Schinus terebinthifolius 简体中文 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Sapindales	Anacardiaceae

Common name pimienta de Brasil (English, Puerto Rico), Christmas berry (English), Mexican pepper (English), Brazilian pepper tree (English), Brazilian pepper (English), Brazilian holly (English), Rosapfeffer (German), Florida holly (English), poivrier d'Am�rique (French), faux poivrier (French), poivre du Br�sil (French), poivre rose (French), encent (French), warui (Fijian), poivre marron (French), naniohilo (Hawaiian), wilelaiki (Hawaiian), copal (Spanish), baie rose (French)

Synonym

Similar species

Summary

Native to Argentina, Paraguay and Brazil, Schinus terebinthifolius is a pioneer of disturbed sites, but is also successful in undisturbed natural environments. It is an aggressive evergreen shrub or small tree, 3-7 metres in height that grows in a variety of soil types and prefers partial sun. Schinus terebinthifolius produces shady habitats that repel other plant species and discourage colonisation by native fauna and alter the natural fire regime. Its fruit has a 'paralysing effect' on birds and even grazing animals when ingested. Schinus terebinthifolius seeds are dispersed by birds and mammals and it readily escapes from garden environments. It is planted as both an ornamental and shade tree and has many uses.

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Species Description

Schinus terebinthifolius is an evergreen shrub or small tree, 3-7 metres tall or more. The odd-pinnately compound leaves are alternately arranged on branches and range from 8 to 17cm in length. Each leaf is composed of usually 4 or 6, or sometimes more, rounded and often toothed lateral leaflets, arranged in pairs along a narrowly winged leaf axis, or rachis, and a single, terminal leaflet. When crushed, the leaves produce a pungent aroma that has been variously described, from “peppery” to “turpentine-like” (Ferriter 1997; Tomlinson, 1980).

The flowers are produced in showy, branched panicles, 2-11cm long, which arise from the axils of leaves near the ends of stems. In addition to flowers, the inflorescences also bear triangular to lanceolate, leaf-like bracts with ciliate margins. Both male and female flowers occur on stalks, or pedicels, 1mm long and essentially have the same structure: 5 small, green, triangular sepals with ciliate margins; 5 small, white, glabrous, ovate petals; 10 stamens concentrically arranged in 2 series of 5, the outer series being longer; a lobed disc at the base of the stamens; and a single-chambered, or unilocular, ovary with 3 short styles. However, in male flowers, the ovary,or pistillode, is non-functional, and in female flowers, the staminodes are sterile. On female trees, flowering is followed by the production of bright red, fleshy, spherical drupes, often referred to as”berries”, each 5-6mm in diameter and containing a single seed (Ferriter 1997).

Notes

There are five varieties listed within the South American distribution: *S. terebinthifolius* var. *terebinthifolius* – from Venezuela to Argentina; *S. terebinthifolius* var. *acutifolius* – southern Brazil and Paraguay to Misiones, Argentina; *S. terebinthifolius* var. *pohlianus* (the most common variety of the species) – southern Brazil, Paraguay, and northern Argentina; *S. terebinthifolius* var. *raddianus* – south central Brazil; and *S. terebinthifolius* var. *rhoifolius* – south central Brazil (Barkley, 1944; Barkley, 1957) in Cuda *et al*, 2006).

Lifecycle Stages
Flowering and fruiting phenomena in Brazilian pepper shows distinct periodicity. The main flowering period, September to October, is marked by the production of copious flowers from axillary inflorescences developing at the ends of leafy branches. A second flowering period (March-May) occurs in less than 10% of the population (Ewel et. al., 1982, in Ferriter 1997). Fruit production occurs during the winter (November to February), at which time the branches of female trees are heavily laden with red fruits while male trees remain barren. Ewel et. al. (1982) observed that ripe fruits are retained on a tree for up to 8 months (Ferriter 1997). The survivorship of naturally established seedlings is very high ranging from 66-100%. It is extremely rare to encounter such high survivorship in weedy species. The tenacity of its seedlings makes *S. terebinthifolius* an especially difficult species to compete with, as its seedlings seem to survive for a very long time in the dense shade of an older stand where they grow, although slowly, while in openings they grow very fast (Ewel *et al*. 1982 in Elfers, 2001).

Uses
Schinus terebinthifolius has been used as a garden plant in many countries. It is planted as both an ornamental and shade tree. The bark serves as a source of tannins and the bright red berries and leaves are used in the making of Christmas Wreaths. The berries are also used as a spice called pink peppercorn. The wood of Brazilian pepper is used in construction, as stakes, posts, and railway sleepers. Virtually all parts of this tropical tree have been used for medicinal purposes throughout the tropics including its leaves, bark, fruit, seeds, resin and oleoresin or balsam. Brazilian peppertree is also considered an important nectar and pollen source by the bee industry in the United States and Hawaii (Cuda *et al*, 2006).

Habitat Description
Schinus terebinthifolius occurs in sub-tropical areas between latitudes 15° and 30° N and S in many countries (Hosking *et al*, 2003). It is a pioneer species and an aggressive invader of mesic and wet lowland environments (Smith, 1985). It is commonly found in disturbed sites, such as highway right-of- ways, canals, drained wetlands, and fallow fields and farmlands but is also successful in undisturbed natural environments including pinelands, hammocks, and mangroves (Woodall, 1982; Cuda *et al*, 2006). *S. terebinthifolius* prefers partial sun to full sun, grows in a variety of soil types (Woodall, 1982; Larocha, 1994a), and is known to be fairly tolerant to shade, high salinity, flooding, and fire ((Ewel, 1979; Mytinger and Williamson, 1987; Doren *et al*, 1991) in Cuda *et al*, 2006).

Reproduction
Schinus terebinthifolius is largely a dioecious plant which means that the flowers are either male (staminate) or female (pistillate), and the sexes occur on male and female trees. However, a small number of trees have been observed producing bisexual (“complete”) flowers or having both unisexual flowers occurring on the same individual (Ferriter 1997). Flowering generally occurs in the fall, while a small fraction flower in the spring (Elfers, 2001). Although in some locations, such as certain locations in Florida, flowering can occur year-round. Numerous small, white flowers occur in dense axillary panicles near the end of branches. Flowers produce copious amounts of pollen and nectar, and are primarily insect pollinated (Ewel *et al*, 1982 in Cuda *et al*, 2006). They are pollinated by diurnal insects, including a number of dipterans (especially a syrphid fly, *Palpada vinetorum*), hymenopterans, and lepidopterans. A massive number of bright red fruits are typically produced on the plants from November to February. Although most seed dispersal occurs shortly thereafter, some trees retain their fruits until July or August. The fruits are eaten and dispersed primarily by mammals and birds although some dispersal occurs by gravity or water. For example, raccoons (*Procyon lotor* L.) and opossums (*Didelphus virginianus*) consume fruits and contribute to seed dispersal. Although catbirds (*Dumatilla carolinensis*) have been observed feeding on the fruits, robins (*Turdus migratorius* L.) are considered the most important avian seed dispersers. They consume large quantities of seed and spread them to habitats that Brazilian peppertree would never otherwise reach (Ewel *et al*. 1982 in Cuda *et al*, 2006). Like many hardwood species, Brazilian peppertree also is capable of resprouting from above-ground stems and crowns after damage from cutting, fire, or herbicide treatment. Resprouting also occurs from the roots with or without evidence of damage and often leads to the development of new daughter plants. Resprouting and suckering often is profuse and the growth rates of the sprouts are high, which contributes to the plant’s habit of forming dense clumps (Cuda *et al* 2006).

General Impacts
Schinus terebinthifolius is an aggressive, rapidly colonizing invader of natural communities and disturbed habits that shades out and displaces native vegetation, often forming dense monocultures that reduce the biological diversity of plants and animals in the invaded areas (Cuda *et al*, 2006; Donnelly & Walters, 2008; Ewe & Sternberg, 2003). It is known to displace native vegetation in Florida, California, Hawaii, Bermuda, the Bahamas, and Australia ((Randall 2000; Hight *et al*. 2002; Habeck *et al*. 1994) in Cuda *et al*, 2006). It is one of the most widespread and problematic invasive plants in Florida where it has infested nearly 280,000 ha of all terrestrial ecosystems (Cuda *et al*, 2006). Vast monospecific stands of it pose a significant threat to the mangrove swamp communities of the Florida Everglades where it threatens rare federal and/or state listed native species such as the Beach Jacquemontia (*Jacquemontia reclinata*), the Beach Star, *Remirea maritime* (Coile 1998, D.F. Austin, pers. comm. in Cuda *et al*, 2006), and the nesting habitat of the gopher tortoise (*Gopherus polyphemus*) (EPPO Reporting Service, 2005; Doren and Jones 1997 in Cuda *et al*, 2006). In Hawaii, *S. terebinthifolius* is negatively impacting several threatened and endangered plant species, including the Haleakala silverword (*Argyroxiphium sandwicense macrocephalum*), liliwai (*Acaena exigua*), and the mahoe tree (*Alectryon micrococcus*) (Hight *et al*. 2002 in Cuda *et al*, 2006). In Bermuda it invades upland margins of mangrove swamps (Mark and Lonsdale 2002). In Malta it invades the Mediterranean maquis community, which consists of mixed species, including olive (*Olea europaea*), bay laurel (*Laurus nobilis*) and the garrigue. In the Bahamas, it is found on remote islands, where it may alter habitats and interfere with nesting sites (Moyroud 2000). *S. terebinthifolius* is believed to have allelopathic properties which aid its displacement of native species (Morgon & Overholt, 2005; Hargraves, 2008). Aqueous extracts from it were found to negatively affect the growth of two native plants commonly found in south Florida’s natural areas, *Bromus alba* and *Rivina humilis* (Morgan and Overholt 2005, in EPPO Reporting Service 2005).
Furthermore, *S. terebinthifolius* has been found to reduce the density and species diversity of native bird populations compared to uninvaded native pinelands and forest-edge habitats and the alter natural fire regimes because of its resultant increased shade (Curnutt, 1989 in Cuda *et al*, 2006). Brazilian peppertree was shown to have species-specific impacts on microalgae at the land–sea interface, making the possibility of a cascade effect on primary productivity, biodiversity, and community structure likely (Hight *et al*, 2003).
S. terebinthifolius is a relative of poison ivy and usually aggregates allergic skin reactions on contact (Florida Department of Environmental Protection). The high concentration of volatile and aromatic monoterpenes has been suggested to be the probable cause of respiratory problems associated with crushed fruits. Its highly toxic resin is found in its bark, leaves, and fruits (Lloyd *et al*, 1977). It contains active alkenyl phenols, e.g., urushiol, cardol, which can cause contact dermatitis and inflammation in sensitive individuals (Lampe and Fagerstrom 1968, Tomlinson 1980) in Cuda *et al*, 2006). Persons sitting beneath *S. terebinthifolius* trees exhibited flu-like symptoms, and sneezing, sinus congestion, chest pains and acute headache (Morton 1969 1978, in Ferriter 1997). The AMA Handbook of Poisonous and Injurious Plants (Lampe and McCann 1985) reports that the tripterpenes found in the fruits can result in irritation of the throat, gastroenteritis, diarrhea, and vomiting in humans (Cuda *et al*, 2006). The ingested fruits have a 'paralysing effect' on birds and grazing animals such as horses are susceptible to its effects which can even prove fatal (Campello and Marsaioli 1974, in Ferriter 1997; Morton, 1978 in Cuda *et al*, 2006). Intoxication of migratory robins, one of the principal avian disseminators of Brazilian peppertree, is not uncommon (Blassingame, 1955 in Cuda *et al*, 2006).

Management Info

\"A Risk Assessment of *Schinus terebinthifolius* for Hawaiʻi and other Pacific islands was prepared by Dr. Curtis Daehler (UH Botany). The result is a score of 19 and a recommendation of: \"\"Likely to cause significant ecological or economic harm in Hawaiʻi and on other Pacific Islands as determined by a high WRA score, which is based on published sources describing species biology and behaviour in Hawaiʻi and/or other parts of the world.\"\"

When developing a management strategy it is important to consider the following biological traits of *S. terebinthifolius*: Its seeds are generally not viable after five months following dispersal. Water availability, especially rapid changes in water level, determines to a great extent seedling success. Its lack of success in California has been attributed to the short period of sufficient soil moisture needed for germination and root establishment. Seedlings grow very slowly and can survive in dense shade, exhibiting vigorous growth if the canopy is cleared (growing at rates of .03 to .05 metres per year (Ferriter 1997). The creation of open habitat influences and increases the rate of spread of *S. terebinthifolius*. When *S. terebinthifolius* occurs in these open disturbed areas it provides a reservoir for the plant to spread to natural environments. This means that the restoration of disturbed ecosystems back to their natural state may control the spread of the weed to native ecosystems, as well as providing an opportunity to regain native environments. The plant is capable of resprouting from above-ground stems and root crowns and resprouting is also often profuse, with new growth originating from dormant and adventitious buds. The characteristics that make the Brazilian pepper plant a successful weed include (1) fast growth, (2) prolific seed production, (3) continuous shoot extension, (4) vigorous resprouting and (5) tolerance of a wide range of growing conditions (Ewel 1979, in Ferriter 1997).

Preventative measures: Prohibiting the sale of *Schinus terebinthifolius* in nursery trade is an important method of slowing its spread. Florida has established a state law prohibiting the sale, cultivation, and transportation of it passed by the Florida legislature in 1990 (Cuda *et al*, 2006). Cooperation among public and private agencies as well as from neighboring states to reduce or prohibit its use as an ornamental and manage existing populations is highly beneficial (Elfers, 2001).Chemical: The use of herbicides is the most commonly used and cost-effective method for controlling *S. terebinithifolius*. *S. terebinthifolius* is sensitive to foliar applications of imazapyr, to foliar and cut surface applications of triclopyr, dicamba and glyphosate, to basal bark applications of triclopyr, and to soil application of tebuthiuron and hexazinone. It is not sensitive to 2,4-D (Matooka *et al*, 2003 in PIER, 2010). Cut-stump treatment and basal bark treatment of triclopyr will effectively control it (Langland & Stocker, 2001 in Cuda *et al*, 2006). Foliar application of imazapyr and triclopyr is also effective and was found to achieve greater than 90% control. However, foliar application will effect non-target vegetation. Imazapyr has also been used in an application referred to as lacing which involves treating only half the foliage with a low volume back pack sprayer that has reportedly yielded 98% control (Phil Waller, BASF, pers. Comm. in Cuda *et al*, 2006). Basal soil applications of both hexazinone and tebuthiuron were also effective and resulted in 80-90% control (Laroche and Baker, 1994 in Cuda *et al*, 2006). Other treatments including basal bark application of a mixture of imazapyr and triclopyr are effective in an oil-based solution (BASF, 2005 in Cuda *et al*, 2001). Excellent control was reported with triclopyr ester/oil applied basal bark at 10% of product, triclopyr amine at 50% of product in water applied to cut surfaces, and imazapyr at 1% of product in water applied as foliar sprays (Matooka *et al*, 2003 in PIER, 2010).

Karmex is recommended when the only objective is to kill *S. terebinthifolius* seedlings. It is, compared to Hyvar or Velpar, less easily leached, making shallow rooted plants, like seedlings, more susceptible than deeper rooted ones. However, on many south Florida sites, feeder roots of established desirable plants may also be very close to the surface and may be affected. Hyvar and Velpar are as effective on seedlings as Karmex, but are recommended only where larger trees are involved. Where soil characteristics or root distributions preclude soil herbicides, Tordon is recommended as a foliar spray (Woodall 1982 in Elfers, 2001).

Biological: A variety of biological control agents have been investigated or released to control *S. terebinthifolius*. The most important include the Brazilian pepper thrip (*Pseudophilothrips ichini*), the Brazilian pepper leafroller (*Episimus utilis*), the Brazilian pepper sawfly (*Heteroperreyia hubrichi*), torymid wasp *Megastigmus transvaalensis*, and a variety of fungal pathogens (Cleary, 2003; Wheeler *et al*, 2001 in Cuda *et al*, 2006).\nA few biological control agents from southern South America that were been screened and released in Hawaii in the 1950s and 1960s include *E. utilis*, *Lithraeus atronotatus*, and *Crasimorpha infuscate*. Of them two established but had little effect on Brazilian peppertree (Julian and Grifiiths, 1998 in Cuda *et al*, 2006).

E. utilis whose larval stages defoliate *S. terebinthifolius*, was released in Hawaii in the 1950s but did not yield effective control due to unsuitable biotic and abiotic conditions. It is being evaluated for use in other locations and results imply that it may be more successful (Manrique *et al*, 2008a; Manrique *et al*, 2008b; Manrique *et al*, 2009a).

The torymid wasp *M. transvaalensis* attacks the drupes or seeds of *S. terebinthifolius* and damages them so they do not germinate. A study in Florida found that it damaged up to 31% of drupes in the major winter fruiting period and 76% in the minor spring fruiting phase. *M. transvaalensis* represents a potential biological control (Wheeler *et al*, 2001 in Cuda *et al*, 2006).

Fungi *Sphaeropsis tumefaciens*, *Rhizoctonia solani* and *Chrondostereum purpureum* are all known to infect *S. terebinthifolius* in different capacities and may also prove to be useful biological controls (Cuda *et al*, 2006).

Physical: The physical techniques for controlling *S. terebinthifolius* include soil removal, prescribed burning, and flooding. Soil removal can be effective for eliminating Brazilian peppertree and preventing its reestablishment but this method is labor intensive and costly. Prescribed burns have been used to control Brazilian peppertree with mixed results. The seeds fail to germinate following exposure to fire but plants readily resprout from crown and roots (Randall, 200 in Cuda *et al*, 2006). Repeated fires at 3 to 7 year intervals were found to slow its invasion but did not completely prevent re-establishment (Doren *et al*, 1991 in Cuda *et al*, 2006).

Hydro-leveling, a new technique, was tested in a mangrove forest restoration project in 2004. Hydro-leveling uses a high pressure stream of water to wash sediment from the spoil mound into the adjacent wetland and ditch. This was found to reduce but not eliminate adult *S. terebintifolius* but did successfully eliminate seedlings. Native plants should be planted following hydro leveling to promote native recolonization (Smith *et al*, 2007).

Mechanical control: Once the Brazilian peppertree reaches heights of several feet, heavy equipment including bulldozers, front end loaders, and root rakes are necessary for the removal of it and its root system to prevent re-sprouting (Cuda *et al*, 2006; Elfers *et al*, 2001).

Integrated management: An integrated, site specific management plan should be developed for the management of *S. terebinthifolius* following guidelines provided by (Cuda, 2006).

Cut-stump treatment with 50% Garlon 3A, 10% Garlon 4 or a basal bark application of 10% Garlon 4. Foliar application of Garlon 4, Garlon 3A, Roundup Pro, Rounup Super Concentrate, or Rodeo, according label directions may be used where appropriate. Glyphosate products are less effective when used alone in spring and early summer. Use Rodeo or cut stump application of 50% Arsenal where plants are growing in aquatic sites (Langland & Stocker, undated).

Additionally, *Schinus terebinthifolius* infestations may be detected with hyperspecteral instrumentation or high resolution imagery by aerial observation to evaluate its infestation in inaccessible locations and aid in management program development (Lass & Prather, 2004; Pearlstine *et al*, 2005).\"

Principal source: Cuda, J. P., A. P. Ferriter, V. Manrique, and J.C. Medal, (Editors) 2006. J.P. Cuda, Brazilian Peppertree Task Force Chair. Interagency Brazilian Peppertree (*Schinus terebinthifolius*) Management Plan for Florida 2nd Edition. Recommendations from the Brazilian Peppertree Task Force Florida Exotic Pest Plant Council April 2006

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ALIEN RANGE

[1] AMERICAN SAMOA
[4] AUSTRALIA
[1] BAHAMAS
[2] BERMUDA
[1] CUBA
[1] FIJI
[2] FRENCH POLYNESIA
[1] GUAM
[1] ISRAEL
[1] MALTA
[1] MARSHALL ISLANDS
[1] MAURITIUS
[1] MAYOTTE
[2] NEW CALEDONIA
[1] NEW ZEALAND
[1] NORFOLK ISLAND
[1] PUERTO RICO
[1] REUNION
[2] SAINT HELENA
[1] SAMOA
[1] TURKS AND CAICOS ISLANDS
[8] UNITED STATES
[2] UNITED STATES MINOR OUTLYING ISLANDS
[1] VANUATU

Red List assessed species 8: CR = 6; EN = 2;

Alectryon macrococcus **CR**
Chamaesyce deppeana **CR**
Chamaesyce herbstii **CR**
Coffea myrtifolia **EN**
Commidendrum robustum **EN**
Labordia cyrtandrae **CR**
Phyllostegia mollis **CR**
Schiedea kaalae **CR**

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