey tomentose, buds brown, flattened, oblong, stipules reniform or semiobovate. Leaves simple, alternate, obovate or obovate-lanceolate, 4 - 10 x 1 - 1.5 cm, abaxially densely grey tomentose, adaxially dull green or greyish-green, base attenuate, margin shallowly serrulate, rarely entire, apex acute, lateral veins raised abaxially; petiole 5 - 7 mm. Flowering precocious or coetaneous; catkins appear in advance of the leaves, cylindrical, 2 - 3 cm long, male catkin 1-2 cm; bracts brown, spatulate, long pubescent. Flowers many, female catkin 3 - 4 cm, smaller and narrower. Fruit a small hairy capsule, to 10 mm long, with two valves, containing many tiny seeds.

Habitat : It is a weed of wet temperate regions commonly found along waterways, lake-edges, swamps and wetlands. It is capable of growing in a wide range of soils and can withstand permanent water logging.

Threat and damage : *Salix* spreads aggressively and forms thick growth along rivers, competing for space, water and nutrients. The thickets reduce light availability to understorey species and eliminate almost all vegetation. The species can alter the shape of riverbanks and streambeds through sediment accumulation and shading affects the richness and abundance of aquatic fauna.

Uses : It is used as an anodyne and febrifuge; also used in the treatment of rheumatism, arthritis, gout, inflammatory stages of autoimmune diseases, diarrhoea, dysentery, colic and headache. It is sometimes planted for soil stabilization.

Management : Seedlings and small plants can be



Distribution : Australia, China, India, New Zealand, Russian Federation, United States.

hand-pulled or dug out. Injection of stems and cutting and painting of stumps with common herbicides are effective. Biological control is unknown.



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Schinus terebinthifolius Raddi

Native : Argentina, Paraguay and Brazil

- Family** : Anacardiaceae
Synonyms : *Sarcotheca bahiensis* Turcz.
Schinus antiarthritis Mart. ex Marchand
S. terebinthifolia Raddi
Common names : Brazilian pepper, christmas berry,
Florida holly

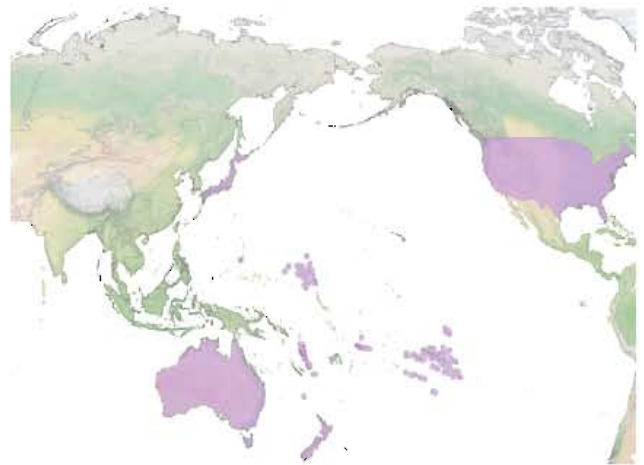
Schinus has been introduced by several countries for ornamental and shading purposes. It can be a pioneer plant in disturbed sites, but is also successful in undisturbed areas. The plant can shade out and affect growth and survival of native flora and fauna. The fruits have a paralyzing effect on birds and grazing animals when ingested. The leaves are aromatic when crushed, smelling like pepper or turpentine. This plant is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database. The seeds are dispersed by birds and mammals.

Description : Shrubs or small trees, to 7 m tall, dioecious, bark smooth, grey, exudate resinous, turn black on exposure. Leaves compound, alternate, rachis 3-14 cm, often winged, leaflets 5-9, lanceolate to elliptic, 1.5 - 7.5 x 1-4 cm, acute at both ends, margin entire to serrate, midribs, rachis and petiole are often reddish, especially when young; crushed foliage smells like turpentine. Inflorescence of a panicle mostly in axils. Flowers 1.2-2.5 mm long, white. Fruit a drupe, 4-6.5 mm in diameter, bright-red, pulp aromatic brown. Seeds one per drupe, elliptic, light brown.

Habitat : The plant is common along roadsides, in mangrove forests, natural forests, planted forests and grasslands. It is drought-resistant and can survive fire well. It is mostly associated with damp soils but can also appear as a dry savannah plant.

Threat and damage : The plant can form thick monospecific stands and displace native flora through release of allelopathic chemicals. The high concentration of volatile and aromatic monoterpenes in the plant causes respiratory problems, itchy skin rash and inflammation and swelling of the face and eyes in human beings.

Uses : The berries are used as a spice and serve as a good food source for wintering songbirds. The bark yields tannin and the wood is used for construction



Distribution : American Samoa, Australia, Fiji, French Polynesia, Guam, Japan, Marshall Islands, New Caledonia, New Zealand, Norfolk Islands, Samoa, Singapore, United States, Vanuatu.

purposes such as railway sleepers and posts.

Management : Seedlings and saplings can be pulled by hand. Fire is used as a control measure in fire-adapted communities. Herbicides such as triclopyr, bromacil and hexazinone are useful to manage the population of the weed. The Brazilian pepper leafroller, *Episimus utilis* Zimmerman, the Brazilian pepper sawfly, *Heteroperreyia hubrichi* Malaise and several fungal pathogens are being tested for their potential as biocontrol agents.



Securigera varia (L.) Lassen

Native : Europe, North Africa and Southwest Asia

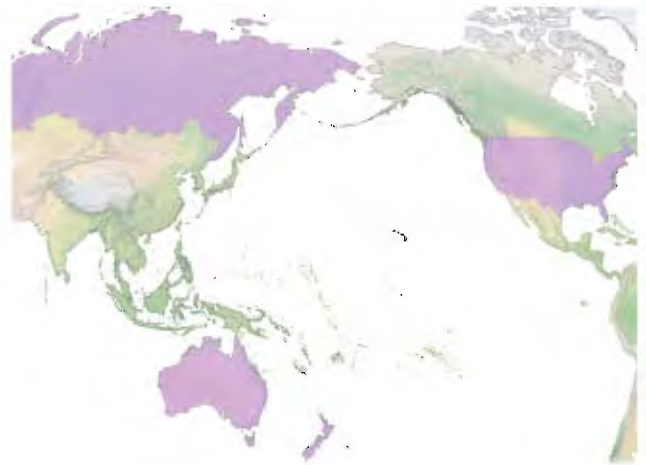
- Family** : Fabaceae
Synonyms : *Coronilla haussknechtii* Boiss.
C. hirta Boiss., *C. varia* L.
Common names : Axseed, crown-vetch,
trailing crown-vetch

Securigera varia, a perennial legume, is widely planted for ground cover on steep banks, mine reclamation sites and as a cover crop on cropland. It can invade and dominate over a variety of vegetation types. The plant reproduces vegetatively via rhizome sprouts. Seeds remain viable in the soil for less than a year to five years. The seeds are light in weight and 1 kg may contain around 240, 000 – 245,000 seeds.

Description : Rhizomatous subshrubs, densely branched, perennial, decumbent to ascending, with angular hollow stems, 1-1.5 m tall. Leaves pinnately compound, leaflets 11-21 pairs, ovate or linear-elongate. Inflorescence of racemes, umbellate, 15 - 20 flowered, peduncle exceeding leaves; pedicels twice as long as the cup. Flowers white, pink or purple, 12 - 13 mm in length; wings and carina almost white, beak dark red. Fruit a pod, 4.5 - 8 x 2 - 2.5 mm, narrowed towards apex, surface with longitudinal wrinkles. Seeds ovate-oblong, 3-3.5 x 1 - 1.5 mm, reddish brown.

Habitat : The plant creeps and spreads along the ground, blanketing anything on the way with its feathery compound leaves carried on thin wiry stems. Beneath the ground, it spreads by underground rhizomes sending up still more plants as it tries to cover the invaded areas. It tolerates drought, heavy precipitation and cold temperatures, but does not tolerate shade. The weed is adapted to all coarse- and medium-textured soils, but does not grow well in fine-textured, saline and alkaline soils.

Threat and damage : Rapid vegetative spread and prolific seeding ability help *S. varia* to create dense, single-species stands. It can alter ecosystem functions and nutrient cycling, leading to further degradation of infested habitats. When it invades new habitats, soil nitrogen increases and the overall fuel-load changes in fire-adapted communities. It can be poisonous to single-stomached animals if eaten in large quantities.



Distribution : Australia, New Zealand, Russian Federation, United States

Uses : An excellent soil binder that quickly covers slopes, especially dry rocky slopes. It is commonly used on sloping highway shoulders. The whole plant, used either fresh or dried is a cardi tonic. A decoction of the bark has been used as an emetic. The crushed plant is rubbed on rheumatic joints and cramp limbs for relief.

Management : Hand-pulling may be effective to control small initial infestations. Mowing plants in the flower bud stage for two or three consecutive years may reduce the vigour and control further spread. Plants should be cut close to ground level before the seeds mature. Dicamba, glyphosate, triclopyr or clopyralid may be used, and glyphosate can be foliar-applied for good control when the weed is actively growing. Clopyralid is a more target-specific herbicide than others. Biological control is unknown.



Sida acuta Burm. f.

Native : Central America

Family : Malvaceae

Synonyms : *Malvastrum carpinifolium* (L. f.) A. Gray
Malvinda carpinifolia (L. f.) Medik.

Common names : Broomweed, southern sida,
spiny-head sida

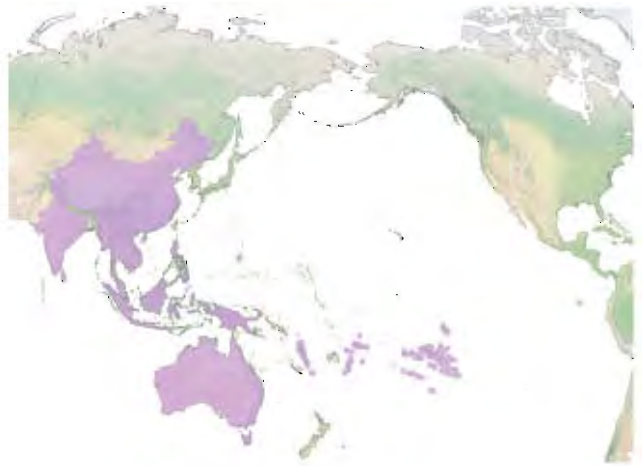
Sida acuta, a native of Central America, is a pantropical weed. The plant is sometimes confused with *Sida rhombifolia* but *Sida acuta* differs from the former by its smaller and narrower leaves. It is widely cultivated as a medicinal plant and is an integral component of Indian Ayurvedic medicine. It is among the top 100 of the world's most serious weeds. The plant will flower throughout the year. The germination rate of seeds is very high.

Description : Perennial subshrubs, to 1 m tall, branchlets pilose or subglabrous. Leaves simple, distichous, ovate, oblong, lanceolate, or linear-lanceolate, 1.2-9 x 0.5-4 cm, both surfaces glabrous or sparsely stellate pilose, rarely with simple hairs adaxially; base obtuse, margin dentate, sometimes partly entire above, apex acute or acuminate. Stipules filiform, usually persistent. Flowers solitary or paired, axillary, sometimes congested at the stem apex, yellow, less often white or yellow-orange. Fruit a capsule, hard, brown, 3-5 mm in diameter, breaking into 5 - 8 triangular segments, each segment contains one seed with a pair of sharp awns, roughly triangular, with a deep depression on each of the sides, reddish-brown or black.

Habitat : *S. acuta* is commonly found in pastures, wastelands, cultivated lands, open areas, along roadsides and in degraded forests. It can grow well in most soils and commonly occurs from near sea level up to 1500 metres elevation.

Threat and damage : The plant is a major problem for plantation crops and vegetables. In Sri Lanka, it is a weed in tea plantations and in Mexico it is a nuisance in maize fields. Once established, the plant will compete with the native flora and displace them. The deep taproot helps the plant to withstand drought.

Uses : Fresh leaves are used for dropsy and chronic renal failure. The plant has aphrodisiac, analgesic and anti-inflammatory properties. It is used to treat fever, headache, infectious diseases and as an astringent and



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antidote for scorpion stings and snake bites. *Sida* is cultivated in many parts of India for its medicinal properties. In Australia, the plant is traditionally used to treat diarrhoea. In Mexico, leaves are smoked for its stimulative effects. In some parts of India, *Sida* leaves are used in tea for the same purpose. Some traditional societies use the plant for the treatment of tuberculosis, chronic dysentery and urinary and cardiac diseases.

Management : Slashing or mowing before flowering are effective. Application of herbicides such as 2,4-D, glyphosate, dicamba, fluroxypyr and metasulfuron methyl are useful for short-term control. In Australia, a chrysomelid beetle viz., *Calligrapha pantherina* Stal, which causes defoliation in *Sida*, is now undergoing host specificity tests. The fungus *Fusarium lateritium* Nees (*Gibberella baccata* (Wallr.) Sacc.) is used as a biocontrol agent in the United States.



Solanum mauritianum Scop.

Native : South America

Family : Solanaceae

Synonyms : *Solanum auriculatum* Aiton
S. tabacifolium Vell.

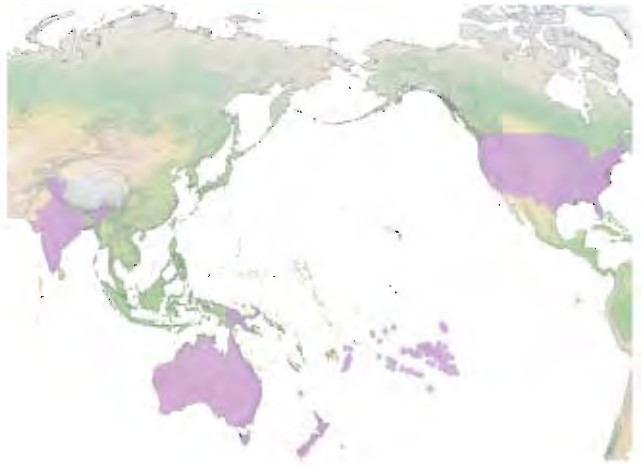
Common names : Bugweed, flannel leaf, kerosene plant, tobacco weed, wild tobacco

Solanum mauritianum is an ornamental plant that has escaped from gardens and started to occupy vacant lands and disturbed areas. All parts of the plant are poisonous to human beings especially the berries. The leaves emit a strong smell of diesel fuel when crushed. The plant can prevent growth of native vegetation by overcrowding. It is a favoured food plant of the African olive pigeon. The seeds are dispersed by birds and seed germination is stimulated by fire.

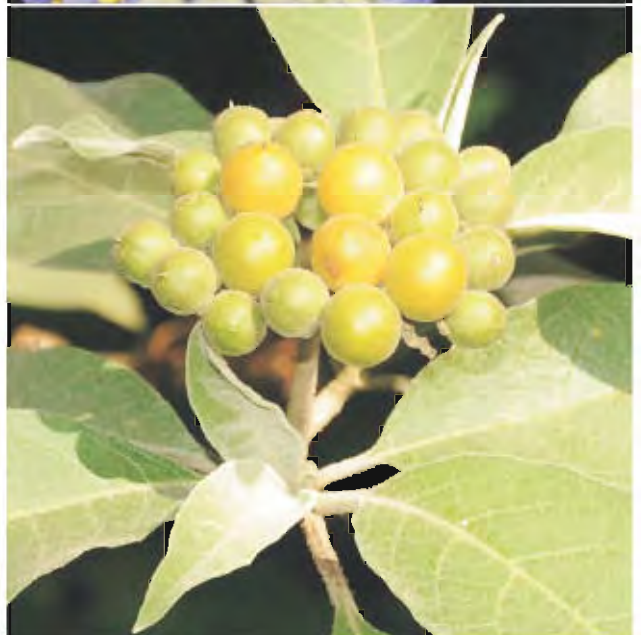
Description : Large perennial shrubs, branches form a rounded canopy, all parts densely pubescent with sessile to long-stalked stellate hairs, loose and floccose when young. Leaves simple, alternate, elliptic, 18 - 30 x 6-12 cm, entire, apex acuminate, base cuneate, often oblique; petioles 3 - 9 cm long, each with one or two smaller auriculate leaves in axils that are sessile, rounded and sometimes absent from weak or distal shoots. Flowers numerous, in branched corymbs, lilac blue with a pale star-shaped area at the base, stellate, 1.5 - 2.5 cm in diameter; peduncles to 15 cm long to first fork, pedicels 2-3 mm long. Fruit a berry, dull-yellowish, succulent, globose, 1-1.5 cm in diameter, pubescent at least in early stages. Seeds numerous, light brown or yellowish, flattened, 1.5 - 2 mm, testa minutely reticulate.

Habitat : It tolerates many soil types and quickly establishes in disturbed areas, agricultural land, natural forests, planted forests, riparian zones and urban areas. In Hawaii, it is naturalized on slopes and ridges of disturbed rain forest. It is common in high rainfall areas in New Zealand.

Threat and damage : It invades almost all ecosystems and forms dense stands that retard the growth of other species by overcrowding and shading. The dust from the plant can cause respiratory problems in men. Also, fine hairs on the plant are an irritant. In New Zealand, propagation and selling of this plant are illegal because of its aggressive growth and impact on human health. The plant is also allelopathic.



Distribution : Australia, Bhutan, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, India, New Caledonia, New Zealand, Norfolk Island, Papua New Guinea, Solomon Islands, Tonga, United States.



Uses : The fruit is a valuable food source for native birds that helps with long distance seed dispersal.

Management : Hand-pulling, digging out and ring barking trees are efficient mechanical control methods. Use of glyphosate, triclopyr and imazapyr

as foliar, basal stem or cut stump applications is reported to be effective. In South Africa, release of a sap-sucking lace bug, *Gargaphia decoris* Drake, has not been effective but a flower bud weevil *Anthonomus santacruzi* Hustache, which prevents fruiting, is currently under trial as a biocontrol agent.



Spathodea campanulata P. Beauv.

Native : West Africa

- Family** : Bignoniaceae
Synonyms : *Bignonia tulipifera* Schum.
Spathodea nilotica Seem.
S. tulipifera (Schum.) G. Don
Common names : African tulip tree

Spathodea campanulata is an evergreen tree with very large, red-orange, cup-shaped flowers. The corolla emerges from the calyx during the preceding afternoon and gradually swells, straightening its wrinkles and emitting a pleasant smell during the night. It favours moist habitats and will grow best in sheltered tropical areas. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. The tree flowers in spurts all through the growing season, but peak bloom is usually seen in the spring. A rare yellow variety of the tree is called *Lutea*. The seeds are mainly dispersed by wind but spread also occurs through root suckers and cuttings. The flowers are pollinated by birds and bats. Seeds are light and winged and dispersed by wind.

Description : Large trees, trunk buttressed, branches lenticellate, subglabrous to thinly puberulent. Leaves compound, usually opposite, rarely three at a node, to 50 cm long; leaflets broadly elliptic or ovate, entire, to 15 x 7.5 cm, puberulent and prominent beneath, apex very slightly acuminate, base asymmetrically obtuse, veins 7 - 8 pairs, lower leaflets tending to be reflexed, petiolule short, 2-3 mm, rachis brownish-puberulent; petiole to 6 cm long, thickened at base. Inflorescence a raceme, 8-10 cm long, with a pair of reduced leaves about halfway up the peduncle; rachis and pedicels thick, brownish puberulent, bracts subtending, pedicels lanceolate, curved, ca. 3-4 cm long, caducous; the pair of bractlets near the summit of the pedicel is similar, opposite. Flower bright vermillion or scarlet, 10-12 cm long, mouth of limb 7 cm across. Fruit a capsule, 15-23 cm long, slightly compressed, lanceolate-oblong, brownish, woody, 2-valved, splits open. Seeds many, 1.5 - 2.5 cm across, winged.

Habitat : *Spathodea* commonly grows in agricultural areas, natural forests and abandoned land. Though good growth is observed in moist, fertile, deep and well-drained loams, it can also tolerate dry and heavily-eroded sites and some salinity.



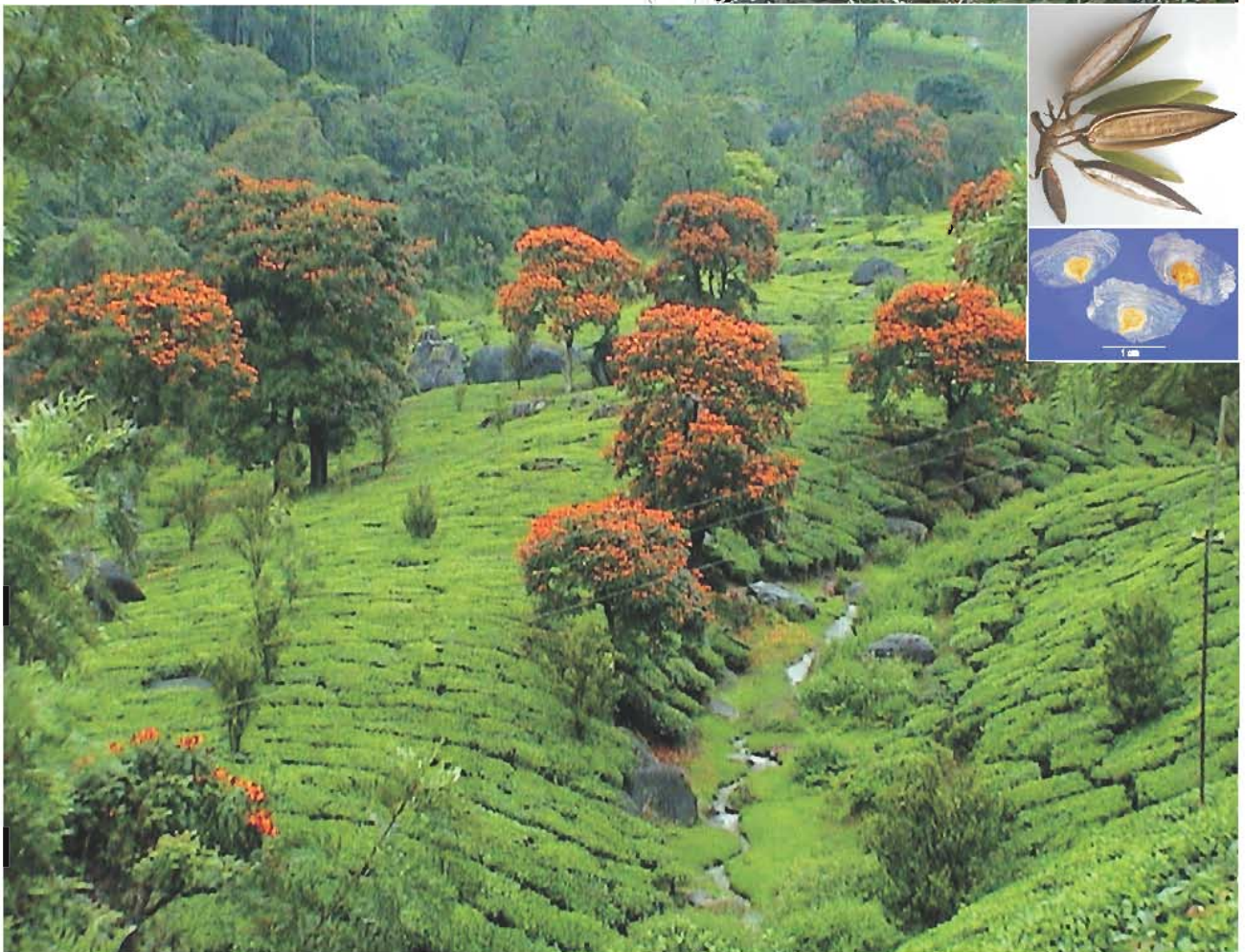
Distribution : American Samoa, Australia, Bangladesh, Bhutan, Brunei, China, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Indonesia, Kiribati, Malaysia, Marshall Islands, Myanmar, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, United States, Vanuatu, Wallis and Futuna Islands.



Threat and damage : *Spathodea* is capable of smothering other trees and crops and dominating in areas wherever it grows. The tree is a major problem in mature forests, where the seed germinates and forms understory thickets from which a few saplings grow into the canopy.

Uses : Grown as an ornamental tree in the tropics. The seeds are edible. In Singapore the timber is used for making paper and in West Africa, it is used to make drums and blacksmith's bellows. The bark, flowers and leaves are used in traditional medicine in its native home range. The tree is used for fire-resistant landscaping since its wood is not easy to burn.

Management : Hand-pull or dig out seedlings and young plants. Cut large plants and treat the stumps with herbicides such as dicamba and glyphosate. Saplings are sensitive to basal bark applications of 2,4-D and triclopyr. Biological control is unknown.



Sphagneticola trilobata (L.) Pruski

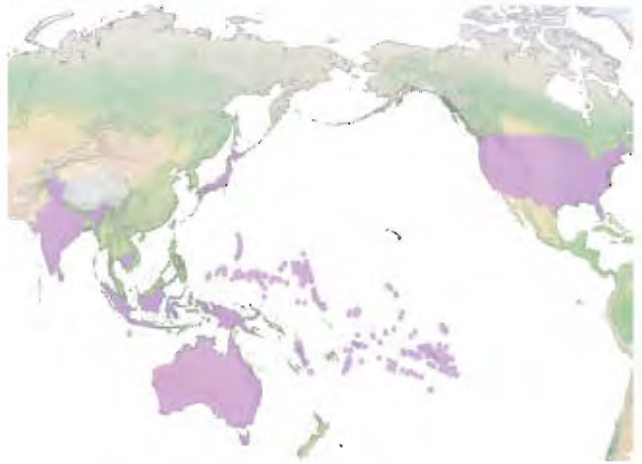
Native : Mexico, Central and South America and the Caribbean

Family : Asteraceae

Synonyms : *Acmella brasiliensis* Spreng.
A. spilanthoides Cass.
Silphium trilobatum L.
Wedelia trilobata (L.) Hitchc.

Common names : Creeping ox-eye, Singapore daisy, wedelia

Sphagneticola trilobata, widely cultivated as an ornamental, can readily escape from gardens and form dense ground cover, crowding out or preventing regeneration of other species. The weed is very toxic to wild and farm animals; aborted fetuses have been reported after animals have grazed on the plant. In the Global Invasive Species Database, it is ranked among the top 100 of the world's worst invaders. It is currently naturalized in many tropical areas. Stems form new plants where they touch the ground by readily taking roots. The main mode of spread is through garden waste. Vegetative propagation is common and the plant usually produces a few fertile seeds.



Distribution : American Samoa, Australia, Cambodia, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Japan, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Singapore, Sri Lanka, Tonga, United States, Vanuatu.

Description : Perennial prostrate and diffuse herbs, rooting at nodes. Leaves simple, dark green above, paler below, elliptic-obovate, usually with three angular lobes with toothed margins, acute at apex, base cuneate, 3-10 x 3-7 cm, glabrous to sparingly pubescent; petiole to 5 mm long. Flower heads radiate, solitary on bracteate peduncles, 2-2.5 cm across; peduncles strigose, 4-15 cm long. Involucre green; bracts lanceolate, 1-1.5 cm long, ciliate, inner narrower, ray florets 5-8, bright yellow, 1.5-2.0 x 0.5-0.7 cm, 3-4 denticulate, tube short, disc florets many, yellow, tube 5-8 mm long, 5-lobed; lobes deltoid, densely pubescent within. Fruit an achene, blackish, warty, 4-6 mm long, crowned by the persistent pappus cup.

Habitat : *Sphagneticola* is a noxious weed along road sides and trails in open and wasteland, agricultural areas, disturbed sites and garbage dumps. It is also invasive along streams, canals, mangroves and coastal vegetation. Since the plant has a wide ecological tolerance range, it is suited to dry and moist sites. It can grow on almost all soil types and is tolerant to dry periods, inundation and salinity. Though it prefers sunny sites for proliferation, it can grow in shady areas as well.



Threat and damage : *S. trilobata* will compete with crops for nutrients, light and water, and reduce yield.

Uses : The plant is an excellent ground cover in warm climates and is also used for soil retention and erosion control. *Sphagneticola* is very attractive because of nearly constant and prolific blooming. It must be mown to keep it low and manicured. The plant is used in traditional medicine; crushed leaves are used as a

poultice, tea is given to alleviate symptoms of colds and flu and it is used in combination with other herbs to clear the placenta after birth.

Management : The top few centimetres of soil needs to be removed along with the plant using a suitable tool such as a fire hoe to control spread. Application of glyphosate will keep the population under check. Biological control is unknown.



Tabebuia heterophylla (DC.) Britton

Native : South America

- Family** : Bignoniaceae
Synonyms : *Bignonia leucoxylon* L., *B. pentaphylla* L.,
Handroanthus pentaphyllus (L.) Mattos
Common names : Pink trumpet tree, white cedar,
whitewood

Tabebuia heterophylla is a deciduous tree introduced to many countries for ornamental purposes and its valuable timber. It can thrive under various environmental conditions and has become invasive, especially in humid and frost-free areas of Africa, Asia and Australia. The mature fruits are dark brown cigar-like pods and are seen on the tree throughout the year. The seeds are dispersed by wind. The seeds are so tiny that 1 kilogram will contain over 70 000.

Description : Small to medium size trees, crown narrow columnar, bark furrowed. Leaves palmately compound, opposite, leaflets 3-5, elliptic to oblanceolate or obovate, 6-16 cm long, leathery, acute-blunt, acute-rounded or oblique at the base, surfaces glabrous, margins entire; petiole 3-12 cm long. Inflorescence panicle, one to several flowers in terminal clusters. Flowers bilabiate, campanulate, 6-9 cm long, pink or lavender with a pale yellow throat. Fruit a narrow cylindrical capsule, 70-160 cm long, each contains numerous winged seeds. Seeds to 2 cm long.

Habitat : *T. heterophylla* is common in dry, coastal woodlands, secondary forests and abandoned pastures but is rarely seen in dry or wet natural forests. It can grow in sand, limestone, alluvial and heavy clay soil.

Threat and damage : The tree is a pioneer species that can spread rapidly and shade out other native plants by forming monocultures. Its thick litter prevents growth of native seedlings.

Uses : The wood of *Tabebuia* is widely used for flooring, furniture, interior work, boat building and sporting equipments. It is planted as an ornamental because of the large and showy flowers. It is used as a shade tree in coffee and cocoa plantations and in degraded sites as a soil improver.

Management : The seedlings can be dug up or cut. Chemical and biological control are not known.



Distribution : American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Marshall Islands, Northern Mariana Islands, Palau, Singapore, Solomon Islands, United States.



Tamarix ramosissima Ledeb.

Native : West Asia and East Europe

Family : Tamaricaceae

Synonyms : *Tamarix altaica* Nied.
T. eversmannii C. Presl ex Bunge
T. pentandra Pall.

Common names : Salt cedar, tamarisk

Tamarix ramosissima, an aggressive ornamental shrub, is a major invasive plant in Southwest United States and desert regions of California, consuming large amounts of groundwater in riparian and oasis habitats. The mature plants secrete salt from their stems and leaves that form a crust above and belowground inhibiting the growth of other plants. *Tamarix* drastically alters the habitat and food web, depletes water sources and increases erosion. It can produce roots from buried or submerged stems or stem fragments. The Global Invasive Species Database ranks *Tamarix* among the top 100 of the world's worst invaders. The seeds are tiny and without endosperm.

Description : Shrubs or small trees, bark reddish or reddish-brown. Leaves simple, alternate, bright green, sessile, ovate or deltoid cordate, 0.2 - 0.5 x 0.1 - 0.2 cm, acute, subamplexicaul. Inflorescence in summer appears as densely compound racemes, in spring they are simple, loose, 1-7 x 3-5 cm; peduncles 0.2 - 1 cm, bracts ovate, trullate, triangular, 1.5 - 2 x 0.5 mm, acute or acuminate, with denticulate margin especially in their lower parts; pedicel ca. 0.5 mm long. Flowers pink to pinkish-purple, rarely white. Fruit a capsule, trigonous, 4-5 x 0.75 - 1 mm, dehiscing by three longitudinal slits. Seeds ca. 0.5 mm long with a tuft of hairs at one end, ca. 2 mm.

Habitat : The plant invades agricultural areas, coastlands, disturbed areas, urban areas and watercourses. It grows well in damp places, especially on saline and alkaline soils.

Threat and damage : The plant is an ecological as well as an environmental problem because it can degrade natural ecosystems by altering their physical and chemical properties. It is an aggressive colonizer and can form dense monotypic stands, replacing native flora. It can also cause water stress to native vegetation by lowering the water table. Its extensive root system can choke stream beds resulting in floods.



Distribution : Australia, China, Democratic People's Republic of Korea, Mongolia, Pakistan, Republic of Korea, Russian Federation, United States.

Uses : Used mainly as an ornamental plant and for preventing soil erosion. The wood is used in furniture-making, as fuelwood and for tannin extraction.

Management : Hand-pulling can be used to remove small plants. Aerial application of imazapyr in combination with glyphosate is effective. The cut stump method is successful with triclopyr application. Grazing by cattle is reported to control growth and spread. The saltcedar leaf beetle (*Diorhabda elongata* [Brulle] sensu lato) is an effective biocontrol agent.



Tradescantia spathacea Sw.

Native : Mexico, Central America and the Caribbean

- Family** : Commelinaceae
- Synonyms** : *Ephemerum bicolor* Moench
E. discolor Moench
Rhoeo discolor (L' He'r) Hance
- Common names** : Boat lily, boat plant, Moses-in-a-basket, Moses in a boat, oyster plant

Tradescantia spathacea is a herbaceous succulent introduced to many countries for its ornamental leaves and flowers. It is an invasive weed in Florida where it disrupts the native plant ecosystem. The plant flowers all year round and is pollinated by insects or self-pollinated. It reproduces by seeds and stem cuttings. The seeds are wind-dispersed.

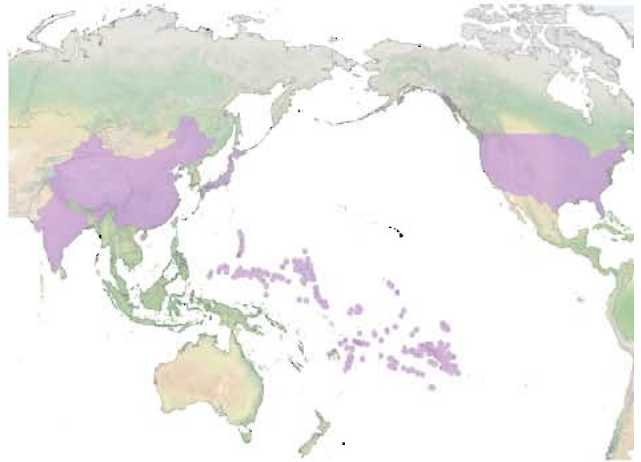
Description : Perennial erect herbs, often forming clusters, simple, glabrous. Leaves alternate, sometimes seemingly spirally arranged, sessile; leaf sheath sometimes pilose at the mouth, lamina dark green adaxially, purple abaxially, oblong-lanceolate, 20-40 x 3-6 cm, glabrous, somewhat fleshy, base narrowed and semi-clasping, apex acuminate. Inflorescence axillary, short; bracts subsessile, boat-shaped. Flowers white, 3-6 mm, many-flowered, clustered with in a folded bract, 3-4 cm long, short stalked from leaf axils. Fruit a capsule, three-valved, rugose, 2-seeded, in clusters with in the bract.

Habitat : The plant grows well in natural forests and is occasionally seen in urban areas. It sometimes grows as an epiphyte and being drought-resistant, it can grow on sand or even coral outcrops. The plant can grow in high- to medium-light conditions.

Threat and damage : It forms dense cover and clumps quickly and can prevent germination of forest seeds. It causes stinging, itching and rashes in humans if the plant surface or the copious astringent juice is contacted. If eaten, it may cause severe burning in the mouth and throat.

Uses : A favorite garden plant in the tropics. The leaves are eaten by raccoons. The flower is used as a medicine to treat dysentery, enterorrhagia and hemoptysis.

Management : Pulling up or digging out seedlings and treating them with common herbicides are usual control methods. Biological control is unknown.



Distribution : American Samoa, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Japan, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Samoa, Tonga, United States, Wallis and Futuna Islands.



Ulex europaeus L.

Native : Central and West Europe and the British Islands

Family : Fabaceae

Synonyms : *Ulex armoricanus* Mabilie
U. compositus Moench, *U. europaea* L.

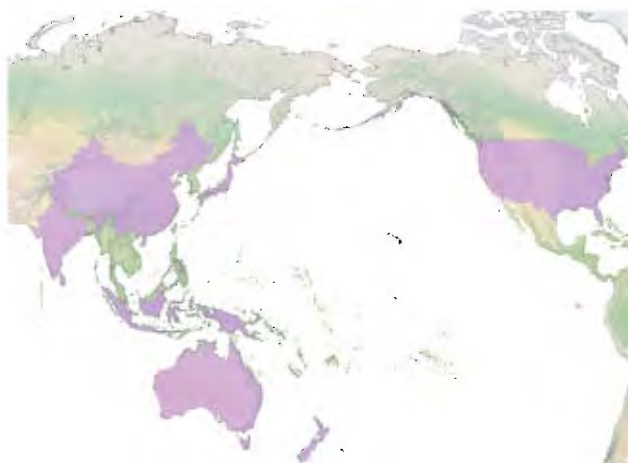
Common names : European gorse, furze, golden gorse

Ulex europaeus is a spiny evergreen legume that can grow in dense thickets and exclude grazing animals from rangelands and pastures. Its invasion in plantations interferes with operations, increases pruning and thinning costs and affects the growth of seedlings. It is ranked among the top 100 of the world's worst invaders by the Global Invasive Species Database. The species can be recognized by its thorny impenetrability, yellow flowers and the conspicuous appendage over the seed scar. Seeds may remain dormant yet viable in the soil for up to 30 years, with one report of 70 years of dormancy.

Description : Perennial shrubs, to 2.5 m tall, stem woody, densely-branched, spiny, rooting at nodes, green to brown when mature, longitudinally ridged, hairy, with numerous long spines modified into primary branches; secondary branches with primary, secondary and tertiary spines. Leaves compound, leaflets 3 in seedlings but reduced to 4.5 - 6.5 cm long spines on maturity such that plants are densely covered with sharp spines. Flowers yellow, showy, fragrant, mostly axillary or in terminal clusters, 15 - 20 mm long. Fruit a pod, hairy, 1 - 2 cm long, slightly compressed. Seeds 2 - 6, 2 - 4 mm across, rounded at one end, broader and shallowly notched at the other, with a conspicuous straw-coloured appendage over the scar, smooth, shiny, olive green to brownish.

Habitat : *Ulex* grows profusely in agricultural areas, coastlands, grasslands, roadsides, ruderal/disturbed areas, natural and planted forests, scrub/shrublands, watercourses and wetlands. The geographical distribution of the plant is mainly determined by temperature. It cannot survive in arid climates or in continental regions. Day length may also affect its latitudinal distribution, as short-day conditions inhibit maturation, thorn formation and flowering. The plant will grow on most soil types and on shady slopes with high soil moisture and good drainage. Optimal growth is observed with soil pH of 4.5-5.

Threat and damage : The plant is extremely competitive and as such it displaces cultivated and



Distribution : Australia, China, India, Indonesia, Japan, New Zealand, Papua New Guinea, Sri Lanka, United States.



native plants, and alters soil conditions by fixing nitrogen and acidifying the soil. It creates an extreme fire hazard due to its oily, highly flammable foliage, seeds and litter. *Ulex* may also increase erosion on steep slopes where the plant has replaced grasses or forbs. Spiny and mostly unpalatable when mature, *Ulex* reduces pasture quality where it invades rangeland.

Uses : Used as a hedge plant and windbreak. On marginal land, it is a source of food for cattle and ponies. Lectins extracted from the seeds will bind selectively to certain glycoproteins and glycolipids, and are widely used in tissue typing. Flowers of *Ulex*

are used in the treatment of jaundice and scarlet fever in children.

Management : Hand-pulling of seedlings and bulldozing of large stands are generally used. Mature plants are difficult to kill with a single application of any herbicide. Use of herbicides such as picloram, triclopyr, glyphosate and metsulfuron are reported to be effective. In the United States, the seed weevil *Apion ulicis* (Forster), introduced from France, was partially successful in controlling the plant. Several insect enemies of *Ulex* are currently being tested for biological control. Grazing by goats is used in some countries to control growth and spread.



Urochloa maxima (Jacq.) R.D. Webster

Native : Africa

Family : Poaceae

Synonyms : *Panicum hirsutissimum* Steud.
P. maximum Jacq.

Common names : Buffalo grass, guinea grass

Urochloa maxima is regarded as one of the most valuable fodder grasses capable of growing in a wide range of environmental conditions and habitats. However, it can cause fatal colic in cattle if eaten excessively. The grass attracts many seed-eating birds such as *Lonchura cucullata* Swainson, which feed in flocks. It produces numerous seeds that are dispersed by wind, birds and water.

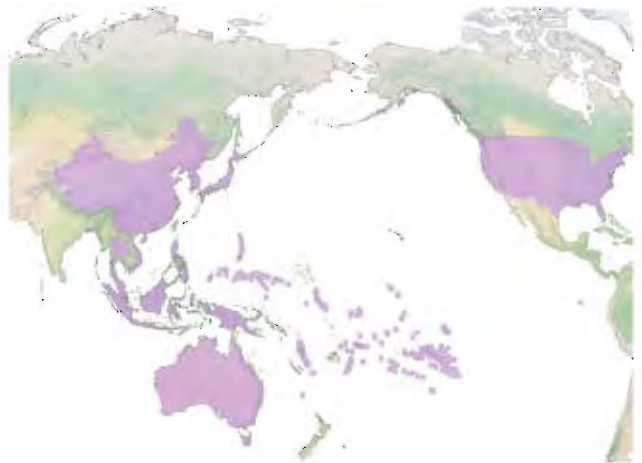
Description : Perennial rhizomatous grass; culms robust, nodes glabrous or pilose. Leaves cauline, leaf sheaths glabrous to hispid, blades linear to narrowly lanceolate, flat, 20 - 60 x 1 - 3.5 cm, narrowed at base, glabrous or pilose, margins scabrid, apex acuminate; ligule 1-3 mm, membranous, with dense cilia dorsally. Inflorescence of panicle, oblong or pyramidal in outline, 10-45 cm, many branched; branches spreading, lowest arranged in whorls, spikelets oblong, 3-4.5 mm, glabrous or pubescent, often tinged purple, obtuse or acute, occasionally overtopped by long hairs from the apex of the pedicel. Grain 2 mm long.

Habitat : Guinea grass grows profusely in open grasslands and abandoned cultivated lands forming colonies. It can grow quickly in moist areas, providing huge biomass but cannot tolerate long dry periods and frost.

Threat and damage : Guinea grass is strongly allelopathic and hence growth and survival of native plants are affected. As it resists drought, biomass accumulates making fires fiercer which wipes out native plants that are not fire-tolerant. It can survive rapidly moving fires which do not harm the roots.

Uses : It is one of the most productive forage grasses. The seeds are a source of food for birds and the leaves provide nesting material for birds. It is generally planted to minimize erosion on slopes.

Management : Hand-pulling and grubbing are efficient methods. Spraying of glyphosate and atrazine is effective. Continuous grazing controls growth and spread.



Distribution : American Samoa, Australia, China, Cook Islands, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, French Polynesia, Guam, Indonesia, Japan, Kiribati, Malaysia, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Solomon Islands, Thailand, Tonga, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.



Verbena brasiliensis Vell.

Native : South America

Family : Verbenaceae

Synonyms : *Verbena approximata* Briq.
V. chacensis Moldenke, *V. hansenii* Greene

Common names : Brazilian vervain, Gin case

Verbena brasiliensis is an ornamental herb introduced to various countries. It is a facultative wetland species and hence can be found both in wetland areas and in drier and upland areas. Propagation is mainly by seeds.

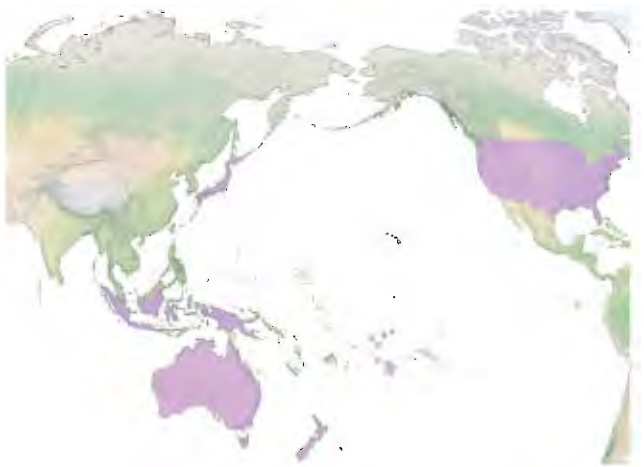
Description : Perennial herbs, to 2 m tall, stems hispid, quadrangular. Leaves simple, opposite, elliptic, 4 - 10 x 0.8 - 2.5 cm, serrate, hispid, veins adaxially with large bristles. Flowers bracteate, on terminal, loose spikes, 0.5 - 4.5 cm long, arranged in triads, bluish-purple. Fruit a schizocarp. Nutlets 2, brown, 1.2 - 1.9 mm long.

Habitat : Mainly found in wetlands, dry fields and arable land as a weedy species. It is also invasive along roadsides, in riverine areas and other disturbed sites.

Threat and damage : *Verbena* threatens the growth and survival of native plant species by overcrowding. The weed is a major problem in the United States.

Uses : Grown as a garden plant.

Management : Hand-pulling or digging out of seedlings and scattered plants. Most herbicides are effective in controlling the weed. Biological control is unknown.



Distribution : Australia, Cook Islands, Fiji, Hong Kong S.A.R., Indonesia, Japan, New Caledonia, New Zealand, Papua New Guinea, United States.



Verbena rigida Spreng.

Native : South America

Family : Verbenaceae

Synonyms : *Verbena scaberrima* Cham.
V. venosa Gillies & Hook.

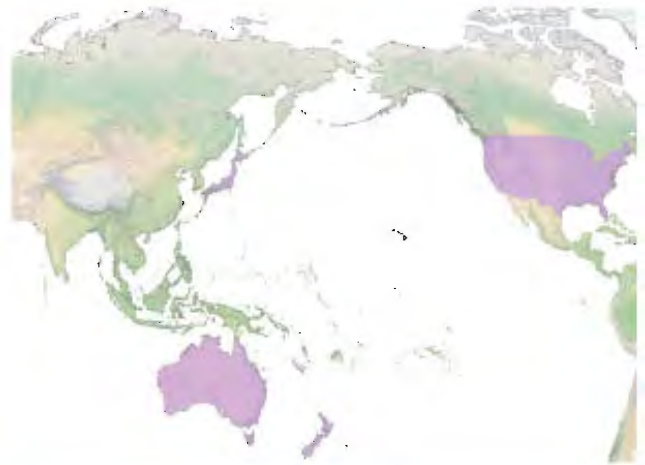
Common names : Creeping verbena, purple verbena,
rigid verbena, sandpaper verbena

Verbena rigida is grown as ground cover and as an ornamental along roadsides and highway medians for its beautiful flowers. The long white rhizome helps the plant to spread and to form dense colonies.

Description : Perennial, tufted, rhizomatous subshrubs, 50-60 cm tall, spreading, forming colonies. Stem scabrous or hirsute. Leaves simple, rigid, oblong to oblong-lanceolate or oblanceolate, 7.5-10 x 1-2.5 cm, both surfaces scabrous to hispidulous, dark green, margins revolute, coarsely serrate, apex acute, base subcordate, clasping the stem. Flowers in short, dense, cylindrical spikes, 1-5 cm long, usually 3 in decussate, purple to magenta, glandular pubescent throughout; bracts lanceolate or subulate-lanceolate. Fruit a schizocarp, separated into four one-seeded segments at maturity. Seeds ca. 2 mm long.

Habitat: It can adapt to a wide range of habitats, from disturbed areas to natural forests. In Australia, it invades woodlands, riverbanks and grasslands. The plant is drought-tolerant and requires only low amounts of water for survival.

Threat and damage : The plant forms dense colonies on roadsides, vacant lands and natural forest fringes outcompeting native flora.



Distribution : Australia, Japan, New Caledonia, New Zealand, United States.

Uses : Used as an ornamental and for erosion control on riverbanks and slopes.

Management : Unknown.



Ziziphus mauritiana Lam.

Native : South Asia and East Africa

- Family** : Rhamnaceae
Synonyms : *Zyziphus jujuba* Lam.
Common names : Chinese apple, Indian cherry,
Indian plum

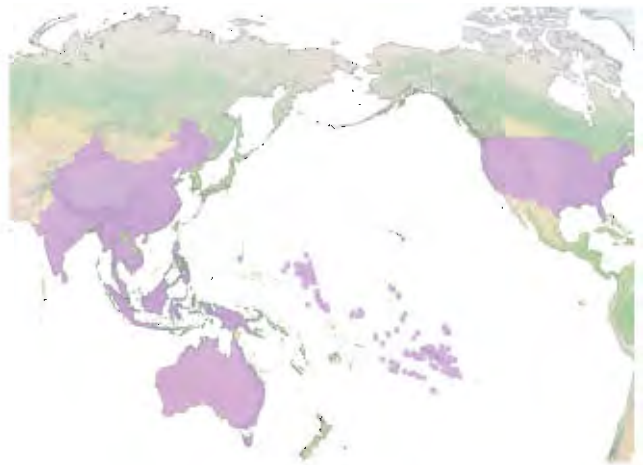
Ziziphus mauritiana, widely cultivated in the tropics, is used for culinary and medicinal purposes. In Australia and Fiji, the plant forms dense thickets posing a threat to ecosystems and the cattle industry. The seeds are dispersed by birds.

Description : Shrubs or small trees, young parts densely yellow-grey, tomentose, branchlets pilose, old branches purple-red, stipular spines two, one oblique, hook-like, recurved. Leaves simple, alternate, adaxially dark green, shiny, ovate or oblong-elliptic, rarely subrounded, 2.5-6 x 1.5-4.5 cm, membranous, abaxially yellow or grey-white tomentose, adaxially glabrous, 3 - nerved from base, veins conspicuously reticulate abaxially, impressed or prominent adaxially; base subrounded, slightly oblique, margin serrulate, apex rounded, rarely acute; petiole 5 - 13 mm, densely grey-yellow tomentose. Flowers greenish-yellow, subsessile or shortly pedunculate, in axillary dichotomous cymes; pedicel 2 - 4 mm, grey-yellow tomentose. Fruit a drupe, orange or red, turning black at maturity, oblong or globose, 10 - 12 mm, with a persistent tube at the base. Seeds reddish-brown, broad and compressed, 6 - 7 x 5 - 6 mm, shiny.

Habitat : It commonly grows along roadsides, in agricultural land, degraded forests, grasslands, flood plains and wasteland up to an elevation of 1 600 metres. Best growth is observed on sandy loam, neutral or slightly alkaline soil, lateritic soil and medium-black soils with good drainage. The plant can tolerate waterlogging as well as drought.

Threat and damage : As the plant is spiny, its dense growth obstructs the movement of animals and humans. It also outcompetes more desirable native pasture species.

Uses : The fruits are very nutritious and the leaves are used as fodder. The timber is used for house construction, making agricultural implements and for charcoal. The fruits are applied to cuts and ulcers to aid healing. The seed is a sedative and the root a purgative.



Distribution : Australia, Bangladesh, Bhutan, Cambodia, China, Cook Islands, Fiji, French Polynesia, Guam, India, Indonesia, Kiribati, Malaysia, Marshall Islands, Myanmar, Nepal, New Caledonia, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, United States, Viet Nam.

Management : Bulldozing can be used for removing large thickets and single plants can be removed by slashing and grubbing. Herbicides such as triclopyr or picloram in a herbicide-diesel mixture applied as bark spray are effective. Soil application of a picloram-triethanolamine mixture will control dense infestation. Biological control is unknown.

