



Mesembryanthemum crystallinum L.: A potential invasive plant in Tunisia

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Abstract

Biological invasions are considered as one of the most serious threats to the biodiversity. *Mesembryanthemum crystallinum* L. (*Aizoaceae*) is reported invasive in many regions over the world. This paper aim to monitor its distribution in the Kerkennah islands and update its invasive status. Field surveys, performed during May 2022, were achieved to record *M. crystallinum* occurrences and generate the plant distribution map. Field monitoring reveals that *M. crystallinum* is widespread and has the ability to grow in a broad range of disturbed habitats. The plant distribution pattern show that it often forms dense stands which allow it to inhibit the growth of other plants. Considering its behaviour *M. crystallinum* should be considered as a potential invasive plant in Tunisia which requires the implementation of an appropriate management plan.

Keywords: Crystalline iceplant, invasive plant, management, monitoring

1. Introduction

Biological invasions are becoming an increasingly widespread problem that affects biodiversity (Bartz and Kowarik, 2019; Krigas *et al.*, 2021) [3, 12]. By definition, invasive species refers to those organisms that have moved from their native habitat to a new location, where they cause significant harm to the environment, economic systems and/or human health (Richardson *et al.*, 2000, Beck *et al.*, 2008) [19, 4]. As per the International Union for Conservation of Nature (IUCN, 2004) [11], the impacts caused by the invasion of exotic species are usually immense, insidious and irreversible (Wekhanya, 2016) [23]. Invasive alien plant species are considered to be major drivers of ecological change worldwide with severe negative impacts on nature conservation and ecosystem services fonctionnement (Winter *et al.*, 2009; Pyšek and Richardson, 2010, Vilà *et al.*, 2011; Vilà and Hulme, 2017) [25, 18, 20, 21]. Invasive plants introduce new traits in the ecosystem which may cause dramatic changes to nutrient (Lone *et al.*, 2019) [15].

Crystalline iceplant (*Mesembryanthemum crystallinum* L.; EPPO code: MEKCR) is a herbaceous plant of the *Aizoaceae* family. It is an annual or biennial succulent halophyte native to South Africa and southern Europe (Cal-IPC, 2022) [8]. It has been introduced in a several countries in the world both intentionally (as an ornamental) and accidentally (in sand used in ships ballasts) (CABI, 2022) [7]. It is naturalized in Mediterranean coastal areas, the U.S., Australia, Mexico, Chile, the Caribbean and Italy (Loconsole *et al.*, 2019) [14]. The Crystalline iceplant is typically distributed on coastal sand dunes, saline flats, inland saline areas, and roadsides. It is tolerant to low temperatures and accumulations of salt on the top soil, which excludes other species from growing (Adams *et al.*, 1998; Wendelberger and Richards, 2017) [2, 24]. The plant has an invasion history in many regions, it is reported as invasive in Australia (Chinnock *et al.*, 2012) [9] and California (Cal-IPC, 2022) [8]. It is also recorded to be subject to control actions in Mediterranean countries (Dana *et al.*, 2009; Brunel *et al.*, 2013) [10, 6].

In Tunisia *M. crystallinum* was reported in many regions but introduction pathways are not Known. It occur in maritime sands, salt depressions and rubble (Pottier-Alapetite, 1979) [17]. It was reported as a weed in cereal crops in Djerba (South of Tunisia) (Berghen, 1980) [5] and in roadsides in El Jem (East central Tunisia) (Labbé, 1964) [13]. In the tunisian climatic conditions, the

species is recognized as highly stress resistant, it tolerate drought, salinity and high levels of organic compounds in the soil (Médail and Véla, 2020) ^[16]. Due to its high prolificity (15000 seed per plant) (CABI, 2022) ^[7] and its adaptation to environmental stress *M. crystallinum* could be a potential invader in arid and semi-arid tunisian regions. This paper aim to monitor and update the invasive status of *M. crystallinum* in Tunisia.

Materials and Methods

Study site

The islands of Kerkennah are located in the east coast of Tunisia in the Gulf of Gabès, at 34°42'N 11°11'E (Fig 1). The Islands are low-lying, being no more than 13 m above sea level. The archipelago has an area of 160 km². The main islands are Chergui and Gharbi where our prospection was performed.

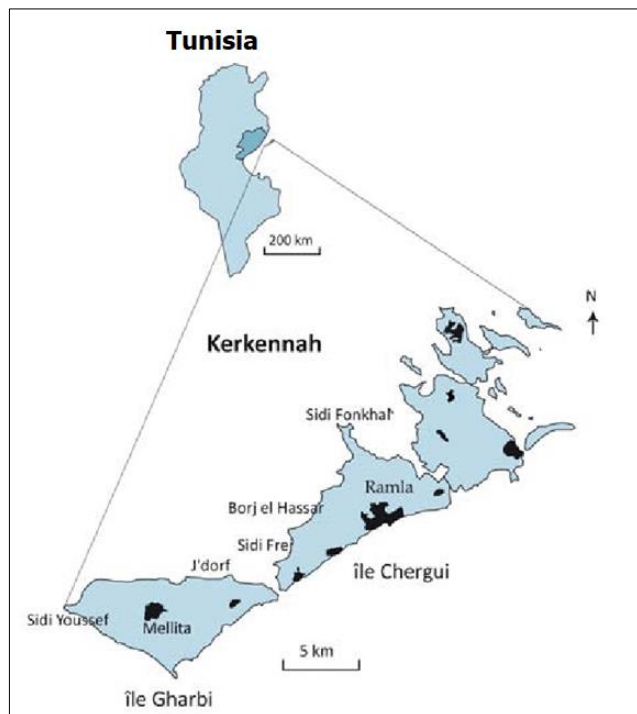


Fig 1 : Geographical localisation of the study site

Field surveys

Field surveys were performed during May 2022, in the main islands of Kerkennah : Chergui and Gharbi. Prospection was achieved following primary and secondary road networks to survey the whole surface of the studied area. *M. crystallinum* occurrences were localized with a GPS (Garmin eTrex Vista, 12 channels) by recording their geographic coordinates (degrees of latitude and longitude) captured in their centers of populations. Geographic records were used to generate the plant distribution map.

Results and discussion

M. crystallinum distribution map revealed that the species is largely common and widespread at the study site (Fig 2). On other hand, field monitoring reveals that the plant has the ability to grow in a broad range of disturbed habitats including roadsides and residential areas. Nevertheless, the plant is also frequent near to olive plantations in plots borders

and between rows (Fig 3).



Fig 2 : *Mesembryanthemum crystallinum* distribution map in Kerkennah (May, 2020)



Fig 3: *Mesembryanthemum crystallinum* occurrence in disturbed habitats (Kerkennah, May 2020)

Over the study site, *M. crystallinum* occur as patches but it often forms dense stands which allow it to inhibit the growth of other plants. These findings are in agreement with those of Abd El-Gawad and Shehata (2014) ^[1] who recorded monotypic stands of *M. crystallinum* in the deltaic Mediterranean coast of Egypt.

M. crystallinum traits such as high seed production (CABI, 2022) ^[7], tolerance to the most severe environmental conditions (Adams et al., 1998; Wendelberger and Richards, 2017) ^[2, 24] and accumulation of high levels of salt in the soil which inhibit grassland establishment (Viverette and Muller, 1977) ^[22] predisposes it to be a successful invader in tunisian coastlands.

Conclusion

Invasive alien plants mapping and monitoring are very useful tools to address management priorities and provide a baseline for future monitoring efforts. Our study results draw attention to the potential risk of *M. crystallinum* and suggest the implementation of a specific management plan for this species including local control and awareness campaigns.

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Conflict of interest

The author declared no conflict of interest for this study.

Consent for publication

Author have given her consent to publish this article.

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