EPPO Datasheet: *Parthenium hysterophorus*

Last updated: 2024-01-02

IDENTITY

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Preferred name: *Parthenium hysterophorus*
Authority: Linnaeus
Taxonomic position: Plantae: Magnoliophyta: Angiospermae: Campanulids: Asterales: Asteraceae: Asteroideae
Common names: Santa Maria feverfew, bastard feverfew, congress weed, parthenium weed (AU), ragweed parthenium (US), whitetop weed
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EPPO Categorization: A2 list
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EU Categorization: IAS of Union concern
EPPO Code: PTNHY

GEOGRAPHICAL DISTRIBUTION

History of introduction and spread

P. hysterophorus is thought to have been introduced into Ethiopia and India with contaminated cereal grain (Fessehaie *et al.*, 2005; Sushilkumar & Varshney, 2010), and into Australia with contaminated pasture seed from the USA (Everist, 1976).

The presence of *P. hysterophorus* in India was first observed in 1955 on the outskirts of Pune (Maharashtra) and described botanically in 1956 by Rao (Rao, 1956 in Kohli *et al.*, 2006). The species is thought to have entered India as a contaminant of food grain imported from the USA in the 1950s and 1960s, but herbarium specimens, catalogues and notes indicate the presence of the species in the country as early as 1810. The species may therefore have remained uncommon and then spread rapidly throughout the plains and along hill tracks.

In the Northern Territory in Australia, the species was discovered in 1977 along Elsey Creek in the Mataranka district and an eradication program was then launched. Since then the species has also been found in Katherine, Tennant Creek, Borroloola and the Roper River. It is though that the Roper River and the Borroloola infestations originated from contaminated tomato seed, while the origin of the other infestations is unknown (Department of Natural Resources, Environment, The Arts & Sport, Government of Northern Territory, 2010). Pathways of entry and spread of the species are described in the EPPO PRA (EPPO, 2014) and in Brunel *et al.*, 2014.

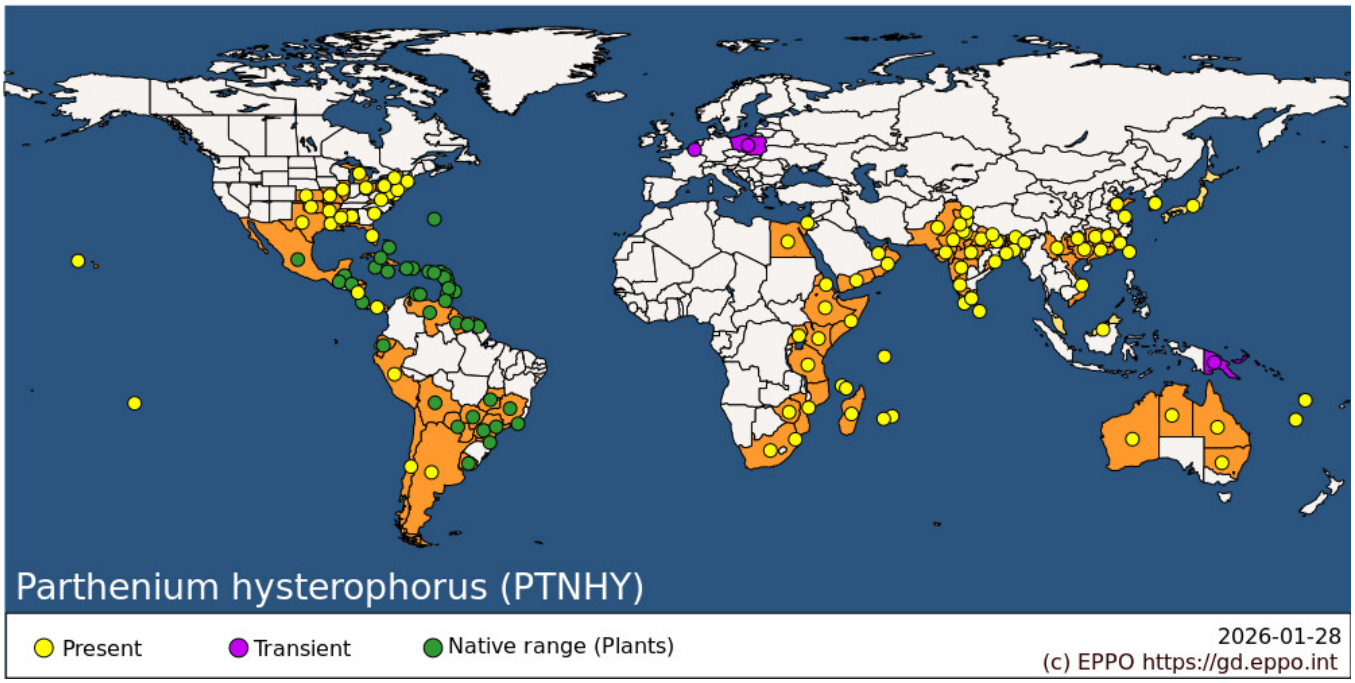
Note: The species is recorded as casual in Belgium. In 1999 in the Ghent port area a single plant was recorded and in 2013 in the port of Roeselare several individuals were reported. It is suspected that these plants did not establish (no cypsela had been observed in November 2013). In Ghent, the species was found at the Ghent train terminal where many kinds of cereals are introduced, and it was found growing among typical soybean aliens, it is therefore suspected that *P. hysterophorus* may have been introduced as a contaminant of cereals or of soybean consignments. In Roeselare, it was found on rough ground surrounding a pet food mill, and it is suspected that the species could have been introduced as a contaminant of birdseed or other pet food (Verloove, 2006). *P. hysterophorus* has also been recorded as casual in Poland in 1938 (Mirek *et al.*, 2002), but no detail was provided on its possible introduction.

Note: In China, a different biotype genetically distinct to the one found in the south of the country (Guangxi, Yunnan, etc.) is recorded in the North Eastern Province of Shandong, according to Tang et al. (2009).

Note: the species was found in a disturbed site in Papua New Guinea but has been declared as eradicated (SPC-PPS,

2003; Kawi & Orapa, 2010).

Due to its inconspicuous appearance, the species may well be present but unreported in additional African or other countries (Wise *et al.*, 2007).



EPPO Region: Belgium, Israel, Poland
Africa: Comoros, Egypt, Eritrea, Eswatini, Ethiopia, Kenya, Madagascar, Mauritius, Mayotte, Mozambique, Reunion, Seychelles, Somalia, South Africa, Tanzania, United Republic of, Uganda, Zimbabwe
Asia: Bangladesh, Bhutan, China (Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Shandong, Yunnan), India (Assam, Bihar, Chandigarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal), Israel, Japan, Korea, Republic of, Malaysia, Nepal, Oman, Pakistan, Sri Lanka, Taiwan, United Arab Emirates, Vietnam, Yemen
North America: Mexico, United States of America (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Hawaii, Illinois, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Virginia)
Central America and Caribbean: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Montserrat, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Lucia, Trinidad and Tobago, Virgin Islands (US)
South America: Argentina, Bolivia, Brazil (Goias, Mato Grosso do Sul, Minas Gerais, Parana, Rio de Janeiro, Santa Catarina, Sao Paulo), Chile, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
Oceania: Australia (New South Wales, Northern Territory, Queensland, Western Australia), French Polynesia, New Caledonia, Papua New Guinea, Vanuatu

MORPHOLOGY

Plant type

Erect, branched and aromatic annual herb that can grow up to 2 m high.

Description

This erect ephemeral herb can grow up to 1.5–2 m high and has a deep tap root. It has branching stems that become woody and hairy with age. Leaves are alternate, finely lobed, covered with fine soft hair, 3–20 cm long and 2–10 cm

wide. Once stem elongation is initiated, smaller leaves are produced and the plant becomes multi-branched in its extremities. The whole plant has a bluish or greyishgreen appearance. Flower heads are small (4 mm across) and numerous in open panicles, creamy-white, with 5 petals. Each flower produces about 5 black achenes which are obovate, 2–2.5 mm long and light weight. The fruit is a cypsela which is obovate to ellipsoid, light brown when young and dark brown when mature, crowned by persistent corolla appendages and style, 2–3 mm x 1–2 mm, pappus are absent (Haseler, 1976; Singh & Chandra, 1982 as reported in Kushwaha & Maurya, 2012).

BIOLOGY AND ECOLOGY

General

P. hysterophorus reproduces only by seeds and is known to be highly prolific, as a single plant produces 15 000 seeds on average and up to 100 000 seeds (GISD Database, Global Invasive Species Database, 2010). Seed viability is high, 85% or higher (Navie *et al.*, 1998). Buried seeds have been found to last longer than seeds on the soil surface, and a significant proportion can still germinate after 8–10 years. Freshly produced seeds demonstrate a degree of dormancy (up to several months) (Navie *et al.*, 1998). In addition, the species is an opportunistic germinator. Seeds can germinate at any time of the year provided moisture is available but they require bare soil to do so (Parsons & Cuthbertson, 1992). The plant flowers 4–8 weeks after germination, and flowering continues until drought or frost kills the plant. Under favourable conditions, 2–3 life cycles can be completed per year (Fatimah & Ahmad, 2009).

Habitats

P. hysterophorus grows in a wide range of habitats, including degraded and disturbed lands, banks of streams and rivers. It is a pioneer species that can invade grazing land and degraded pastures, crops, orchards, summer crops, disturbed and cultivated areas, forests, railway tracks and roadsides, recreation areas, as well as river banks and floodplains (Navie *et al.*, 1996). *P. hysterophorus* can also invade perennial crops (alfalfa, clover, banana, cardamom, ginger, coconut, areca nut, mango, citrus species, etc.) as well as annual crops (cotton, pineapple, rice, sorghum, tomato, sugarcane, onion, cucumber, watermelon, groundnut, tobacco, garlic, eggplant, beans, capsicum, maize, etc.) (see the EPPO PRA for further details and references).

According to the Corine Land Cover nomenclature, the following habitats are invaded: arable land, permanent crops (e.g. vineyards, fruit tree and berry plantations, olive), pastures, riverbanks/canalsides (dry river beds), road and rail networks and associated land, other artificial surfaces (wastelands).

Environmental requirements

The species prefers neutral to alkaline pH soils, but tolerates a wide variety of soil types. *P. hysterophorus* is best suited to areas with an annual summer rainfall greater than 500 mm (Chamberlain & Gittens, 2004). Macconnachie *et al.* (2010) performed a climatic projection with CLIMEX for *P. hysterophorus* which concluded that within the EPPO region, the Mediterranean Basin is at risk from the species (Algeria, Croatia, France, Greece, Italy, Morocco, Spain, Tunisia, Turkey, etc.).

Natural enemies

No natural enemies of *P. hysterophorus* are known to occur within the EPPO region. While classical biological control has been effectively employed against the species elsewhere in the world (Dhileepan & McFadyen, 2012), in the absence of intentionally introduced agents the distribution and abundance of *P. hysterophorus* in its exotic range have generally been determined by other factors, such as climate, soils and disturbance regimes (land use).

Uses and benefits

P. hysterophorus can be used as green manure, and compost, as well as a soil improver that may improve physical, chemical and biological properties of the soils and is a source of readily available plant micro- and macronutrients (Kishor *et al.*, 2010). *P. hysterophorus* can also be used as a bioherbicide. *P. hysterophorus* also has medicial uses, in

particular as a remedy for skin inflammation, rheumatic pain, diarrhoea, urinary tract infections, dysentery, malaria and neuralgia. Other potential uses include removal of heavy metals, substrate for commercial enzyme production, additives in cattle manure for biogas production (Patel, 2011).

PATHWAYS FOR MOVEMENT

P. hysterophorus is thought to have been introduced into Ethiopia and India with contaminated cereal grain and into Australia with contaminated pasture seed from the USA, and other seed may also represent a pathway. Used machinery (e.g. grain harvesters, vehicles, military equipment) have also been noted as an important pathway of entry for *P. hysterophorus*. The species may also enter as a contaminant of growing medium attached to plants for planting, or as a contaminant of travellers (tourists, migrants, etc.) and their clothes, shoes and luggage.

Locally, the seeds are dispersed naturally by wind and water usually in the order of a few meters and as a contaminant of hay, seed, harvested material, in farmyard manure and compost, through livestock, soil and by vehicles, machinery or animals over longer distances. *P. hysterophorus* is also spread via cyclones and flooding events (see the EPPO PRA for further details).

IMPACTS

Effects on plants

P. hysterophorus aggressively colonises disturbed sites and causes major negative impacts on pastures and crops. Crop losses are reported to be primarily through allelopathic effects over and above the ability of *P. hysterophorus* to compete for nutrients and moisture. The impacts of *P. hysterophorus* upon cropping systems may be both direct and indirect from a competition point of view (Lakshmi & Srinivas, 2007). In India, it has been observed that P. hysterophorus can cause yield losses of up to 40% in agricultural crops (Khosla & Sobti, 1981, cited in Kandasamy, 2005). In Ethiopia, the yield in Sorghum bicolor grain was reduced by between 40% and 90% when *P. hysterophorus* was left uncontrolled throughout the season (Tamado *et al.*, 2002).

Indirect effects occur through interference with the reproduction of crop plants, e.g. when pollen of *P. hysterophorus* is deposited upon floral stigmatic surfaces (Jayachandra, 1980), which prevents seed set with resulting losses in yields of up to 40% (Wise *et al.*, 2007). In particular, *P. hysterophorus* pollen has been reported to be able to inhibit fruit set through allelopathy in beans, eggplant, peppers, tomatoes and other plants (Sukhada & Jayachandra, 1980 in Stamps, 2011) and grain filling of corn. Stands of *P. hysterophorus* are indeed reported to be able to produce an average of 316 million pollen grains per square foot (Sukhada & Jayachandra, 1980 in Stamps, 2011). *P. hysterophorus* was also found to reduce chlorophyll content of heavily infested crops, probably owing to interference with porphyrin biosynthesis (Towers & Subba Rao, 1992).

In Queensland (Australia), the species has invaded 170 000 km² of high quality grazing areas and losses to the cattle industry have been estimated to be 22 million AUS per year in control costs and loss of pasture (Chippendale & Panetta, 1994).

As another indirect effect upon crop production, *P. hysterophorus* acts as a reservoir host for plant pathogens and insect pests of crop plants (Basappa, 2005; Govindappa *et al.*, 2005; Prasada Rao et al., 2005; Lakshmi & Srinivas, 2007).

Environmental and social impact

Infestations of *P. hysterophorus* can also degrade natural ecosystems, and out-compete native species as observed in tropical and subtropical rangelands.

Because the plant contains sesquiterpenes and phenolics, it is toxic to cattle. Serious impacts upon the health of livestock in *P. hysterophorus*-infested areas have been reported from India (Lakshmi & Srinivas, 2007). In addition, meat and milk produced from livestock that has eaten the weed can be tainted (Towers & Subba Rao, 1992).

Humans who have continued exposure to *P. hysterophorus* can develop allergic eczematous contact dermatitis

(Navie *et al.*, 1996). Patients with severe dermatitis suffer fatigue and weight loss and deaths have occurred in severely affected people (Lonkar *et al.*, 1974). The pollen of the plant is also allergenic. On examination, it was concluded that the likelihood of getting sensitised to *P. hysterophorus* is 50% for individuals with regular exposure by direct contact, leading to allergic rhinitis resulting from exposure to the species' pollen. Cross sensitivity with other plants, particularly other members of the Asteraceae, may occur, causing patients to react to plants to which they previously had not been sensitive (Rodriguez *et al.*, 1977).

CONTROL

Unintentional transport of seeds through the transfer of soil material, human activity, the movement of grazing animals and by vehicles should be avoided. Good pasture management practices are also recommended. Herbicides, either as pre- or post-emergence applications, can provide effective control of *P. hysterophorus* in crops (e.g. 2,4-D, atrazine, metsulfuron, glyphosate and dicamba). Treatments should be applied when plants are small and have not produced seeds, and when grasses are actively growing to recolonize the infested area. As with any long-term chemical management approach, the potential for herbicide resistance exists (Crane *et al.*, 2006; Vila-Aiub *et al.*, 2008). Ploughing the weed before plants reach flowering stage and then establishing pasture may be effective. Biological control agents are being used with success: for example, the moth *Epiblema strenuana* (Lepidoptera: Tortricidae) and the rust *Puccinia abrupta var. partheniicola* (Basidiomycota: Puccinaceae) (Adkins & Shabbir, 2014).

REGULATORY STATUS

In the EU, *Parthenium hysterophorus* is included in the EU Regulation (1143/2014) and is listed as a species of Union concern.

In Australia, *Parthenium hysterophorus* is a Weed of National Significance and is a declared weed in all States of Australia, under different categories Weeds Australia Database (undated) http://www.weeds.org.au/noxious.htm (last accessed 01 Sep 2014).

In South Africa, *P. hysterophorus* is regulated as well under the existing legislation (CARA 2002 – Category 1 according to which 'Invader plants must be removed & destroyed immediately. No trade in these plants', see Invasive Species South Africa Website).

P. hysterophorus is also reported as listed as a noxious weed by the governments of Kenya and Puerto Rico (University of Florida website, undated).

PHYTOSANITARY MEASURES

EPPO (2014) recommend that seed or grain is accompanied with a phytosanitary certificate or produced in pest-free place of production or produced under a certification scheme. For grain there is also the measure to import under special licence/permit and specified restrictions (for grain which is aimed to be crushed or transformed).

Plants for planting with growing media attached should be accompanied with a phytosanitary certificate or produced in pest-free place of production or growing media should be removed or produced under a certification scheme.

Used machinery follow ISPM 41.

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