

ORIGINAL ARTICLE

Two new records to the flora of the Arabian Peninsula from Yemen

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ABSTRACT

The Arabian Peninsula contains a rich and varied flora, which is still incompletely known. In the period 2008-2011 have been conducted field studies and collections in the area of the Toor Al-Baha district, Lahej province, Republic of Yemen. The result of these studies was recorded in the first time to the flora of the Arabian Peninsula, two species of vascular plants: *Allium subhirsutum* L. (Alliaceae) and *Justicia ladanoides* Lam. (Acanthaceae). *Allium subhirsutum* L. was found at altitude 1214 m a.s.l., where it grows in rocky place, while *Justicia ladanoides* Lam. was found at altitude 1095 m a.s.l., where it grows in rocky limestone places. Descriptions, habitats, distributions and figures of these new records are given.

Key words: *Allium*; *Justicia*; New records; Vascular plants; Arabian Peninsula; Yemen.

INTRODUCTION

The Republic of Yemen lies in the south-western corner of the Arabian Peninsula. It extends between latitudes 12° 40' to 19° 00' N, and longitudes 42° 30' to 53° 05' E. It is bordered by Kingdom of Saudi Arabia in the north, the Arabian Sea and the Gulf of Aden in the south, Sultanate of Oman in the east, and the Red Sea in the west. It comprises about 527.970 sq. km. The study area (Toor Al-Baha) is a district of Lahej governorate. Lahej governorate is located at the south-western part of Yemen at latitudes 12° 30' and 14° 00' N, and longitudes between 43° 30' and 45° 30' E. This governorate is bounded by Abyan governorate on the east, by Taiz governorate on the west, by Al-Bayda, Al-Dhala governorates and some parts of Taiz governorate on the north, by Aden governorate and the Gulf of Aden on the south. The central city of Lahej governorate (Al-Hawtah)

distances from Sana'a (the capital of Yemen) about 320 km south (Fig. 1).



Figure 1. Map of Yemen (source: www.google.com).

The flora of Yemen is very rich and diverse. Species diversity is a result of considerable climatic changes in former periods, which enabled different species to survive, in the different ecological habitats [1]. Former studies have reported that there are about 2838 plant species belong to 1068 genera and 179 families in Yemen [2, 3]. Since considering the southwestern part of the Arabian Peninsula as a part of the hotspots of the world [4- 7], a high attention has been paid to study of the vegetation and flora of the Arabian Peninsula particularly the southwestern part including Yemen.

In recent time there were more than 200 new records of vascular plants added to Yemen flora [8-11]. In fact, Toor Al-Baha district was rarely visited by botanists until the last decade of the 20th century. This area was already known as a rich site in succulents and is the type locality of some species [12-15]. In this paper the author collected two interesting species belonging to the genus *Allium* and *Justicia* (Toor Al-Baha district, Lahej governorate, Yemen). The specimens collected were compared with the relevant data in the literature [3, 16-20].

As a result of all these comparisons, the specimens collected were found to be new records for the Arabian Peninsula flora from Yemen.

2. MATERIALS AND METHODS

During the intensive floristic survey between 2008 and 2011, the author was collected plant samples from different habitats of Toor Al-Baha district, Lahej governorate, southern Yemen. The specimens were first compared with similar species from flora of Yemen and then flora of Kingdom of Saudi Arabia, Flora of Oman, flora of Somalia and flora of Ethiopia, in order to identify them. The collected specimens were pressed and mounted on herbarium sheet and deposited in the herbarium of Biology Department, Faculty of Education, Aden University (Yemen). The references [18-21] were used for the identification of the taxa.

3. RESULTS

During the present study two species viz., *Allium subhirsutum* L. (Alliaceae) and *Justicia ladanoides* Lam. (Acanthaceae), were recorded for

the first time for Yemen, and were not previously recorded for the Arabian Peninsula.

A list of the species arranged alphabetically within their families is given with citations of their description, synonym, type, habitats and distribution.

1. *Allium subhirsutum* L. Sp. Pl. 1: 295. 1753. (Fig. 2)

Synonyms: *A. spathaceum* Steud. ex A. Rich. (1851); *A. subhirsutum* var. *spathaceum* (Steud. ex A. Rich.) Regel (1875).

Type: Linn 4193.

Herb smelling mildly of garlic when crushed; bulb globose to ovoid-oblong, to 1.5 cm diameter, bulb coat membranous, grayish. Leaves (1-)2-3, linear, flat or slightly keeled when fresh, 8-50 x 0.2-2 cm, hairy at least along margins; sheaths 1.5-14 cm, mostly below ground, pale white or yellow, glabrous or hairy especially near the top. Inflorescence-stem single (sometimes 2 or 3), solid, uniform in thickness, shorter or longer than leaves. Spathe opening along 1 slit, persistent, up to 1.3 cm long, with green or pale purple veins, shorter than pedicles. Inflorescence an umbel or spherical cluster, 2-7 cm in diameter, few- to many-flowered. Pedicles to 10-40 mm long, bracteoles absent. Flowers campanulate to stellate; tepals spreading white with a pale-red midvein, elliptic or oblong, 5-8.5 mm long, the outer slightly wider than the inner, obtuse or acute, joined together and also to the filaments for c. 1 mm at the base; filaments $\frac{1}{2}$ to $\frac{3}{5}$ the length of the tepals, filaments simple; pistil shorter or longer than perianth, ovary globose to obovoid with style attached about half way above the base; style 3-6 mm long, slender with 3-lobed stigma. Capsules subglobose, 3-6 mm in diameter. Seeds black c. 2.5-3.5 mm long.

Habitat: The specimen was collected from a single locality in Jabal Athumah, Toor Al-Baha district, Lahej province, where it was found growing in rocky place at alt. 1214 m a.s.l.

Phytochory: Mediterranean

Previous report from Yemen: None.

Specimens examined: Yemen, Toor Al-Baha district, Lahej governorate, on alt. 1214 m a.s.l., 13° 02' 505" N, 44° 16' 111" E, 10. 4. 2010, Othman 4229.



Figure 2. *Allium subhirsutum* inflorescence in habitat. Photography taken by the author.

2. *Justicia ladanoides* Lam., Tabl. Encycl. 1(1): 42 (1791). (Fig. 3)

Synonyms: *Tyloglossa kotschyi* Hochst. (1843); *Justicia kotschyi* (Hochst.) Dandy (1956); *J. schimperi* (Hochst.) Dandy (1956) var. *kotschyi* (Hochst) J. K. Morton (1978).

Type: without collector and locality.

Erect or straggling annual or short-lived perennial herb 0.1-1.5 m high. Stems glabrous to densely pubescent with spreading or descending non-glandular hairs; internodes up to 5-18 cm long. Leaves: blade 2-11 x 1-5 cm, linear, narrowly ovate to ovate-elliptic or elliptic, attenuate to rounded at the base, acute to obtuse or acuminate at the apex, lateral veins 5-7 pairs, sparsely to densely pubescent with ascending appressed non glandular hairs; petiole in distinct up to 5-40 mm long, pubescent with spreading non-glandular white hairs. Flowers several together at the upper nodes.

Bracts 6-12 x 1.5-3 mm, linear to narrowly obovate or narrowly elliptic, ciliate along the margins. Bracteoles 1.5-3.5 x 0.3-0.6 mm, linear to subulate. Calyx lobes 4-6 x 1-1.2 mm, subulate, with green middle and white hyaline margins, nearly glabrous except for the margins which are ciliate or fimbriate, or sparsely pubescent with mostly ascending non-glandular hairs and also rarely with glandular hairs. Corolla purple or very rarely white with a white/purple pattern on lower lip near throat, 17-20 mm long; tube 8-10 mm long, 2-4 mm wide at the mouth, pubescent outside; lower lip 8-10 mm

long with the 3 lobes 2.5-3 x 2.3 3 mm; upper lip 4-6 mm long and bifid at the apex. Stamens with filaments 4-6 mm long, glabrous; anthers usually yellow or occasionally purplish 1.2-2.4 mm long, lower theca with a 0.3-0.6 mm long tail. Ovary 1.8-2 mm long, glabrous; style 11-14 mm long, pubescent below half; stigma with subequal lobes. Capsule 7-10 x 2.5-3 mm, sterile basal portion 2.5-3 mm long, acute to obtuse at the apex, glabrous or rarely sparsely pubescent at apex. All capsule 4-seeded; seeds 1.5-2 x 1.1-1.5 mm, triangular-discoid, flattened, densely verrucose.



Figure 3. *Justicia ladanoides*, A: habit, B & C: fruiting branches. Photographs taken by the author.

Habitat: It was collected from a single locality in Jabal Athumah, Toor Al-Baha district, Lahej province, where it grows in rocky limestone places at alt. 1095 m a.s.l.

Phytochory: Sudano-Zambezian

Previous report from Yemen: None.

Specimens examined: Yemen, Toor Al-Baha district, Lahej governorate, on alt. 1095 m a.s.l., 13° 02' 736" N, 44° 16' 078" E, 22. 3. 2010, Othman 4110.

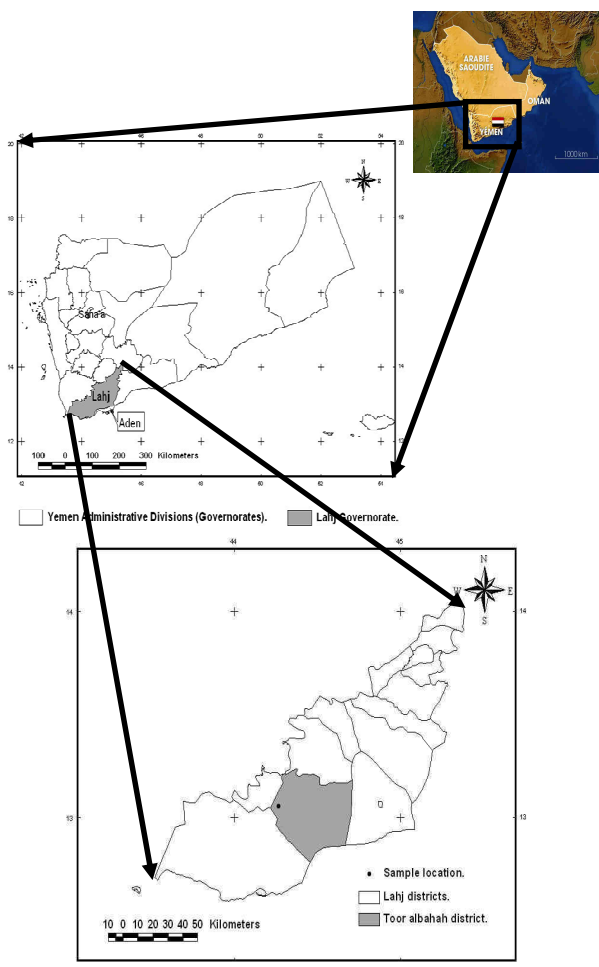


Figure 4. Location map of Yemen, Showing its administrative divisions (governorates) browsing location of Lahej governorate of which the study area is within (at Toor Al-Baha district) where *Allium subhirsutum* and *Justicia ladanoides* were found.

4. DISCUSSION

The *Allium* specimens collected from Toor Al-Baha district, Lahej province, Yemen, were first compared with the related species in floras of the neighboring countries. It was seen that the specimens were markedly different from the related *Allium alibile* Steud. ex A. Rich. due to the fact that the specimens collected from Toor Al-Baha district were leaves hairy at least along margins and the anthers are shorter than the perianth [18]. The morphological characteristics of the species were identical to those of *Allium subhirsutum*, which is

distribution in N Sudan, N Somalia, Djibouti, Ethiopia and Eritrea [18, 20].

Key to closely related *Allium* species:

1. Bulb single and prominent, with or without small, spherical bulblets, plant not cultivated.
2. Umbel with a ring of scarious bracteoles; anthers longer than the perianth; leaves smooth → *A. alibile*
2. Umbel without bracteoles; anthers shorter than the perianth; leaves hairy at least along margins → *A. subhirsutum*
1. Bulb made of several more or less equal bulblets or single and virtually indistinguishable from the base of the scape; plants cultivated.

The *Justicia* specimens collected from Toor Al-Baha district, Lahej province, Yemen, were first compared with the related species in floras of the neighboring countries. According to this comparison, the specimens looking like *Justicia heterocarpa* T. Anders. due to the fact that specimens collected from Toor Al-Baha district were corolla purple, more than 10 mm long, bracts more than twice as long as wide and capsules 4-seeded. The morphological features of the collected specimens were identical to those of *Justicia ladanoides*. This proves the presence of this species, which is known to grow in Senegal to Ethiopia, extending north to Sudan and south-east Egypt, southwards to northern Zaire, Uganda and Kenya [19, 21].

Key to closely related *Justicia* species:

1. Plant herbaceous; capsules at least some of them, 4-seeded; seeds tuberculate, somewhat flattened.
2. Corolla purple, usually more than 10 mm long; bracts usually more than twice as long as wide; capsules smooth, 4-seeded → *J. ladanoides*
2. Corolla pink, less than 10 mm long; bracts less than twice as long as wide; capsules with 6 deeply dissected wings and 1-seeded → *J. heterocarpa*
1. Plant herbaceous; capsules 2-seeded; seeds smooth, strongly flattened.

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TRANSPARENCY DECLARATION

The authors declare no conflicts of interest.

REFERENCES

1. Ministry of Water and Environment. 2010. Fourth national report, Assessing Progress towards Target – the 4th national CBD report July, 2009. Environment Protection Authority, Ministry of Water and Environment, Republic of Yemen, pp. 100.
2. Al-Khulaidi AA. 2013. Flora of Yemen. (SEMP, YEM/97/100) EPC, Sana'a, Yemen.
3. Wood JRI. 1997. A handbook of the Yemen flora. Royal Botanic Gardens, Kew, UK, pp. 434.
4. Mittermeir RA, Myers N, Thomsen JB, Da Fonseca GAB, Olivieri S. Biodiversity hotspots and major tropical wilderness areas: approaches to setting conservation priorities. *Conserv Biol.* 1998; 12: 516-520. <http://dx.doi.org/10.1046/j.1523-1739.1998.012003516.x>
5. Mittermeir RA, Turner WR, Larsen FW, Brooks TM, Gascon C. 2004. Global biodiversity conservation: The critical role of hotspots. pp. 3-7.
6. Myers N. Threatened biotas: "hot-spots" in tropical forests. *Environmetalist.* 1988; 8: 187-208.
7. Myers N, Mittermeir RA, Mittermeir CG, Da Fonseca GAB, Kent J. Biodiversity hotspots for conservation priorities. *Nature.* 2000; 403: 853-858.
8. Thulin M, Al-Gifri AN, Hussein MA, Gabali S. Additions to the Yemen flora. *Biol Skr.* 2001; 54: 137-153.
9. Kilian N, Hein P, Hubaishan MA. New and noteworthy recorded for the flora of Yemen, chiefly of Hadhramout and Al-Mahrah. *Willdenowia.* 2002; 32: 239-269.
10. Kilian N, Hein P, Hubaishan MA. Further notes on the flora of the southern coastal mountains of Yemen. *Willdenowia.* 2004; 34: 159-182.
11. Mohamed SS, Al-Hawshabi OSS, Atef MAA, Aulqi WA. *Syzygium jambos* (L.) Alston (Myrtaceae), a new record introduced to the flora of Yemen. *J Biol Earth Sci.* 2014; 4(1): B52-B56.
12. White A, Sloane BL. 1937. The Stapelieae. 3 vols. Abbes San Encino Press, Pasadena, California, USA, pp. 1185.
13. Albers F, Meve U. 2002. Illustrated handbook of succulent plants: Asclepiadaceae. Springer Verlag, Heidelberg, Berlin, Germany, pp. 318.
14. Meve U. 1997. The genus *Duvalia* (Stapelieae) stem-succulents between Cape and Arabia. Springer-Verlag Wien New York. *Pl. Syst. Evol., Suppl.* 10: pp. 130.
15. McCoy TA. *Rhytidocaulon splendidum* McCoy, a new species from southwestern Yemen. *Cact Succ J.* 2003; 75(4): 154-157.
16. Chaudhary SA. 2000. Flora of the Kingdom of Saudi Arabia illustrated. Vol. 2 (3), National Herbarium, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Riyadh, Kingdom of Saudi Arabia, pp. 432.
17. Chaudhary SA. 2001. Flora of the Kingdom of Saudi Arabia illustrated. Vol. 3, National Herbarium, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Riyadh, Kingdom of Saudi Arabia, pp. 368.

18. Edwards S, Demissew S, Hedberg I. 1997. Flora of Ethiopia and Eritrea. Vol. 6, National Herbarium, Biology Department, Science Faculty, Addis Ababa University, Ethiopia and Department of Systematic Botany Uppsala University, Sweden, pp. 151-153.
19. Hedberg I, Kelbessa E, Edwards S, Demissew S, Persson E. 2006. Flora of Ethiopia and Eritrea. Vol. 5, National Herbarium, Biology Department, Science Faculty, Addis Ababa University, Ethiopia and Department of Systematic Botany Uppsala University, Sweden, pp. 476-477.
20. Thulin M. 1995. Flora of Somalia. Vol. 4, Royal Botanic Gardens, Kew, pp. 298.
21. Boulos L. 2002. Flora of Egypt. Vol. 3, Al-Hadara Publishing, Cairo, Egypt, pp. 371.