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Academy, Moscow, Russia**Flora of Fujairah Emirate (UAE): new herbaceous and woody species of ergasiophygophytes in Emirate. Part 4.**

During the floristic research in the Emirate of Fujairah in the United Arab Emirates (UAE) in 2017–2022, we made new findings that complement the species composition of the flora of vascular plants in the territory of the Emirate and the UAE as a whole. The article provides data on 17 new ergasiophygophytes – cultivated and running wild plant species, alien to the Emirate of Fujairah: *Pseuderanthemum maculatum* (G. Lodd.) I.M. Turner var. *atropurpureum* (W. Bull) V.V. Byalt et M.V. Korshunov comb. nov. (*P. atropurpureum* (W. Bull) L.H. Bailey) (Acanthaceae), *Jatropha gossypifolia* L., *J. integerrima* Jacq., *Manihot esculenta* Crantz (Euphorbiaceae), *Linum usitatissimum* L. (Linaceae), *Gossypium barbadense* L., *Hibiscus sabdariffa* L. (Malvaceae), *Melaleuca viminalis* (Sol. ex Gaertn.) Byrnes (*Callistemon viminalis* (Sol. ex Gaertn.) G. Don) (Myrtaceae), *Physalis angulata* L., *P. peruviana* L., *Solanum melongena* L., *S. tuberosum* L. (Solanaceae), *Allium cepa* L., *A. sativum* L. (Alliaceae), *Asparagus aethiopicus* L. (*A. sprengeri* Regel) (Asparagaceae), *Tradescantia pallida* (Rose) D.R. Hunt (*Setcreasea pallida* Rose) (Commelinaceae), *Eleusine coracana* (L.) Gaertner (Poaceae). Most of these species have also never been previously listed in the Arabian floras and checklists as alien adventive species.

Key words: Arabia, UAE, Emirate of Fujairah, plant geography, flowering plants, alien flora, ergasiophygophytes

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ОРИГИНАЛЬНАЯ СТАТЬЯ

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Флора эмирата Фуджейра (ОАЭ): новые травянистые и древесные виды эргасиофитов для эмирата. Часть 4

В ходе флористических исследований в 2017–2022 гг. в эмирате Фуджейра в Объединенных Арабских Эмиратах (ОАЭ) нами были сделаны новые находки, дополняющие видовой состав флоры сосудистых растений на территории эмирата и ОАЭ в целом. В статье приведены данные о 17 новых эргасиофитах – культивируемых и дичающих видах растений, чужеродных для эмирата Фуджейра: *Pseuderanthemum maculatum* (G. Lodd.) I.M. Turner var. *atropurpureum* (W. Bull) V.V. Byalt et M.V. Korshunov comb. nov. (*P. atropurpureum* (W. Bull) L.H. Bailey) (Acanthaceae), *Jatropha gossypifolia* L., *J. integerrima* Jacq., *Manihot esculenta* Crantz (Euphorbiaceae), *Linum usitatissimum* L. (Linaceae), *Gossypium barbadense* L., *Hibiscus sabdariffa* L. (Malvaceae), *Melaleuca viminalis* (Sol. ex Gaertn.) Byrnes (*Callistemon viminalis* (Sol. ex Gaertn.) G. Don) (Myrtaceae), *Physalis angulata* L., *P. peruviana* L., *Solanum melongena* L., *S. tuberosum* L. (Solanaceae), *Allium cepa* L., *A. sativum* L. (Alliaceae), *Asparagus aethiopicus* L. (*A. sprengeri* Regel) (Asparagaceae), *Tradescantia spathacea* (Rose) D.R. Hunt (*Setcreasea pallida* Rose) (Commelinaceae), *Eleusine coracana* (L.) Gaertner (Poaceae). Большинство из этих видов также ранее не приводились в Аравийских флорах и Списках растений как чужеродные адвентивные виды.

Ключевые слова: Аравия, ОАЭ, эмират Фуджейра, география растений, цветковые растения, чужеродная флора, эргасиофиты

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The article presents the fourth part of the new findings of ergasiophygophytes (cultivated plants that escaped into the wild) in the flora of the Emirate of Fujairah (Byalt, Korshunov, 2020c, 2022; Korshunov, Byalt, 2021). Ergasiophygophytes are a significant part of the alien flora of various regions (DAISIE, 2009; Pyšek et al., 2017; Kleunen et al., 2018; Mayorov et al., 2019). The monitoring of this fraction of the regional flora is undoubtedly relevant in modern times. The United Arab Emirates is located in the tropical desert zone, which leaves a serious imprint on the composition of the country's cultural flora. Most alien plant species are grown on irrigation and die very quickly without it. We studied the flora of the emirate in 2017–2022, and an active research of the adventive element took place in 2019–2020 (Byalt, Korshunov, 2018, 2020 a–d; Byalt et al., 2020 a, b). As a result, we came to the conclusion that nurseries and mini-markets of plants are the main source of the primary appearance of ergasiophygophytes (as well as many purely weedy species) in the emirate. We managed to find the largest number of alien adventive species, some of which turned out to be new for the flora of Fujairah and the UAE as a whole.

When identifying groups of alien species, the modernized classification by F.-G. Schroöder (Schroöder, 1969; Baranova et al., 2018) is used. Latin names of plants are given in the “Catalogue of Life” (URL: <https://www.catalogueoflife.org/col/>) and “Plants of the world online” (URL: <http://plantsoftheworldonline.org/>). Herbarium specimens confirming the findings are kept in the Herbarium of the V.L. Komarov Botanical Institute RAS (LE) and Fujairah Scientific Herbarium (FSH, Wadi Wuraya, Fujairah, United Arab Emirates)

(Byalt et al., 2020a) and duplicates were transferred to the VIR Herbarium (WIR). Collectors are the authors of the article.

The following species of flowering plants are new to Fujairah: *Pseuderanthemum maculatum* (G. Lodd.) I.M. Turner var. *atropurpurem* (W. Bull) V.V. Byalt et M.V. Korshunov (*P. atropurpureum* (W. Bull) L.H. Bailey) (Acanthaceae), *Jatropha gossypifolia* L., *J. integerrima* Jacq., *Manihot esculenta* Crantz (Euphorbiaceae), *Linum usitatissimum* L. (Linaceae), *Gossypium barbadense* L., *Hibiscus sabdariffa* L. (Malvaceae), *Melaleuca viminalis* (Sol. ex Gaertn.) Byrnes (*Callistemon viminalis* (Sol. ex Gaertn.) G. Don) (Myrtaceae), *Physalis angulata* L., *P. peruviana* L., *Solanum melongena* L., *S. tuberosum* L. (Solanaceae), *Allium cepa* L., *A. sativum* L. (Alliaceae), *Asparagus aethiopicus* L. (*A. sprengeri* Regel) (Asparagaceae), *Tradescantia pallida* (Rose) D.R. Hunt (*Setcreasea pallida* Rose) (Commelinaceae), *Eleusine coracana* (L.) Gaertner (Poaceae). Most of these species have not been previously listed in the Arabian floras and checklists as alien adventive species.

The species first reported for the emirate are marked with an asterisk (*); the species first reported for the UAE are marked with two asterisks (**). Abbreviations in article: United Arab Emirates – UAE, fl. – with flowers, fr. – with fruits, veg. – in a vegetative state, juv. – young, underdeveloped. LE – Herbarium of BIN RAS, FSH [no acronym yet] – Fujairah Scientific Herbarium (Byalt et al., 2020a). The labels are in English or in Russian and English as in the original. The numbers in square brackets indicate the place of our research, recorded by GPS “e.g., [point 776]”. They are given on the labels for the convenience



of working with the herbarium.

*****Pseuderanthemum maculatum*** (G. Lodd.) I.M. Turner var. ***atropurpureum*** (W. Bull) V.V. Byalt et M.V. Korshunov comb. nov. ($\equiv$ *Eranthemum atropurpureum* W. Bull, 1875, Gard. Chron., n.s. 3: 619. $\equiv$ *P. atropurpureum* (W. Bull) L.H. Bailey $\equiv$ *P. carruthersii* (Seem.) Guill. var. *atropurpureum* (W. Bull) Fosberg) (Acanthaceae) (Fig. 1): 1) UAE, Fujairah Emirate, Al Bidiya, Al Qalamoon Nursery, 0.3 km East from Eid Prayer Ground Bidiyah, 25°25'24.70"N, 56°20'18.77"E, elevation 22 m: [point 781a]: cultivated in plastic pots, 19 V 2020, fl., V. V. Byalt, M. V. Korshunov 2939 (LE); 2) UAE, Fujairah Emirate, Al Aqah, Fujairah Rotana Resort & Spa, near Shark roundabout, next to Le Meridien Al Aqah Beach Resort. 25°30'30.31"N, 56°21'45.86"E, elevation 5 m [point 813]: cultivated and run wild (seedlings) under bushes on irrigation, 4 VIII 2020, veg. V. V. Byalt, M. V. Korshunov 4413 (LE; FSH). – Ergasiophygophyte, ephemerophyte. – New alien species to Fujairah and UAE.

Very ornamental bush; its native range is Solomon Islands to Vanuatu. It is used as a medicinal plant, for environmental purposes, for food (URL: <http://plantsoftheworldonline.org/>), and has been introduced as ornamental to other islands of Oceania and to some parts of Southeast Asia, Africa, Central America and South America. It is recorded as introduced in 19 countries or islands, including Saudi Arabia in Arabian Peninsula (URL: <https://www.gbif.org/species/3173133>). Cultivated in Saudi Arabia (Santhosh Kumar, 2014) (as *Pseuderanthemum carruthersi* var. *atropurpureum*), in Yemen (Al-Khulaidi, 2013) (as *P. atropurpureum*), in UAE (Byalt, Korshunov. 2020d) (as *P. atropurpureum*).

The study of relevant literature revealed that *Pseuderanthemum maculatum* s. l. has not been reported as an alien species in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Miller,

Morris, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Mandaville, 1990; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Jongbloed et al., 2000; Omar, 2000, 2007; Jongbloed et al., 2003; Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah emirate and commonly used in landscaping of hotels and private villas.

Self-sowing of this plant was found by us once among the plantings of this shrub on the territory of the Fujairah Rotana Resort & Spa Hotel in Al Aqah on the coast of the Gulf of Oman. We did not observe a large invasive potential in this plant, since it seldom forms seeds and is demanding on high humidity.

*****Jatropha gossypifolia*** L. (Fig. 2): 1) UAE, Fujairah Emirate, Rul Dadhna, Plant Nursery 0.6 km West from ADNOC Petrol Station on E99 Rugaylat road. 25°31'36.30"N, 56°20'58.46"E, elevation 17 m. [point 766]: near garden fence of plant nursery on roadside, 25 IV 2020, veg., fl., fr., V. V. Byalt, M. V. Korshunov 2459 (LE); 2) United Arab Emirates. Fujairah Emirate, Al Dibba town, Al Shams Nursery, near Dibba Theatre (0.1 km East of). 25°36'9.81"N, 56°16'41.30"E, elevation 6 m. [point 767a]: running wild in plant market and nursery pots, 28 IV 2020, veg., V. V. Byalt, M. V. Korshunov 2548 (LE); 3) UAE, Fujairah Emirate, Al Bidiya, Abu Khalid agricultural nursery. 0.3 km South from Eid Prayer Ground Bidiyah, 25°25'15.85"N, 56°20'27.64"E, elevation 18 m. [point 780]: run wild in and between plastic pots with cultivated plants and between irrigated lines, 12 V 2020, veg., V. V. Byalt, M. V. Korshunov 2885 (LE; FSH); 4) UAE, Fujairah Emirate, Rul Dadhna, Plant Nursery 1 km North-North-West from ADNOC Petrol Station on E99 Rugaylat road, 25°32'11.94"N, 56°21'4.36"E, Elevation 13 m [point 788]: run wild in plant nursery near garden wall, in agricultural waste, 23 V 2020, veg., V. V. Byalt, M. V. Korshunov 3164



(LE); 5) UAE, Fujairah Emirate, Al Dibba town, Alamarey Nursery, 0.5 km South from Khalid Hadi Resort Dibba. 25°34'33.97"N, 56°14'6.15"E, elevation 45 m [point 797]: weed in and between plastic pots with cultivated trees, 13 VI 2020, V. V. Byalt, M. V. Korshunov 3561 (LE; FSH). – Ergasiophygophyte, colonophyte. New alien adventive species to Fujairah, UAE and Arabia at whole.

This is an accepted species recorded in the taxonomic databases Catalogue of Life (URL: <https://www.catalogueoflife.org/col/>), Global Biodiversity Information Facility (GBIF) (URL: <https://www.gbif.org/>), Plants of the World Online (URL: <http://plantsoftheworldonline.org/>), and the World Checklist of Vascular Plants (URL: <https://wcvp.science.kew.org/>). Its native distribution range is reported to be Mexico to Tropical America. It is used to treat unspecified medicinal disorders, as poison and medicine, fuel and food (URL: <http://plantsoftheworldonline.org/>), also it has environmental and social applications. It is recorded as introduced in 40 countries or islands, but not in Arabia (URL: <https://www.gbif.org/species/3072900>), and it is invasive in USA (Kraus et al., 2020), India (Sankaran et al., 2021), Australia (Randall et al., 2020;

URL: https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/bellyache-bush.pdf), etc. It is a declared noxious weed in Puerto Rico and is naturalized in northern Australia, including Queensland where it is listed as a Class 2 declared pest plant. Cultivated on the Arabian Peninsula in Qatar (URL: <https://www.floraofqatar.com/indexf.htm#Euphorbiaceae>) and UAE (Byalt, Korshunov, 2020d).

The study of relevant literature revealed that *Jatropha gossypifolia* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Miller, Morris, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and is commonly used in landscaping of hotels and private villas. According to our observations, this species easily self-sows in plant nurseries, it can weed on irrigation and also occur near fences in places without irrigation. It appears to be a potentially invasive species in UAE and Arabia in general.



Fig. 1. *Pseuderanthemum maculatum* (G. Lodd.) I.M. Turner var. *atropurpurem* (W. Bull)
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Fig. 2. *Jatropha gossypifolia* L.

*****Jatropha integerrima*** Jacq. var. ***coccinea*** (Link) N.P. Balakr. (Fig. 3): 1) United Arab Emirates. Fujairah Emirate, Al Dibba town, Al Shams Nursery, near Dibba Theatre (0.1 km to East). 25°36'9.81"N, 56°16'41.30"E, Elevation 6 m. [point 767a]: cultivated and running wild in plant market and nursery, between pots, 28 IV 2020, fl., fr., veg., V. V. Byalt, M. V. Korshunov 2522 (LE); 2) Fujairah Emirate, Al Dibba town, Green Oasis Nursery, 0.6 km South-West from Street Number 35, or 0.8 km North from Federal Electricity & Water Authority, 25°36'5.21"N, 56°15'45.67"E, elevation 10 m [point 769]: running wild between pots, 3 V 2020, fl., veg., V. V. Byalt, M. V. Korshunov 2670 (LE); 3) UAE, Fujairah Emirate, Al Dibba town, plant nursery Corniche Nursery, 0.4 km South-West by road from roundabout between Corniche Street 101 and Sambraid Beach road. 25°36'19.87"N, 56°17'0.48"E, Elevation 3 m [point 800]: run wild on irrigation under date palm, near the garden fence, 19 VI 2020, fl., veg., V. V. Byalt, M. V. Korshunov 3728 (LE; FSH); 4) UAE, Fujairah Emirate, Rul Dadhna, Majid Nursery (plants), near E99 road and Mina road intersection. 25°31'15.68"N, 56°21'10.02"E,

Elevation 15 m [point 804]: run wild in and between plastic pots with cultivated plants, 30 VI 2020, veg., V. V. Byalt, M. V. Korshunov 3872 (LE; FSH); 5) UAE, Fujairah Emirate, Rul Dadhna, 0.8 km by the unnamed road from E99 to Wadi Zikt dam and after 0.4 km to North by track-road, 25°31'20.73"N, 56°20'39.06"E, elevation 27 m [point 808]: cultivated and weed in and between plastic pots with cultivated plants, 11 VII 2020, veg., V. V. Byalt, M. V. Korshunov 4059 (LE; FSH); 6) UAE, Fujairah Emirate, Rul Dadhna, 0.8 km by the unnamed road from E99 to Wadi Zikt dam and after 0.4 km to North by track-road, 25°31'20.73"N, 56°20'39.06"E, elevation 27 m [point 808]: cultivated and run wild in and between plastic pots with cultivated plants, 11 VII 2020, veg., V. V. Byalt, M. V. Korshunov 4105 (LE; FSH). – Ergasiophytophyte, colonophyte. – New alien adventive species to Fujairah, UAE and Arabia at whole.

This species is a well-known tropical ornamental tree, and its native range is W. Cuba (incl. Island de la Juventud). It is used as a medicine and has environmental applications (URL: <http://plant-softheworldonline.org/>). It is recorded as intro-



duced in 20 countries or islands, including Oman (K000254565!), Saudi Arabia and UAE in Arabia (URL: <https://www.gbif.org/>; <http://plantsoftheworldonline.org/>), it is invasive in USA (Kraus et al., 2020) and India (Sankaran et al., 2021). Cultivated in Oman (Ghazanfar, 1992), Saudi Arabia (Santhosh Kumar, 2014), UAE (Byalt, Korshunov, 2022), Qatar (<https://www.floraofqatar.com/indexf.htm#Euphorbiaceae>).

The study of relevant literature revealed that *Jatropha integerrima* var. *coccinea* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992, 2007; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and commonly used in landscaping of hotels and private villas. In plant nurseries, self-seeding around plantings of these plants is quite common, once we observed

a young tree in a wasteland near the village of Al Bidiya at the site of an agricultural waste dump. Due to the fact that it forms many seeds and its easy self-seeding, it can be a potentially invasive species in the UAE under irrigated conditions.

*****Jatropha integerrima* Jacq. var. *integerrima*:**

1) UAE, Fujairah Emirate, Al Bidiya, Abu Khalid agricultural nursery. 0.3 km to South from Eid Prayer Ground Bidyah, 25°25'15.85"N, 56°20'27.64"E, Elevation 18 m. [point 780]: cultivated and run wild between cultivated plants, 12 V 2020, fl., veg., V. V. Byalt, M. V. Korshunov 2883 (LE; FSH). – Ergasiophytophyte, ephemerophyte. This variety is less decorative (distinguished by pink rather than bright red flowers), therefore it is less often cultivated in the Fujairah Emirate. Self-sowing was found by us only in one place in the village of Al Bidiya (on the territory of the Abu Khalid agricultural nursery) around the plantings of this plant. We did not observe a large invasive potential in this plant, since it rarely cultivated.



Fig. 3. *Jatropha integerrima* Jacq. var. *coccinea* (Link) N.P. Balakr.



*****Manihot esculenta*** Crantz (Euphorbiaceae) (Fig. 4): 1) United Arab Emirates. Fujairah Emirate, Rul Dhadna, villas and dwellings north from Mina road, corner with E99 Rugaylat road. 25°31'16.29"N, 56°21'19.69"E, Elevation 12 m [point 755]: cultivated in small orchard near home wall, 17 IV 2020, veg., V. V. Byalt, M. V. Korshunov 2206 (LE); 2) UAE, Fujairah Emirate, Al Dibba town, Green Oasis Nursery, 0.6 km South-West from Street Number 35, or 0.8 km North from Federal Electricity & Water Authority, 25°36'5.21"N, 56°15'45.67"E, Elevation 10 m [point 769a]: run wild under date palms near garden wall, 3 V 2020, veg., V. V. Byalt, M. V. Korshunov 2645 (LE); 3) UAE, Fujairah Emirate, Al Bidiya, Desert Oasis Nursery Bidyah, 0.7 km West from Bidiyah Association for Culture and Folklore. 25°26'9.06"N, 56°20'17.72"E, elevation 14 m [point 794]: cultivated on irrigation near garden fence, 4 VI 2020, veg., V. V. Byalt, M. V. Korshunov 3401 (LE; FSH). – Ergasiophygophyte, colonophyte. – New alien species to Fujairah and UAE.

Manihot esculenta or cassava, is a woody shrub of the spurge family, Euphorbiaceae, and its native range is W. South America to Brazil (URL: <http://plantsoftheworldonline.org/>). Although a perennial plant, cassava is extensively cultivated as an annual crop in tropical and subtropical regions for its edible starchy tuberous root, a major source of carbohydrates (Qi et al., 2022).

Wild populations of *M. esculenta* subsp. *flabellifolia*, shown to be the progenitor of domesticated cassava, are centered in west-central Brazil, where it was likely first domesticated no more than 10,000 years BP (Qi et al., 2022). Forms of the modern domesticated species can also be found growing in the wild in the south of Brazil. By 4,600 BC, manioc (cassava) pollen appears in the Gulf of Mexico lowlands, at the San Andrés archaeological site (Olsen, Schaal, 1999). The oldest direct evidence of cassava cultivation comes from a 1,400-year-old Maya site, Joya de Cerén, in El Salvador (Pope et al., 2001). With its high food

potential, it used to be a staple food of the native populations of northern South America, southern Mesoamerica, and the Taino people in the Caribbean islands, who grew it using a high-yielding form of shifting agriculture by the time of European contact in 1492 (URL: <https://www.britannica.com/topic/Taino>).

The study of relevant literature revealed that *Manihot esculenta* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Mandaville, 1990; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003; Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and commonly cultivated on private gardens and orchards. We have found it once as run wild under date palms near garden wall in Green Oasis Nursery at Al Dibba town. We did not observe a large invasive potential in this plant, since it seldom forms seeds and is demanding on high humidity.

****Linum usitatissimum*** L. (Linaceae) (Fig. 5): UAE, Fujairah Emirate, Masafi, near Masafi Fort. 25°18'9.44"N, 56° 9'45.71"E, elevation 440–460 m [point 762]: in shady garden, weed on cereal field, 21 IV 2020, V. V. Byalt, M. V. Korshunov 2362 (LE). – Ergasiophygophyte, ephemerophyte. – New alien species to Fujairah and UAE.

Flax (*Linum usitatissimum* L.) has native range is Turkey to Iran. It is used to treat some health disorders, it can also be used as a forage, poison, fuel and food (URL: <http://plantsoftheworldonline.org/>). *Linum usitatissimum* appears to have been domesticated just once from the wild species *Linum bienne*, called pale flax (Allaby et al., 2005). It is the earliest oil and fibre crop, constituting part of the “Neolithic package” of crops emanating from the Near East some 10,000 years ago (Zohary, Hopf, 2000). Flax is a principal source of oil and fibre from prehistoric times until



the early twentieth century, and remains a crop of considerable economic importance. However, the domestication process of flax is still shrouded in uncertainty (Zohary, Hopf, 2000). It is recorded as introduced in 33 countries or islands (<https://www.gbif.org/species/2873861>), and it is invasive in USA, United Kingdom of Great Britain, India, Japan (Ikeda et al., 2021; Kraus et al., 2020; Roy et al., 2020; Sankaran et al., 2021), etc.

Cultivated in Saudi Arabia (URL: <http://plantdiversityofsaudi-arabia.info/Biodiversity-Saudi-Arabia/Flora/Checklist/Checklist.htm>), Yemen (Wood, 1997; Al-Khulaidi, 2013), in Oman (Mandaville, 1977; Ghazanfar, 1992), UAE (Byalt, Korshunov, 2020d) on Arabian Peninsula.

The study of relevant literature revealed that

Linum usitatissimum has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is rarely grown in the Fujairah Emirate, sometimes it becomes naturalized and weedy. We have collected it in shady garden as weed in a cereal field in Masafi-Fort environs, and once found running wild in a wasteland in the village of Zubara. We did not observe a large invasive potential in this plant, since it rarely cultivated.



Fig. 4. *Manihot esculenta* Crantz



Fig. 5. *Linum usitatissimum* L.

*****Gossypium barbadense* L.** (Malvaceae) (Fig. 6): United Arab Emirates. Emirate of Fujairah. Al Fujairah, E seafront part, 25°07'55.41"N 56°21'08.54"E, 4 m alt.: in a shady alley between villas, run wild shrub 1,5 m h. – ОАЭ, Фуджейра. Эмират Фуджейра. Аль-Фуджейра, вост.-приморская часть, 25°07'55.41"N, 56°21'08.54"E, 4 м над ур. м.: сорное в тенистом переулке между виллами; одичавший кустарник 1,5 м выс. ед., 30 XI 2019, fl., fr., V. V. Byalt, M. V. Korshunov 1938, 1924 (LE). – Ergasiophygophyte, colonophyte. – New alien species to Fujairah and UAE.

This is an accepted species; its native range is Colombia to Peru. It has environmental and social applications, it can be used as poison, medicine, fuel and food (URL: <http://plantsoftheworldonline.org/>). It is now cultivated around the world, including China, Egypt, Sudan, India, Australia, Peru, Israel, the southwestern United States, Tajikistan, Turkmenistan, and Uzbekistan. It accounts for about 5 % of the world's cotton production. According to the GBIF website,

it is regarded as introduced in 9 countries of the world, and invasive in the USA (Kraus et al., 2020), Madagascar (Randrianizahana et al., 2020), etc. There are no records for the Arabian Peninsula (<https://www.gbif.org/ru/species/3152666> and <https://www.gbif.org/ru/species/8732615>). Cultivated in Yemen (Al-Khulaidi, 2013), UAE (Byalt, Korshunov, 2020d), and possibly in other countries of Arabia.

The study of relevant literature revealed that *Gossypium barbadense* L. has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It was found once as wild in a shady alley between villas in Fujairah City. Small bush about 1 m tall was here with flowers and fruit remnants. We did not observe a large invasive potential in this plant, since it rarely cultivated.



Note. In addition to *Gossypium barbadense* in Fujairah, another species of cotton is found as wild, presumably *G. herbaceum* L. (UAE, Fujairah Emirate, wadi Tayybah, 2.3 km north from Al Taiba Heritage Museum, wadi from Al Tayybah to Al Uyaynah. 25°26'4.80" N, 56°9'46.05"E, elevation 260–450 m [point 750]: run wild in gravel-sand wadi, on wadi banks and bottom, 9 IV 2020, V. V. Byalt, M. V. Korshunov 1968 (LE)). It was found by us in the form of seedlings in the lower part of wadi Al Tayybah on the way to Al Uyaynah, where its single specimens grew along the road for hundreds of meters. Since the plants we collected are very young, it is quite difficult to reliably determine their species affiliation.

*****Hibiscus sabdariffa* L.** (Fig. 7): UAE, Fujairah Emirate, 2.2 km North from Al Manama by E18 road. 25°21'1.38"N, 56°1'24.38"E, elevation 222 m [point 731]: drainage from building, 3 IV 2020, fr., V. V. Byalt, M. V. Korshunov 1766 (LE); United Arab Emirates. Fujairah Emirate, Rul Dhadna, villas and dwellings north from Mina road, corner with E99 Rugaylat road. 25°31'16.29"N, 56°21'19.69"E, elevation 12 m [point 755]: in drainage; on wasteland between villas and behind the store; on roadside, 17 IV 2020, V. V. Byalt, M. V. Korshunov 2192 (LE); UAE, Fujairah Emirate, Dibba town, 0.9 km south from Dibba Port. 25°36'3.02"N, 56°17'47.12"E, elevation 10 m [point 760]: weed in drainage, 19 IV 2020, fr., V. V. Byalt, M. V. Korshunov 2242 (LE); UAE, Fujairah Emirate, Al Dibba town, drainage channel with mango plantation in it, 0.4 km North-West from Federal Electricity & Water Authority, 25°35'47.57"N, 56°15'32.82"E, elevation 13 m [768]: weed in a shady lane, in irrigated spot with date palm, 2 V 2020, veg., V. V. Byalt, M. V. Korshunov 2577 (LE); UAE, Fujairah Emirate, Al Dibba town, plant nursery Corniche Nursery, 0.4 km South-West by road from roundabout between Corniche Street 101 and Sambraid Beach road. 25°36'19.87"N, 56°17'0.48"E, elevation 3 m [point

800]: cultivated / weed / run wild on irrigation in plantation; weed in and between plastic pots with cultivated plants; under tree / date palm, in shade; on sand between irrigated lines; near / on the garden fence; near nursery wall; without irrigation on abandoned land; on the agricultural waste, 19 VI 2020, V. V. Byalt, M. V. Korshunov 3797 (LE; FSH). – Ergasiophytophyte, ephemerohyte. – New alien species to Fujairah and UAE.

Hibiscus sabdariffa is native from W. Tropical Africa to Sudan (URL: <http://plantsoftheworldonline.org/>). In the 16th and early 17th centuries it was spread to the West Indies and Asia, respectively, where it has since become naturalized in many places (URL: <https://www.britannica.com/plant/roselle-plant>). It recorded as introduced in 25 countries including UAE and Yemen on Arabian Peninsula (<https://www.gbif.org/species/3152582>). The stems are used for the production of bast fibre, and the dried cranberry-tasting calyces are commonly steeped to make a popular infusion known as carcade (URL: <http://plantsoftheworldonline.org/>). The most common form of this species is the form with fleshy edible calyces that are used for drinks and jams, and are the source of Hibiscus tea of commerce (Verdcourt, Mwachala, 2009). Cultivated in Yemen (Al-Khulaidi, 2013), UAE (Byalt, Korshunov, 2020d), and possibly in other Arabian countries.

The study of relevant literature revealed that *Hibiscus sabdariffa* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000; Jongbloed et al., 2003; Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, Al-Khulaidi, 2013, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and commonly used in landscaping of hotels and private villas.



Fig. 6. *Gossypium barbadense* L.



Fig. 7. *Hibiscus sabdariffa* L.



*****Melaleuca viminalis*** (Sol. ex Gaertn.) Byrnes (*Callistemon viminalis* (Sol. ex Gaertn.) G. Don) (Myrtaceae) (Fig. 8): 1) UAE, Fujairah Emirate, Al Dibba town, private nurseries, 0.2 km South from Al Amerey Nursery, 25°34'24.07"N, 56°14'6.39"E, Elevation 48 m [point 776]: cultivated in plastic pots, 7 V 2020, fl., fl., V. V. Byalt, M. V. Korshunov 2762 (LE); 2) UAE, Fujairah Emirate, Al Bidiya, Desert Oasis Nursery Bidyah, 0.7 km West from Bidiyah Association for Culture and Folklore. 25°26'9.06"N, 56°20'17.72"E, elevation 14 m [point 794]: cultivated and run wild in plastic pot and between pots, 4 VI 2020, fr., veg., V. V. Byalt, M. V. Korshunov 3425 (LE; FSH). – Ergasiophytophyte, ephemerophyte. – New alien species to Fujairah and UAE.

Melaleuca viminalis is a large ornamental shrub, or a small tree shrub, and its native range is Queensland to New South Wales. It is used as invertebrate food, fuel, and has environmental applications (URL: <http://plantsoftheworldonline.org/>). A widely grown garden plant and street tree, usually known as *Callistemon viminalis*, *Melaleuca viminalis* is a hardy species in most soils when grown in full sun. It is useful as a screening plant and is suitable for planting as a street tree (Wrigley, Fagg, 1983). Recorded as introduced in 9 countries or islands, including UAE (URL: <https://www.gbif.org/species/3173353>), it is invasive in South Africa (Robinson et al., 2020), India (Sankaran et al., 2021), etc.

Cultivated on the Arabian Peninsula in Qatar (URL: <https://www.floraofqatar.com/indexf.htm#-Myrtaceae>), Saudi Arabia (Santhosh Kumar, 2014), UAE (Byalt, Korshunov, 2020d), etc.

The study of relevant literature revealed that *Melaleuca viminalis* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim,

Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and sometimes used in landscaping of hotels and private villas. We have recorded self-seeding of this species several times in plant nurseries. We did not observe a large invasive potential in this plant, since it is rarely cultivated.

****Physalis angulata*** L. (Solanaceae) (Fig. 9): 1) UAE, Fujairah Emirate, Al Fujairah city, near UAE Ministry of Culture and Knowledge Development building. 25°8'6.51"N, 56°17'30.93"E, elevation 70 m [point 703]: on sand near wall, 11 III 2020, fl., V. V. Byalt, M. V. Korshunov 246 (LE); 2) UAE, Fujairah Emirate, Al Hayl Fort (Al Hayl Castle). 25°5'4.59"N, 56°13'36.84"E, elevation 240–310 m [point 704]: garden near the Fort, 11 III 2020, fl., V. V. Byalt, M. V. Korshunov 277 (LE); 3) UAE, Fujairah Emirate, vil. Murbah, Murbah Seaport st., near ADNOC Petrol station in Seaport, 25°15'51.80"N, 56°22'5.06"E, elevation 4 m [point 711]: on roadside near garden, 15 III 2020, V. V. Byalt, M. V. Korshunov 519 (LE); 4) UAE, Fujairah Emirate, Al Qurayyah. 25°14'5.97"N, 56°21'20.50"E, elevation 8 m [point 709]: weed in garden and orchard, 15 III 2020, fl., fr., V. V. Byalt, M. V. Korshunov 622 (LE); 5) UAE, Fujairah Emirate, Al Wahlah, wadi Al Hilo Fort (Ohala Fort). 24°54'29.51"N, 56°18'11.86"E, elevation 75 m. [point 334]: on roadside in village; in gravel-stony wadi; aba UAE, Fujairah Emirate, Masafi Friday market, E88 Al Dhaid – Masafi road, 5.2 km to Masafi, 25°17'28.28"N, 56° 6'48.62"E, elevation 370 m. [point 732]: weed in plant market and plant nursery, 3 IV 2020, V. V. Byalt, M. V. Korshunov 1745 (LE); 6) UAE, Fujairah Emirate, wadi Tayybah, 2.3 km north from Al Taiba Heritage Museum, wadi from Al Tayybah to Al Uyaynah. 25°26'4.80"N, 56° 9'46.05"E, elevation 260–450 m. [point 750]: in abandoned garden, 9 IV 2020, V. V. Byalt, M. V. Korshunov 2013 (LE); 7) UAE, Fujairah Emirate, Masafi, near



Masafi Fort. 25°18'9.44"N, 56° 9'45.71"E, elevation 440–460 m [point 762]: weed in shady garden, in cereal field, 21 IV 2020, fl., V. V. Byalt, M. V. Korshunov 2366 (LE); 8) UAE, Fujairah Emirate, Rul Dadhna, Salama Plant Nursery 0.6 km West from ADNOC Petrol Station on E99 Rugaylat road. 25°31'36.30"N, 56°20'58.46"E, elevation 17 m. [point 766]: weed in plant nursery between pots, 25 IV 2020, fl., V. V. Byalt, M. V. Korshunov 2434 (LE); 9) UAE, Fujairah Emirate, Al Dibba town, private nurseries, 0.2 km South from Al Amerey Nursery, 25°34'24.07"N, 56°14'6.39"E, Elevation 48 m [point 776]: weed on irrigation in plantation (1 nursery), 7 V 2020, fl., veg., V. V. Byalt, M. V. Korshunov 2715 (LE); 10) UAE, Fujairah Emirate, Al Bidiya, Abu Khalid agricultural nursery, 0.3 km to South from Eid Prayer Ground Bidiyah, 25°25'15.85"N, 56°20'27.64"E, elevation 18 m. [point 780]: weed on irrigation in plantation and between plastic pots with cultivated plants, 12 V 2020, V. V. Byalt, M. V. Korshunov 2864 (LE; FSH); 11) UAE, Fujairah Emirate, Sharm, 25°28'17.54"N, 56°21'8.03"E, elevation 10–45 m [point 793]: on drainage near wall in shady side street between villas, 28 V 2020, fl., V. V. Byalt, M. V. Korshunov 3338 (LE); 12) UAE, Fujairah Emirate, Al Dibba town, Alamarey Nursery, 0.5 km South from Khalid Hadi Resort Dibba. 25°34'33.97"N, 56°14'6.15"E, elevation 45 m [point 797]: weed in and between plastic pots with cultivated plants, 13 VI 2020, fl., V. V. Byalt, M. V. Korshunov 3600 (LE; FSH); 13) UAE, Fujairah Emirate, Al Dibba town, Alamarey Nursery, 0.5 km South from Khalid Hadi Resort Dibba. 25°34'33.97"N, 56°14'6.15"E, elevation 45 m [point 797]: on drainage pipe outlet near back wall of house, 13 VI 2020, V. V. Byalt, M. V. Korshunov 3643 (LE; FSH); 14) UAE, Fujairah Emirate, Al Dibba town, plant nursery Corniche Nursery, 0.4 km South-West by road from roundabout between Corniche Street 101 and Sambraid Beach road. 25°36'19.87"N, 56°17'0.48"E, elevation 3 m [point 800]: weed between plastic pots with cultivated plants, on sand between irrigated

lines, 19 VI 2020, fl., V. V. Byalt, M. V. Korshunov 3840 (LE; FSH); 15) UAE, Fujairah Emirate, Rul Dadhna, Majid Nursery (plants), near E99 road and Mina road intersection. 25°31'15.68"N, 56°21'10.02"E, Elevation 15 m [point 804]: weed in and between plastic pots with cultivated plants and under trees in shade, 30 VI 2020, fl., fr., V. V. Byalt, M. V. Korshunov 3867 (LE; FSH); 16) UAE, Fujairah Emirate, Rul Dadhna, Al Jawhara Plants Nursery, 2 km by the unnamed road from E99 to Wadi Zikt dam. 25°30'52.69"N, 56°20'11.79"E, Elevation 33 m [point 805]: weed in and between plastic pots with cultivated plants, 4 VII 2020, fl., V. V. Byalt, M. V. Korshunov 3930 (LE; FSH); 17) Sharjah Emirate, Khor-Fakkan, The New Khor-Fakkan Corniche (goes in to Khor-Fakkan Beach), 25°21'1.30"N, 56°21'22.36"E, elevation 3 m [point 807]: weed in and between plastic pots with cultivated plants, 9 VII 2020, V. V. Byalt, M. V. Korshunov 4020 (LE; FSH); 18) UAE, Fujairah Emirate, Rul Dadhna, 0.8 km by the unnamed road from E99 to Wadi Zikt dam and after 0.4 km to North by track-road, 25°31'20.73"N, 56°20'39.06"E, elevation 27 m [point 808]: weed in and between plastic pots with cultivated plants, 11 VII 2020, V. V. Byalt, M. V. Korshunov 4072 (LE; FSH); 19) UAE, Fujairah Emirate, Al Bidiya, Desert Nurseries Group store 1 (palms), 0.9 km West from Bidiyah Association for Culture and Folklore, 25°26'9.61"N, 56°20'8.21"E, elevation 14 m [point 809]: weed between plastic pots with cultivated plants, on sand between irrigated lines, 16 VII 2020, V. V. Byalt, M. V. Korshunov 4155 (LE; FSH); 20) UAE, Fujairah Emirate, Al Dibba, Holiday Beach Motel & Resort, between Radisson Blu Fujairah and Royal Beach Hotel & Resort Fujairah. 25°35'56.93"N, 56°20'32.02"E, elevation 6 m [point 812]: weed on irrigation, 28 VII 2020, fl., V. V. Byalt, M. V. Korshunov 4360 (LE; FSH). – Ergasiophytophyte, colonophyte. – New alien species to Fujairah.

This is an accepted species recorded in such taxonomic databases as the Catalogue of Life



(URL: <https://www.catalogueoflife.org/col/>), GBIF (URL: <https://www.gbif.org/>), Plants of the World Online (URL: <http://plantsoftheworldonline.org/>), and the World Checklist of Vascular Plants (URL: <https://wcvp.science.kew.org/>). Its native distribution range is reported to be Tropical & Subtropical America. It has social applications and can be used as a medicine and for food (URL: <http://plantsoftheworldonline.org/>). Recorded as introduced in 89 countries or islands including UAE on Arabian Peninsula (<https://www.gbif.org/species/5341792>) and it is invasive in USA (Kraus et al., 2020), Japan (Ikeda et al., 2021), India (Sankaran et al., 2021), China (Zhang et al., 1994; Zhao et al., 2020) etc.

The study of relevant literature revealed that *Physalis angulata* has been reported as alien adventive species in Yemen (Wood, 1997; Al-Khulaidi, 2013), but not in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985;

Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). The history of the invasion of this plant into the territory of Fujairah is not known to us. We assume that initially *Physalis angulata* was cultivated in gardens and subsequently became wild en masse. It is now a fairly common weed on irrigated lands and can be considered an invasive species in Fujairah Emirate. Unlike *Physalis minima* L., which is a local ephemeral species and blooms in winter and spring, *P. angulata* is a weed and blooms massively in summer and is found only under irrigation.

The main differences between species of *Physalis* known in the UAE can be seen in Table (based on descriptions of Zhang et al., 1994).



Fig. 8. *Melaleuca viminalis* (Sol. ex Gaertn.) Byrnes

Fig. 9. *Physalis angulata* L.Table. The main differences between *Physalis* species of the UAEТаблица. Основные отличия между видами *Physalis* ОАЭ

Species Виды	Life form Жизненная форма	Pedicels Цветonoжки	Corolla Венчик	Calyx Чашечка	Berry Ягода
<i>Physalis angulata</i> L.	Annual	Fruiting pedicel 10–25 mm.	Corolla pale yellow or white, spotted in throat, 6–8 mm	Calyx divided about halfway, campanulate, 4–5 mm	Berry globose, yellow-orange, ca. 1.2 cm in dia
<i>Physalis minima</i> L.	Annual	Fruiting pedicel 3–8 mm	Corolla yellow, ca. 5 mm	Calyx divided about 1/3, campanulate, 2.5–3 mm,	Berry globose, yellow-orange, ca. 6 mm in dia.
<i>Physalis peruviana</i> L.	Perennial	Fruiting pedicel ca. 15 mm.	Corolla yellow, spotted in throat, 1.2-1.5 × 1.2- 2 cm.	Calyx broadly campanulate, 7-9 mm.	Berry orange, 1-1.5 cm in dia.

*****Physalis peruviana* L.** (Fig. 10): 1) UAE. Fujairah Emirate, Rul Dhadna, villas and dwellings north from Mina road, corner with E99 Rugaylat road. 25°31'16.29"N, 56°21'19.69"E, elevation 12 m [point 755]: weed on wasteland between villas, 17 IV 2020, V. V. Byalt, M. V. Korshunov 2231 (LE). – Ergasiophygophyte, ephemerophyte. New alien species to Fujairah and UAE. – This is an accepted

species; its native range is to the mountain slope regions of Peru and Chile (Morton, 1987) or Bolivia to W. Brazil. It is used as a poison, medicine, and for food, and has environmental applications (URL: <http://plantsoftheworldonline.org/>).

The history of *P. peruviana* cultivation in South America can be traced to the Inca Empire (Cailes, 1952; Legge 1974). It has been cultivated in



England since the late 18th century, and in South Africa in the Cape of Good Hope since at least the start of the 19th century (Morton, 1987). Widely introduced in the 20th century, *P. peruviana* is recorded in 84 countries or islands (URL: <https://www.cabi.org/isc/datasheet/53143>; URL: <https://www.cabi.org/isc/datasheet/40713>; URL: <https://doi.org/10.15468/39omei>), it is invasive in Belgium (Desmet et al., 2021), Great Britain (Roy et al., 2020), Spain (Rodríguez Luengo et al., 2020), Australia (Randall et al., 2020), New Zealand (Webb et al., 1988), etc.

Recorded as a cultivated species in Saudi Arabia (URL: <http://plantdiversityofsaudi-arabia.info/Biodiversity-Saudi-Arabia/Flora/Checklist/Checklist.htm>), UAE (Byalt, Korshunov, 2020d). The study

of relevant literature revealed that *P. peruviana* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.), but it is recorded as weed on Green Circles (center-pivot irrigation) in Irkhaya (Irkaya) Farms in South-western Qatar (URL: <https://www.floraofqatar.com/indexf.htm#Solanaceae>). It was found by us once as weed on wasteland between villas in Rul Dhadna. We did not observe a large invasive potential in this plant as it is rarely cultivated.



Fig. 10. *Physalis peruviana* L.

***Solanum melongena* L.:** 1) UAE. Emirate of Fujairah, central part of Al Fujera city, 25°07'17"N 56°20'12"E: cultivated in park near Government of Fujaira. – ОАЭ, Фуджейра, г. Фуджейра, район города близ аэропорта, 25°07'17"N 56°20'12"E: культивируется в парке у Правительства

Фуджейры, 29 III 2018, V. V. Byalt 1268 (LE); UAE, Fujairah Emirate, Al Qurrayah. 25°14'5.97"N, 56°21'20.50"E, elevation 8 m [point 709]: weed in garden and orchard, on roadside near gardens, 15 III 2020, V. V. Byalt, M. V. Korshunov 576 (LE); UAE, Fujairah Emirate, wadi Tayybah, 2.3 km



North from Al Taiba Heritage Museum, wadi from Al Tayybah to Al Uyaynah. 25°26'4.80"N, 56°9'46.05"E, elevation 260-450 m. [point 750]: on left side of gravel-sand wadi, 9 IV 2020, V. V. Byalt, M. V. Korshunov 1967 (LE); UAE, Fujairah Emirate, wadi Tayybah, 2.3 km north from Al Taiba Heritage Museum, wadi from Al Tayybah to Al Uyaynah. 25°26'4.80"N, 56°9'46.05"E, elevation 260-450 m. [point 750]: in gravel-sand wadi, on wadi banks, 9 IV 2020, V. V. Byalt, M. V. Korshunov 2069, 2089 (LE); UAE, Fujairah Emirate, Dibba town, 0.9 km south from Dibba Port. 25°36'3.02"N, 56°17'47.12"E, elevation 10 m [point 760]: on dranaige, garden side, 19 IV 2020, V. V. Byalt, M. V. Korshunov 2276 (LE); UAE, Fujairah Emirate, Rul Dadhna, 0.8 km by the unnamed road from E99 to Wadi Zikt dam and after 0.4 km to North by track-road, 25°31'20.73"N, 56°20'39.06"E, elevation 27 m [point 808]: wild near wall without irrigation on abandoned land, 11 VII 2020, fl., fr., V. V. Byalt, M. V. Korshunov 4115 (LE; FSH). – Ergasiophygophyte, colonophyte (epicophyte). New alien species to Fujairah Emirate and UAE.

Solanum melongena is a well-known food plant which was first domesticated in India. Now aubergine is cultivated worldwide and is a popular ingredient in many traditional recipes (URL: <http://plantsoftheworldonline.org/>). Recorded as introduced in 29 countries or islands, including Yemen in the Arabian Peninsula (<https://www.gbif.org/species/5341784>). Cultivated in Yemen (Wood, 1997; Al-Khulaidi, 2013), in Oman (Ghazanfar, 1992), in Qatar (URL: <https://www.floraofqatar.com/indexf.htm#Solanaceae>), UAE (Byalt, Korshunov, 2020d), etc.

The study of relevant literature revealed that *S. melongena* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003; Karim, Dakheel, 2006;

Karim, Fawzi, 2007; Norton et al., 2009, et al.).

It is grown in the Fujairah Emirate for food practically in all gardens and orchards near private villas and sometime used in landscaping of hotels (photo). This plant is quite common as seedlings and mature plants outside beds in gardens and wastelands. In addition, we found a large wild population of eggplant on the left slope in the upper part of wadi Al Tayybah, represented by plants of different ages, from self-seeding to fertile individuals. It is potentially invasive in the UAE.

*****Solanum tuberosum* L.:** 1) UAE. Fujairah Emirate, Al Dibba town, Al Shams Nursery, near Dibba Theatre (0.1 km to East). 25°36'9.81"N, 56°16'41.30"E, elevation 6 m. [point 767a]: weed on dranaige outlet near accommodation, 28 IV 2020, veg. V. V. Byalt, M. V. Korshunov 2510 (LE). – Ergasiophygophyte, ephemerophyte. – New alien species to Fujairah and UAE.

Wild potato species can be found from the southern United States to southern Chile (Hijmans, Spooner, 2001; Spooner et al., 2005). The potato was originally believed to have been domesticated by Native Americans independently in multiple locations (Lost Crops ..., 1989), but later genetic studies traced a single origin, in the area of present-day southern Peru and extreme northwestern Bolivia. Potatoes were domesticated there approximately 7,000–10,000 years ago, from a species in the *Solanum brevicaulis* complex (Francis, 2005; URL: www.sciencedaily.com/releases/2005/10/051004085552.htm). In the Andes region of South America, where the species is indigenous, some close relatives of the potato are cultivated. Potatoes were introduced to Europe from the Americas in the second half of the 16th century by the Spanish. Today this crop is a staple food in many parts of the world and an integral part of much of the world's food supply.

Cultivated on the Arabian Peninsula in Yemen (Wood, 1997; Al-Khulaidi, 2013), Oman (Ghazanfar,



1992), UAE (Byalt, Korshunov, 2020d), etc.

The study of relevant literature revealed that *Solanum tuberosum* has not been reported as alien in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). Potatoes are sold in all vegetable shops, supermarkets and markets of the emirate and are very rarely cultivated in the Fujairah Emirate for food in some gardens and orchards near private villas. Occasionally found in winter and spring running wild on wastelands and dumps of agricultural waste, or on drainage outlet near dwellings, and dying in the hot period. We did not observe a large invasive potential in this plant.

*****Allium cepa* L.** (Alliaceae): UAE. Fujairah Emirate, Rul Dhadna, villas and dwellings north from Mina road, corner with E99 Rugaylat road. 25°31'16.29"N, 56°21'19.69"E, elevation 12 m [point 755]: on wasteland between villas and behind the store, 17 IV 2020, V. V. Byalt, M. V. Korshunov 2196 (LE). – Ergasiophytophyte, ephemerophyte. – New alien species to Fujairah and UAE.

This is an accepted species recorded in the taxonomic databases Catalogue of Life (URL: <https://www.catalogueoflife.org/col/>), GBIF (URL: <https://www.gbif.org/>), Plants of the World Online (URL: <http://plantsoftheworldonline.org/>), and the World Checklist of Vascular Plants (URL: <https://wcvp.science.kew.org/>), and its native range is in the Middle and Central Asia. It has environmental and social applications; it can be used as forage, poison, medicine and food (URL: <http://plantsoftheworldonline.org/>). Recorded as introduced in 35 countries or islands, including Oman and Yemen in Arabian Peninsula (<https://www.gbif.org/species/2857697>). Cultivated in Yemen (Wood, 1997; Al-Khulaidi, 2013), Oman (Ghazanfar, 2018),

etc. The study of relevant literature revealed that *Allium cepa* has not been reported as alien adventive species in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, Al-Khulaidi, 2013, et al.). It is grown for food in some private gardens and orchards in the Fujairah Emirate and sometime run wild in garbage dumps and wastelands. We did not observe a large invasive potential in this plant.

*****Allium sativum* L.**: UAE, Fujairah Emirate, Al Siji, Al Siji dump wasting area. 25°16'7.17"N, 56° 0'37.91"E, elevation 200 m [point 727]: between agricultural and household trash in wadi, 1 IV 2020, V. V. Byalt, M. V. Korshunov 1664 (LE). – Ergasiophytophyte, ephemerophyte. – New alien species to Fujairah and UAE.

Garlic is a strongly aromatic bulb crop that has been cultivated for thousands of years. It is renowned throughout the world for its distinctive flavour as well as its health-giving properties (URL: <http://plantsoftheworldonline.org/>). It is native to Central Asia and northeastern Iran, and has long been used as a seasoning worldwide, with a history of several thousand years of human consumption and use (Rivlin, 2001; Block, 2010). It was known to ancient Egyptians and has been used as both a food flavoring and a traditional medicine (Lutowski, 1989; URL: <https://www.drugs.com/search.php?searchterm=garlic>). *Allium sativum* grows in the wild in areas where it has become naturalized. Recorded as introduced in 23 countries or islands, including Saudi Arabia (URL: <https://www.gbif.org/species/2856681>).

Cultivated in Yemen (Wood, 1997; Al-Khulaidi, 2013), Saudi Arabia, UAE (Byalt, Korshunov, 2020d) and probably in other countries on the Arabian Peninsula. The study of relevant literature



revealed that *Allium sativum* has not been reported as alien and adventive species in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000; Jongbloed et al., 2003; Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for food in some private gardens and orchards in the Fujairah Emirate and sometime runs wild in garbage dumps and on wastelands (as, for example, in Al Siji dump wasting area). We did not observe a large invasive potential in this plant.

*****Asparagus aethiopicus* L. (*A. sprengeri* Regel, *A. densiflorus* auct.) (Asparagaceae) (Fig. 11):** 1) UAE, Fujairah Emirate, Al Bidiya, Al Qalamoon Nursery, 0.3 km East from Eid Prayer Ground Bidyah, 25°25'24.70"N, 56°20'18.77"E, elevation 22 m [point 781a]: cultivated in nursery, 19 V 2020, fl., V. V. Byalt, M. V. Korshunov 2930 (LE); 2) UAE, Fujairah Emirate, Al Dibba town, Alamarey Nursery, 0.5 km South from Khalid Hadi Resort Dibba. 25°34'33.97"N, 56°14'6.15"E, elevation 45 m [point 797]: cultivated and run wild between plastic pots with cultivated trees (far from mother plans), 13 VI 2020, veg., V. V. Byalt, M. V. Korshunov 3607 (LE). – Ergasiophygophyte, ephemerophyte. – New for Fujairah Emirate, UAE and Arabia in whole.

Asparagus aethiopicus is a well-known ornamental perennial herb, and its native range is South Africa from Cape Prov. to North-West Province. It has environmental applications and can be used as a medicine and food (URL: <http://plantsoftheworldonline.org/>). Recorded as introduced in 11 countries or islands, but no countries in Arabian Peninsula (<https://www.gbif.org/species/2768763>), it is invasive in the USA, it has been declared a weed in Hawaii and Florida (Kraus et al., 2020), has become established around major urban areas in Australia including Sydney,

Wollongong, the Central Coast, Southeastern Queensland, and Adelaide (Wolff, 1999), as well as on Lord Howe Island and Norfolk Island (Green, 1994), Brazil (Ziller et al., 2020), etc.

Cultivated in Saudi Arabia (Santhosh Kumar, 2014), UAE (Byalt, Korshunov, 2020d), etc. The study of relevant literature revealed that *Pseuderanthemum maculatum* has not been reported as an alien species in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, Cornes, 1989, Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003; Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and commonly used in landscaping of hotels and private villas. We did not observe a large invasive potential in this plant.

*****Tradescantia pallida* (Rose) D.R. Hunt (*Setcreasea pallida* Rose) (Commelinaceae) (Fig. 12):** 1) UAE, Fujairah Emirate, Al Fujairah city, wasteland near Fujairah Corniche road, opposite the Fujairah International Marine Club, 25°7'22.82"N, 56°21'23.00"E, elevation 3 m [point 758a]: weed under cultivated bushes in irrigated circles between highway lanes, 9 V 2020, fl., V. V. Byalt, M. V. Korshunov 2784 (LE); UAE, Fujairah Emirate, Al Aqah, Le Meridien Al Aqah Beach Resort, near Shark roundabout, between Fujairah Rotana Resort & Spa and InterContinentAl Fujairah Resort, 25°30'25.89"N, 56°21'43.39"E, elevation 5 m [point 811]: run wild in part near hotel, on wet sand in shady place under stairs, 23 VII 2020, veg., V. V. Byalt, M. V. Korshunov 4346 (LE). – Ergasiophygophyte, colonophyte. New alien species to Fujairah and UAE. – This is an accepted species; and its native range is Mexico. It is used as a medicine and has environmental applications (URL: <http://plantsoftheworldonline.org/>). Recorded as introduced in 28 countries including Sau-



di Arabia in Arabian Peninsula (URL: <https://doi.org/10.15468/39omei>), and it is invasive in Spain (Rodríguez Luengo et al., 2020), Australia (Rendall et al., 2021), South Africa (Robinson et al., 2020), India (Sankaran et al., 2021) etc. Cultivated in Saudi Arabia (Santhosh Kumar, 2014), UAE (Byalt, Korshunov, 2020d).

The study of relevant literature revealed that *Tradescantia pallida* has not been reported as an alien species in other countries of the Arabian Peninsula (Daoud, Al-Rawi, 1985; Collenette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, Western, 1989; Gazanfar, 1992, 2018; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dak-

heel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.). It is grown for sale in some plant nurseries in the Fujairah Emirate and is commonly used in landscaping of hotels and private villas. We did not observe a large invasive potential in this plant.

Tradescantia pallida is grown in Fujairah Emirate as an ornamental plant in urban landscaping, near hotels, villas and sometimes runs wild (near InterContinental Fujairah Resort hotel in Al Aqah and in irrigated circles between highway lanes in Fujairah City). We did not observe a large invasive potential in this plant, since it gives few seeds and is demanding on moisture.

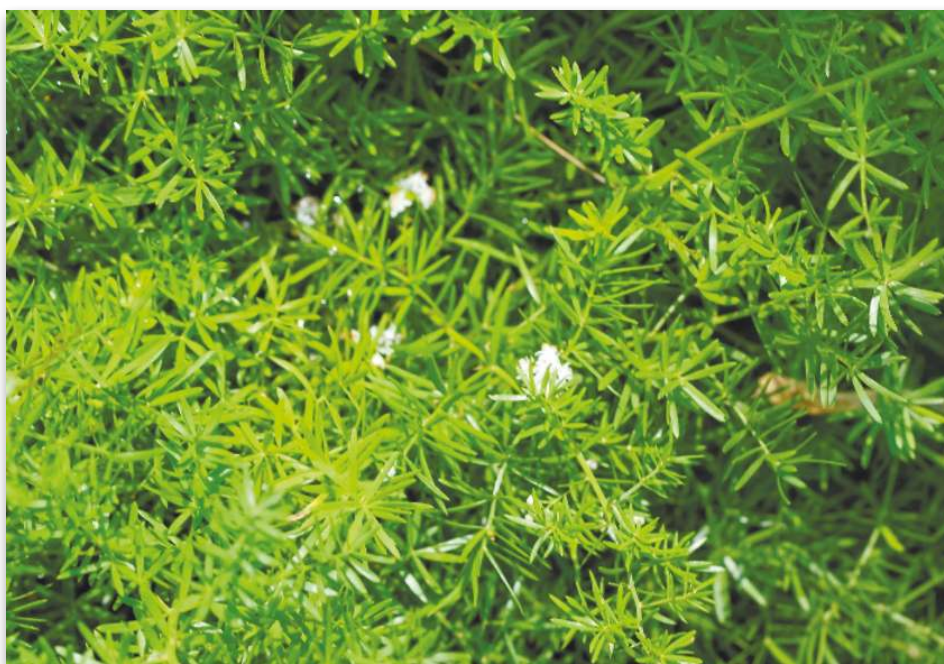


Fig. 11. *Asparagus aethiopicus* L.

*****Eleusine coracana* (L.) Gaertner (Poaceae):**
1) UAE, Fujairah Emirate, Al Dibba town, drainage channel near the Green Oasis Nursery, 0.6 km South-West from Street Number 35, or 0.8 km North from Federal Electricity & Water Authority, 25°36'5.21"N, 56°15'45.67"E, elevation 10 m [point 769]: wild in sewer drainage behind the private villa, together with *Saccharum officinarum*, 2 V 2020, V. V. Byalt, M. V. Korshunov 2619 (LE). –

Ergasiophytophyte, ephemerohyte. New alien (adventive) species to Fujairah, UAE and Arabian Peninsula in general.

Finger millet (*Eleusine coracana*) is a variety of millet grown in the arid parts of Africa and Asia. It is one of the most nutritious of all the world's cereal crops, containing high levels of starch, calcium, iron and methionine, an amino acid that is absent from the diets of millions of the poor who



Fig. 12. *Tradescantia pallida* (Rose) D.R. Hunt

live on starchy foods such as cassava and plantain (URL: <http://plantsoftheworldonline.org/>). It is native to the Ethiopian and Ugandan highlands (D'Andrea et al., 1999). Interesting characteristics of finger millet as a crop are the suitability to withstand cultivation at altitudes over 2000 m above sea level, its high drought tolerance, and the long storage time of the grains (Borlaug et al., 1996). recorded as introduced in 14 countries or islands including Bahrain, Oman, Saudi Arabia and Yemen (Cope, 2007; <https://www.gbif.org/species/2705957>). It is invasive in India (Sankaran et al., 2021), USA, Australia (Pagard, 2019; Randall et al., 2020), etc.

Eleusine coracana cultivated on Arabian Peninsula in Bahrain (URL: <https://www.gbif.org/species/2705957>), Saudi Arabia (URL: <http://plantdiversityofsaudiarabia.info/Biodiversity-Saudi-Arabia/Flora/Checklist/Checklist.htm>), Oman (Ghazanfar, 1992, 2018), UAE (Byalt, Korshunov, 2022), and Yemen (Wood, 1997; Al Khulaidi, 2013).

The study of relevant literature revealed that *Eleusine coracana* has not been reported as an alien adventive species in other countries of the Arabian Peninsula, but noted only as a cultivated one (Daoud, Al-Rawi, 1985; Colletette, 1985, 1999; Phillips, 1988; Migahid, 1989; Cornes, 1989, 1989, Western, 1989; Gazanfar, 1992;

Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000, 2007; Jongbloed et al., 2003, Karim, Dakheel, 2006; Karim, Fawzi, 2007; Norton et al., 2009, et al.), or as cultivated in Saudi Arabia, Yemen, Socotra, Oman, Bahrain and occasionally escaping into the wild (Cope, 2007). *Eleusine coracana* was found by us as wild in Dibba town in sewage drainage behind a private villa, together with *Saccharum officinarum* L. We did not observe a large invasive potential in this plant as it is rare cultivated in UAE. ✓

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