

EPPO Prioritization Process for Invasive Alien Plants

14-19446

Arctotheca calendula (Asteraceae)



Arctotheca calendula in Cádiz, Spain

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The prioritization process assessment for *Arctotheca calendula* (Asteraceae) has been elaborated by the EPPO Secretariat and was reviewed by the EPPO Panel on Invasive Alien Plants in 2014.

Section A Prioritization process scheme for the elaboration of different lists of invasive alien plants (pests or potential pests) for the area under assessment

Init1 - Enter the name of the pest

Arctotheca calendula (Linnaeus) Levyns

Init2 - Indicate the taxonomic position and synonyms

Asteraceae

Init3 - Clearly define the PRA area

The EPPO region (see map at http://www.eppo.int/ABOUT_EPPO/images/clickable_map.htm).

Init4 - Provide the reasons for performing this assessment, and report any risk analysis available for the assessed species.

Arctotheca calendula (Asteraceae) is an annual or perennial plant native to South Africa. The species has been introduced in the USA and in Australia where it is listed as invasive, as well as in Japan, and New Zealand. The species is present in a few countries in the EPPO region and due to its invasive behavior and potential economic impact, the EPPO Panel on Invasive Alien Plants suggested its inclusion in the EPPO Alert list.

A.1 - Is the plant species known to be alien in all, or a significant part, of the area under assessment?

Yes

The species originates from South Africa and is alien in the whole EPPO region.

A.2 - Is the plant species established in at least a part of the area under assessment?

Yes (for references and an updated distribution, please, check the EPPO PQR Database <https://www.eppo.int/DATABASES/pqr/pqr.htm>)

The species is established in the EPPO region (see Figure 1): France (including Corsica), Greece (Crete), Israel (Flora of Israel on line), Italy (including Sardinia and Sicily), Morocco, Portugal (including Azores), Spain (including Balears and Canarias) and Tunisia.

For the EPPO Region, the first record is probably dated 1883 and refers to the Berlengas archipelago in Portugal. In Portugal, the species is regulated as invasive (Decreto Lei 565). The first record for the Czech Republic refers to the period 1961-1963 during which the species was recorded as a wool alien in the locality Brno as a consequence of wool processing in the Mosilana factory. In Czech Republic, the species has only been recorded as casual. The species was also recorded once in Sweden in 1924 and has not been found since then. In Belgium, the species has been observed as casual and was introduced as seeds in wool. The species is also reported as casual in Kriti (Greece), in Germany and in the United Kingdom.

In Spain, the species is present in Andalucia, Asturias, Balears, Canarias, Cantabria, Catalonia, Galicia, Pais Vasco and Valencia. In Italy, *A. calendula* is recorded in a campsite in the Lipari Islands (Sicily), in Calabria and in Sardinia. In France, the species is recorded in campsites in the Landes and in the Pyrénées Atlantiques departments as well as in Corsica.

The species is native to South Africa: Lesotho, South Africa.

The species has also been introduced and is established in the United States of America as well as in South America in Argentina and Chile, Australia (Northern Territory, New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia), New Zealand and Japan.

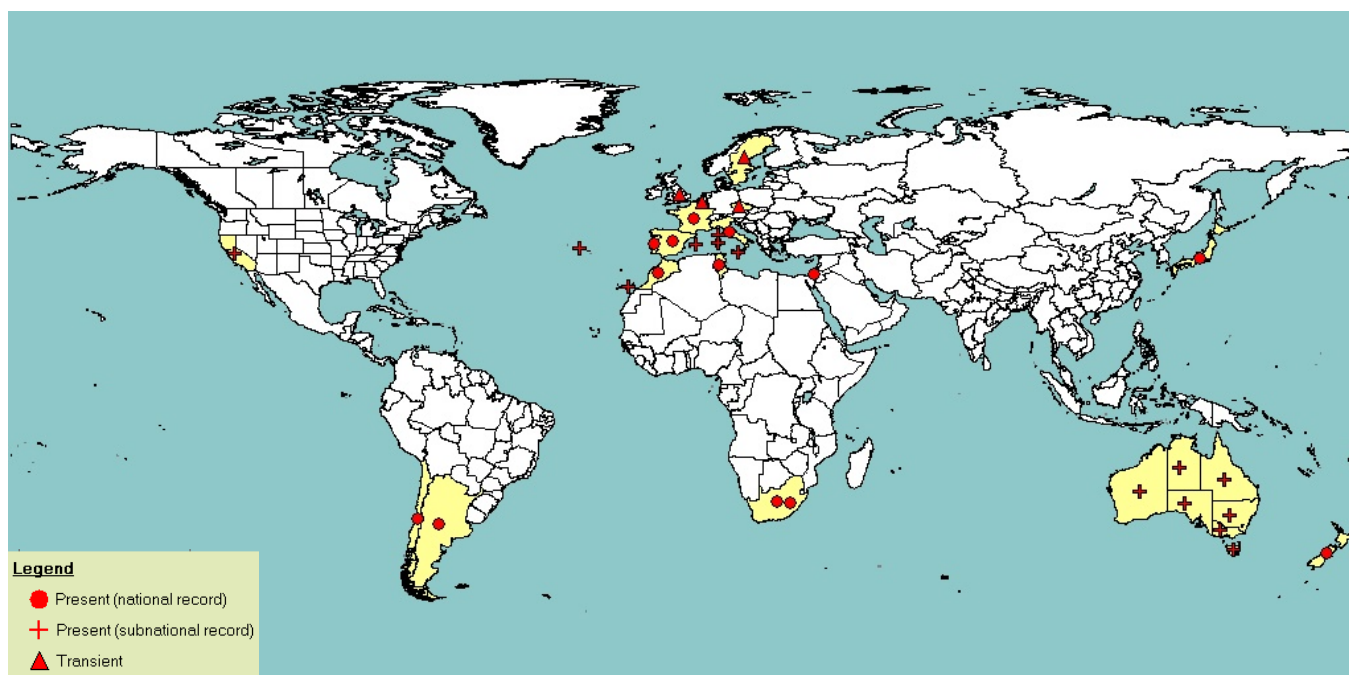


Figure 1: EPPO Worldwide distribution map for *Arctotheca calendula*.

A. calendula is thermophilous, frost sensitive and mostly found in maritime environments in dunes and beaches) (Ministerio de medio ambiente y medio rural y marino, 2011).

It is broadly considered that *A. calendula* could establish in the Mediterranean Basin (the GBIF Niche Model is not provided as it is not considered accurate).

Questions A.5, A.6, A.7 and A.8 all have to be assessed independently. The risk should be considered for the area under assessment where the species is able to establish and to cause damage. The risk should not be downgraded by making an average for the entire area under assessment, if it is different from the area of potential establishment.

As far as possible, evidence should be obtained from records of invasive behaviour in the area under assessment or in the EPPO region. Information on invasive behaviour elsewhere may also provide guidance.

It should be ensured that suitable habitats are present in the area under assessment, for instance, mangroves and some specific cropping systems are not found in the EPPO region.

Any impact through hybridization on native plant species, crops or wild crop relatives is also considered in this section.

A.5 - How high is the spread potential of the plant in the area under assessment?

High

Level of uncertainty: Low

The sexually reproducing *A. calendula* can spread rapidly by seeds (up to 4300 seeds are produced per plant per year), typically colonizing open or disturbed sites with exposed soil. A sterile, vegetatively reproducing yellow-flowered type also exists. This is considered by some experts to be a separate species, and it is noted to spread via creeping stolons.

A. calendula is naturally spread by wind and water. In 2013 in Sardinia it was observed that soil disturbance caused by flooding promoted the establishment of seedlings of *A. calendula*, which were transported by water from an agricultural invaded area to an adjacent non-invaded area (Sulas and Brundu, pers. comm., 2013).

The plant is currently spreading around the Mediterranean area as a contaminant of seed, of machinery, of soil, and via movement of livestock and humans, in particular of campers (Lehtonen, 2009).

A.6 - How high is the potential negative impact of the plant on native species, habitats and ecosystems in the area under assessment?

List natural and semi-natural habitats where the species is known to occur. It includes all EUNIS habitat types 1 (<http://eunis.eea.europa.eu/habitats-code-browser.jsp>), except I (Regularly or recently cultivated agricultural, horticultural and domestic habitats) and J (Constructed, industrial and other artificial habitats).

High

Level of uncertainty: Medium

According to the EUNIS nomenclature, the following natural or semi-natural habitats are invaded: Coastal habitats: Coastal dunes and sandy shores [B1]; Inland water surface: Littoral zone of inland surface waterbodies [C3]; Grasslands and lands dominated by forbs, mosses or lichens: Dry grasslands [E1]; Messic grasslands [E2]; Seasonally wet and wet grasslands [E3]; Woodland fringes and clearings and tall forb stands [E5]; Sparsely wooded grasslands [E7].

Ecological impacts of *A. calendula* have been reported. In California, it is reported to be an aggressive competitor for water and space and to seriously threaten native plant communities by crowding out grasses, herbs and small shrubs, in particular in coastal grasslands and riparian zones (California Invasive Plant Council Website; Bossard *et al.*, 2000). In such habitats, the plant has been observed to form impenetrable monospecific stands. Invasion by *A. calendula* is also described as a serious threat to five types of vegetation formations in Victoria (Australia) (dry coastal vegetation, heathland & healthy woodland, mallee shrubland, lowland grassland & grassy woodland, dry sclerophyll forest & woodland, Carr *et al.*, 1992)).

On the other hand, in Western Australia, the plant seems to be a relatively poor competitor with native

species, but if established, it can have a moderate impact on native plant communities (Florabase).

Although the species is present in the EPPO region, little information on its impacts on natural and semi-natural habitats can be found. In Spain, the species penetrates valuable and vulnerable coastal dunes (Dana *et al.*, 2005; Verloove & Sánchez Gullón, 2008). It is for instance present in the Monumento Natural de la Playa de Penarronda and in the Monumento Natural de la Playa de Frexulfe y en la playa de Misiago (Reserva de Villaviciosa) in Asturiás. In Spain, *A. calendula* is reported to displace native species of sandy coastal ecosystems: *Ammophila arenaria* (Poaceae), *Crucianella maritima* (Rubiaceae, Protected in the Principado de Asturias, Asturnatura Website), *Malcolmia littorea* (Brassicaceae, Protected in the Principado de Asturias, Asturnatura Website), *Pancratium maritimum* (Amaryllidaceae, Protected in France, as well as in Spain), etc. Not all species displaced by *A. calendula* are reported above, and the listing of the protection status may not be exhaustive.

In Sardinia the species thrives in two different habitat and land uses types. One invaded sites is an occasionally ploughed pasture in a *Quercus* dehesa (i. e. rangeland with sparse trees of *Quercus* sp.) on acidic sandy soils. The second invaded site is an intensive agricultural area on alluvial sandy soil (cultivated with annual crops and forage crops, occasionally irrigated) where *A. calendula* behaves like a typical weed of agricultural crops, with high density cover (50-90%), and where it is difficult to control. So far the species has not been recorded in coastal areas or protected areas in Sardinia.

Diverging information is found in California and Western Australia and little information is available in the EPPO region. The uncertainty is therefore considered as medium.

A.7 - How high is the potential negative impact of the plant on agriculture, horticulture or forestry in the area under assessment?

The habitats and the situations in which the species has negative impact on agriculture, horticulture or forestry should be listed. It includes EUNIS habitat (<http://eunis.eea.europa.eu/habitats-code-browser.jsp>) I (Regularly or recently cultivated agricultural, horticultural and domestic habitats) and J (Constructed, industrial and other artificial habitats).

Medium

Level of uncertainty: Low

According to the EUNIS nomenclature, the following habitats are invaded: Regularly or recently cultivated agricultural, horticultural and domestic habitats: Cultivated areas of gardens and parks [I2]; Constructed, industrial and other artificial habitats: Extractive industrial site [J3]; Transport networks and other constructed hard-surfaced areas [J4]; Highly artificial man-made waters and associated structures [J5]; Waste deposit [J6].

A. calendula is a weed of cereals, oil seed rape and legumes in Australia. It has been estimated to cost 9.7 million AUD per annum in yield losses in annual winter crops including wheat, oats, barley, oil seed rape, and pulses, not counting pre and post emergent control costs (Jones *et al.*, 2000). The species also dominates pastures in Australia and reduces the value of stock by lowering their weight (Lehtonen, 2009).

Similarly, according to Sulas (2000) the traits responsible for the competitive ability and weediness of *A. calendula* in Australia apply to the Mediterranean agricultural areas, pastures and rangelands. These traits are: the rapid growth soon after the first rains at the end of the summer period, the prostrate habit, the vigorous root system, the limited palatability for sheep, the short life cycle with an early flowering, the production of large numbers of cypselas and the presence of dormant seeds. Flowering in March in Europe allows the species to set its seeds when grazing pressure is lower due to the presence at this time of a diverse and rich plant community with more palatable species (Sulas, 2000). The forage values of natural and artificial pastures decreases considerably with the presence of *A. calendula*.

A.8 - How high are the potential additional impacts (e.g. on animal and human health, on infrastructures, on recreational activities, other trade related impacts such as market losses)?

Medium

Level of uncertainty: Medium

The plant also has impacts on animal health. It has been reported that seeds of the plant may be embedded in wool which when ingested by animals (most likely when they clean themselves) may form hair balls in their stomach which can be fatal (Clemson, 1985 in Lehtonen, 2009). Grazing is thought to taint milk, and where *A. calendula* is the dominant feed, nitrate poisoning of stock is possible (Department of Primary Industries, Tasmania, Water and Environment, 2002). *A. calendula* accumulates cadmium (which occurs as a contaminant in phosphate fertilizers), which has an adverse effect on animal production (Bramley & Barrow, 1994).

Responses to questions on impacts (A.6, A.7 and A.8) should be reported in the matrix in Fig. 2 in order to categorize the species. The highest score should be considered; however, impacts listed in question A.8 cannot be taken on their own as the highest impacts. Only if A.6 and/or A.7 is medium and A.8 is high should the overall impact be considered high.

Those species that have both a high spread potential and a high impact (either on cultivated or uncultivated ecosystems) are included in the list of invasive alien plants. Species with either medium spread or impacts are included in the observation list of invasive alien plants. Species with low spread and high impact are included in the observation list of invasive alien plants. All other species are registered on the list of minor concern.

The conclusions of the process can be presented in a matrix (see Fig. 2).

		A5 -Spread potential		
		Low	Medium	High
Adverse impacts (maximum rating from questions A6, A7. and A.8)	Low	List of minor concern	List of minor concern	List of minor concern
	Medium	List of minor concern	Observation list of invasive alien plants	Observation list of invasive alien plants
	High	Observation list of invasive alien plants	Observation list of invasive alien plants	List of invasive alien plants

Fig. 2 matrix combining spread potential and adverse impacts.

The answer provided to question A.5 on the spread potential of the species assessed was:

High

The answer provided to question A.6 on negative impact on native species, habitats and ecosystems was:

High

The answer provided to question A.7 on negative impact on agriculture, horticulture or forestry was:

Medium

The answer provided to question A.8 on additional impacts was:

Medium

According to the ratings provided, the assessed species falls into the:
List of invasive alien plants

A.9 - The overall uncertainty for Part A of the EPPO prioritization process for invasive alien plants should be summarized:

Medium

Although the species is established in a few countries of the EPPO region (France, Greece, Israel, Italy,

Morocco, Portugal, Spain, Tunisia), only two publications on the impacts of *A. calendula* in the EPPO region could be retrieved: (i.e. Sulas, 2000) for Sardinia (Italy) and Ministerio de medio ambiente y medio rural y marino (2011) for Spain. Nevertheless, the species is regulated as an invasive alien plant in Portugal (Decreto Lei 565/99) and listed as having invasive potential in Spain (Ministerio de agricultura, alimentación y medio ambiente, 2011).

Section B Prioritization process scheme for the identification of invasive alien plants for which a PRA is needed

B.1 - Is the plant species internationally traded or are there other existing or potential international pathways?

List the pathway(s) as justification.

Yes, at least one international pathway is identified.

A. calendula is considered to have been introduced in Spain as an ornamental plant (Ministerio de medio ambiente, y medio rural y marino, 2011). According to the PPP index, *A. calendula* is traded in at least 2 nurseries in Europe (PPP index website). The plant is also known to be used as groundcover and sometimes as a medicinal plant (Lehtonen, 2009). In Australia, the plant was introduced from South Africa, probably as a contaminant of packing material, stock fodder and sheep fleeces. In Europe, it is also thought to have been accidentally imported as a contaminant of Leguminosae of non-European origin, in particular from Australia. Likely pathways of entry also include contaminated seed and grain. The plant is currently spreading around the Mediterranean area as a contaminant of seed, of machinery, of soil, and via movement of livestock and humans, in particular of campers (Madon, 1994; Lehtonen, 2009).

B.2 - Is the risk of introduction by these international pathways identified to be superior to natural spread?

Yes

There are numerous pathways of introduction. The species is recorded as established in 8 EPPO countries but does not have a widespread distribution in these countries.

B.3 - Does the plant species still have a significant area suitable for further spread in the area under assessment?

Medium area suitable for further spread.

The species is established in 8 countries in the EPPO region. Even if its distribution in these countries is not large (France, Greece, Israel, Italy, Morocco, Portugal, Spain, Tunisia), the species could still expand its range to the Mediterranean basin, though, the area for further spread is considered to be medium. The climatic potential range of the species remains uncertain and could be wider than the Mediterranean basin considering the native distribution of the species.

The species still has a medium area for further spread, but the uncertainty on this point remains high.

The species assessed is a lower priority for PRA.

The guidelines on pest risk analysis of EPPO Standard PM 5/3 *Decision-support scheme for quarantine pests* should be followed to perform a PRA.

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