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***Ziziphus mauritiana* Lam. f. *pendula* V.V.Byalt & Korshunov (Rhamnaceae), a new form of an alien species newly recorded for the United Arab Emirates**Vyacheslav V. Byalt^{1*} and Mikhail V. Korshunov²¹Komarov Botanical Institute RAS, Professor Popov str. 2, St. Petersburg, 197376, Russia²Government of Fujairah, Wadi Al-Wuraya National Park, P.O. Box: 1, Fujairah, UAEEmail: mikh.korshunov@gmail.com*Corresponding author. Email: byalt66@mail.ru, VByalt@binran.ru

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Abstract

A new alien species for the United Arab Emirates, *Ziziphus mauritiana* Lam. (Rhamnaceae), is reported and a new form of this species, *Ziziphus mauritiana* Lam. f. *pendula* V.V.Byalt & Korshunov, is described. This form was found in Fujairah Emirate.

Keywords: alien plants, new form, new records, Rhamnaceae, taxonomy, *Ziziphus mauritiana*.**Introduction**

Ziziphus mauritiana Lam. (Rhamnaceae) is a large evergreen shrub or tree that probably originated in the Indo-Malaysian region of South-East Asia (Janick and Paull, 2008) and that has long been cultivated in the Middle East and India. It has naturalized in various countries of Asia, Africa and America which have a tropical or subtropical climate; and now is widely distributed in cultivation and as escapes from cultivation (Novak and Schulz, 2002; *Plants of the World Online*, POWO, 2021; *Global Biodiversity Information Facility*, GBIF, 2021). According to the GBIF website (2021), *Ziziphus mauritiana* is recorded as an alien plant in 64 countries of the world, including Arabia where it is cultivated (Cornes and Cornes, 1989; Ghazanfar, 1992). It often escapes from cultivation and can form dense stands in some countries and is included in the lists of invasive species for the USA (Kraus *et al.*, 2020), Australia (Pagad, 2019), and Brazil (Ziller *et al.*, 2020).

In the United Arab Emirates (UAE), there are three wild species of the genus *Ziziphus*, *Z. spina-christi* (L.) Willd., *Z. nummularia* (Burm. f.) Wight & Walk., and *Z. lotus* (L.) Lam. (Böer, 2000; Jongbloed *et al.*, 2003; Karim and Fawzi, 2007). *Ziziphus spina-christi* is a small tree with fruits up to 2 cm in diameter and is therefore often cultivated in local gardens as a food and decorative plant. The other two species are usually small, very thorny shrubs with small fruits 0.5–1 cm in diameter and are not cultivated. *Z. mauritiana* is an alien species

cultivated in the UAE which has large spherical, edible fruits and is quite often grown in gardens and on the streets of settlements. Another cultivated species of the genus *Ziziphus* with large ovoid shiny fruits is *Z. jujuba* Mill. which is less common and, from our observations in nurseries, can only be grown here when grafted onto the local *Z. spina-christi* (Byalt and Korshunov, 2020). In general, the cultivated plants of the genus *Ziziphus* in Fujairah Emirate, UAE, are very diverse and it is possible that other species of this genus are grown here, such as *Z. rugosa* Lam., *Z. oxyphylla* Edgew. and *Z. mucronata* Willd. In addition, in culture, different species hybridize easily if grown side by side, which affects the variability among cultivated plants.

There are different opinions on the taxonomy of *Ziziphus jujuba* Mill. and *Z. mauritiana*. Some distinguish these species (Thulin, 2008; Nesom, 2016, 2017; WCVP, 2021; POWO, 2021), while others combine them into one large species with many varieties and cultivars (Morton, 1987; GBIF, 2020). The authors of the current paper follow the first opinion and accept two species. According to Thulin (2008) and Nesom (2016, 2017) the main differences between *Z. jujuba* and *Z. mauritiana* in the hairiness of secondary branches and abaxial surface of leaves, and the length of stipular spines. Secondary branches and the abaxial surface of leaves in *Z. jujuba* are glabrous, and have stipular spines 15–40 mm. In *Z. mauritiana* secondary branches and the abaxial surface of leaves are tomentose and stipular spines are 2–3 mm.

According to our observations, in Fujairah *Ziziphus jujuba* is grown in the nurseries and private gardens exclusively by grafting onto the native species, *Z. spina-christi*. At the same time, *Z. mauritiana* is a common fruit tree cultivated in private gardens. It produces seeds, easily self-seeds and grows near the fences in the gardens of villas, in places where water leaks out during irrigation, on wastelands and in alleys between houses. The usual erect form of *Z. mauritiana* with straight branches grows everywhere as a cultivated plant and often escapes into the wild. Only in two places, on a farm near Al Dibba and at Rul Dadna, was an unusual form of this species with long hanging branches which form a weeping crown observed by the authors. Both of these plants were growing outside irrigation zones, which is a sign that they escaped into the wild although it is difficult to know how these plants were distributed, by birds, animals or humans. The tree on the farm grows on wasteland, at the edge of a large pit, approximately 100 m from other buildings, which indicates that it was never cultivated here.

It is important to note that in the conditions of Fujairah with its climate of dry tropical deserts *Ziziphus mauritiana* is usually irrigated and grows as an evergreen tree, it does not shed its leaves in winter as it does in temperate regions.

According to the World Checklist of Vascular Plants (WCVP, 2021), several different varieties of this species have been described, such as *Ziziphus mauritiana* var. *spontanea* (Edgew.) R.R.Stewart ex Qaiser & S.Nazimuddin, *Z. mauritiana* var. *orthacantha* (DC.) A.Chev. (\equiv *Z. orthacantha* DC.), *Z. mauritiana* var. *hysundrica* (Edgew.) M.R.Almeida, *Z. mauritiana* var. *pedunculata* Bhandari & Bhansali, *Z. mauritiana* var. *pubescens* Bhandari & Bhansali, *Ziziphus mauritiana* var. *fruticosa* (Haines) Sebastine & Balakr. (\equiv *Z. jujuba* var. *fruticosa* Haines). They differ from *Ziziphus mauritiana* var. *mauritiana*, in a variety of characteristics, such as habit, degree of pubescence on leaves and shoots, and size of thorns.

Material and methods

Floristic research was carried out in Fujairah Emirate, UAE, where ca 60 sites were surveyed in nature, gardens, plant nurseries, and settlements (Byalt *et al.*, 2020a; Byalt and Korshunov, 2020). Both native and not-native components of the flora were studied. Herbarium material was collected and stored at LE (Herbarium codes are given as in Thiers, 2021) and FSH (not yet an approved acronym). The description of the new form was prepared according to the rules of the *International Code of Nomenclature for algae, fungi and plants* (ICN, Turland *et al.*, 2018).

Results and discussion

As mentioned in the Introduction, *Ziziphus mauritiana* is an alien cultivated species for the UAE with large and edible fruits and is often grown in gardens. Our observations in Fujairah have shown that *Z. mauritiana* easily self-seeds and grows vigorously, especially, near the fences of gardens, on roadsides and wastelands, e.g., in Qidfa – “UAE, Fujaira Emirate, village Qidfa, 25°17'40.91" N 56°21'28.51" E, roadsides in backstreets on waste place, grows wild, 25.XI.2019, V.V. Byalt & M.V. Korshunov 1684, fr. (LE!)” (fig. 1). This is a new alien species (ergaziophygophyte) for Fujairah and the UAE. To our knowledge this species does not occur in the wild anywhere in Arabia (Daoud and Al-Rawi, 1987; Phillips, 1988; Cornes and Cornes, 1989; Migahid, 1989; Western, 1989; Ghazanfar, 1992; Shuaib, 1995; Wood, 1997; Jongbloed *et al.*, 2003, Karim and Fawzi, 2007; Norton *et al.*, 2009). The detailed description for *Z. mauritiana* is given by Thulin (2008) and Nesom (2016, 2017).

***Ziziphus mauritiana* Lam. f. *mauritiana* (Fig. 1).**

Usually, a large shrub or tree to 9–15 m high with greyish fissured bark and straight thorny branches. Leaves glabrous and shiny above and tomentose below, on petioles (8–20 mm long), with finely serrulate margin, 2–9 × 1.5–5 cm, remaining in winter. Flowers hairy, white



Figure 1. Specimen of naturalised *Ziziphus mauritiana* f. *mauritiana* V.V.Byalt & Korshunov with straight branches, collected in Qidfa village (UAE)

or yellow-greenish in many-flowered cymes, sepals tiny, ca. 1.5 mm long with petals to 1.5 mm long. Fruits – drupes (one stone) up to $1.5\text{--}3.5 \times 1.5\text{--}2.5$ cm, yellow-orange.

For synonyms see WCVF ([Ziziphus mauritiana](#), 2021), and for distribution see POWO ([Ziziphus mauritiana](#), 2021).

The scientific name for the new pendulous form of *Z. mauritiana* was not found by the authors of the current paper in the different resources for cultivated plants (Rehder, 1949; Hillier and Coombes, 2002; *International Plant Names Index* (IPNI), 2021; TROPICOS, 2021) and its description is given below.

Ziziphus mauritiana Lam. f. ***pendula*** V.V.Byalt & Korshunov **f. nov.** (Figs. 2–3).
(urn:lsid:ipni.org:names: 77217253-1)



Figure 2. The tree of *Ziziphus mauritiana* Lam. f. *pendula* V.V.Byalt & Korshunov with weeping crown and long hanging branches from two different angles. Photographs by Vyacheslav V. Byalt

Type: UAE, Fujairah Emirate, Al Dibba, Wam Community, Fujairah National Dairy Farm, 25°36'2.49"N, 56°14'2.64"E, elevation 25 m, grows on edge of hollow, on gravel wasteland near farm fence, 17.III.2020, veg., fr., V.V. Byalt & M.V. Korshunov (holotype – LE!, isotypes – LE!, FSH!). Paratype: United Arab Emirates. Fujairah Emirate, Rul Dadna, villas and other



Figure 3. Holotype of *Ziziphus mauritiana* f. *pendula* V.V.Byalt & Korshunov preserved in LE (scanned by M. Legchenko).

accommodations north from Mina road, on the corner with E99 Rugaylat road, 25°31'16.29"N, 56°21'19.69"E, elevation 12 m on wasteland between villas in dry backstreet, 17.IV.2020, V.V. Byalt & M.V. Korshunov 2226, veg. (LE01072694!).

Affinity: It differs from the typical form in a weeping crown and long hanging branches.

Description: The plant belonging to *Ziziphus mauritiana* f. *pendula* is a mature fruiting tree, 4.5 m tall, with a crown diameter ca. 3.5 m. It is characterized by a weeping crown and long hanging branches (Fig. 2), which is not usual for *Z. mauritiana* f. *mauritiana*. There are trees of this species growing on the same farm with upright crowns and straight branches. Other characteristics of these two forms, such as pubescence of shoots and leaves (glabrous and shiny above, reddish and pubescent below), leaf shape and size, shape and color of fruits (up to 1.5 cm in diameter, round and yellow-orange), do not differ. There was also a young tree about 2 m high with similar features growing in a dry lane between villas in the village of Rule Dadna. It had an umbrella-shaped crown with long branches hanging down to the ground.

Distribution. The new form was seen growing on gravelly wasteland without irrigation on a livestock farm in the city of Al Dibba in the northern part of Fujairah Emirate (Figs. 4 and 5) and in another place on wasteland between villas in a dry backstreet in the village Rul Dadna (Fig. 5).

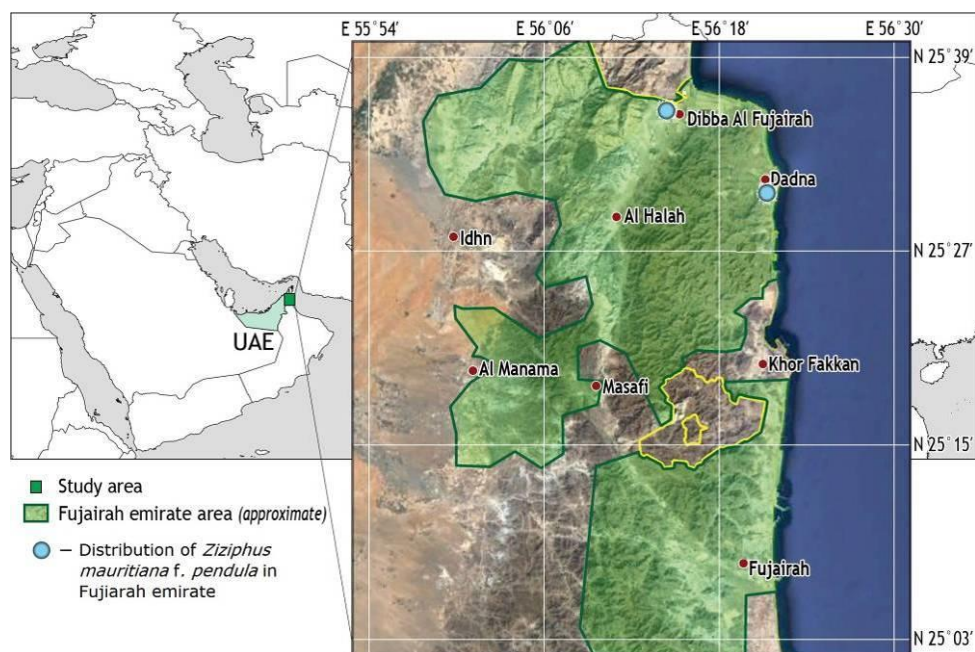


Figure 4. Distribution of *Ziziphus mauritiana* f. *pendula* V.V.Byalt & Korshunov in Fujairah.



Figure 5. *Locus classicus* of *Ziziphus mauritiana* Lam. f. *pendula* V.V.Byalt & Korshunov in Al Dibba, Fujairah marked with a red star (based on Google maps).

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Authors’ contributions

Vyacheslav V. Byalt (VVB) initiated the project together with MVK, collected, preserved, identified and labeled plants, analysed material prepared by MVK, wrote the manuscript, participated in discussion and revision of the manuscript, and coordinated the project.

Mikhail V. Korshunov (MK) together with VVB collected and preserved plants, participated in the discussion of the manuscript.

References

- Böer, B.** 2000. Annotated check-list for plants in the United Arab Emirates. Emirates Natural History Group, Abu Dhabi, Al Ain, and Dubai: Zodiac Publishing.
- Byalt, V.V., Korshunov, M.V.** 2020. Predvaritel'nyĭ spisok kul'turnykh rastenii emirata Fudzheira (Ob'edinennyye Arabskiye Emirate) [Preliminary list of cultivated plants in the Fujairah Emirate (UAE)]. Vestn. Orenburgsk. State Pedagog. Univ. 4 (36): 29 – 116. URL: http://vestospu.ru/archive/2020/articles/3_36_2020.pdf. DOI:10.32516/2303-9922.2020.36.3 (In Russian)
- Byalt, V.V., Korshunov, V.M. and Korshunov M.V.** 2020a. New records of three species of Asteraceae in Fujairah, United Arab Emirates. [Skvortsovia 6\(3\): 77–86](#).
- Byalt, V.V., Korshunov, M.V. and Korshunov, V.M.** 2020b. The Fujairah Scientific Herbarium – a new herbarium in the United Arab Emirates. [Skvortsovia 6\(3\): 7–29](#).
- Cornes, M.D. and Cornes, C.D.** 1989. The wild flowering plants of Bahrain; an illustrated guide. London: Immel Publishing.
- Daoud, H.S., Al-Rawi, A.** 1987. Flora of Kuwait 2: Compositae and Monocotyledoneae. London: KPI Limited, & University of Kuwait.
- Ghazanfar, S.A.** 1992. An annotated catalogue of the vascular plants of Oman and their vernacular names 2. Meise, Belgium: National Botanic Garden of Belgium.
- Global Biodiversity Information Facility (GBIF).** 2021. www.gbif.org (accessed 15 May 2021).
- Hillier, J. and Coombes, A. (Eds.).** 2002. The Hillier manual of trees and shrubs. Newton Abbot: David and Charles.
- International Plant Names Index (IPNI).** 2021. <https://beta.ipni.org/> (accessed 27 January 2021)
- Janick, J. and Paull, R.E. (Eds.).** 2008. [The encyclopedia of fruit and nuts](#). Wallingford: Cabi Publishing: 615–619.
- Jongbloed, M., Feulner, G., Böer, B. and Western, A.R.** 2003. The Comprehensive Guide to the Wild Flowers of the United Arab Emirates. Abu Dhabi, UAE: Environmental Research and Wildlife Development Agency (ERWDA).
- Karim, F.M. and Fawzi, N.M.** 2007. Flora of the United Arab Emirates 1–2. Al-Ain: United Arab Emirates University.
- Kraus, F., Daniel, W., Wong, L.J. and Pagad, S.** 2020. Global Register of Introduced and Invasive Species – United States of America (Continuous). Version 1.3. Invasive Species

Specialist Group ISSG. Checklist dataset <https://doi.org/10.15468/ehzr9f> accessed via GBIF.org (accessed 15 May 2021).

Migahid, A. M. 1989. Flora of Saudi Arabia, 3rd ed., 2. Riyadh, Saudi Arabia: University Libraries, King Saud University.

Morton, J.F. 1987. Indian Jujube. In: Fruits of warm climates. Miami, FL: J.F. Morton; Winterville, N.C.: 272–275.

(https://www.hort.purdue.edu/newcrop/morton/indian_jujube.html)

Nesom, G.L. 2016. Rhamnaceae. In: Flora of North America: north of Mexico 12 Vitaceae to Garryaceae. New York; Oxford: Oxford University Press.

Nesom, G.L. 2017. Ziziphus Miller. Flora of North America: north of Mexico 12. Available online: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=135333 (accessed 10 May 2021)

Norton, J. A., Abdul, Majid S., Allan, D. R., Al Safran, M., Böer, B. and Richer, R. 2009. An Illustrated Checklist of the Flora of Qatar. Doha: UNESCO office in Doha.

Novak, B. and Schulz, B. 2002. Tropicheskiye plody. Biologiya, primeneniye, vyrashchivaniye i sbor urozhaya [Tropical fruits. Biology, application, cultivation and harvesting]. Moscow: BMM AO: 36–37. (In Russian)

Pagad, S. 2019. Global Register of Introduced and Invasive Species – Australia. Invasive Species Specialist Group ISSG. Checklist dataset <https://doi.org/10.15468/3pz20c> accessed via GBIF.org (accessed 02 January 2021).

Phillips, D. C. 1998. Wild flowers of Bahrain. A field guide to herbs, shrubs and trees. Bahrain: Privately published.

Plants of the World Online (POWO). 2021. <http://plantsoftheworldonline.org/> (accessed 15 May 2021).

Randall, J., McDonald, J., Wong, L. J., Pagad, S. 2020. Global Register of Introduced and Invasive Species – Australia. Version 1.3. Invasive Species Specialist Group ISSG. Checklist dataset <https://doi.org/10.15468/3pz20c> accessed via GBIF.org (accessed 10 September 2020).

Rehder, A. 1949. Manual of Cultivated Trees and Shrubs Hardy in North America. 2nd ed. New York: The MacMillan Company.

Shuaib, L. 1995. Wild flowers of Kuwait. London: Stacey International.

Thiers, B. (Ed.). 2021. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available from: <http://sweetgum.nybg.org/science/ih> (accessed 15 October 2020).

- Thulin, M.** 2008. Flora of Somalia 1–4. <https://plants.jstor.org/collection/FLOS> (accessed 15 May 2021).
- TROPICOS.** 2021. <http://www.tropicos.org> (accessed 15 May 2021)
- Turland, N. J., Wiersema, J. H., Barrie, F. R., Greuter, W., Hawksworth, D. L., Herendeen, P. S., Knapp, S., Kusber, W.-H., Li D.-Z., Marhold, K., May, T. W., McNeill, J., Monro, A.M., Prado, J., Price, M.J., Smith, G.F. (Eds.).** 2018: International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books. DOI <https://doi.org/10.12705/Code>.
- Western, A. R.** 1989. The flora of the United Arab Emirates: an introduction. Al Ain: United Arab Emirates University.
- Wood J. R. I.** 1997. A handbook of the Yemen flora. London: Royal Botanic Gardens, Kew.
- World Checklist of Vascular Plants (WCVP).** 2020. <https://wcvp.science.kew.org> (accessed 15 May 2021).
- Ziller, S., Zenni, R., Souza, Bastos, L., Possato Rossi, V., Wong, L.J. and Pagad, S.** 2020. Global Register of Introduced and Invasive Species - Brazil. Version 1.5. Invasive Species Specialist Group ISSG. Checklist dataset <https://doi.org/10.15468/i0avrm> accessed via GBIF.org (accessed 23 September 2020).