

Contribution to the flora of United Arab Emirates: *Glinus lotoides* L. (Molluginaceae) and *Senna occidentalis* L. (Fabaceae) two new records

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ABSTRACT

This paper reports *Glinus lotoides* L. (Molluginaceae) and *Senna occidentalis* L. (Fabaceae) as two new records to the flora of the United Arab Emirates (UAE). In the UAE, *G. lotoides* grows in the seasonally inundated land when the water recedes and soils have high clay contents. This is the only representative species of the genus *Glinus* in the UAE. Hence, we added a new genus to the country's flora. *Senna occidentalis* was recorded from Wadi Al-Ain with ca. 15 individuals in its population. This species is considered as a weed elsewhere, so, there should be further assessments in order to monitor naturalization potential in its new localities in the UAE. The general distribution of the newly recorded species, habitat preferences and taxonomy with a map of localities in the UAE are presented. The occurrence of both species in different places in the UAE calls for further investigation and more extensive field studies to explore the country's genetic resources.

KEY WORDS

Floristic survey; *Glinus lotoides*; *Senna occidentalis*; new record; UAE.

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INTRODUCTION

The United Arab Emirates (UAE) is characterized by a wide variety of habitats (i.e., mountainous, coastal lowlands, desert and alluvial plains) that support unique diversity of plant genetic resources. Despite the UAE is regarded as floristically poor, it harbors unique plants with remarkable morphological, physiological and anatomical adaptations strategies that enable them tolerating the very harsh climatic conditions prevailing in the country (Tourenq & Launay, 2008).

The UAE supports varying amounts of sparse seasonal vegetation. The flora of the UAE accounts for ca. 750 species of vascular plants including important native plant species and is affected by

alien invasive species (El-Keblawy & Abdel Fatah, 2014).

Although it might be regarded that there is a reasonable knowledge on the general distribution of vascular plants in the UAE, recent studies showed new regular discoveries that enriching the flora of the country (e.g., Gairola et al., 2015; Mahmoud et al., 2015a, b; Shahid & Rao, 2015). There are some potentially very interesting remote areas (e.g., mountainous regions) thus have not been fully explored floristically. In such areas, certain new plant records or new species to the UAE are waiting to be recorded. For example, in a recent survey for the flora of the remote area of Wadi Helo, El-Keblawy et al. (2016) recorded 6 species new to the UAE flora.

Since 2009, the research team of the Sharjah Seed Bank & Herbarium (SSBH) is extensively exploring plant diversity of the country. It was realized that the exploration of non-recorded species is vital in assessing the genetic resources, especially in the more vulnerable and remote high mountains in this harsh part of the world. As a continuation of such explorations, some taxa have been recently collected from the region and added as new records to the flora of the UAE. The recent contributions to the flora of the UAE include a series of joint botanical collecting trips involving the staff of Kew Herbarium and SSBH (e.g., Heller & El-Keblawy, 2013; Gairola et al., 2015; Mahmoud et al., 2015a, b) and various other researchers (e.g., Feulner, 1997; Böer & Chaudhary, 1999.; Brown et al., 2006; Shahid, 2014; Shahid & Rao, 2014a, b; Shahid & Rao, 2015) have revealed the presence of some spontaneously occurring plant species new to the UAE. The recently published new records from the UAE are important additions to Jongbloed (2003) and Karim & Fawzi (2007). However, a few non-indigenous invasive or weedy elements that have been recorded for the first time among the flora of the UAE need critical monitoring to assess their future distribution. The climatic and environmental harshness of the Arabian deserts might hinder the invasion of alien plant species. However, the increasing human impacts, such as habitat fragmentation, encroachment of natural habitats through farmland and expansion of residential areas are threatening the natural flora. Some of the unre-

corded species of the UAE flora might extinct before being discovered. Present article sheds light on the distribution, habitats preferences, and taxonomy of two newly recorded plant species in the UAE.

MATERIAL AND METHODS

During the years 2015-2016, floristic surveys were undertaken in different parts of the UAE and samples of a particular plant species were collected for observation and identification. The digital photos of plants in their natural habitat were also taken to facilitate the identification process. Preliminary identification of *Glinus lotoides* L. (Molluginaceae) and *Senna occidentalis* L. (Fabaceae) was done using taxonomic keys in different flora books, including Flora of Arabian Peninsula and Socotra (Miller & Cope, 1996). The identification of *G. lotoides* was confirmed by Dr. Jacob Thomas, a key taxonomist in the Arabian flora. Once the species was identified, the collected material with voucher numbers, family, species and collection details was kept at the Sharjah Seed Bank & Herbarium, Sharjah Research Academy, Sharjah. Flora of UAE (Karim & Fawzi, 2007) and other available literature (e.g., Jongbloed, 2003) were thoroughly checked and have been found that there were no previous records for *G. lotoides* and *S. occidentalis* from the country.

Therefore, we consider these plants are a new addition to the flora of UAE. For each species, synonyms, general distribution, habitat preferences, and taxonomy as well as a list of localities recorded are presented.

RESULTS AND DISCUSSION

During our recent floristic surveys, it became apparent that *G. lotoides* was recorded for the first time from UAE. Another newly recorded species *S. occidentalis* was found growing in a moist habitat of wadi Al Ain bed. Furthermore, after going through the literatures, it has been confirmed that *G. lotoides* and *S. occidentalis* are new records to the UAE flora.

Glinus lotoides is recorded from the adjacent countries including Saudi Arabia and Oman (Miller & Cope, 1996). Figure 1 and Table 1 present the

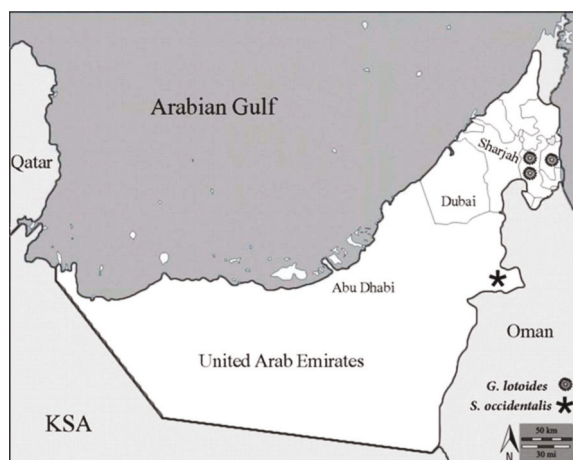


Figure 1. Map showing the sites where *G. lotoides* and *S. occidentalis* was found in UAE.

Locality/ Species	Latitude	Longitude	Alt. (m)	Phenology	Local status
<i>Glinus lotoides</i>					
Wadi Ham Dam, Fujairah	25.13311	56.28102	80	Vegetative	Not common
Wadi Al Quor Dam, Ras Al Khaimah	24.90565	56.15346	238	Flowering and Fruiting	Co-dominant
Wadi Al Mansab Dam, Ras Al Khaimah	25.06022	55.99275	255	Flowering	Common
Wadi Al Mudaynah Dam, Ras Al Khaimah	25.03348	56.02315	300	Flowering	Not common
Wadi Shawkah Dam, Ras Al Khaimah	25.10585	56.04448	295	Flowering	Common
Wadi Al Qasheesh Dam, Ras Al Khaimah	25.13964	56.01296	240	Vegetative	Common
Wadi Sfini Dam, Ras Al Khaimah	25.17176	56.10849	320	Vegetative	Rare
<i>Senna occidentalis</i>					
Wadi Al Ain (upstream)	24.20895	55.77321	290	Fruiting	Not Common
Wadi Al Ain (upstream)	24.20232	55.72448	260	Flowering and Fruiting	Not Common

Table 1. Recording site details, phenology and local status of *Glinus lotoides* and *Senna occidentalis* populations in UAE.

collection localities of *G. lotoides* and *S. occidentalis* in the UAE. The population of *G. lotoides* was recorded repeatedly in different seasonally inundated areas, especially in the front of dams (Figs. 2, 3). In a few sites, *G. lotoides* occurs in large numbers and establishes a viable population. It is worth mentioning that *G. lotoides* is the only representative of the genus *Glinus* in the UAE flora.

The population of *S. occidentalis* consists of ca. 15 individuals and was found in moist, sandy areas in Wadi Al Ain (Figs. 4, 5). It is important to mention here that *S. occidentalis* is regarded as an alien weed elsewhere (Holm et al., 1997; Wu et al., 2003). Therefore, the population of *S. occidentalis* should be monitored for its naturalization potential and long-term observations need to be conducted to prove the future weedy status of this species in the UAE.

The brief below descriptions of the two newly recorded species are based on various flora books. In addition, we relied on the description of our collected specimens from the UAE.

Glinus lotoides L.

SYNONYMS. *Mollugo hirta* Thunb., *Mollugo lotoides* (Linn.) O. Kuntze, *Glinus dictamnoides* Burman f. and *Mollugo glinus* A. Richard.

DESCRIPTION. Prostrate to spreading annual or short-lived perennial, up to 50 cm high. Stems procumbent or decumbent, stellate-tomentose throughout. Leaves elliptic to obovate and obcordate, to 20 mm long, acute to obtuse, hairy; petiolate. Flowers in axillary clusters of 3–15, subsessile, shortly pedicellate; pedicel up to 1.5 mm long. Capsule sub-globose or oblong, ca. 6 mm long, membranous, enclosed in the sepals. Seeds, many tuberculate, strophiolate, less than 1 mm long, orange-brown in colour.

DISTRIBUTION. *Glinus lotoides* is native to Eurasia and Africa and has become widespread in tropical, subtropical and warm-temperate areas worldwide (El-Hamidi et al., 1967). Regionally, it is recorded in Saudi Arabia, Oman, Yemen and Socotra. In the UAE, it was reported from Fujairah and Ras Al Khaimah.

FLOWERING AND FRUITING. January–March. In the UAE, it was recorded in flowering and fruiting stage in some sites, but in vegetative phase in other sites.

HABITAT. *Glinus lotoides* was found growing in occasionally inundated areas in wet clay soils. It was recorded in seven sites in the front of dams and water breakers.

ASSOCIATE SPECIES. *Asphodelus tenuifolius* Cav., *Erucaria hispanica* (L.) Druce, *Launaea capitata* (Spreng.) Dandy, *Physorhynchus chamaerapistrum* Boiss., *Sisymbrium erysimoides* Desf.

MEDICINAL USES. *Glinus lotoides* serves a variety of medicinal purposes. This species is used as treatment for diarrhea, boils and abdominal diseases as well as weakness in children (Kirtikar & Basu, 1935; Qureshi et al., 2010). Antihelmintic properties are reported for *G. lotoides* from several African studies (Abegaz & Tecle, 1980; Broberg, 1980).

Senna occidentalis (Linnaeus) Link

SYNONYMS. *Cassia occidentalis* L.

DESCRIPTION. *Senna occidentalis* is an annual or perennial undershrub, erect, up to 1.5 m high. Leaves ca. 20 cm; stipules caducous, triangular to lanceolate, petiole 3–4 cm, with a large, brown, ovoid gland near the petiole base. Leaflets 3–5 (or 6) pairs, ovate to ovate-oblong; mucronate, opposite, petiolule ca. 1 mm. Inflorescence pedunculate, axillary or terminal, corymbose raceme forming terminal panicles. Flowers ca. 2 cm. Sepals unequal, outer ones suborbicular, ca. 6 mm in diam., inner ones ovate, 8–9 mm. Petals yellow, purplish veined, 2 outer slightly larger, shortly clawed. Legume 9–12 cm long, brown, with pale thick margins, strap-shaped, falcate, flattened, 10–13 × ca. 1 cm with septa between seeds. Seeds flat, orbicular, pale-brown.

DISTRIBUTION. Wadi Al-Ain in the UAE. A circumtropical weed, possibly native to tropical America; widely introduced and naturalized in the tropics and subtropics elsewhere (Wu & Raven, 1994).

FLOWERING AND FRUITING. November–June. In the UAE, flowering and fruiting were recorded during May.

HABITAT. Wadis in shady moist places.

ASSOCIATE SPECIES. *Cenchrus ciliaris* L., *Cynodon dactylon* (L.) Pers., *Senna italica* Mill., *Sesbania sesban* (L.) Merr, *Tephrosia apollinea* (Delile) DC., *Ziziphus spina-christi* (L.) Desf.

WAY OF INTRODUCTION IN UAE. Unknown. The recorded locations of *S. occidentalis* in Wadi Al Ain

basin are adjacent to the territory of the neighboring country Oman from where the wadi originates. So, the seeds might have been introduced through this corridor of the Wadi bed from Oman to the UAE. *Senna occidentalis* also might have been introduced with transported agricultural materials to many farms present on both sides of the Wadi.

INVASIVE/WEEDY STATUS. Casual in the UAE but need further assessment as this species is listed among the world's worst weeds (Hsu, 1975; Holm et al., 1997; Wu et al., 2003).

MEDICINAL USES. *Senna occidentalis* has been known to possess antibacterial, antifungal, antidiabetic, anti-inflammatory and hepatoprotective activity (Yadav et al., 2010). Leaves and seeds are externally applied as antiperiodic to be useful in the cure of itch and other cutaneous diseases. A decoction of the root is said to be diuretic. Seeds are roasted and used as a substitute for coffee in French Africa and Argentina.

CONCLUSIONS

Glinus lotoides, a therophyte, was found in seasonally inundated areas. It is obvious that due to the cryptic nature and seasonal growth cycles of certain plants, especially in unpredictable desert environments, ecological surveys are sometimes unable to detect all species present at particular sites, such as flooded habitats. Therefore, floristic surveys following natural flooding would help to document full floristic diversity of the temporarily inundated areas. On the other hand, *S. occidentalis* is likely to be found in the early stages of its naturalization in the UAE. Consequently, regular field assessments of *S. occidentalis* should be undertaken to monitor its population dynamics and naturalization potential.

From the literatures, it is evident that most of the newly recorded species for the country are desert annuals. In fact, many desert annuals characteristically form persistence seed banks and can be absent for many years and only appear in particularly wet seasons. Therefore, floristic surveys throughout a range of seasons are suggested to fully document the flora present in the country. As the UAE, like most of the other Arab Gulf countries, is experiencing a fast growth and development, particularly in the agricultural exchange, there is a



Figures 2, 3. *Glinus lotoides*: habitat (Fig. 2); flowering twig with fruit capsules (Fig. 3).
Figures 4, 5. *Senna occidentalis*: flowering twig (Fig. 4); pods (Fig. 5).

possibility of spontaneous occurrence of new vascular plants to the country's flora. The increased knowledge of the existence of newly recorded species and their habitats can assist to detect, monitor, measure and predict changes in biological diversity and its conservation.

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