EPPO Datasheet: *Ehrharta calycina*

Last updated: 2020-04-23

IDENTITY

Preferred name: *Ehrharta calycina*
Authority: Smith
Taxonomic position: Plantae: Magnoliophyta: Angiospermae: Commelinids: Poales: Poaceae: Ehrhartoideae
Other scientific names: *Ehrharta melicoides* Thunberg
Common names: common ehrharta, perennial veldt grass (AU), purple veldt grass, veldt grass
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EPPO Categorization: A2 list
view more categorizations online...
EU Categorization: IAS of Union concern
EPPO Code: EHRCA

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GEOGRAPHICAL DISTRIBUTION

History of introduction and spread

E. calycina has a native range extending from the extreme southern winter-rainfall parts of Namibia, through the south-west and southern parts of South Africa and up into the east of the country in KwaZulu-Natal (Fish *et al.*, 2015). However, it is most abundant in the south-western Cape of South Africa (Mashau, 2008). Elsewhere in Africa, this species is only known to occur in Tunisia, where it was planted as a forage crop and escaped into nearby land near Cap Serrat (Greuter & Raus, 1998), and in Egypt. It was very likely to have also been introduced in the past in Morocco (Tropical Agronomy, 1953).

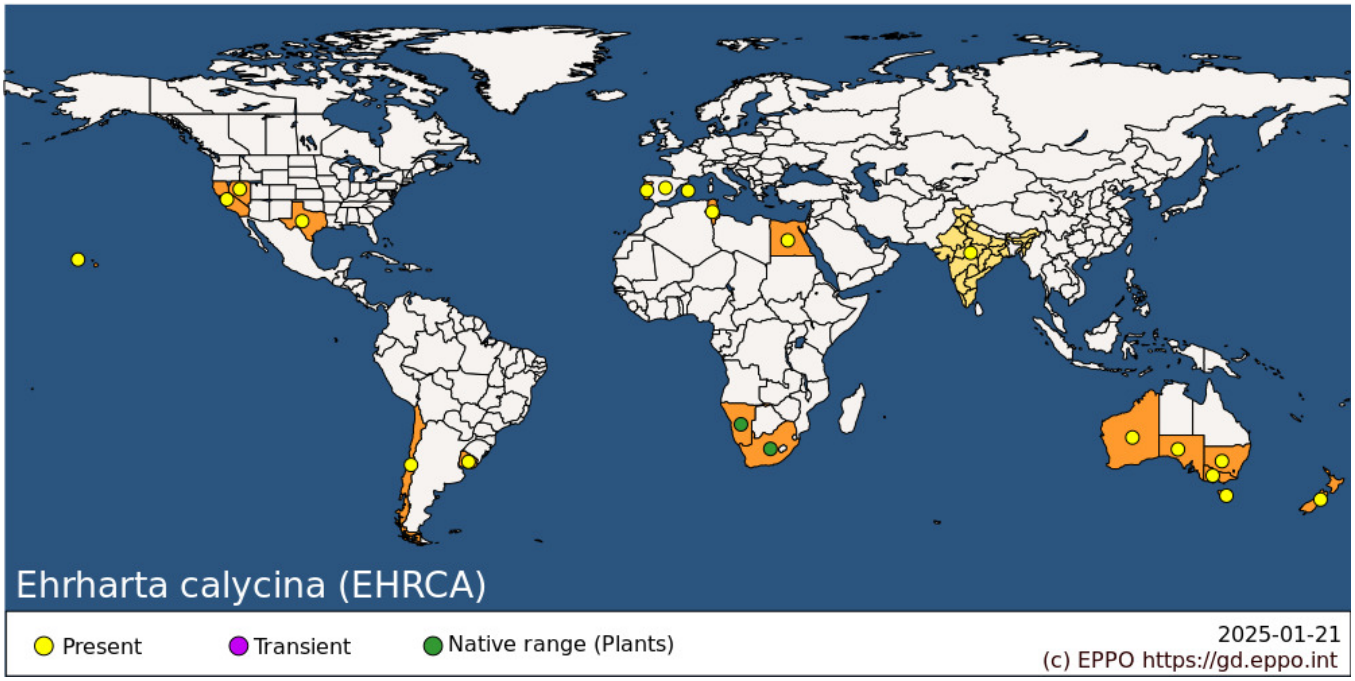
First introduced into California in 1928 as forage seed (Mulroy *et al.*, 1992), *E. calycina* became established there in about 1930 (Pickart, 2000). This species was actively spread throughout California in the 1950s and 1960s by the Soil Conservation Service of the time, being promoted as a forage crop and for erosion control (Pickart, 2000). Currently *E. calycina* is invasive in a number of coastal counties and further inland in Yolo County in California (Pickart, 2000). Elsewhere in the USA, this species is known to occur in Nevada and Texas (Barkworth *et al.*, 2007). However, the reference for Texas is an old reference (1950s) and the species has not been collected since. In Hawaii there are two records for the species, one in an agricultural experimental station (on Maui) and another in an army training camp (Big Island) (Bishop Museum, 1997, 2004). *E. calycina* has also been reported in a Uruguayan flora, but the current status of this species is uncertain (Rosengurtt *et al.*, 1970). It was also introduced into Chile as a forage crop and has naturalized in two localities (Ovalle and Cauquenes) (Pizarro, 1959). *E. calycina* has been reported as being naturalized in India, but other information on its distribution or status there is very limited (USDA, 2016).

E. calycina was introduced into Australia around 1900 (HerbiGuide, 2016), and it now occurs across Southern Australia, including Western Australia, South Australia, New South Wales, Victoria and Tasmania (HerbiGuide, 2016). In Western Australia it is a problematic invader of woodlands on sandy soils and along roadsides and is particularly common in the very south-west of the state (Biosecurity Queensland, 2016). In southern Western Australia *E. calycina* is also common alongside wetlands and waterways (Biosecurity Queensland, 2016). In south-eastern South Australia, this species is also invasive, particularly around Adelaide and on Kangaroo Island (Biosecurity Queensland, 2016). In New Zealand, this species was first recorded in 1956 at Santoft and has spread to a number of other localities on the North Island (Edgar *et al.*, 1991; Edgar & Connor, 2000). It is reported growing mostly in sandy areas (e.g. dunes), pastures and in pine plantations (Frey, 2005).

In the EPPO region, *E. calycina* is known to occur in Portugal, Spain and Tunisia. In Portugal, this species has been

recently (2015) observed in a number of new localities near Lisbon (GBIF, 2016). In Spain, the species was first recorded in Seville in 1982 and is now reported as naturalized in the Doñana area (Valdés, 2015), in dry pastures (Valdés *et al.*, 1987), and in the vicinity of Pontevedra and Cañaveral (GBIF, 2016). In Tunisia, the species is naturalized, but only reported from one locality near Cap Serrat.

Distribution



EPPO Region: Portugal (mainland), Spain (Islas Baleares, Mainland Spain), Tunisia
Africa: Egypt, Namibia, South Africa, Tunisia
Asia: India
North America: United States of America (California, Hawaii, Nevada, Texas)
South America: Chile, Uruguay
Oceania: Australia (New South Wales, South Australia, Tasmania, Victoria, Western Australia), New Zealand

MORPHOLOGY

Plant type

Perennial grass.

Description

E. calycina is a very variable species that has many described ecotypes or regional variants, suggesting that it represents a species complex (Fish *et al.*, 2015). It is a tussock grass (Fig. 1), with culms generally varying in height from 30 to 70 cm high (but it can reach up to 180 cm) (Fish *et al.*, 2015) and has creeping, branched rhizomes (Mashau, 2008). Leaves are often red to purple tinged, up to 7 mm wide, flat or rolled, often wrinkled along the blade margin and filiform in shape (Fish *et al.*, 2015; CAL-IPC, 2016). Inflorescences (panicles) are red in colour and may be produced at any time of the year, but usually in spring (Fish *et al.*, 2015; Valdés et al., 1987).

BIOLOGY AND ECOLOGY

General

In California and Australia, *E. calycina* can dominate plant communities, excluding native plant species and transforming shrubland into grasslands (Milberg & Lamont, 1995; Pickart, 2000; Frey, 2005; Fisher *et al.*, 2009). This species can form monospecific stands by suppressing the germination of native species through rapid growth and shading out of native plant seedlings. *E. calycina* can initiate an enhanced grass-fire cycle, promoting more frequent fires, which in turn favour this fire-adapted species at the expense of native plant species (Milberg & Lamont, 1995; Fisher *et al*., 2009). In eutrophic Australian Mediterranean-type environments, *E. calycina* has been shown to cause a shift in phosphorus nutrient cycling, with vegetation transformation coinciding with a shift of phosphorus from biomass to soils (Fisher *et al.*, 2006).

Habitats

In its native range, *Ehrharta calycina* occurs in a variety of habitats (Fish *et al.*, 2015; Hoare, 2016), but it is most common in sandy soils and disturbed areas (Mashau, 2008). In California, this species is common on sandy substrates, invading dunes and shrublands, but is present in a number of habitats, including dunes, dune scrub, maritime chaparral, coast live oak woodlands, coastal grasslands and coastal sage scrub (Bossard *et al.*, 2000; CAL-IPC, 2016). In Australia, it invades *Banksia* woodlands on sandy soils (Western Australian Herbarium, 2016), and is also found in other woodlands, along waterways and wetlands and in disturbed environments (Biosecurity Queensland, 2016). In Spain it has been found in dunes and dry pastures (Valdés *et al*., 1987), in Portugal along roadsides and open woodland (GBIF, 2016) and in Tunisia in pastures (Greuter & Raus, 1998). In New Zealand, this species has been reported mostly in sandy areas and pastures and in pine plantations (Frey, 2005).

Environmental requirements

E. calycina appears to have fairly broad environmental tolerance. It occurs in areas with mean annual precipitation ranging from 200 mm to over 800 mm and in areas with precipitation seasonality varying from almost exclusively in winter to almost exclusively in summer (Hoare, 2016). It is tolerant of fire, frost and drought (HerbiGuide, 2016; Western Australian Herbarium, 2016). The species has been documented in areas in South Africa with very low rainfall (Mucina *et al*., 2006). Experiments carried out to identify plants suitable for vegetating mine tailings found that *E. calycina* is fairly tolerant of high aluminium concentrations (Edmeades *et al.*, 1991). It prefers sandy soil textures, but can grow in most soils (Moore *et al.*, 2006; Mashau, 2008). CABI (2016) details that the species tolerates free-draining, acidic to neutral soils with light texture. However, *E. calycina* is intolerant of waterlogging and cannot tolerate heavy grazing (Rossiter, 1947; van der Westhuizen & Joubert, 1983; Moore *et al*., 2006; HerbiGuide, 2016) or high salinity levels (Western Australian Herbarium, 1998).

Natural enemies

A smut fungus, *Tilletia ehrhartae*, native to South Africa and highly host-specific to *E. calycina*, has been found in Australian and Californian populations of this grass (Piatek *et al.*, 2015). There are no known natural enemies in the EPPO region.

Uses and benefits

E. calycina is a valuable forage grass (Quattrocchi, 2006; Hoare, 2016), but it is not known if it is actively cultivated or sold as such within the EPPO region (with the exception of Tunisia where it was introduced in the 1970s as a forage species Greuter & Raus (1998)). The species has been used for rehabilitation of mine tailings and for revegetation purposes (Schmalzer & Hinkle, 1987; Quattrocchi, 2006; Pauw, 2011). *E. calycina* has been promoted for erosion control and landscaping in the USA.

PATHWAYS FOR MOVEMENT

E. calycina has been planted as a forage plant in Australia and New Zealand (Pickart, 2000; Quattrocchi, 2006). There is no evidence that the species is currently promoted as a forage grass within the EPPO region, but this is how it entered Tunisia where it was introduced as a fodder and pasture grass, almost certainly as seed (Greuter & Raus,

1998).

E. calycina has been planted for erosion control (Pickart, 2000; Quattrocchi, 2006). The species is used for erosion control, and seed mixes are sold for this purpose. At present, no information is available on whether *E. calycina* is used in such mixes. There is no evidence that the species is promoted for erosion control within the EPPO region.

Although there is no published evidence of *E. calycina* being transported as part of hay material from the USA (California), there is evidence that hay is imported from this state into the European Union (EU) (see https://apps.fas.usda.gov/gats/default.aspx) and seed material of *E. calycina* may potentially be included. Hay imports into Alaska have resulted in viable grass seed being intercepted with the commodity (see Conn *et al.*, 2010).

IMPACTS

Effects on plants

In California and Australia, *E. calycina* can dominate plant communities, excluding native plant species and transforming shrublands into grasslands (Milberg & Lamont, 1995; Pickart, 2000; Frey, 2005; Fisher *et al*., 2009). This species can form monospecific stands by suppressing the germination of native species through rapid growth and shading out of native plant seedlings.

In California, *E. calycina* has caused the transformation of native shrublands to grasslands and it dominates dunes along the central Californian coast (Pickart, 2000; Frey, 2005). *E. calycina* either prevents the germination of native plants or prevents their establishment and survival through promotion of more frequent fires (Pickart, 2000; Frey, 2005). Vegetation transformation in California is thought to be responsible for declines in the abundance of the endangered Morro Bay kangaroo rat, *Dipodomys heermanni* ss. *morroensis* (Trunzo, 2015), and threatens the rare endemic shrub *Arctostaphylos morroensis* (Odion & Tyler, 2002).

In Australia, *E. calycina* is similarly causing the transformation of woodlands to grasslands (Milberg & Lamont, 1995; Fisher *et al.*, 2009). This has resulted in the displacement of the endangered metallic sun orchid (*Thelymitra epipactoides*) in South Australia (Vidler, 2003). It is also displacing native sedges and grasses alongside seasonally dry wetlands (Biosecurity Queensland, 2016). On Kangaroo Island, it is listed among the top five invasive plants threatening biodiversity and it is a major threat to the endangered Kangaroo Island phebalium (*Leionema equestre* subsp. *phebalioides*) (Biosecurity Queensland, 2016).

Environmental and social impact

This species has negative impacts on a number of regulating ecosystem services. It can cause major increases in fire frequencies, thereby influencing the regulation of natural hazards. *E. calycina* can initiate an enhanced grassfire cycle which in turn favours this fire-adapted species at the expense of native plant species (Milberg & Lamont, 1995; Fisher *et al.*, 2009).

As a result of *E. calycina*'s ability to transform vegetation and to outcompete native plants, this species has a large potential to impact biodiversity and is documented as doing so in California and Australia.

E. calycina has higher nutrient concentrations, grows faster and has shorter tissue lifespans than native sclerophyllous vegetation in Australia and thereby alters nutrient cycling, shifting nutrient pools from plant biomass to the soil. Primary production and habitat stability are also probably altered by *E. calycina* invasions due to transformation of vegetation from woodlands to grasslands, although this has not been investigated.

No studies have investigated the socio-economic impacts of *E. calycina* invasions. The only economic costs associated with this species are likely to be from its control. However, there is almost no published information on management costs for this species. In California, it has been reported that manual herbicide application for *E. calycina* can cost about 300 USD per acre and aerial herbicide spraying about 30 USD per acre (Kinkade, 2015). The costs of controlling wild fires that may be increased as a result of the presence of *E. calycina* are also likely to be substantial.

E. calycina is very likely to have similar impacts in the EPPO region as in Australia and California (EPPO, 2018).

Sandy habitats, shrub and rangelands in the Mediterranean region of the pest risk analysis (PRA) area are environmentally very like those in Australia and California where this species has had the greatest impacts. Moreover, *E. calycina* seems to have been introduced much earlier in Australia and California (in about 1900 and 1940, respectively) than in parts of the EPPO region (Portugal and Spain), providing less time for the establishment and spread of this species.

CONTROL

Frey (2005) recommends hand pulling and digging up of plants as an effective control method, but with the following provisos: this method is labour intensive and therefore only suitable for small areas, and the disturbance associated with manual removal can also result in the germination of new *E. calycina* plants. Care must be taken to remove the entire plant or it will resprout (Pickart, 2000; Frey, 2005). Manual removal is recommended during summer (Western Australian Herbarium, 2016).

The use of black landscape fabric and straw (to a depth of 15 cm) to smother plants is also recommended as an effective control method, but again only for small areas (Frey, 2005).

Although mowing during flower anthesis causes a large reduction in stored carbohydrates over the growing season, and despite this species being relatively intolerant of grazing, there is contradictory advice as to whether mowing is an effective control method. Pickart (2000) does not recommend mowing because *E. calycina* plants are able to recover. However, in Australia it is recommended that regular grazing (and mowing), especially in spring, can lead to the disappearance of this species (HerbiGuide, 2016).

E. calycina is not very tolerant of heavy grazing, despite its use as a forage grass (Rossiter, 1947; Moore *et al*., 2006; HerbiGuide, 2016). It apparently does not persist under a continuous grazing regime due to selective grazing of this palatable species (Rossiter, 1947; Moore *et al.*, 2006). However, despite this species' apparent intolerance of grazing, most of the literature investigated does not recommend this as a control strategy. Only HerbiGuide (2016) recommends continuous heavy grazing to exterminate this species. One reason for not using grazing as a control strategy is that the seeds can be transported by grazing animals (Newsome *et al*., 2008; Chimera, 2015).

Setting fire to stands of *E. calycina* is not a recommended method to eradicate this species. This species becomes dormant in the dry summer months (in Mediterranean-type climates), producing abundant dry leaves and stems that are highly flammable (Pickart, 2000). Once burnt, this species is able to resprout from rootstocks (CABI, 2016; Smith *et al.*, 1999; Western Australian Herbarium, 2016). This species also produces a large seedbank (Smith *et al*., 1999), and although fire does not stimulate germination of this species' seeds, and fire also destroy many seeds in the upper soil profile where these seeds tend to accumulate, about 50% of the seedbank survives fire (Smith *et al.*, 1999). Consequently, *E. calycina* thrives in the post-fire environment and ultimately stimulates the development of a grass-fire cycle in which fires increase in frequency, and this species increases in abundance at the expense of native species that are not adapted to such regular fires (Milberg & Lamont, 1995; Fisher *et al*., 2009). The only time that controlled (prescribed) fires might be useful in control of this species is in conjunction with chemical control of seedlings and regrowth directly after burning (CABI, 2016).

For biological control, the efficacy of the fungus *Tilletia ehrhartae* in controlling *E. calycina* populations has not been evaluated. It is not certain that this fungal species alone will be able to control *E. calycina* populations as it has been observed to infect some, but not all, plants in a population and it also only leads to a reduction in plant vigour and not to plant death (Overman *et al*., 2010).

Herbicide control has been found to be generally very effective in managing *E. calycina*, but the timing of application appears to be imperative. Both grass-specific and broad-spectrum herbicides have been used and can be effective. Herbicide application appears to be most effective when plants are actively growing and unstressed, which is from autumn to spring in Mediterranean climates (Herbi-Guide, 2016). It is further recommended that spraying be done before flowering as this results in much higher mortality (Dixon, 1999 cited in CABI, 2016). Follow-up treatments in subsequent years are also highly recommended (Western Australian Herbarium, 2016).

REGULATORY STATUS

E. calycina has been included in a list of 95 invasive alien species that are likely to 'arrive, establish, spread and have

an impact on biodiversity or related ecosystem services in the EU over the next decade' (Roy *et al*., 2015). In 2016, *E. calycina* was identified as a priority for risk assessment within the requirements of Regulation 1143/2014 (Branquart *et al.*, 2016; Tanner *et al.*, 2017). A subsequent PRA concluded that *E. calycina* carried a moderate phytosanitary risk to the endangered area (EPPO, 2018) and was added to the EPPO A2 List of pests recommended for regulation. In 2019, *E. calycina* was included on the (EU) list of species of Union concern (EU Regulation 1143/2014).

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 2019 and is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity' and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

EPPO (2019) *Ehrharta calycina* Sm. Datasheets on pests recommended for regulation. *EPPO Bulletin* **49**(1), 55-60. https://doi.org/10.1111/epp.12525