Brazilian Peppertree — *Schinus terebinthifolius*

Sumac family—Anacardiaceae

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Brazilian peppertree (*Schinus terebinthifolius*), also known as Christmasberry or Florida holly, is an invasive, toxic evergreen shrub or small tree that is threatening the biodiversity of Florida, California, and Hawaii. Native to Argentina, Paraguay, and Brazil, Brazilian peppertree was introduced into Florida as a landscape ornamental in the late 19th century. Its popularity as an ornamental plant can be attributed to the numerous bright-red drupes (fruits) produced during the October to December holiday season. Brazilian peppertree now dominates entire ecosystems in southcentral Florida and its invasive potential has been documented in California as well as Hawaii. The plant readily invades disturbed sites as well as natural communities where it forms dense thickets that completely shade out and displace native vegetation.

Brazilian peppertree also is considered an invasive weed in at least 20 countries throughout subtropical regions worldwide. Its invasiveness is attributed to its enormous reproductive potential. Large quantities of drupes are produced per plant, and wildlife disperse the seeds in their droppings. Brazilian peppertree outcompetes native plants because of its tolerance to extreme moisture conditions, its capacity to grow in shady environments, and possible allelopathic effects on neighboring plants. In Florida, the plant readily invades disturbed sites (e.g., fallow farmlands) as well as natural communities such as pinelands, hardwood hammocks, and mangrove forests, and is a major invader of the Everglades National Park. In the early 1990s, it was estimated that more than 400,000 ha in Florida were infested with Brazilian peppertree.

A lack of natural enemies on Brazilian peppertree in Hawaii was the rationale for initiating a classical biological control program in the 1950s. Surveys were conducted in South America and three insects (two moths and one beetle) were screened and eventually released in Hawaii. Two of the insects established, but they apparently have had little effect on Brazilian peppertree population levels in Hawaii.

During the 1980s, a classical biological control program was initiated in Florida following the completion of two domestic surveys of the insect fauna associated with Brazilian peppertree. Exploratory surveys for promising natural enemies in the native range of Brazilian peppertree were initiated in 1987 in South America. Several insects were identified as potential biological control agents.

The defoliating sawfly *Heteroperreyia hubrichi* (Hymenoptera: Pergidae) was initially selected as a candidate for further study because the larvae visibly damaged the plant in its native range, and because the insect was collected in South America only from Brazilian peppertree. Field studies in Brazil indicated the sawfly is capable of developing high population densities and the voracious larvae may completely defoliate Brazilian peppertrees up to 6 m in height. This type of feeding damage could severely injure or kill young plants and prevent older plants from reproducing, thereby reducing the competitive advantage that Brazilian peppertree currently holds over native vegetation.

The results of Hawaiian screening studies showed that although Brazilian peppertree was the preferred host for the sawfly, a native sumac (*Rhus sandwicensis*) also could be a potential host plant. Because of the perceived risk to the native Hawaiian sumac, the introduction of the sawfly into Hawaii was postponed until additional information about the insect's host range could be obtained from multiple-choice laboratory tests or preferably open field tests conducted in Brazil. These studies have been postponed due to a lack of funding and public support for the project.

A petition to release the sawfly in Florida was submitted to the Technical Advisory Group for Biological Control Agents of Weeds (TAG) in 1996. After reviewing the petition, the TAG considered the insect to be sufficiently host-specific to introduce into Florida. Based on the TAG recommendation, an Environmental Assessment was prepared by APHIS-PPQ and submitted to the U.S. Fish and Wildlife Service for consultation. The U.S. Fish and Wildlife Service expressed concern that the sawfly could pose a risk to Michaux's sumac (*Rhus michauxii*), a federally listed endangered species. Supplemental host range tests showed that *H. hubrichi* will not attack this sumac. However, field release of *H. hubrichi* has been delayed following the discovery that the larvae contain the amino acids lophyrotomin and pergidin, which are toxic to some vertebrates. The presence of these toxins has created a risk issue that is unprecedented in the field of weed biological control because of the potential for poisoning of susceptible native wildlife and domesticated animals that may consume the sawfly larvae. A pilot release of unmated females, which will produce only male progeny, has been proposed for a field risk assessment study.

Additional information on the management of Brazilian peppertree can be found in:

Ferriter, A. P., ed. 1997. Brazilian pepper management plan for Florida. Florida Exotic Pest Plant Council, Brazilian Pepper Task Force, SFWMD, West Palm Beach, FL. http://www.fleppc.org/Manage_Plans/schinus.pdf.

Hight, S. D., J. P. Cuda, and J. C. Medal. 2002. Brazilian peppertree. Pages 311-21 *in* R. Van Driesche, S. Lyon, B. Blossey, M. Hoddle, and R. Reardon, eds. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Pub. FHTET-2002-04. Morgantown, WV.

Randall, J. M. 2000. *Schinus terebinthifolius* Raddi. Pages 282-87 *in* C. C. Bossard, J. M. Randall, and M. C. Hoshovsky, eds. Invasive Plants of California's Wildlands. Univ. California Press, Berkeley, CA.

Another promising natural enemy of Brazilian peppertree is the thrips *Pseudophilothrips ichini* (Thysanoptera: Phlaeothripidae). The biology and field host range of *P. ichini* were studied in southeastern Brazil, and its host range was investigated in Florida quarantine. A petition to release the thrips was submitted to the TAG in 2002. A permit to release *P. ichini* in Florida is expected, pending TAG approval and an Environmental Assessment in consultation with the U.S. Fish and Wildlife Service.

The host range of the leafroller moth *Episimus utilis* (Lepidoptera: Tortricidae) that was introduced into Hawaii for classical biological control of Brazilian peppertree in the 1950s currently is under investigation in Florida quarantine. The biology of *E. utilis* and development of a rearing procedure for maintaining a laboratory colony for host specificity studies were completed in 2001.

The adventive torymid wasp *Megastigmus transvaalensis* (Hymenoptera: Torymidae) attacks the drupes and is the only insect currently causing some damage to the plant in California, Florida, and Hawaii. This wasp was originally described from South Africa and was probably introduced accidentally into the United States in Brazilian peppertree seeds sold as spices in some food shops. A detailed study on the distribution and effect of the wasp on Brazilian peppertree was completed in Florida in 2001.

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