

***Tridax procumbens* L. (Asterales Asteraceae), a new record to the flora of the United Arab Emirates**

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ABSTRACT

Tridax procumbens L. (1753), recently collected from the mountain area in Masafi of Fujairah emirate, is recorded as a new alien plant for the flora of United Arab Emirates (UAE). With this discovery, *Tridax* is also added as a new genus to the country's flora. *T. procumbens* is a weed that is native to the tropical and subtropical Americas and naturalized in many other countries as it can grow under a wide range of environmental conditions. This plant is locally of considerable medicinal importance in many countries as it can be used for the treatment of many diseases. Description, distribution, and photographs of this taxa, along with a distribution map, is presented. Herbarium and seed specimens of *T. procumbens* were deposited in the Sharjah Seed Bank and Herbarium (SSBH) of Sharjah Research Academy, UAE. The way of introduction of *T. procumbens* and time of its arrival in the UAE remains unknown. A more detailed study of the extent of the range of this species, its densities, and regeneration potential is suggested in the near future. The reports of new plant records to the flora highlight the importance of thorough botanical exploration in the country. Such botanical recording would be beneficial to nature conservationists and researchers alike.

KEY WORDS

Medicinal; new record; *Tridax procumbens*; United Arab Emirates; weed.

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INTRODUCTION

The Asteraceae (Compositae) is one of the largest vascular plant families, comprising about 2250 genera and 25000 species worldwide (Funk et al., 2005; Funk et al., 2009; Stevens, 2017). In the vascular flora of the United Arab Emirates (UAE), Asteraceae is the second largest family after Poaceae, with approximately 84 species “includes both native and alien taxa” and it is distributed in every habitat of UAE (Jongbloed, 2003; Karim & Fawzi, 2007; Shahid & Rao, 2015; SSBH unpublished database).

The genus *Tridax* L. is distributed mainly in Central and South Americas and more concentrated

in Mexico. This genus includes about 26 species, which are native in the new world. One weedy species of this genus, *Tridax procumbens* L. (1753), is widely naturalized in the Old World. *Tridax* plants are annual, perennial, erect, procumbent habits (Powell, 1965; Holm et al., 1997), and occupy a variety of habitats.

With the increasing international trade, the number of accidental and intentional exotic introductions species is probably increasing (Keane & Crawley, 2002; Lehan et al., 2013). Like other oil-producing countries, UAE is rapidly developing, with more commercial and agricultural exchange. As a result of that, the possibility of new or alien

plants appearing in the flora of the country is very high. The UAE has a hyper-arid climate and harsh environmental conditions and limited resources (Sherif et al., 2009; Shabana et al., 2018). Therefore, the existence of any alien plant might have a negative effect on plant diversity and biodiversity of the UAE.

This article reports for the first time the existence of *Tridax procumbens* in the natural flora of UAE and provides some data about habitat distribution and current information on the population of the species.

MATERIAL AND METHODS

During field explorations of Sharjah Seed Bank and Herbarium (SSBH) in April 2020, the authors collected specimens and fruits of a plant belonging to family Asteraceae from the Masafi region of Fujairah emirate. Along with plant samples, all relevant field data, including geographic coordinates of the collection sites, associated species, phenology, number of individuals, and habitats were recorded based on personal observations. Also, some morphological traits such as plant height and width, size (length) of 50 fruits (achenes and pappus), and 50 seeds without pappus were recorded.

Detailed morphological characters of plants were noted in the field and from herbarium material and then compared with the taxonomic information from relevant literature (e.g., Powell, 1965; Keil et al., 1987; Holm et al., 1997; Funk et al., 2005; Panda & Behera, 2019). Reference voucher specimens were deposited in the herbarium of SSBH, Sharjah, UAE.

Study area

The United Arab Emirates (Fig. 1) is located in the south-eastern part of the Arabian Peninsula between latitudes 22°40' and 26°00' north and longitudes 51°00' and 56°00' east. Its climate is hyper-arid with high temperatures that can reach up to 47 °C in August. The rainfall is very scarce and erratic, with around 110 mm per year (Böer, 1997; Sherif et al., 2009; Merabtene et al., 2016).

RESULTS AND DISCUSSION

Based on the detailed study of morphological

characteristics and consultation of relevant literature, our observations allowed us to deduce that the collected plant specimens belong to *Tridax procumbens*. Accordingly, we conclude that the plant is *T. procumbens* (Figs. 2–7), a new record to the flora of UAE.

The flora of UAE (Karim & Fawzi, 2007) and the flora of the Arabian Peninsula and Socotra Island (Miller & Cope, 1996), as well as other available literature (e.g., Jongbloed, 2003; Feulner, 2011), were thoroughly checked, and no previous records of this plant was found for the UAE. Hence, we record the discovery of *T. procumbens* as new species and genera record to the flora of UAE. The identification of *T. procumbens* was made by the authors based on the morphological characteristics of plant and field experience and consultation of published accounts of *Tridax* (e.g., Powell, 1965; Holm et al., 1997). Prof. Mats Thulin and Prof. Wafaa Taiaa confirmed the identity of this species from the author's photographs. The way of introduction of *T. procumbens* and time of its arrival in the UAE remains unknown.

Tridax procumbens L. (1753) (Figs. 2–7)

SYNONYMS. *Amellus pedunculatus* Ortega ex Willd., *Balbisia elongata* Willd., *Chrysanthemum procumbens* (L.) Sessé & Moc., *Tridax procumbens* var. *canescens* (Rich. ex Pers.) DC. and *Tridax procumbens* var. *ovatifolia* B.L.Rob. & Greenm.

COMMON NAMES. Coat buttons and *Tridax* daisy.

DESCRIPTION. *Tridax procumbens* is a hairy, semi-prostrate perennial herb with woody base; 30 cm–50 cm high; with adventitious roots at nodes. Plant stems are procumbent, branched near the base, round, sparsely to very hairy. Leaves are simple, opposite, lanceolate to ovate, 2 cm–7 cm long and 1 cm–4 cm wide, with irregularly toothed margins, base wedge-shaped, shortly-petioled, densely hairy on both surfaces. Inflorescence is a terminal involucre flower head “capitulum”, solitary on erect peduncle 10 cm to 25 cm long. Involucre 2–3-seriate, ovate, acute to shortly acuminate, 5 mm to 6 mm long. Receptacle with oblong, hairy scales. Its ray flowers are few, 3–dentate, pale yellow, and disk flowers are tubular, 5–dentate, yellow to brownish-yellow, with recurved hairy segments. Fruit is a black achene covered with fine, pale hairs,

grayish-brown, base narrow, 2 mm long, 1 mm wide at apex, pappus in one row, unequal in length, 5 mm–6 mm long (Powell, 1965; Ivens, 1967; Holm et al., 1997; Graves, 2000). Interestingly, one individual can produce about 500 to 2500 fruits. Mostly, the plant is a perennial, but some refer to it as an annual or short-lived perennial (Holm et al., 1997).

DISTRIBUTION. *Tridax procumbens* is native throughout the tropical and subtropical Americas. Now its distribution is increasing in other parts of the world as naturalized species and found in about

60 countries such as Angola, India, Vietnam, Thailand, and Australia (Powell, 1965; Holm et al., 1997; NGRP, 2018; United States Department of Agriculture, 2018). *Tridax procumbens* is a weed widespread in many countries due to its ability to adapt to diverse environments and rapidly colonize new areas as well as its abundant seed production (Powell, 1965; Holm et al., 1997). It has agricultural impact as it is a weed of 31 crops (e.g., rice and wheat) in 60 countries (Holm et al., 1997). This plant has high seed germination (ca, 98%) and viability of seeds extending to 450 days. Its seed germination is high in light and wide temperatures and

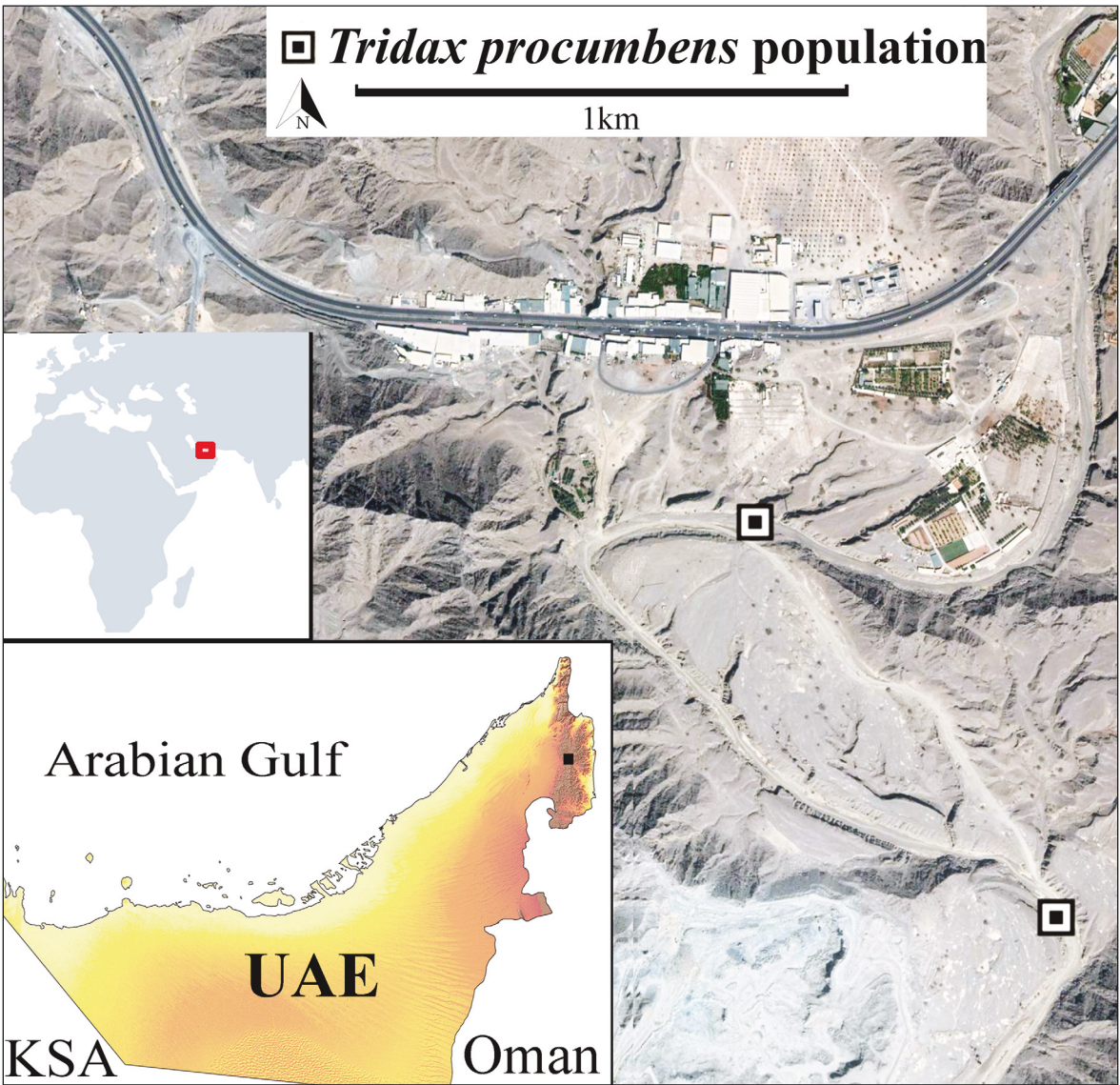


Figure 1. Map showing the distribution of records for *Tridax procumbens* in UAE.

pH range (Chauhan & Johnson, 2008; Vanijajiva, 2014). It is considered invasive in some countries, for example, China (Weber et al., 2008), Taiwan (Wu et al., 2004), and India (Panda & Behera, 2019). In the Arabian Peninsula, it is recorded from Saudi Arabia (Alfarhan et al., 1997; Thomas et al., 2016), Oman (Pickering & Patzelt, 2008; Patzelt et al., 2014), and Yemen (Hall et al., 2008; Hall et al., 2009).

In United Arab Emirates, *T. procumbens* was recorded from two sites in the south of Masafi, Fujairah emirate. The distance between the two sites is about one Km., (N: 25.282151, E: 56.121951, Alt.: 236 m and N: 25.288572, E: 56.116737, Alt: 338 m) (Fig. 1).

As this species has been recorded in three countries in the Arabian Peninsula, two from them are neighboring UAE (Hall et al., 2009; Patzelt, 2014; Thomas et al., 2016). Therefore, there is a possibility that the plant may transfer from the neighboring regions to UAE. However, we cannot confirm this, because at present there is not sufficient information available about the plant in these countries, such as its distribution, rate of spread, and its population size.

HABITAT AND ECOLOGY IN UAE. *Tridax procumbens* was found growing in mountain wadi banks and adjacent slopes at about 340 m altitude. In UAE, the mountain area contains a reasonable amount of water from rain compared to other habitats. This plant was associated with 19 species from 15 families, and the more dominant species were *Frankenia pulverulenta* L. (1753), *Aizoon canariense* L. (1753), *Cenchrus ciliaris* L. (1854), *Tephrosia apollinea* (Delile) DC. (1822), *Amaranthus viridis* L. (1763), *Cleome noeana* Boiss. & Popov (1916), *Andrachne aspera* Spreng. (1826), *Boerhavia elegans* Choisy (1849), *Datura stramonium* L. (1938) and *Citrullus colocynthis* (L.) Schrad (1838).

NUMBER OF INDIVIDUALS IN UAE. During the course of the survey, ca. 55 individuals of this species were recorded from the two sites. These can be categorized into mature, vegetative, and seedling stages. The mature individuals were five, two of them had both flowers and fruits, and the other three with flowers only. The other 50 individuals were recorded in the seedling and vegetative stage.

PHENOLOGY IN UAE. Flowering and fruiting of the plants have been seen in April–May. Recording mature individuals with flowers and fruits gives the

impression that this species might be flowering and fruiting throughout the year. Observations on young individuals of this species suggest that the seedling emergence began before one week in the natural population (Figs. 2–7). Therefore, we recommend that this plant needs more monitoring in the near future to understand its phenological aspects in UAE.

PLANT AND FRUIT SIZE. The mean and standard deviation of plant height and width of the mature plants were (40.0 cm \pm 7.9 and 86.0 cm \pm 39.3, respectively). For small plants (vegetative and seedling), it was (4.5 cm \pm 1.0 and 6.2 cm \pm 1.2, respectively).

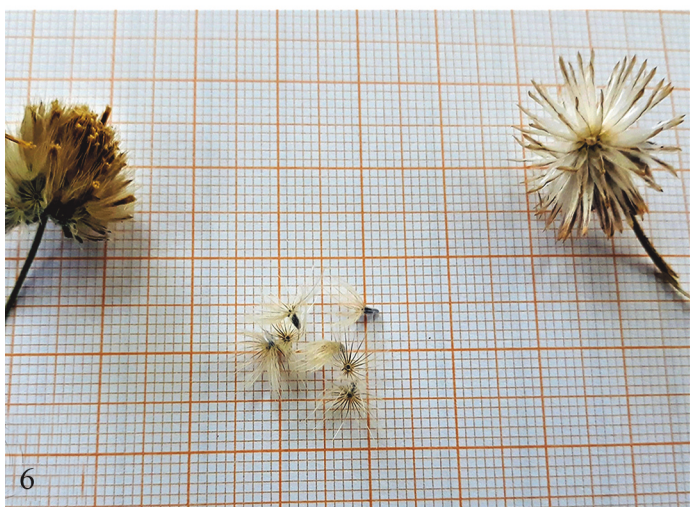
Mean and standard deviation of fruit size (length) was 0.5 cm \pm 0.1, the seed (achene) without pappus was 0.2 cm \pm 0.1 (Figs. 6, 7).

DISPERSAL TRAITS. Literature suggests that *T. procumbens* might have different dispersal patterns. The fruits of this species are able to disperse over long distances by both wind and water with its pappus (Shaukat et al., 2005; Vanijajiva, 2014). Another strategy includes restricted dispersal by falling fruit clusters together around the mother plant and stored in the soil seed bank (Shaukat & Siddiqui, 2004; Shaukat et al., 2005). It has been suggested that the production of numerous fruits that disperse by the wind for long-distance may make it invasive (Vanijajiva, 2014; Amutha et al., 2019).

In UAE, the distribution of *T. procumbens* in two sites indicate its possible long-distance dispersal as the fruits might have dispersed from one site to another while the small individuals around big plants express the restricted dispersal. The characteristics of long-distance dispersal, rapid growth and regeneration, and reproductive ability might enable the spread of *T. procumbens* in UAE.

USES OF *TRIDAX PROCUMBENS*. The plant is used as an ornamental, for feed and medicinal purposes, and its leaves are cooked as vegetables in some places (Prajapati, 2008; Acharya & Srivastava, 2010; Kethamakka & Deogade, 2014).

Tridax procumbens is used in a wide range in folklore medicine (Kethamakka & Deogade, 2014). It is used in the treatment of many ailments including diarrhea, malaria, stomach pains, diabetes, cough, fever in different countries in the world (Martín-Quintal et al., 2009; Ahirwar et al., 2010;



Figures 2–7. *Tridax procumbens* from United Arab Emirates. Fig. 2: whole plant “mature, vegetative, and seedling”. Fig. 3: stem with leaves. Fig. 4: inflorescence “capitulum”. Fig. 5: fruit set per head. Fig. 6: fruit clusters. Fig. 7: fruits size “achene and pappus”.

Kethamakka & Deogade, 2014). In addition, many therapeutic activities such as anti-cancer, anti-bacterial, anti-fungal, antioxidant property, wound healing, and anti-diabetic are reported for this plant (Kethamakka & Deogade, 2014; Jhample et al., 2015; Saini et al., 2016).

In UAE, *T. procumbens* can be used as medicinal, ornamental, and for animal feed by keeping it under control to prevent its spread. Therefore, studying the spatial distribution of *T. procumbens* would help to understand the spread and predict its future distribution and invasion risk, as such information enables the development of means of invasion control.

CONCLUSIONS

Our findings contribute towards an update of the range of *T. procumbens*, a new alien plant record and a new genus added for the flora of UAE. Elsewhere this species is reported as a weed and also have invasive characteristics; therefore, regular field assessments should be undertaken to monitor the spread and population dynamics as well as observing any threats by it to native plants in UAE. Thus, it becomes more important to prevent future introduction of such alien species and their spread for safeguarding native plant diversity.

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