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Six records of new and rare alien species to the flora of United Arab Emirates (UAE)

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Summary. The article presents new records for six alien species previously not known or rare from flora of United Arab Emirates (UAE) – *Sagina apetala* Ard., *Stellaria apetala* Ucria (*S. pallida* (Dumort.) P. Fourn.), *Stellaria media* L. (Caryophyllaceae), *Acalypha lanceolata* Willd. (Euphorbiaceae), *Boerhavia erecta* L. (Nyctaginaceae), *Oxalis dillenii* Jacq. (Oxalidaceae). All of these species have been recorded for the first time from the Emirate of Fujairah in north-eastern UAE. *Sagina apetala* and *Stellaria apetala* were found on wet sand around Masafi in the Masafi Friday market, *Acalypha lanceolata* as a weed between plastic pots in Al Qalamoon Nursery in village Al Bidiya, *Boerhavia erecta* a common weed found in different places, such as roadside in a backstreet in Qidfa, as a weed in Salman Nursery in Masafi, on stone-gravel wadi banks near the Masafi Friday market Sur, in a plant nursery between pots Rul Dadhna, at the Salama Plant Nursery in Al Dibba town, as a weed on irrigated plantation, between irrigated lines and without irrigation on abandoned land in the Green Nursery Sales Dibba and on irrigation and weed in and between plastic pots, on sand between irrigated lines in nursery in Al Bidiya; *Oxalis dillenii* was found as a weed in the Masafi Friday market in around Masafi town, as rare weed in Al Shams Nursery and private nursery in 0.2 km South from Al Amerey Nursery in Al Dibba town. These taxa are new for the flora of Fujairah and the UAE. *Stellaria media*, a weed in small garden in Al Dibba and in Masafi Friday market, is rare in the UAE, and new for Fujairah. Species, synonyms, spatial distribution, habitat preferences, and species taxonomy with remarks on identification and differentiation from the most similar taxa occurring in the study area, as well as the list of localities are presented. Herbarium material was transferred to the Herbarium of the Komarov Botanical Institute (LE), duplicates – to the Herbarium of Altai State University (ALTB) and the Scientific Herbarium of Fujairah (FSH, Wadi Wuraya national park, Fujairah, United Arab Emirates).

Шесть новых и редких чужеродных видов для флоры Объединённых Арабских Эмиратов

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Аннотация. В статье представлены новые находки шести ранее неизвестных или редких чужеродных видов во флоре Объединённых Арабских Эмиратов (ОАЭ) – *Sagina apetala* Ard., *Stellaria apetala* Ucria (*S. pallida* (Dumort.) P. Fourn.), *S. media* L. (Caryophyllaceae), *Acalypha lanceolata* Willd. (Euphorbiaceae), *Boerhavia erecta* L. (Nyctaginaceae), *Oxalis dillenii* Jacq. (Oxalidaceae). Все они зарегистрированы впервые в эмирате Фуджейра в северо-восточной части ОАЭ. *Sagina apetala* была обнаружена на мокром песке в окрестностях Мазафи на «Пятничном рынке Мазафи», *Stellaria apetala* – также на «Пятничном рынке Мазафи», *Acalypha lanceolata* – растёт как сорняк между пластиковыми горшками в «питомнике Аль-Каламун» в пос. Аль-Бидия, *Boerhavia erecta* – обычный сорняк в разных местах эмирата – на обочине дороги в переулке в пос. Кидфа, как сорняк в «Питомнике растений Салмана» в Мазафи, дико на каменно-гравийных берегах вади возле «Мазафи Фрайдей Маркет Сур», в питомнике растений между горшками в пос. Рул Дадна, в «Питомнике растений Саламан» в г. Аль-Дибба, как сорное на орошаемой плантации, между поливными рядами и без орошения на заброшенных участках земли в «Зелёном питомнике-распродаже в Диббе» и на поливе и сорняках в и между пластиковыми горшками, на песке между поливными рядами в питомнике в Аль-Бидии, *Oxalis dillenii* был обнаружен как сорняк на «Пятничном рынке Мазафи» в окрестностях г. Мазафи, как редкий сорняк в «Питомнике Аль-Шамс» и частном питомнике в 0,2 км к югу от «Питомника Аль-Амерей» в г. Аль-Дибба; они вообще новые для флоры Фуджейры и ОАЭ. *Stellaria media* – обнаружен как сорняк в небольшом саду в Аль-Диббе и на «Пятничном рынке Мазафи», редко встречается в ОАЭ (ранее указывался для оазисов Аль-Айна) и является новым для Фуджейры.

This research is part of the project "Flora of Fujairah, United Arab Emirates", under a cooperation agreement between the Office of the Crown Prince of Fujairah and the Komarov Botanical Institute of the Russian Academy of Sciences, St. Petersburg (Byalt, Korshunov, 2018, 2021a, b, 2022a–c; Byalt et al., 2020a–c; Korshunov, Byalt, 2022). During field investigations in 2017–2022, the authors have documented information on the distribution of new alien plant species in the territory of the Emirate of Fujairah, United Arab Emirates (UAE). The article presents new records found there.

Material and methods

During various botanical surveys in the UAE in 2017–2022, the specimens and/or photos of *Stellaria apetala* Ucria (Caryophyllaceae), *Acalypha lanceolata* Willd. (Euphorbiaceae), *Boerhavia erecta* L. (Nyctaginaceae), *Oxalis dillenii* Jacq. (Oxalidaceae) were collected by the authors in several localities in the territory of the Emirate of Fujairah (UAE) (Fig. 1). Data on plant populations and habitats were also gathered during the expeditions. The following flora compendia and identification guides were used to identify specimens and determine their taxonomic status: local Floras and field guides for UAE (Western, 1989; Jongbloed et al., 2000, 2003; Karim, Fawzi, 2007) and Floras for neighbouring countries (Batanouny, 1981; Collenette, 1985, 1999; Daoud, Al-Rawi, 1985; Phillips, 1988; Cornes C., Cornes M., 1989; Migahid, 1989, 1996; Ghazanfar, 1992, 2003, 2007; Shuaib, 1995; Miller, Cope, 1996; Wood, 1997; Chaudhary, 1999, 2001; Omar, 2001; Jongbloed et al., 2003; Miller, Morris, 2004; Norton et al., 2009; Abdullah, Al-Dosari, 2022; etc.), websites "Flora of Qatar", 2013–2016 (https://www.floraofqatar.com/indexf.htm), "UAE Flora" (https://www.uaeflora.ae; Alyammahi et al., 2023), Norton et al. (2009) and "Global Biodiversity Information Facility" (GBIF. URL: https://www.gbif.org) were used to identify determine.

The alien plant status was determined by the following criteria (Egorov et al., 2016; Baranova et al., 2018): 1) an indication in the literature that the species has been introduced into the study area or a larger region encompassing the study area; 2) the species occurred only or mainly in ruderal and/or weedy habitats; 3) the species occurred in isolation from its main natural geographic range. The status of the alien species was determined to be casual, naturalized, or invasive, using the approach developed by Pyšek et al. (2004) and which is quite widely used in Western Europe (Galasso et al., 2018). However, because our observations were made only once, the alien species status that we give might not be correct.

Specimens were deposited in the following herbaria (acronyms according to Thiers, 2021): (LE), and Wadi Wuraya National Park (FSH, not acronym).

A Garmin GPS 72H was used for the geographic coordinates of the collecting sites. All coordinates use the WGS84 standard.

The locations of the study sites Emirate of Fujairah: Al Dibba town, environs of Masafi, wadi Siji, 3.1 km East from Wadi Siji Old Dam, villages Qidfa and Al Bidya.

Abbreviations used: United Arab Emirates – UAE, spp. – species, fl. – with flowers, fr. – with fruits, veg. – in a vegetative state, juv. – young, underdeveloped. LE – Herbarium of BIN RAS, FSH [not yet acronym] – Fujairah Scientific Herbarium (Byalt et al., 2020d). The labels are in English as in the original. The numbers in square brackets indicate the place of our research, recorded by GPS [point 776] and others. They are given on the labels for the convenience of working with the herbarium.

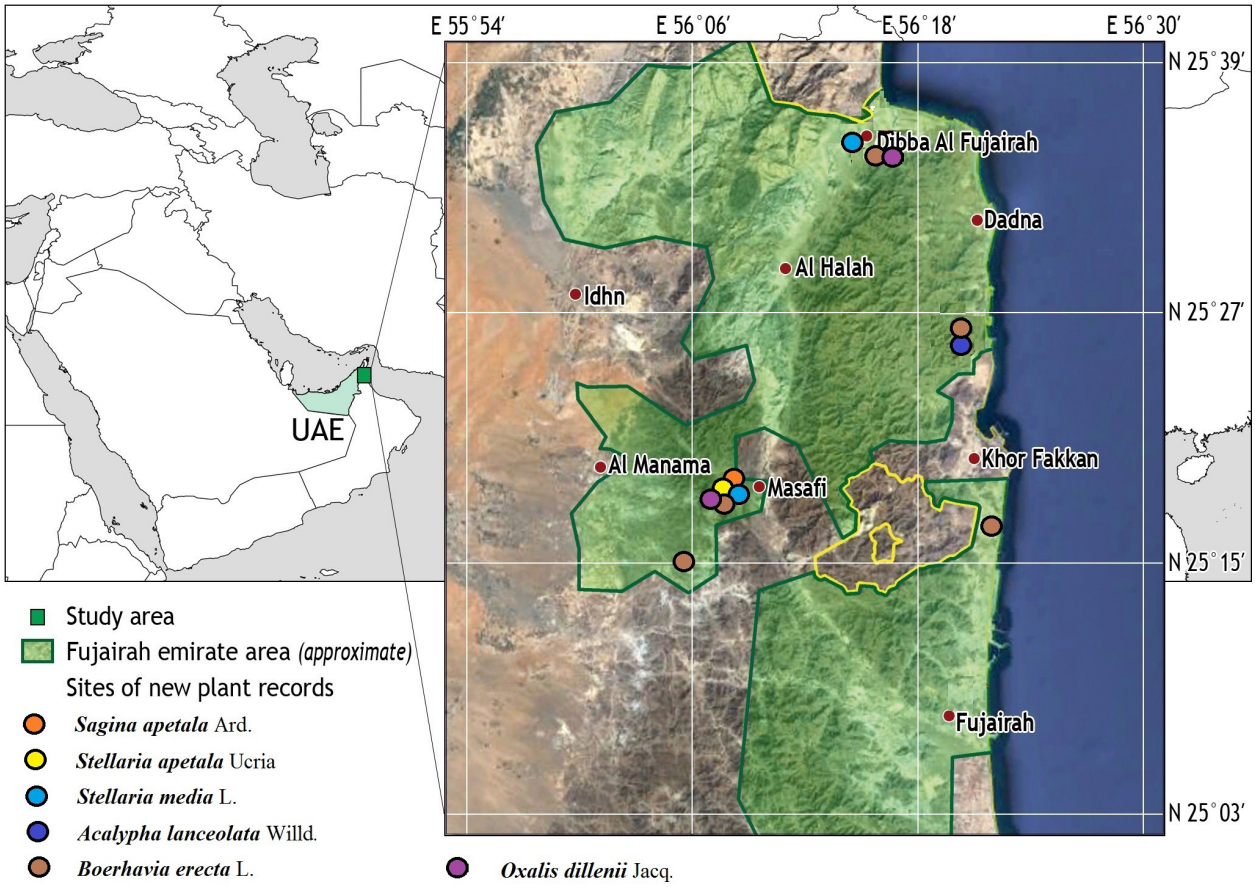

Fig. 1. Map of the distribution of new alien plants in Emirate of Fujairah (based on map of Google Earth): *Sagina apetala* Ard., *Stellaria apetala* Ucria, *Stellaria media* L., *Acalypha lanceolata* Willd., *Boerhavia erecta* L., *Oxalis dillenii* Jacq.

Sagina apetala Ard.: "UAE, Fujairah Emirate, Masafi friday market, E88 Al Dhaid – Masafi road, 4 km to Masafi. 25°17'47.12"N, 56°7'26.88"E, elevation 380 m: weed in plant market and plant nursery, on wet sand on pathside, a few exemplars. 23 III 2020. Fl., fr. V. V. Byalt, M. V. Korshunov 996" (LE). – Therophyte/Annual. European-Southwestern Asian-African. Xenophyte, ephemerophyte, euneophyte. Propagation by seeds, autochorus, anthropochorus. Weed. New species and genus for flora of Arabia (Figs 1, 2).

The native range of this species is Europe to N. Pakistan, Macaronesia, N. Africa to Ethiopia. It grows primarily in the temperate biomes (POWO, 2024). It is recorded as introduced in several countries, including South African Republic and Indonesia (*Sagina apetala*, 2024). Invasive species in India (Sankaran et al., 2021), Australia (Randall et al., 2022), USA (Kraus et al., 2020) et al.

Sagina apetala differs from the closely related annual and perennial species of genus *Sagina* in the following features (see Table 1).

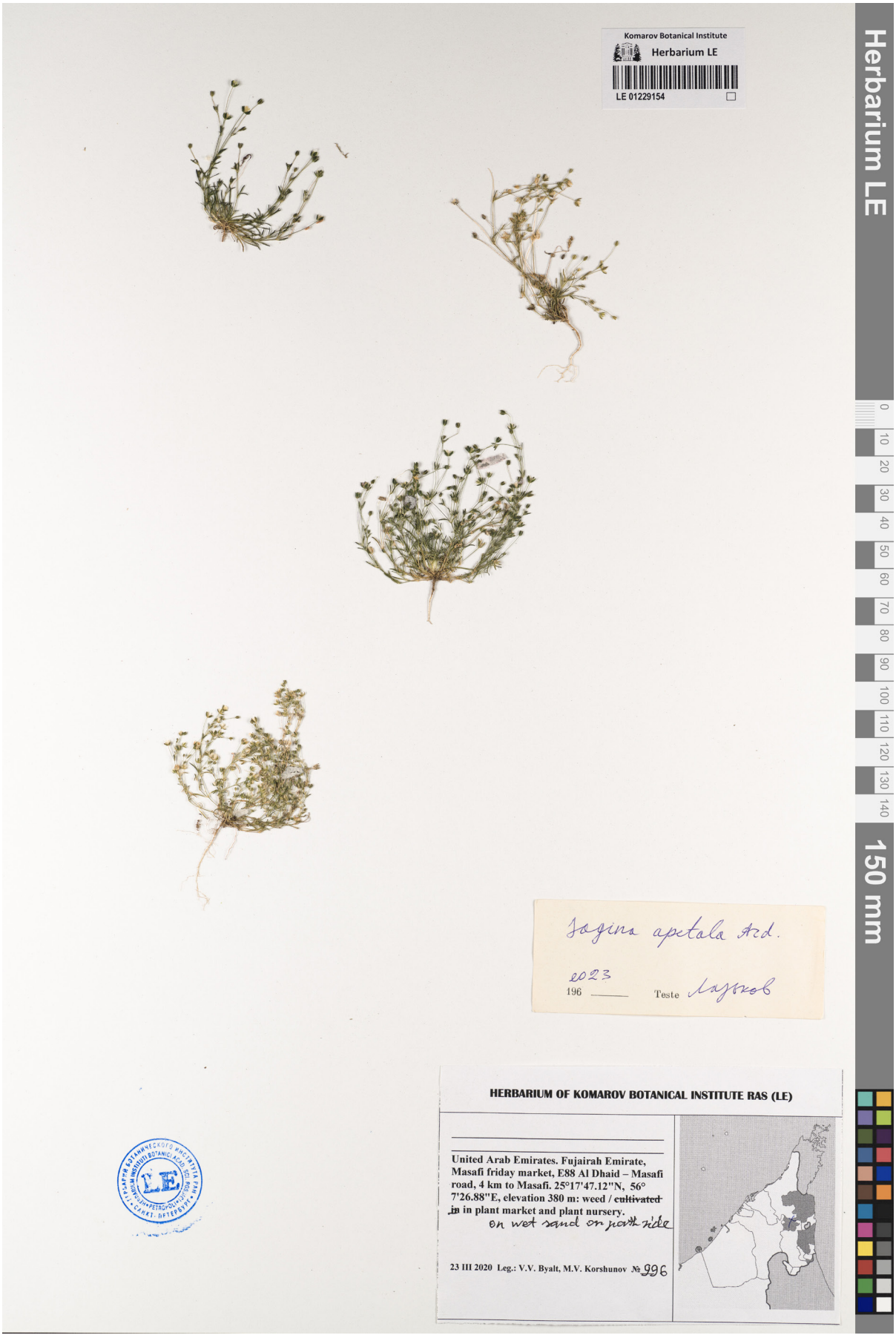

Fig. 2. Herbarium specimen of *Sagina apetala* Ard. from environs of Masafi kept in LE (LE 01229154, scan by L. Orlova).

Table 1

Comparative features of *Sagina apetala* Ard. and closely related species of the genus *Sagina*

Species	Life form	Flowers	Capsules	Leaves
Sagina saginoides (L.) H. Karst.	Perennial	Flowers 5-merous	Capsule splitting by 5 valves. Capsules longer than sepals	Leaf blade bases glabrous
Sagina apetala Ard.	Annual	Flowers 4-merous	Capsule splitting by 4 valves. Capsules equaling to sepals	Leaf blade bases distinctly ciliate, especially of distal cauline leaves
Sagina decumbens (Elliott) Torr. et A. Gray	Annual	Flowers 5-merous (rarely 4-merous)	Capsule splitting by 5 (rarely 4) valves. Capsules longer than sepals	Leaf blade bases never ciliate

Stellaria apetala Ucria (*S. pallida* (Dumort.) P. Fourn.): "UAE, Fujairah Emirate, Masafi friday market, E88 Al Dhaid – Masafi road, 4 km to Masafi. 25°17'47.12"N, 56°7'26.88"E, elevation 380 m: weed in plant market and plant nursery, in pots and between pots on wet sand, in shade. 23 III 2020. Fl. V. V. Byalt, M. V. Korshunov. 976 bis" [mixed with *S. media* on sheet] (LE). – Terophyte/Annual. Eurasian and North African element. Xenophyte, colonophyte, neophyte. Propagation by seeds, autochorus, antropochorous. Weed. Rare alien species in UAE, new to Fujairah (Figs 1, 3).

The native range of this species is Europe to N. China and Arabian Peninsula, Canary Islands, N. Africa (Davis, 1967; Meikle, 1977; Rechinger et al., 1988; Chater, Hetwood, 1993; Boulos, 1999; Wu et al., 2001; Nooteboom, 2002; Lazkov, 2012; Ackerfield, 2015; Danin, Fragman-Sapir, 2019; Dobignard, Chatelain, 2011; etc.). It grows primarily in the temperate biomes (POWO, 2024).

Introduced in more than 10 countries (POWO, 2024), naturalized and invasive in Australia, South Africa, Zambia, Argentina, Mexico, Japan (Exell, Wild, 1961; Germishuizen, Meyer, 2003; Iwatsuki et al., 2006; Zuloaga et al., 2008; Rebman et al., 2016; Zalba et al., 2021; De Salas et al., 2022). In Arabia this is weed in Kuwait, Oman, Qatar, Saudi Arabia, and Yemen (Miller, Cope, 1996; Wood, 1997; Collenette, 1999; Checklist, 2011–2024; Al-Khulaidi, 2013). It is not clear whether this species is native or alien to the indicated countries, possibly an archeophyte and associated with ancient agriculture in the oases. As for the United Arab Emirates and Fujairah, we have no doubts about its alien origin, since we met it once in a clearly anthropogenic habitat in a plant nursery in the city of Masafi and in a small number of individuals (together with *S. media* L.). This species has not previously been reported for the UAE in the main literature (see Western, 1989; Miller, Cope, 1996; Jongbloed et al., 2000, 2003; Karim, Fawzi, 2007), therefore, it is a new alien species for Fujairah and the UAE in general. Not a potentially invasive species due to high substrate moisture requirements.

Stellaria apetala differs from the closely related annual and perennial species of genus *Stellaria* in the following features (see Table 2).

Table 2

Comparative features of closely related species to *Stellaria apetala* Ucria

Species	Stem	Sterile shoots	Capsules	Habit	Seeds
Stellaria apetala Ucria	The stems, herbaceous, terete and glabrous, with a single line of hairs down one side, which alternates at the nodes	Sterile shoots absent	Capsules equaling to slightly longer than sepals	Annual	seeds 6–8, pale brown, ovoid to suborbicular, slightly compressed, 0.5–0.8 mm in diam., with a ring of small, blunt tubercles around the rim
Stellaria decumbens Edgew.	Stem woody at base, hairy all around	Sterile shoots with leaf fascicles	Capsule shorter than sepals	Perennial	Seeds 2–8, smooth
Stellaria media L.	Stems herbaceous, hairy on one side only	Sterile shoots absent	Capsule exceeding sepals	Annual	Seeds numerous, red-brown, ovoid to suborbicular, slightly compressed, 1–1.2 mm in diam., with notable semiglobose-tuberculate

Fig. 3. Herbarium specimen of *Stellaria apetala* Ucria and *S. media* L. collected in Masafi Friday market, kept in LE (LE 01229139, scan by D. Melnikov).

The taxonomic status of *Stellaria apetala* (Dumort.) Piré has been confused. James Dandy (1958) and A. R. Clapham, T. G. Tutin and E. F. Warburg (Clapham et al., 1962) adopted the name *Stellaria pallida* (Dandy, 1958; Clapham et al., 1962), but while Clapham et al. treated *S. apetala* Ucria as a synonym, Dandy considered it to be a synonym of *S. media* L., as also did A. O. Chater and V. H. Heywood (1964). F. H. Whitehead and R. P. Sinha (1967) concluded that *S. apetala* Ucria could be regarded as synonyms of *S. pallida* (Dumort.) Piré. *Stellaria pallida* is now considered as a junior synonym of *Stellaria apetala* (POWO, 2024).

Stellaria media L.: "UAE, Fujairah Emirate, Masafi friday market, E88 Al Dhaid – Masafi road, 4 km to Masafi. 25°17'47.12"N, 56°7'26.88"E, elevation 380 m: weed in plant market and plant nursery, in pots and between pots on wet sand, in shade. 23 III 2020. Fl. V. V. Byalt, M. V. Korshunov. 976" [mixed with *S. apetala* on sheet] (LE); "UAE, Fujairah Emirate, Al Dibba town, Garden on the road corner, 0.15 km North-East from Ministry of Community Development. 25°35'25.46"N, 56°15'32.36"E, elevation 19 m [point 773]: weed in small garden with irrigation near villas gate, between decorative plants. 6 V 2020. Fl., fr. V. V. Byalt, M. V. Korshunov. 2703" (LE). – Terophyte/Annual. Eurasian element. Xenophyte, colonophyte, neophyte. Propagation by seeds, autochorus, antropochorous. Weed. (Fig. 1, 3).

The native range of this species is temperate Eurasia, N. and N.E. Tropical Africa (Dobignard, Chatelain, 2011; Darbyshire et al., 2015; POWO, 2024). It is an annual or biennial and grows primarily in the temperate biome. It is used as animal food, a poison and a medicine, and for food (it is sometimes grown as a salad crop or for poultry consumption) (POWO, 2024).

Recorded as introduced in 61 countries or islands (*Stellaria media*, 2022) and naturalized throughout the world, where it is a weed of waste ground, farmland and gardens. It is invasive in such countries as Australia, New Zealand, South Africa, Zambia, USA, Argentina, Mexico, Japan, etc. (Exell, Wild, 1961; Webb et al., 1988; Germishuizen, Meyer, 2003; Iwatsuki et al., 2006; Zuloaga et al., 2008; Rebman et al., 2016; Foxcroft et al., 2020; Kraus et al., 2020; Randall et al., 2022). In Arabia it is natural in western parts of Saudi Arabia, Yemen, and Kuwait (Ghazanfar, 1992, 2003; Miller, Cope, 1996; Wood, 1997; Collenette, 1999; Abdullah, Al-Dosari, 2022).

In UAE it was recorded by Jongbloed et al. (2003) as weed plant in Al Ain oasis (Abu Dabi emirate). As for the United Arab Emirates and Fujairah, we have no doubts about its alien origin, since we met it in a clearly anthropogenic habitats in a plant nursery in the city of Mazafi and in a small number of individuals (together with *S. media* L.) and as weed in small garden with irrigation near villas gate at Al Dibba town. Rare alien species in UAE, new for Fujairah. It is not a potentially invasive species due to high substrate moisture requirements.

Stellaria media differs from the closely related annual species of the genus *Stellaria* in the following features (see Table 3).

Table 3

Comparative features of closely related species to *Acalypha lanceolata* L.

Species	Inflorescens	Branchlets	Bracts	Leaf blades
A. indica L.	Inflorescences all axillary, pedunculate, androgynous, spicate, up to 10 cm long, with female bracts 3–9, less than 5 mm	Branchlets adpressed pubescent when young	Bracts of the female flowers ovate-cordate, crenulate	Leaf-blade ovate, rhombic-ovate or ovate-lanceolate, 2–6(–9) × 1–5 cm, acute or subacute, cuneate, crenate-serrate
A. lanceolata Willd.	Inflorescences axillary, bisexual, pubescent; peduncle short, 1–3 together, 1–2.5 cm, with female bracts 3–9, less than 5 mm	Branchlets pubescent and sparsely hirsute when young	Female bracts fan-shaped, denticulate	Leaf blade rhombic-ovate or oblong-ovate, 4–8 × 2–4 cm, in base cuneate or broadly cuneate, margin crenate, apex acuminate; basal veins 5
A. ciliata Forssk.	Inflorescences axillary, sessile, androgynous, spicate, up to 2 cm long, with female bracts up to 12 mm	Branchlets sparingly puberulous, sometimes also slightly pilose	Bracts of the female flowers transversely ovate, laciniate-fimbriate or fringed	Leaf-blade elliptic-ovate, 3–8 × 1.5–4 cm, acutely or subacutely caudate-acuminate, cuneate or rounded, crenate-serrate

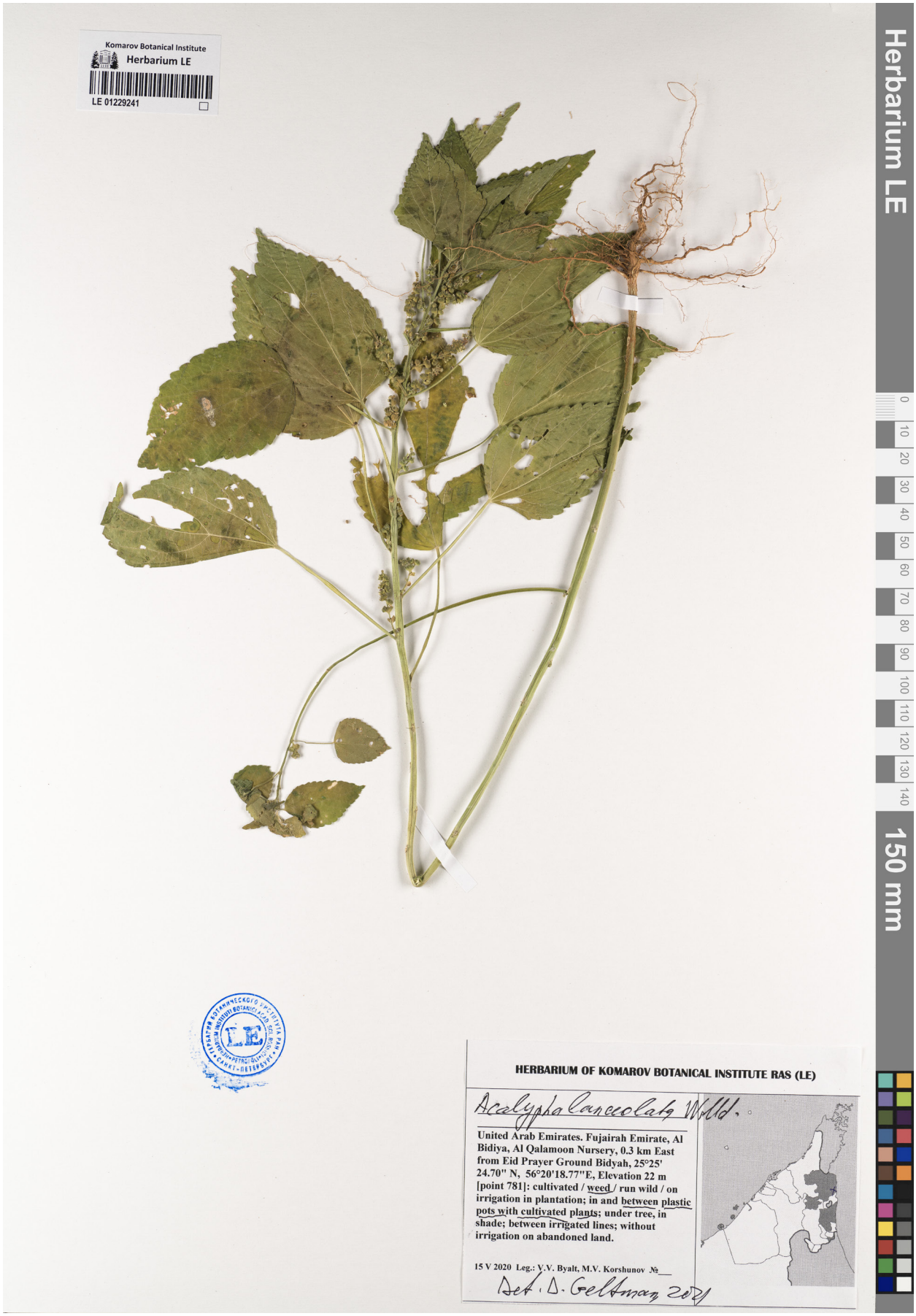

Fig. 4. Herbarium specimen of *Acalypha lanceolata* Willd. from Al Qalamoon Nursery in Village Al Bidya, kept in LE (LE 01229241, scan by D. Melnikov).

Acalypha lanceolata Willd. (Euphorbiaceae): "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 781]: weed between plastic pots with cultivated plants. 15 V 2020. Fl., fr. V. V. Byalt, M. V. Korshunov. s. n." (LE; FSH). – Terophyte/Annual. African-South Asian-Australian tropical. Xenophyte, colonophyte (hemiepecophyte), neophyte. Propagation by seeds, autochorus, antropochorous. Weed-ruderal. New alien species in Fujairah and UAE (Figs 1, 4).

The native range of this species is Tropical Africa to Pacific. It grows primarily in the wet tropical biome (Govaerts, 1995; Govaerts et al., 2000; Sagun et al., 2010; POWO, 2024).

Recorded as introduced in 12 countries (GBIF, 2024). Invasive in India (Balakrishnan, Chakrabarty, 2007; Sankaran et al., 2021), there are no localities in Arabia in the GBIF (*Acalypha lanceolata*, 2024). Study of the pertinent literature revealed that these species has also not been reported from the UAE so far (Western, 1993; Jongbloed, 2000, 2003). Found several specimens in the plant nursery in Al Qalamoon Nursery in village Al Bidya between plastic pots with cultivated plants. New alien species for Fujairah and UAE.

Acalypha lanceolata differs from the closely related annual species of genus *Acalypha* in the following features (see Table 3).

Note. Thus, 10 species and 2 varieties of the genus *Acalypha* have currently been identified on the Arabian Peninsula: **Acalypha chamaedrifolia* (Lam.) Müll. Arg. (*A. hotteana* Urb., *A. reptans* Sw.) cultivated in UAE, *Acalypha ciliata* Forssk. – natural in Saudi Arabia, Yemen, *Acalypha crenata* A. Rich. – natural in Yemen, *Acalypha fruticosa* var. *fruticosa* Forssk. – natural in Saudi Arabia and Yemen, *Acalypha fruticosa* var. *villosa* Hutch. – natural in Saudi Arabia, **Acalypha hispida* Burm. f. – cultivated in Saudi Arabia, *Acalypha indica* L. – natural in Oman, Saudi Arabia, Yemen and alien in UAE, *Acalypha lanceolata* Willd. (syn. *A. glomerata* Hutch.) – natural in Saudi Arabia and Yemen, alien in UAE, *Acalypha racemosa* Wall ex Bail. (syn. *A. paniculata* Miq.) – natural in Saudi Arabia, Yemen, **Acalypha stricta* Poepp. (*Acalypha variegata* Rusby) cultivated in Qatar and alien in UAE, **Acalypha wilckensisna* Muell. Arg. cultivated in Qatar, Saudi Arabia and alien in UAE.

Boerhavia erecta L. (Nyctaginaceae): "United Arab Emirates. Emirate of Fujaira, village Qidfa, 25°17'40.91"N, 56°21'28.51"E [point 343]: roadside in backstreet. – ОАЭ, Фуджейра, пос. Кидфа, 25°17'40.91"N, 56°21'28.51"E [point 343]: обочина дороги в переулке. 25 XI 2019. Fl. V. V. Byalt, M. V. Korshunov. 1763" (LE); "UAE. Emirate of Fujairah, Al Dhaid-Masafi Road, environs of Masafi, 25°17'47.19"N, 56°07'28.25"E [point 358]: weed in Salman Nursery, among plantings. – ОАЭ, Фуджейра, дорога Аль Даид-Мазафи, окр. Мазафи, 25°17'47.19"N, 56°07'28.25"E [точка 358]: сорняк в питомнике Салмана, среди посадок. 29 XI 2019. Fl. V. V. Byalt, M. V. Korshunov. 1874bis, 1797/608" (LE); "UAE, Fujairah Emirate, Al Siji, wadi Siji, 3.1 km East from Wadi Siji Old Dam, 3.6 km South from Masafi Friday Market Sur (plant market 4.8 km from Masafi by E88 road). 25°15'33.84"N, 56°6'30.33"E, elevation 314 m. [730]: on stone-gravel wadi banks, waste place on slope under garden. 1 IV 2020. Fr. V. V. Byalt, M. V. Korshunov. 1616" (LE); "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]: in plant nursery between pots. 25 IV 2020. Fl. V. V. Byalt, M. V. Korshunov 2444" (LE); "UAE, Fujairah Emirate, Al Dibba town, The Green Nursery Sales Dibba, 0.2 km South from Khalid Hadi Resort Dibba. 25°34'29.81"N, 56°14'16.32"E, elevation 44 m [point 795]: weed on irrigated plantation, between irrigated lines and without irrigation on abandoned land, very common. 8 VI 2020. Fl., fr. V. V. Byalt, M. V. Korshunov. 3463" (LE; FSH); "UAE, Fujairah Emirate, Al Bidiya, 0.4 km to South from Eid Prayer Ground Bidyah, 25°25'13.53"N, 56°20'27.57"E, elevation 18 m [point 801]: on irrigation, weed in and between plastic pots, on sand between irrigated lines in nursery, very common. 22 VI 2020. Fr. V. V. Byalt, M. V. Korshunov. 3747 (8)" (LE; FSH). – Terophyte or hemicryptophyte/annual or perennial. American tropical and subtropical, but also invasive in other regions of the world. Xenophyte, hemiepecophyte, euneophyte. Propagation by seeds, autochorus, zoochore, anthropochorus. Weed-ruderal. New alien species in Fujairah, UAE (Jongbloed et al., 2003) (Figs 1, 5). The native range of this species is tropical and subtropical America (Govaerts, 1996; Hokche et al., 2005; Acevedo-Rodríguez, Strong, 2012; Jørgensen et al., 2013; Bernal et al., 2016; Villaseñor, 2016). It grows primarily in the seasonally dry tropical biome. It is used as animal food and a medicine and for food (POWO, 2024). Recorded as introduced in 13 countries or islands (Hutchinson et al., 1954–1958; Van Steenis, 1960–1972; Whitehouse, 1996; Edwards et al., 2000; *Boerhavia erecta*,

2024), and invasive in India (Pramanick et al., 2018), South Africa, Japan (Iwatsuki et al., 2006; Ikeda et al., 2020), Papua New Guinea (Orapa Pagard, 2020). We managed to find a photo of this plant posted on the Al Jaddaf – Dubai – United Arab Emirates website (https://www.inatu.../photos/178661597). But there are no others for the UAE. There is also a photo-confirmed indication for Qatar by Alexei Sergeev from Texas on his website "Flora of Qatar" (2013–2016) (https://www.floraofqatar.com/indexf.htm#Nyctaginaceae) – "near a pond on Green Circles (center-pivot irrigation) in Irkhaya (Irkaya) Farms in Qatar (May 1, 2015)". We have found this plant in large numbers as a weed in irrigated plantation, between irrigated lines and without irrigation on abandoned land, very common in gardens and plant nurseries in summer and autumn period but not in winter-spring. It was found in various locations in Fujairah, sometimes forming large clumps in empty lots and paths, and appears to be already an invasive species in irrigated areas. Also occasionally found in shady alleys and wastelands completely without watering. New alien species for Fujairah. Requires monitoring as an aggressive invasive species.

Boerhavia erecta differs from the closely related annual species of genus *Boerhavia* in the following features (see Table 4).

Table 4

Comparative features of *Boerhavia erecta* L. and closely related species of the genus *Borhavia* L.

Species	Stems	Flowers	Perianth	Anthocarp	Leaf margins
B. coccinea Mill.	Stems sprawling to ascending, most parts hairy	flowers in axillary umbels or cymes, or in ill-defined terminal panicles with lower branches subtended by well-developed leaves	Perianth limb white, pink, or mauve, rarely purplish red, to 2(–2.5) mm	Anthocarp fusiform, 3–3.5(–4) mm, obviously 5-ribbed, usually glandular hairy	Lack of multicellular hairs along the leaf margins
B. diffusa L.	Stems trailing, ascending to erect, upper parts glabrous	flowers in well-defined leafless terminal panicle	Perianth limb bright purple or purple-red	Anthocarp glandular-hairy, tip ± rounded	Leaf margin with stout, multicellular hairs, at least when young
B. erecta L.	Stems erect or decumbent at base, upper parts glabrous	flowers in well-defined leafless terminal panicle	Perianth limb white, red, or pink	Anthocarp glabrous, tip sharply angular	Leaf margin with unicellular hairs
B. elegans Choisy (*B. rubicunda* Steud. ex Heimerl)	Branches erect, Stem woody, diffuse, puberulous	flowers in well-defined leafless terminal panicle	Perianth campanulate, pink, embedded with raphides	Anthocarp narrow to oblong-clavate, c. 3 mm long, 5-ribbed, puberulous in the furrows	Lack of multicellular hairs along the leaf margins
B. repens L.	Stems prostrate on ground or nearly so, most parts hairy	flowers in axillary umbels or cymes, or in ill-defined terminal panicles with lower branches subtended by well-developed leaves	Perianth limb white, pink, or pale purple, to 1 mm	Anthocarp clavate, 3–3.5 mm, 5-ribbed, sparsely puberulent, sometimes with ± sessile glands	Lack of multicellular hairs along the leaf margins

Oxalis dillenii Jacq. (Oxalidaceae): "UAE, Fujairah Emirate, Masafi friday market, E88 Al Dhaid – Masafi road, 4 km to Masafi. 25°17'47.12"N, 56°7'26.88"E, elevation 380 m: weed in plant market and plant nursery, a few. 23 III 2020. Fl. V. V. Byalt, M. V. Korshunov. 982" (LE); "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 (running wild) in plant market and nursery, in pots and between pots.

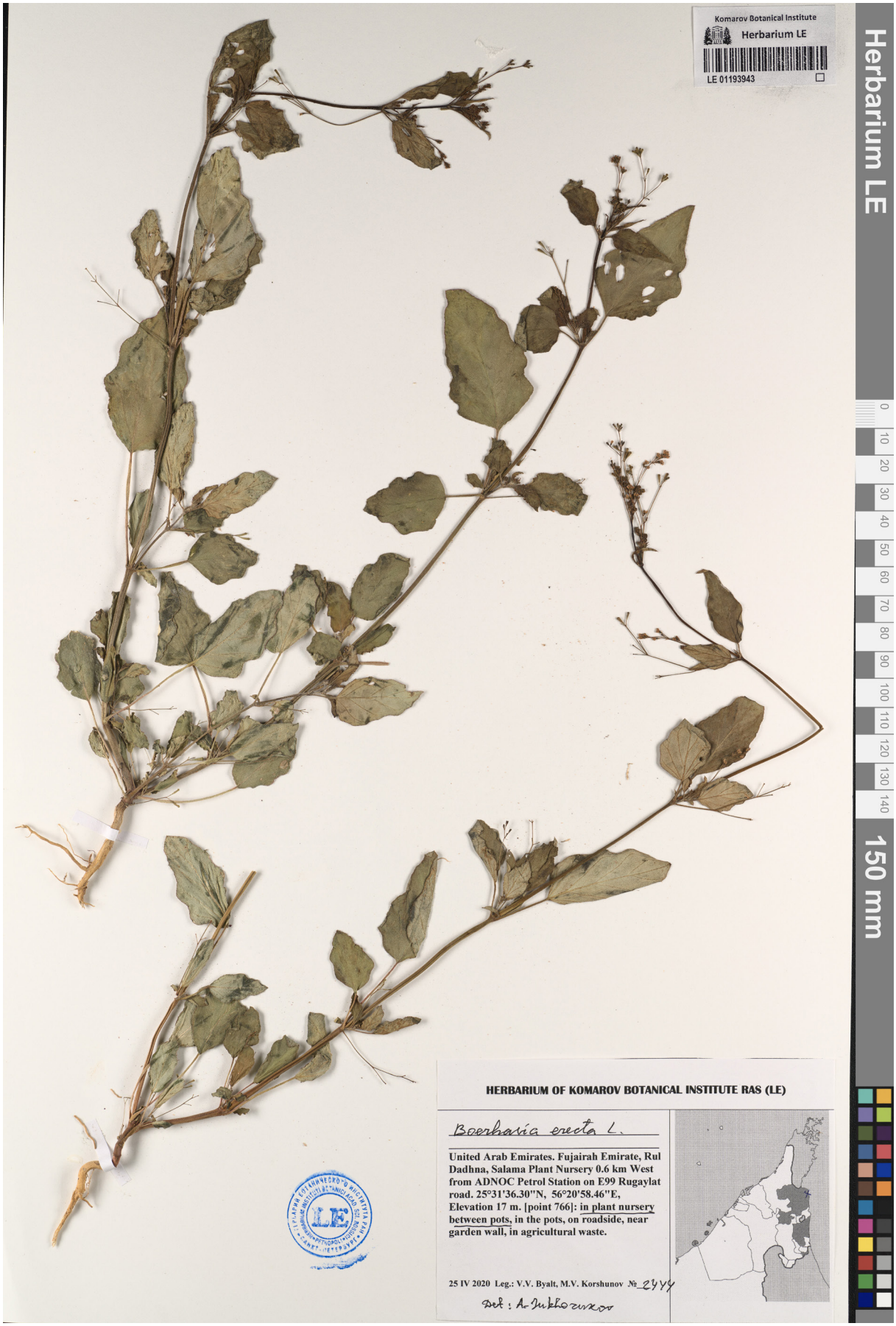

Fig. 5. Herbarium specimen of *Boerhavia erecta* L. from Salama Plant Nursery in Rul Dadhna, kept in LE (LE 0119343, scan by L. Orlova).

28 IV 2020. Fl., fr. V. V. Byalt, M. V. Korshunov. 2553-2" (LE); "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 in plastic pots and between pots. 7 V 2020. Fl., fr. V. V. Byalt, M. V. Korshunov. 2744" (LE). – Hemicryptophyte/Caulescent perennial. North American temperate. Xenophyte, colonophyte, euneophyte. Propagation by seeds, autochorus, balistochorus, anthropochorus. Weed. Alien adventive species in Fujairah, UAE. The native range of this species is Central and E. Canada to E. Mexico. It grows primarily in the temperate biomes (Eiten, 1963; Nesom, 2009a, b, 2016; Nesom et al., 2014; Villaseñor, 2016; POWO, 2024). Recorded as introduced in 24 countries or islands (Ebel, 2008; *Oxalis dillenii*, 2024), but no points in Arabia in GBIF (2024). Study of the pertinent literature revealed that the species has also not been reported from the UAE so far (Western, 1993; Jongbloed, 2000, 2003; Karim, Fawzi, 2007; etc.).

Oxalis dillenii was found as weed in "Masafi Friday market" in environs of Masafi town, as rare weed in "Al Shams Nursery" and private nursery in 0.2 km South from "Al Amerey Nursery" at Al Dibba town. It occurs occasionally as an admixture with *O. corniculata* L. and, apparently, is seen in herbarium collections, although it is well distinguished by its life form (see table 5), since it is a stemless perennial (*O. corniculata* forms long creeping but not rooting shoots). It is rarely found in Fujairah under irrigation and is not yet a potentially invasive species. New alien species for Fujairah, UAE and Arabia in general.

Oxalis dillenii differs from the closely related species of genus *Oxalis* in the following features (see Table 5).

Table 5

Comparative features of *Oxalis dillenii* Jacq. and closely related species of the genus *Oxalis* L.

Species	Life form	Plants habit	Stipules	Flowers	Pedicels
O. corniculata L.	Perennials	Plants prostrate or decumbent, root at nodes, without septate hairs on vegetative parts; stolons absent	Stipules well developed	Flowers in an umbellate inflorescence or solitary	Fruiting pedicels deflexed to horizontal
O. dillenii Jacq.	Perennials	Plants caespitose, caulesaent, not root at nodes, with strigillose cauline vestiture on vegetative parts; stolons absent	Stipules reduced	Flowers in an umbellate inflorescence	Fruiting pedicels deflexed to horizontal
O. stricta L.	Annuals or short-lived perennials	Plants erect to decumbent, with septate hairs on vegetative parts; stolons present	Stipules rudimentary	Flowers in a cymose inflorescence	Fruiting pedicels erect

Conclusions

In the flora of the UAE, several taxa have been introduced during development of gardens, road planting and through imported plants and soil in plant nurseries. As our new research has shown, it is now similar for Fujairah. However, alien plants are introduced here exclusively in anthropogenic habitats, disturbed habitats, plant nurseries, private gardens, on wastelands, irrigated lawns, near garden fences with water inflow and along roadsides. The processes of their naturalization in transformed habitats have not yet been completed. With the development of roads, several aliens are found in the mountains along roadsides. In Fujairah, plant nurseries appear to be an important source of introduction of new alien species. These introductions have occurred in the last 20–25 years, as evidenced by the absence of inclusion of these species in the floras of the UAE (Jongbloed et al., 2000, 2003; Karim, Fawzi, 2007).

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