

New alien species of flowering plants to the flora of the Arabian Peninsula

Новые чужеродные виды цветковых растений для флоры Аравийского полуострова

V. V. Byalt^{1*}, M. V. Korshunov²

¹Komarov Botanical Institute, Russian Academy of Sciences
Prof. Popova Str., 2, St. Petersburg, 197376, Russia
byalt66@mail.ru, VByalt@binran.ru

²Wadi Wurayah National Park and Reserve, Government of
Fujairah
P.O. Box: 1, UAE
mikh.korshunov@gmail.com

*Corresponding author

В. В. Бялт^{1*}, М. В. Коршунов²

¹Ботанический институт им. В. Л. Комарова РАН
ул. Профессора Попова, 2, Санкт-Петербург, 197376, Россия
byalt66@mail.ru, Vbyalt@binran.ru

²Национальный парк и заповедник Вади Вурая,
правительство Фуджейры
P.O. Box: 1, ОАЭ
mikh.korshunov@gmail.com

*Автор для переписки

<https://doi.org/10.31111/novitates/2020.51.118>

Abstract. Seven species of alien flowering plants collected in the Emirate of Fujairah (the UAE) in 2020 are recorded for the first time for the flora of the Arabian Peninsula: *Hydrocotyle verticillata* Thunb. (*Apiaceae*), *Asclepias curassavica* L. (*Asclepiadaceae* / *Apocynaceae*), *Croton bonplandianus* Baill. (*Euphorbiaceae*), *Glinus oppositifolius* (L.) Aug. DC. (*Molluginaceae*), *Eucalyptus camaldulensis* Dehnh. (*Myrtaceae*), *Oxalis debilis* subsp. *corymbosa* (DC.) O. Bolòs & Vigo (*Oxalidaceae*), and *Tropaeolum majus* L. (*Tropaeolaceae*).

For all the species, data on their distribution, citations of voucher herbarium specimens, characteristics of their habitats in Fujairah and appropriate notes are given. The herbarium specimens are stored at the Komarov Botanical Institute of RAS (LE) in St. Petersburg, Russia, and the Fujairah Scientific Herbarium (FSH) in the UAE.

Keywords: alien plants, Arabian Peninsula, novel plant records.

Аннотация. Впервые для флоры Аравийского полуострова приводятся семь видов заносных цветковых растений, собранных нами во время флористических исследований в эмирате Фуджейра (Объединенные Арабские Эмираты) в 2020 г. Это *Hydrocotyle verticillata* Thunb. (*Apiaceae*), найденный в г. Аль Дибба; *Asclepias curassavica* L. (*Asclepiadaceae* / *Apocynaceae*) – пос. Аль Бидия; *Croton bonplandianus* Baill. (*Euphorbiaceae*) – г. Аль Дибба и пос. Аль Бидия; *Glinus oppositifolius* (L.) Aug. DC. (*Molluginaceae*) – пос. Аль Бидия; *Eucalyptus camaldulensis* Dehnh. (*Myrtaceae*) – г. Аль Фуджейра, г. Аль Дибба, пос. Аль Бидия; *Oxalis debilis* subsp. *corymbosa* (DC.) O. Bolòs et Vigo (*Oxalidaceae*) – Аль Фуджейра и Аль Бидия; *Tropaeolum majus* L. (*Tropaeolaceae*) – Аль Дибба. Для всех видов приведены данные об их общем распространении, цитаты этикеток гербарных образцов, характеристика местообитаний в Фуджейре и необходимые примечания. Гербарные образцы хранятся в Ботаническом институте им. В. Л. Комарова РАН (LE) в Санкт-Петербурге и Научном гербарии Фуджейры (FSH) в ОАЭ.

Ключевые слова: чужеродные виды растений, Аравийский полуостров, новые находки.

During the floristic research in the Emirate of Fujairah (the United Arab Emirates), we have made new records of the vascular plant species adding to the genera and species composition of the flora of both the emirate and the Arabian Peninsula in general.

Research objects and methods

The research was carried out in 2017–2020 in the Emirate of Fujairah (the UAE) (Fig.), where many localities were surveyed, both in the wild and in gardens, plant nurseries and villages. Both native and alien (cultivated and adventive) flora was studied. The

territory was surveyed using a traditional route method (Shcherbakov, Mayorov, 2006a, b). The routes, places of findings, height above sea level and coordinates were recorded using GPS navigator.

Plants were identified using a number of “Floras”, guides and keys for determination, both printed and online (Hutchinson et al., 1954–1958; Jeffrey, 1961; Kabuye, 1971; Tutin et al., 1968, 1972; Launert, 1978; Ali, 1983; Townsend, 1989; Iwatsuki et al., 1993; Orchard, 1994, 1996; Edwards et al., 1995; Jagtap, Singh, 1999; Thulin, 1999; Tzvelev, 2000; Balakrishnan, Chakrabarty, 2007; Plantarium, 2007–2020; eFloras,

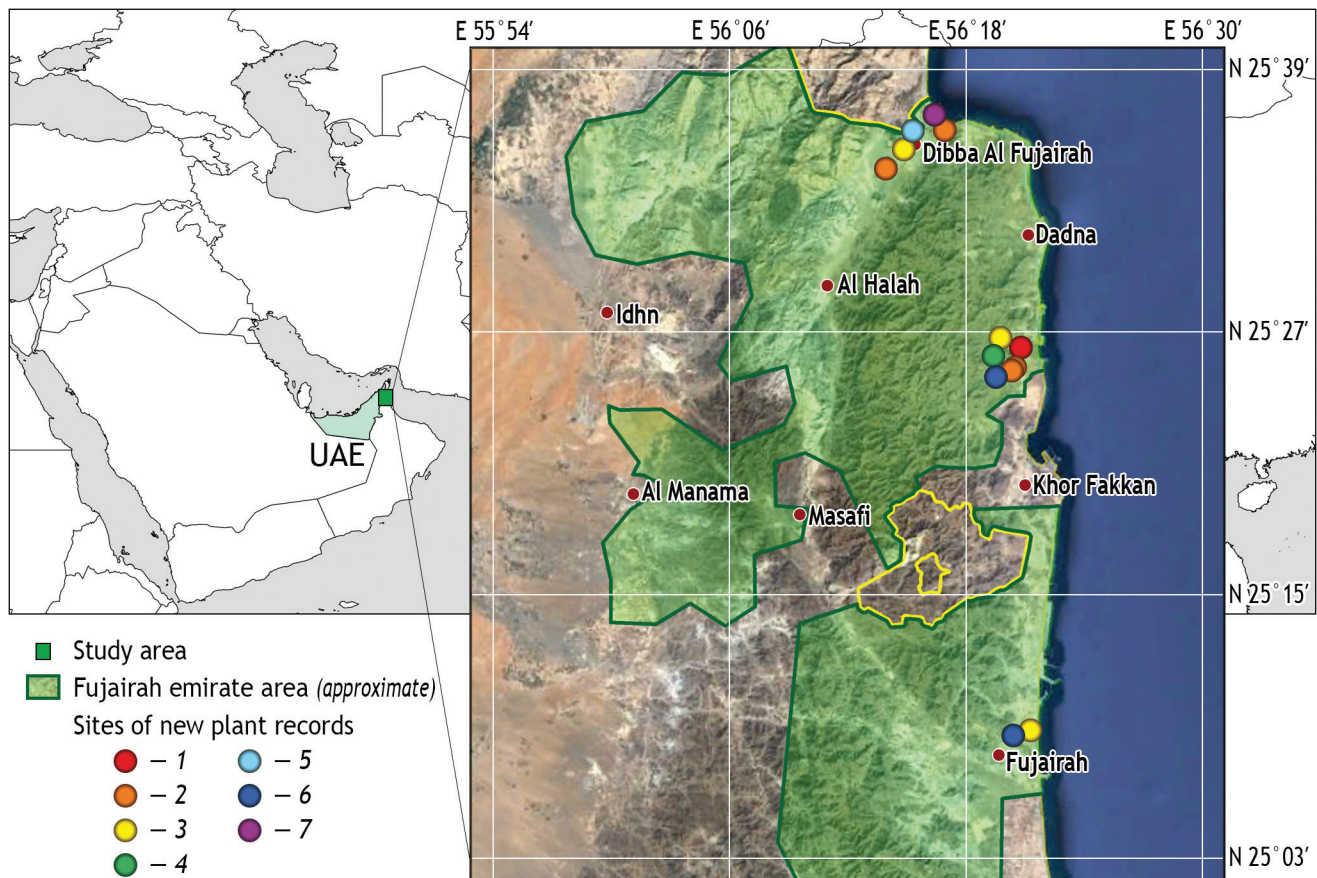


Fig. Sites of new plant records in the Emirate of Fujairah (modified from Google Maps).

1 – *Asclepias curassavica*; 2 – *Croton bonplandianus*; 3 – *Eucalyptus camaldulensis*; 4 – *Glinus oppositifolius*; 5 – *Hydrocotyle verticillata*; 6 – *Oxalis debilis* subsp. *corymbosa*; 7 – *Tropaeolum majus*.

2008–2020; Davidse et al., 2009; Goyder et al., 2012; POWO, 2020).

The above-mentioned and many other sources (Nasir, Ali, 1970–1995; Van Steenis, 1971–1976; Greuter et al., 1984; Brako, Zarucchi, 1993; Hansen, Sunding, 1993; Govaerts, 1995, 1999; Govaerts et al., 2000, 2008; Germishuizen, Meyer, 2003; Newman et al., 2007; Figueiredo, Smith, 2008; Greuter, Raus, 2008, 2010; Dobignard, Chatelain, 2011, 2013; Kral et al., 2011; Acevedo-Rodríguez, Strong, 2012; Allred, 2012; Danihelka et al., 2012; Khodashenas, Amini, 2012; Kuo, 2012; Shou et al., 2012; Dimopoulos et al., 2013; Jørgensen et al., 2013; Chang et al., 2014; Darbyshire et al., 2015; Villaseñor, 2016; Zuloaga, Belgrano, 2017; Bernal et al., 2019; Dufour-Dror, Fragman-Sapir, 2019; GBIF Secretariat, 2019; Zhao et al., 2020; Ziller et al., 2020) were used to specify native and introduced distribution ranges of the species.

A substantial body of literature was reviewed to check whether a taxon had been previously reported from Fujairah, the UAE, and the other countries of the

Arabian Peninsula (Collenette, 1985, 1999; Daoud, Al-Rawi, 1985; Phillips, 1988; Cornes, Cornes, 1989; Migahid, 1989; Western, 1989; Gazanfar, 1992; Shuaib, 1995; Wood, 1997; Chaudhary, 1999; Omar, 2000; Jongbloed et al., 2003; Karim, Fawzi, 2007; Norton et al., 2009; Sergeev, 2010–2016).

As a result, about 70–80 new species were discovered for the flora of the Fujairah emirate and the UAE in general. Seven of them were found to represent both genera and species new to the flora of the Arabian Peninsula. These species are all regarded as alien. To determine the status of an alien species, the following traditional criteria were used: a large disjunction of the species finding from its main range, records of its introduction and/or cultivation in a neighboring area, and presence only in disturbed habitats (Egorov et al., 2016; Baranova et al., 2018; Byalt, Korshunov, 2018). The newly recorded species occurred in all kinds of disturbed habitats – on irrigated landscaped islands on road medians, near the fences of irrigated gardens and in plant nurseries, on wastelands and along roadsides.

Below there are data on the alien species of the flowering plants collected in 2020, which proved to be new genera and species to the flora of the Arabian Peninsula.

The species are provided with following information: general distribution and residence status in other parts of the world; data on the herbarium specimens collected in Fujairah emirate (original Russian labels, if available, are translated into English); notes on their occurrence in Fujairah emirate; morphological differences from relative species if appropriate. Voucher specimens are stored in the Herbarium of the Komarov Botanical Institute of RAS (LE: St. Petersburg, Russia) and in the Scientific Herbarium of Fujairah (FSH: Wadi Wuraya National Park, UAE).

The names of the taxa and the abbreviations of author names follow the nomenclatural database “International Plant Name Index” (IPNI, 2020). The main abbreviations used in the label citations: fl. – flowering (Latin: florifer), fr. – fruiting (Latin: fructifer), veg. – vegetative (Latin: vegetativus).

Results and discussion

***Asclepias curassavica* L. (Asclepiadaceae Borkh. / Apocynaceae Juss.)**

General distribution and status. *A. curassavica* has a native range from Mexico to tropical America. It is recorded as introduced in 61 countries and widely naturalized in tropical Asia (India, Bhutan, Indonesia, Philippines, Singapore, Sri Lanka, Papua New Guinea, China, Taiwan, Thailand, etc.), Africa (Botswana, Egypt, Ghana, Lesotho, Namibia, RSA, Sudan, Swaziland, Zimbabwe), and Australia.

Voucher specimens. **UAE, Fujairah emirate:** Al Bidiya, Al Qalamoon Nursery, 0.3 km E of Eid Prayer Ground Bidyah, 25°25'24.70" N, 56°20'18.77" E, elevation 22 m: weed (running wild?) in and between plastic pots with cultivated plants, 15 V 2020, fl., fr., V. V. Byalt, M. V. Korshunov, № 2959 (LE, FSH).

A. curassavica is a pan-tropical weed, but currently the only species of the genus *Asclepias* L. in Arabia. We have found this plant in “Al Qalamoon nursery” in Al Bidiya village as a weed in and between plastic pots with cultivated plants (e. g. between *Portulacaria afra* Jacq.) (Fig.: 1).

A. curassavica differs from other closely related species by flowers with bright red corolla, orange or yellow corona with prominent tooth arising from the cavity and arching over the styler head (the other species have white, yellow, green or brownish corolla with corona variously coloured, corona tooth missing or inconspicuous and included within the cavity of the lobe); it is an annual or short-lived perennial

from fibrous, non-tuberous rootstock (see Goyder, 2009).

***Croton bonplandianus* Baill. (Euphorbiaceae Juss.)**

General distribution and status. The native range of the species is from southern Bolivia to Uruguay. It has widely naturalized in tropical Asia (Bangladesh, Cambodia, Comoros, India, Laos, Malaya, Myanmar, Nepal, Pakistan, Rodrigues, Réunion, Sri Lanka, Taiwan, Thailand, etc.), Africa (Kenya), and Australia. *C. bonplandianus* is currently the only non-native, naturalized species of *Croton* L. in the Western Indian Ocean region. Oddly, it is known from Mayotte and the Mascarenes, but it has not yet been observed or collected in Madagascar (Berry et al., 2017).

Voucher specimens. **UAE, Fujairah emirate:** Al Dibba town, Al Shams Nursery, near Dibba Theatre (0.1 km E), 25°36'9.81" N, 56°16'41.30" E, elevation 6 m: weed or naturalized plant in wasteland in place of an abandoned garden (or plant nursery), at hothouse and fence of operating nursery, 28 IV 2020, fl., fr., Byalt, Korshunov, № 2467 (FSH, LE); *ibidem*, private nurseries, 0.2 km S of Al Amerey Nursery, 25°34'24.07" N, 56°14'6.39" E, elevation 48 m: weed in nursery, 7 V 2020, fl., *idem*, № 2724 (LE); *ibidem*, plant nursery “Corniche Nursery”, 0.4 km SW on road from roundabout between Corniche Street 101 and Sambraid Beach Road, 25°36'19.87" N, 56°17'0.48" E, elevation 3 m: weed in and between plastic pots with cultivated plants, 19 VI 2020, fl., *idem*, № 3715 (LE; FSH); Al Bidiya, Abu Khalid agricultural nursery, 0.3 km S of Eid Prayer Ground Bidyah, 25°25'15.85" N, 56°20'27.64" E, elevation 18 m: weed in and between plastic pots with cultivated plants, 12 V 2020, fl., *idem*, № 2902 (LE; FSH); *ibidem*, Al Qalamoon Nursery, 0.3 km E of Eid Prayer Ground Bidyah, 25°25'24.70" N, 56°20'18.77" E, elevation 22 m: weed in between irrigated lines, on sand, 19 V 2020, fl., *idem* (LE; FSH).

We found this plant in Al Dibba and Al Bidiya as weed or naturalized in some plant nurseries, both abandoned and operating (Fig.: 2).

Currently, *C. bonplandianus* is the only species of the genus *Croton* in Arabia, but several species of a closely related genus *Chrozophora* A. Juss. occur there. The main difference between these two genera is free filaments incurved in bud in *Croton* vs. filaments fused into a column and erect in bud in *Chrozophora* (see Radcliffe-Smith, 1986).

***Eucalyptus camaldulensis* Dehnh. (Myrtaceae Juss.)**

General distribution and status. The native range of *E. camaldulensis* is restricted to

mainland Australia. It has widely naturalized in tropical and temperate Asia (Bangladesh, China, India, Israel, Laos, Pakistan, Taiwan, Turkey, etc.), Africa (Algeria, Chad, Ethiopia, Kenya, Libya, RSA, Swaziland, etc. — see Doran, Wongkaew, 2002; Forsyth et al., 2004; McDonald et al., 2009), and Americas (Argentina, Bolivia, Mexico, Nicaragua, etc.).

Voucher specimens. **UAE, Fujairah emirate:** Al Fujairah city, lanes in the square near Al Hayl Tower, ca. 25°7'22.82" N, 56°21'23.00" E, elevation 3 m: weed (run wild) near house wall, in non-irrigated place (rather far from the mother plant), 9 V 2020, veg., Byalt, Korshunov, № 2776 (LE); *ibidem*: cultivated and escaped near fence in small yard, 9 V 2020, fr., veg., *ibidem*, № 2764 (LE); Al Bidiya, near Green Cost Nursery Bidiya plant selling, 25°25'55.03" N, 56°20'20.99" E, elevation 14 m: run wild in wet place near wall, 11 V 2020, veg., *ibidem*, № 2853 (LE); *Al Dibba town*, 0.2 km N of ADNOC Service Station, Al Muhallab (885), 25°35'45.41" N, 56°16'36.48" E, elevation 14 m: run wild on roadside, 26 V 2020, veg., *ibidem*, № 3193 (LE, FSH); *ibidem*, wasteland on the abandoned villas land near the Dibba Port, 25°36'27.67" N, 56°17'50.50" E, elevation 3 m: run wild on sand-gravel wasteland, 16 VI 2020, fr., *ibidem*, № 3644 (LE, FSH).

This tree is rarely cultivated in gardens and on the streets of settlements (Al Fujairah, Al Dibba, Al Bidiya, etc.). Several other species of *Eucalyptus* L'Hér. are cultivated in the UAE (e. g. *E. alba*), but only *E. camaldulensis* is currently self-seeding, escaping to settle in suitable places, and naturalizing (Fig.: 3).

***Glinus oppositifolius* (L.) A. DC. (Molluginaceae Bartl.)**

General distribution and status. *G. oppositifolius* has its native range in tropical and subtropical Old World (Africa south of Sahara), tropical Southern Asia (Bhutan, China, India, Indonesia, Papua New Guinea, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, etc.), and Australia.

Voucher specimens. **UAE, Fujairah emirate:** Al Bidiya, Desert Oasis Nursery Bidyah, 0.7 km W of Bidyah Association for Culture and Folklore, 25°26'9.06" N, 56°20'17.72" E, elevation 14 m: weed in plastic pot and between pots in nursery, 4 VI 2020, fl., fr., Byalt, Korshunov, № 3446 (LE, FSH).

A rare weed in plant nurseries in Al Bidiya (Fig.: 4). We assume that it is introduced from time to time with planting material from India, where it is quite common.

G. oppositifolius differs from *G. lotoides* L., a closely related species naturally growing in UAE, by stems and leaves subglabrous or pilose with simple hairs (*G. lotoides* has stems and leaves densely tomentose with stel-

late hairs), 3 or 4 styles, 3- or 4-valved capsule; pedicels 5–14(18) mm long (*G. lotoides* has 5 styles, 5-valved capsule, and pedicel to 4 mm long) (see eFloras, 2008–2020).

***Hydrocotyle verticillata* Thunb. (Apiaceae Lindl.)**

General distribution and status.

H. verticillata is native in the Americas (from USA to Argentina and Chile), tropical and subtropical Africa (from Somalia and Angola to South Africa). It has naturalized in Europe, China and Australia.

Voucher specimens. **UAE, Fujairah emirate:** Al Dibba town, Green Oasis Nursery, 0.6 km SW of Street Number 35, or 0.8 km N from Federal Electricity and Water Authority, 25°36'5.21" N, 56°15'45.67" E, elevation 10 m: weed in and between pots, on irrigated plantation, on path sides, common, 3 V 2020, fl., veg., Byalt, Korshunov, № 2628 (LE, FSH).

We have found numerous individuals of this species in “Green Oasis Nursery” at Al Dibba town (Fig.: 5). We assume that it got into the plant nursery with planting material and then multiplied en masse.

***Oxalis debilis* Kunth subsp. *corymbosa* (DC.)**

O. Bolòs et Vigo (*O. corymbosa* DC.) (*Oxalidaceae* R. Br.)

General distribution and status.

O. debilis subsp. *corymbosa* is native in Central America to Guyana, Argentina and Paraguay. It is widely naturalized in different countries (for example in Spain, Georgia, India et al.).

Voucher specimens. **UAE, Fujairah emirate:** Al Fujairah, wasteland near Fujairah Corniche Road, opposite the Fujairah International Marine Club, 25°7'22.82" N, 56°21'23.00" E, elevation 3 m: weed in irrigated landscaped islands on median strip between highway lanes, 9 V 2020, fl., Byalt, Korshunov, № 2798 (LE); Al Bidiya, Al Qalamoon Nursery, 0.3 km E of Eid Prayer Ground Bidyah, 25°25'24.70" N, 56°20'18.77" E, elevation 22 m: weed in plastic pots with cultivated plants, 15 V 2020, *ibidem*, № 2941 (LE, FSH).

We have found this plant several times as a weed in Al Fujairah city and in Al Bidiya, as well as under palm *Washingtonia filifera* (Linden ex André) H. Wendl. ex de Bary in a park of motel near Aqa village (on beach of Oman Bay between Al Bidiya and Rul Dadna) (Fig.: 6).

O. debilis subsp. *corymbosa* clearly differs from other species of *Oxalis* L. found in the UAE (*O. corniculata* L. and others) by large pink flowers. From a very close species *O. latifolia* Kunth it differs by obcordate leaflets, hairy pedicel and longer filaments ca. 4.5 mm long vs. triangular leaflets, glabrous pedicel and longer filaments 3 mm long in *O. latifolia* (see eFloras, 2008–2020).

Tropaeolum majus* L. (*Tropaeolaceae* Juss. ex DC.)*General distribution and status.**

T. majus is native to South America (Peru). It is widely cultivated and occasionally naturalized in Europe (France, Greece, Spain, etc.), Asia (China, NE India, Korea peninsula, Vietnam, etc.), North and South America (Argentina, Bolivia, Brazil, Canada, Chile, Mexico, USA, etc.), Africa (Algeria, Angola, Ethiopia, Lesotho, Morocco, etc.), and New Zealand.

Voucher specimens. **UAE, Fujairah emirate:** Al Dibba town, Al Shams Nursery, near Dibba Theatre (0.1 km E), 25°36'9.81" N, 56°16'41.30" E, elevation 6 m: weed and cultivated plant in the plant market and nursery, between pots and in waste places, 28 IV 2020, veg., fl., Byalt, Korshunov, № 2525 (LE, FSH).

Rare alien species in Arabia. Found only once in "Al Shams Plant Nursery" (Fig.: 7).

T. majus differs from another more or less widely cultivated species, *T. peregrinum* L., by unlobed nearly circular peltate leaves (vs. slightly pierced, palmately (3)5(7)-lobed subpeltate leaves in *T. peregrinum*) and from yellow to orange to red, flowers 2.5–6 cm in diam. (vs. bright pale yellow, 2–4 cm in diam. in *T. peregrinum*) (see Tzvelev, 2000).

Acknowledgments

The work was performed as part of institutional research project of the Komarov Botanical Institute № AAAA-A19-119031290052-1 "Vascular plants of Eurasia: taxonomy, flora, plant resources". The authors express their gratitude to H. E. Salem Al Zahmi (Director of H. H. Crown-Prince Office) and to Dr. Vladimir M. Korshunov (General Zoologist of Wadi Wurayah National Park and Reserve Department, Government of Fujairah) for their assistance in conducting field work and for long-term fruitful cooperation.

References

- Acevedo-Rodríguez P., Strong M. T. 2012. Catalogue of seed plants of the West Indies // *Smithsonian Contr. Bot.* Vol. 98. P. 1–1192. <https://doi.org/10.5479/si.0081024X.98.1>
- Ali S. I. 1983. Flora of Pakistan. Vol. 150: *Asclepiadaceae*. Karachi: Department of Botany, University of Karachi. 65 p.
- Allred K. W. 2012. Flora Neomexicana. Ed. 2. Vol. 1: Annotated Checklist. Las Cruces, New Mexico: Range Science Herbarium. P. 1–599.
- Balakrishnan N. P., Chakrabarty T. 2007. The family *Euphorbiaceae* in India: A synopsis of its profile, taxonomy and bibliography. Dehra Dun: Bishen Singh Mahendra Pal Singh. 500 p.
- Baranova O. G., Shcherbakov A. V., Senator S. A., Panasenko N. N., Sagalae V. A., Saksonov S. V. 2018. The main terms and concepts used in the study of alien and synanthropic flora // *Phytodiversity of Eastern Europe*. Vol. 12, № 4. P. 4–22. [In Russian] (Баранова О. Г., Щербаков А. В., Сенатор С. А., Панасенко Н. Н., Сагалаев В. А., Саксонов С. В. 2018. Основные термины и понятия, используемые при изучении чужеродной и синантропной флоры // *Фиторазнообразия Восточной Европы*. Т. 12, № 4. С. 4–22). <https://doi.org/10.24411/2072-8816-2018-10031>
- Bernal R., Gradstein R. S., Celis M. (eds.). 2019. *Catálogo de plantas y líquenes de Colombia*. Bogotá: Instituto de Ciencias Naturales, Universidad Nacional de Colombia. <http://catalogoplantasdecolombia.unal.edu.co> (Accessed 16.11.2020).
- Berry P. E., Kainulainen K., van Ee B. W. 2017. A nomenclator of *Croton* (*Euphorbiaceae*) in Madagascar, the Comoros Archipelago, and the Mascarene Islands // *PhytoKeys*. № 90. P. 1–87. <https://doi.org/10.3897/phytokeys.90.20586>
- Brako L., Zarucchi J. L. 1993. *Catalogue of the flowering plants and gymnosperms of Peru*. St. Louis: Missouri Botanical Garden Press. i–xl + 1286 p. (Monogr. Syst. Bot. Missouri Bot. Gard. Vol. 45).
- Byalt V. V., Korshunov M. V. 2018. Adventive and invasive plant species in the flora of the United Arab Emirates // *Actual Issues of Biogeography: Proceedings of International conference, 9–12 October 2018 Saint-Petersburg, Russia*. St. Petersburg: State University. P. 73–76. [In Russian] (Бялт В. В. Коршунов М. В. Адвентивные и инвазивные виды растений во флоре Объединенных Арабских Эмиратов // *Актуальные вопросы биогеографии: Материалы междунар. конф. (Санкт-Петербург, Россия, 9–12 октября 2018 г.)*. СПб.: С.-Петерб. гос. ун-т. С. 73–76).
- Chang C. S., Kim H., Chang K. S. 2014. Provisional checklist of vascular plants for the Korea Peninsula flora (KPF). Pajo: Designpost. 660 p.
- Chaudhary S. A. 1999. *Flora of the Kingdom of Saudi Arabia, illustrated*. Vol. 1. Riyadh: National Agriculture and Water Research Centre. 691 p.; ills.
- Collenette S. 1985. *An illustrated guide to the flowers of Saudi Arabia*. London: Scorpion Publ. Ltd. 514 p.; ills.
- Collenette S. 1999. *Wildflowers of Saudi Arabia*. Riyadh: National Commission for Wildlife Conservation and Development & Sheila Collenette. xxxii + 799 p.
- Cornes M. D., Cornes C. D. 1989. *The wild flowering plants of Bahrain; an illustrated guide*. London: IMMEL Publ. 272 p.; ills.
- Danihelka J., Chrtek J., Kaplan Z. 2012. Checklist of vascular plants of the Czech Republic // *Preslia*. Vol. 84. P. 647–811.
- Daoud H. S., Al-Rawi A. 1985. *Flora of Kuwait*. Vol. 1: *Dicotyledoneae*. London: KPI Ltd.; University of Kuwait. 285 p.; ills.
- Darbyshire I., Kordofani M., Farag I., Candiga R., Pickering H. (eds.). 2015. *The plants of Sudan and South Sudan*. Kew: Royal Botanic Gardens. 400 p.
- Davidse G., Sousa Sánchez M., Knapp S., Chiang Cabrera F. (eds.). 2009. *Flora Mesoamericana*. Vol. 4, pt. 1. México: Universidad Nacional Autónoma de México. 855 p.
- Dimopoulos P., Raus T., Bergmeier E., Constantinidis T., Iatrou G., Kokkini S., Strid A., Tzanoudakis D. 2013. *Vascular*

- plants of Greece: An annotated checklist. Berlin: BGBM Berlin-Dahlem; Athens: Hellenic Botanical Society. 372 p. (Englera. Vol. 31).
- Dobignard A., Chatelain C. 2011. Index synonymique de la flore d'Afrique du Nord. Vol. 2. Genève: Éd. Conservatoire et Jardin Botaniques. 429 p.
- Dobignard A., Chatelain C. 2013. Index synonymique de la flore d'Afrique du Nord. Vol. 5. Genève: Éd. Conservatoire et Jardin Botaniques. 451 p.
- Doran J. C., Wongkaew W. 2002. *Eucalyptus camaldulensis* // L. P. A. Oyen, R. H. M. J. Lemmens (eds.). Plant Resources of Tropical Africa: Precursor. Wageningen: Prota Programme. P. 79–84.
- Dufour-Dror J.-M., Fragman-Sapir O. 2019. Alien plant species in natural and disturbed areas in Israel // J.-M. Dufour-Dror (ed.). Alien invasive plants in Israel. 2nd ed. Ahva; Jerusalem: Dan Perry Pub.; Nature & Parks Authority, Israel Ministry of Environmental Protection. P. 1–8.
- Edwards S., Tadesse M., Demissew S., Hedberg I. (eds.). 2000. Flora of Ethiopia and Eritrea. Vol. 2, pt. 1. Addis Ababa: Natl. Herbarium, Addis Ababa Univ.; Uppsala: Dept. of Systematic Botany, Uppsala Univ. 532 p.
- Edwards S., Tadesse M., Hedberg I. (eds.). 1995. Flora of Ethiopia and Eritrea. Vol. 1, pt. 2. Addis Ababa: Natl. Herbarium, Addis Ababa Univ.; Uppsala: Dept. of Systematic Botany, Uppsala Univ. 456 p.
- eFloras. 2008–2020. St. Louis (MO): Missouri Botanical Garden; Cambridge (MA): Harvard University Herbaria. <http://www.efloras.org> (Accessed 18.11.2020).
- Egorov A. A., Byalt V. V., Pismarkina E. V. 2016. Alien plant species in the north of Western Siberia // UArctic Congress 2016, 12–16 September, St. Petersburg, Russia: Abstract Book / University of the Arctic; University of Oulu. P. 105.
- Figueiredo E., Smith G. F. 2008. Plants of Angola. Pretoria: National Botanical Institute. 279 p. (Strelitzia. Vol. 22).
- Forsyth G. G., Richardson D. M., Brown P. J., van Wilgen B. W. 2004. A rapid assessment of the invasive status of *Eucalyptus* species in two South African provinces // S. African J. Sci. Vol. 100, № 1. P. 75–77.
- GBIF Secretariat. 2019. GBIF Backbone Taxonomy: Checklist dataset. <https://doi.org/10.15468/39omei> (Accessed 17.09.2020).
- Germishuizen G., Meyer N. L. (eds.). 2003. Plants of Southern Africa: an annotated checklist. Pretoria: National Botanical Institute. 1231 p. (Strelitzia. Vol. 14).
- Ghazanfar S. A. 1992. An annotated catalogue of the vascular plants of Oman and their vernacular names. Vol. 2. Meise: National Botanic Garden of Belgium. 153 p.
- Govaerts R. 1995. World Checklist of seed plants. Vol. 1 (pts. 1, 2): Deurne: MIM. Pt. 1: 483 p.; pt. 2: 529 p.
- Govaerts R. 1999. World checklist of seed plants. Vol. 3 (pts. 1, 2a, 2b). Deurne: MIM. 1532 p.
- Govaerts R., Frodin D. G., Radcliffe-Smith A. 2000. World checklist and bibliography of *Euphorbiaceae* (and *Pandaceae*). Vols. 1–4. Kew: Royal Botanic Gardens. 1622 p.
- Govaerts R., Sobral N., Ashton P., Barrie F. et al. 2008. World checklist of *Myrtaceae*. Kew: Royal Botanic Gardens. 455 p.
- Goyder D. J. 2009. A synopsis of *Asclepias* (*Apocynaceae: Asclepiadoideae*) in tropical Africa // Kew Bulletin. Vol. 64. P. 369–399.
- Goyder S., Harris T., Masinde S., Meve U., Venter J. 2012. Flora of Tropical East Africa. *Apocynaceae* (pt. 2). Kew: Royal Botanic Gardens. 530 p.
- Greuter W., Burdet H. M., Long G. (eds.). 1984. Med-Checklist. Vol. 3: *Dicotyledones* (*Convolvulaceae* – *Labiatae*). Ville de Genève: Conservatoire et Jardin botaniques. 330 p.
- Greuter W., Raus T. (eds.). 2008. Med-Checklist Notulae, 27 // Willdenowia. Vol. 38. P. 465–474. <https://doi.org/10.3372/wi.38.38207>
- Greuter W., Raus T. (eds.). 2010. Med-Checklist Notulae, 29 // Willdenowia. Vol. 40. P. 189–204. <https://doi.org/10.3372/wi.40.40205>
- Hansen A., Sunding P. 1993. Flora of Macaronesia: Checklist of vascular plants. 4th rev. ed. 295 p. (Sommerfeltia. Vol. 17).
- Hutchinson J., Dalziel J. M., Keay R. W. J. 1954–1958. Flora of West Tropical Africa. 2nd ed. Vol. 1 (pts. 1, 2). London: Crown Agents for Overseas Governments and Administrations. 828 p.
- Iwatsuki K., Yamazaki T., Boufford D. E., Ohba H. (eds.). 1993. Flora of Japan. Vol. 3a: *Angiospermae* – *Dicotyledoneae* – *Sympetalae*. Tokyo: Kodansha Ltd. 482 p.
- Jagtap A. P., Singh N. P. 1999. Fascicles of flora of India. Vol. 24. Calcutta: Botanical Survey of India. 332 p.
- Jeffrey C. 1961. Flora of Tropical East Africa: *Aizoaceae*. Kew: Royal Botanic Gardens. 35 p.
- Jongbloed M., Feulner G., Böer, B., Western A. R. 2003. The comprehensive guide to the wild flowers of the United Arab Emirates. Abu Dhabi. 576 p.; ills.
- Jørgensen P. M., Nee M. H., Beck S. G. (eds.). 2013. Catálogo de las plantas vasculares de Bolivia. St. Louis: Missouri Botanical Garden Press. 1741 p. (Monogr. Syst. Bot. Missouri Bot. Gard. Vol. 127).
- Kabuye C. H. S. 1971. Flora of Tropical East Africa: *Oxalidaceae*. Kew. 19 p.
- Karim F. M., Fawzi N. M. 2007. Flora of the United Arab Emirates. Vols. 1–2. Al-Ain: United Arab Emirates University. Vol. 1: 444 p.; ills.; vol. 2: 502 p.; ills. (UAE Univ. Publ. Vol. 98).
- Khaytarova M. 2009–2020. Trees of Tropical Asia. <http://www.plantsofasia.com> (Accessed 16.11.2020).
- Khodashenas M., Amini T. 2012. A new record and a key to the species of the genus *Oxalis* (*Oxalidaceae*) // Iran. J. Bot. Vol. 18. P. 196–198.
- Kral R., Diamond A. R., Ginzburg S. L., Hansen C. J., Haynes R. R., Keener B. R., Lelong M. G., Spaulding D. D., Woods M. 2011. Annotated checklist of the vascular plants of Alabama. Botanical Research Institute of Texas. 112 p.
- Kuo M. L. (ed.). 2012. Flora of Taiwan. 2nd ed. Supplement / Editorial Committee of the Flora of Taiwan; National Taiwan University. 414 p.
- Launert E. (ed.). 1978. Flora Zambesiaca. Vol. 4. Kew: Royal Botanic Gardens. 658 p.
- McDonald M. W., Brooker M. I. H., Butcher P. A. 2009. A taxonomic revision of *Eucalyptus camaldulensis* (*Myrtaceae*) // Austral. Syst. Bot. Vol. 22. P. 257–285.

- Migahid A. M. 1989. Flora of Saudi Arabia. 3rd ed. Vol. 2. Riyadh: King Saud University, University Libraries. 282 p.; ill.
- Nasir E., Ali S. I. (eds.). 1970–1995. Flora of West Pakistan. Vols. 1–131.
- Newman M., Ketphanh S., Svengsuksa B., Thomas P., Sengdala K., Lamxay V., Armstrong K. 2007. A checklist of the vascular plants of Lao PDR. Edinburgh: Royal Botanic Gardens. 394 p.
- Norton J. A., Abdul Majid S., Allan D. R., Al Safran M., Böer B., Richer R. 2009. An illustrated checklist of the flora of Qatar. Doha: Unesco Office in Doha. 95 p.
- Omar S. A. S. 2000. Vegetation of Kuwait: A comprehensive illustrative guide to the flora and ecology of the desert of Kuwait. Kuwait: Kuwait Institute for Scientific Research. 159 p.; ill.
- Orchard A. E. (ed.). 1994. Flora of Australia. Vol. 49: Oceanic Islands 1. Canberra: Australian Government Publishing Service. 681 p.
- Orchard A. E. (ed.). 1996. Flora of Australia. Vol. 28: *Gentianales*. Canberra: Australian Government Publishing Service. 335 p.
- Phillips D. C. 1988. Wild flowers of Bahrain. A field guide to herbs, shrubs and trees. Bahrain: Privately published. 206 p.
- Plantarium: open on-line atlas and key to plants and lichens of Russia and neighbouring countries. 2007–2020. [In Russian] (Плантариум: открытый онлайн атлас-определитель растений и лишайников России и сопредельных стран. 2007–2020). <http://www.plantarium.ru/> (Accessed 16.11.2020).
- POWO. 2020. Plants of the world online. <http://plantsoftheworldonline.org/> (Accessed 15.10.2020).
- Sergeev A. 2010–2016. Flora of Qatar. <http://www.floraofqatar.com> (Accessed 17.11.2020).
- Shcherbakov A. V., Mayorov S. R. 2006a. Inventarizatsiya flory i osnovy gerbar'nogo dela: metodicheskiye rekomendatsii [Inventory of flora and the basics of herbarium management: guidelines] / ed. V. S. Novikov. Moscow: KMK Sci. Press. 50 p. [In Russian] (Щербаков А. В., Майоров С. Р. 2006а. Инвентаризация флоры и основы гербарного дела: методические рекомендации / под ред. В. С. Новикова. М.: Т-во науч. изд. КМК. 50 с.).
- Shcherbakov A. V., Mayorov S. R. 2006b. Polevoye izucheniye flory i gerbarizatsiya rasteniy / [Field study of flora and herbarization of plants]. Moscow: Dept. of Higher Plants, Biol. Faculty of Moscow State University. 86 p. (Letnyaya uchebno-proizvodstvennaya praktika po botanike. Chast 1 [Summer educational and work-based training in botany. Part 1]) [In Russian] (Щербаков А. В., Майоров С. Р. 2006b. Полевое изучение флоры и гербаризация растений. М.: Изд. каф. высших растений биол. ф-та МГУ. 86 с. (Летняя учебно-производственная практика по ботанике. Ч. 1)).
- Shou H. Y., Yan X. L., Ma J. S. 2012. Nomenclatural notes on alien invasive vascular plants in China (2) // Pl. Diversity Resources. Vol. 34. P. 345–353. <https://doi.org/10.3724/SP.J.1143.2012.12016>
- Shuaib L. 1995. Wild flowers of Kuwait. London: Stacey Intl. 128 p.
- Thulin M. 1999. Flora of Somalia. Vol. 2. Kew: Royal Botanic Gardens. 303 p.
- Townsend C. C. 1989. Flora of Tropical East Africa: *Umbelliferae*. Kew: Royal Botanic Gardens. 127 p.
- Tutin T. G. et al. (eds.). 1972. Flora Europaea. Vol. 3. Cambridge Univ. Press. xxix + 385 p.
- Tutin T. G. et al. (eds.). 1968. Flora Europaea. Vol. 2. Cambridge Univ. Press. xxvii + 469 p.
- Tzvelev N. N. 2000. Manual of the vascular plants of North-West Russia (Leningrad, Pskov and Novgorod provinces). St. Petersburg: State Chem.-Pharm. Acad. 781 p. [In Russian] (Цвелёв Н. Н. 2000. Определитель сосудистых растений Северо-Западной России (Ленинградская, Псковская и Новгородская области). СПб.: Изд-во СПХФА. 781 с.).
- Van Steenis C. G. G. J. (ed.). 1971–1976. Flora Malesiana. Vol. 7. Djakarta: Noordhoff-Kolff N. V. 876 p.
- Western A. R. 1989. The flora of the United Arab Emirates: an introduction. Al Ain: United Arab Emirates Univ. 188 p.
- Villaseñor J. L. 2016. Checklist of the native vascular plants of Mexico // Revista Mex. Biodivers. Vol. 87. P. 559–902. <https://doi.org/10.1016/j.rmb.2016.06.017>
- Wood J. R. I. 1997. A handbook of the Yemen flora. Kew: Royal Botanic Gardens. vi + 434 p.; ill.
- Zhao C., Liu Q., Li F., Wong L. J., Pagad S. 2020. Global register of introduced and invasive species — China. Version 1.3. Checklist dataset / Invasive Species Specialist Group ISSG. <https://doi.org/10.15468/wstyjh> (Accessed 19.09.2020).
- Ziller S., Zenni R., Souza Bastos L., Possato Rossi V., Wong L. J., Pagad S. 2020. Global register of introduced and invasive species — Brazil. Version 1.5. Checklist dataset / Invasive Species Specialist Group ISSG. <https://doi.org/10.15468/i0avrm> (Accessed 16.11.2020).
- Zuloaga F. O., Belgrano M. J. (eds.). 2017. Flora Argentina: Flora vascular de la República Argentina. T. 17. San Isidro: Instituto de Botánica Darwinion. 434 p. <https://doi.org/10.2307/j.ctt20p56nv>