

## Addition of some Angiospermic plants to the flora of Yemen

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### Abstract

This present paper deals with six species of flowering plants as an addition to the flora of Yemen reported from field trips undertaken during 2008 to 2012. For instance *Dipcadi serotinum*, *Hibiscus aristaevalvis*, *Pluchea ovalis* and *Viscum cruciatum* have been reported as new record for Yemen, and *Helianthemum stipulatum* and *Striga angustifolia* are recorded as new for the southwestern part of Yemen or larger parts of it. A brief morphological description, occurrence, habitat, life form, phytogeographical affinities, global distribution and photographs of each species are given for easy identification.

**Keywords:** Addition; flora; flowering plants; new records; taxa.

### 1. Introduction

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. Yemen is having one of the most diverse floras of Arabian Peninsula region (Wood, 1997). The flora of this country is characterized by its high diversity and density, particularly in the Southern and Western regions, that makes it a complex one. This flora is having affinities with the floras of the tropical African, Sudanese region, the Saharo-Arabian region, the Mediterranean countries, and the Irano-Turanian region (Al-Hubaishi & Muller-Hohenstein, 1984). Previous studies reported that there are about 2838 plant species belonging to 1068 genera and 179 families in Yemen (Boulos, 1988; Wood, 1997; Thulin *et al.*, 2001; Kilian *et al.*, 2002 & 2004; Al-Khulaidi, 2013). In recent time, there are seven new records of vascular plants added to flora of Yemen (Mohamed *et al.*, 2014; Al-Hawshabi, 2014; 2015a & b; 2016; Al-Hawshabi *et al.*, 2015). In this paper, we report the recent findings of six wild species from Yemen..

#### 1. 1 Study area

The Republic of Yemen lies in the southwestern 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 (Figure 1). The climate of Yemen varies mainly with altitude from a hot and dry desert climate in the low lying South East and West regions to a temperate in Southern, Central and Northern highland. Republic of Yemen consists of twenty one governorates; Lahej (the study area) is one of them. This governorate consists of 15 districts. Toor Al-Baha district is one of them. It extends between latitudes 12° 58' - 13° 20' of the North Latitude and 44° 11' - 44° 39' of the East Longitude, with an area of about 1883 sq. km. Toor Al-Baha district is bordered by Al-Qubaytah district in the north, Al-Maqatrah district, Al-Madaribah and Ras Al-Aarah district in the west, Tuban district in the east and by Gulf of Aden and parts of Aden governorate in the south (Figure 1).

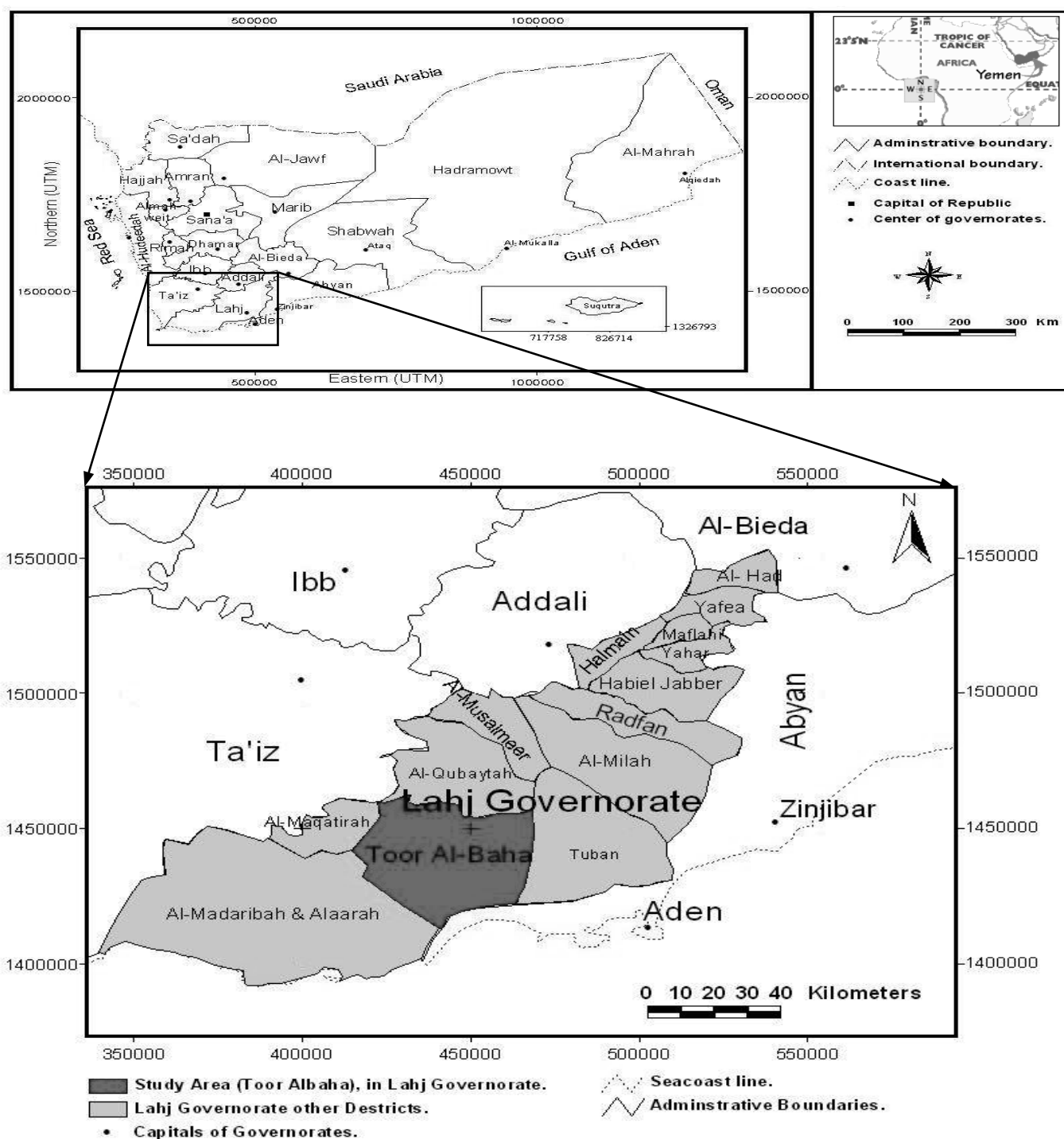


Fig. 1. Map of Yemen (modified after [http://www.worldatlas.com/web image/ country's/ asia/ye.htm](http://www.worldatlas.com/web/image/country/s/asia/ye.htm)), showing political map of Lahej governorate with the location of study area -Toor Al-Baha highlighted (modified after Ministry of the Local administration).

## 2. Materials and methods

During intensive floristic survey between 2008 and 2012, the first author of this paper collected from different habitats of Toor Al-Baha district, of Lahej, the southwestern governorate of the Republic of Yemen, about 5019 plant specimens comprising 564 taxa (of which 6 are new and noteworthy records to Yemen). The references, Chaudhary

(1999, 2000 & 2001a, b, c), Thulin (2006), Boulos (2000) and King-Jones (1999), were used for the identification of the taxa. The recorded species were classified according to the life form system proposed by Raunkiaer (1937). Voucher specimens for each taxon reported are kept in each of: Herbarium of Biology Department, Faculty of Education, Aden University, and the Herbarium of Center for Environmental Studies and Research.

### 3. Results and discussion

The floristic studies are considered to be the keystone of the other biological studies, particularly those pertaining to the biodiversity. Also, flora of any area is not static. It changes from time to time. Various ecological factors, mostly biotic, change the floristic components. Recently, bio-geographers and plant geographers have recognized certain regions in the world as floristic hotspots; some of them are the southwestern region of the Arabian Peninsula and Yemen, as a part of the African Horn (Myers et al., 2000; Mittermeir et al., 2004). In spite of the intensive floristic studies on the flora of Arabia and Yemen, these regions are considered to be the least known region floristically, compared to other neighboring countries (Miller & Nyberg, 1991). The same words can be said about the flora of Toor Al-Baha district (Lahej governorate, Yemen, the study area), comparing with the other governorates of Yemen.

After consulting most of the publications on the flora of Yemen, the present study reveals that there are four species viz.; *Dipcadi serotinum* (Hyacinthaceae), *Hibiscus aristaevalvis* (Malvaceae), *Pluchea ovalis* (Asteraceae) and *Viscum cruciatum* (Viscaceae) to be added as new to the flora of Yemen through the flora of Toor Al-Baha. In addition, there are two species viz.: *Helianthemum stipulatum* (Cistaceae) and *Striga angustifolia* (Scrophulariaceae) that are recorded as new for the southwestern part of Yemen or larger parts of it. The present results are in agreement with those studies that have been carried out previously (Boulos, 1988; Thulin et al., 2001; Kilian et al., 2002 & 2004; Al-Rehaily et al., 2015) confirming that the southern part of Arabia is the least known region from the floristic point of view (Miller & Nyberg, 1991). Following the well 'life form' system of Raunkiaer (1937), based on the location of renewal buds the Chamaephytes and Therophytes are represented by two species each, while Geophytes, Epiphytes and Parasites are represented by one species each.

The following enumeration is alphabetically arranged with correct botanical name, followed by synonyms, type, short botanical description, occurrence, habitats, life form, phytogeographical affinities, global distribution, voucher number and lastly photographs.

1. *Dipcadi serotinum* (L.) Medic. in Act. Acad. Theod. Palat. VI. Physic. : 431 (1790). (Hyacinthaceae).

Synonym: *Hyacinthus serotinus* L. (1753).

Type: Spain.

Bulbous herb. Leaves 2-4, flat or folded, narrow. Scape many-flowered. Perianth greyish-lilac. Capsule c. 15 mm long. Seeds black with membranous margins.

Occurrence: A single plant was collected from Toor Al-Baha district, Lahej governorate, alt. 690 m, 13° 09' 466" N, 44° 12' 936" E, 10. 6. 2009, Othman 0823.

Habitat: It grows in gravelly, dry sandy soils.

Life form: Geophytes.

Phytochory: Saharo-Sindian, Sudano-Zambebian and Euro-Siberian.

Global distribution: Oman, Saudi Arabia, SW Europe, SW Asia, Western, Himalayas, Egypt, and NE Africa (Ghazanfar, 1996). New record to Yemen.

2. *Helianthemum stipulatum* (Forssk.) C. Chr., Dansk Bot. Ark. 4 (3): 20, no. 11 (1922). (Cistaceae).

Synonym: *Cistus stipulatus* Forssk., Fl. Aegypt.-Arab. 100 (1775).

Type: The type was collected from Alexandria, Egypt, by Forsskal.

Slender shrublet, usually erect, up to 0.3 m tall; stems stellate-tomentose. Leaves petiolate, linear to elliptic or ovate, acute apiculate, tomentose above, more densely so beneath. Flowers sessile in 3-12-flowered leaf-opposed cymes. Sepals stellate-hairy. Petals yellow, about as long as or slightly longer than sepals. Ovary tomentosa; capsule 4-5 mm long.

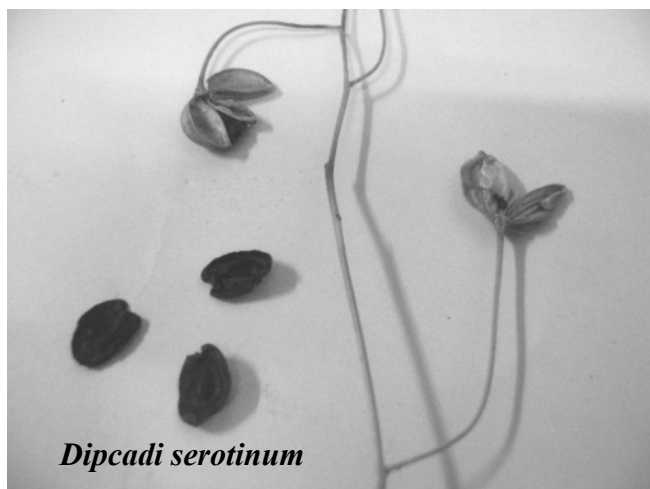
Occurrence: It was collected from a single locality in Toor Al-Baha district, Lahej governorate alt. 1214m, 13° 02' 505" N, 44° 16' 111" E, 10. 4. 2010, Othman 4232.

Habitat: A single plant was found on rocky limestone and gravelly ground in the plateau. Rare.

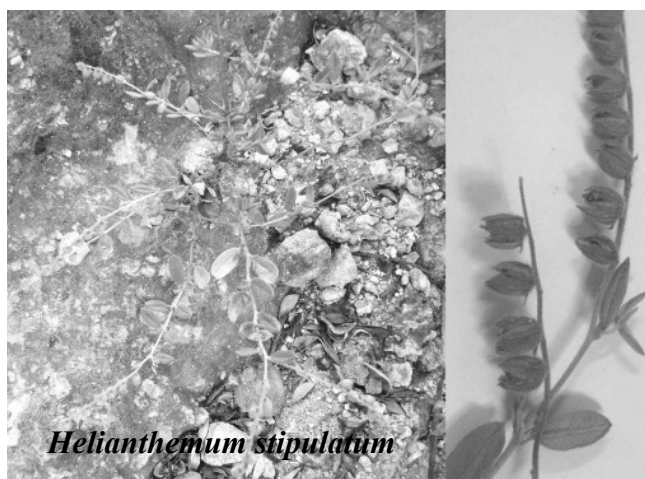
Life form: Chamaephytes.

Phytochory: Saharo-Sindian and Mediterranean.

Global distribution: Egypt, Mediterranean region, Djibouti, Somalia and Yemen (Hadhramout) (Boulos, 2000; Thulin, 2002 & 2006). New record for the southwestern part of Yemen or larger parts of it.



*Dipcadi serotinum*



*Helianthemum stipulatum*

3. *Hibiscus aristaevalvis* Garcke, in Bot. Zeit 7: 849: (1849). (Malvaceae).

Synonyms: *Hibiscus intermedius* A. Rich., (1834); *Hibiscus dijabinianus* Parsa (1947).

Type: Ethiopia

Annual, semiprostrate herb, with weak stems bearing reflexed stiff hairs and a line of soft, simple or stellate hairs along one side but in a different position at each node. Leaves petiolate; blades 3-7- partite; lobes unequal, nearly free to the base, irregularly toothed, thinly stellate-hairy on both sides, long narrow, linear-lanceolate. Flowers axillary, solitary, yellowish with dark purple center. Epicalyx-segments 7-10, linear. Calyx slightly longer than epicalyx-segments. Petals obliquely obovate, glabrous. Capsule subglobose, hispid above, awns 2-3 mm long. Seeds black, 3-4 in each valve, densely brown, silky, appressed hairy.

Occurrence: A single plant was collected from Toor Al-Baha district, Lahej governorate, alt. 740 m, 13° 12' 642" N, 44° 18' 099" E, 17. 10. 2009, Othman 2308.

Habitat: It grows in alluvial soil, or as a weed, especially in Sorghum fields.

Life form: Therophytes.

Phytochory: Saharo-Sindian and Sudano-Zambebian.

Global distribution: Tropical Africa, Saudi Arabia, Pakistan and India (Chaudhary, 1999). New record to Yemen.

4. *Pluchea ovalis* (Pers.) DC., Prodr. 5: 450. 1863. (Asteraceae).

Synonyms: *Baccharis ovalis* Pers., Syn. Pl. 2: 424. 1807; *Baccharis ovata* Sieber ex DC., Prodr. 5: 450. 1836; *Pluchea tomentosa* DC. in Wight, Contr. Bot. India: 16. 1834; *Pluchea mollis* Baker in Bull. Misc. Inform. 1895: 182. 1895; *Pluchea dioscoridis* var. *pseudovalis* Cufod. in Nuovo Giorn. Bot. Ital., n.s. 50: 105. 1943.

Type: Senegal.

Shrub with erect branches. Leaves ovate, lanceolate or oblanceolate, with acute or obtuse apex. Capitula campanulate, numerous, marginal florets female, disc florets hermaphroditic, corolla purple. Achenes hairy or sparsely hairy. Pappus 4-5(-5.6) mm long, of 13-20 free barbellate bristles in one row.

Occurrence: It was collected from Toor Al-Baha district, Lahej governorate, alts. 752 m, 13° 11' 881" N, 44° 17' 381" E, 10. 10. 2009, Othman 2107; 709 m, 13° 12' 611" N, 44° 18' 090" E, 17. 10. 2009, Othman 2348; 713m, 13° 12' 568" N, 44° 18' 079" E, 31. 3. 2010, Othman 4175 & 770 m, 13° 11' 878" N, 44° 17' 408" E, 27. 10. 2010, Othman 4847.

Habitat: It grows in moist habitats, seasonally swampy ground. Margins of pools.

Life form: Chamaephytes.

Phytochory: Saharo-Sindian, Sudano-Zambebian and Irano-Turanian.

Global distribution: West Africa (Cape Verde Island, Senegal, Togo, Morocco and Mauritania), Saudi Arabia, Oman and Bahrain (King-Jones, 1999; Chaudhary, 2000; Thulin, 2006). New record to Yemen.



*Hibiscus aristaevalvis*



*Pluchea ovalis*

5. *Striga angustifolia* (D. Don.) C. J. Saldanha, Bull. Bot. Surv. India. 5:70. 1963. (Scrophulariaceae).

Synonym: *Buchnera angustifolia* D. Don, Prodr. Fl. Nepal. 91. 1825.

Type: Nepal. Wallich s.n. (holotype, K).

Annual 10-50 cm tall, stiffly erect, unbranched or with 2 or 3 branches from below middle. Stem obtusely square. Leaves sessile, linear, alternate. Flowers alternate in lax racemes, raceme shorter than vegetative stem. Calyx 15-ribbed; lobes 5, equal, linear to lanceolate, equal or subequal to the tube. Corolla white, tube densely pubescent. Capsule obovoid-oblong. Seeds brown, minute.

Occurrence: The specimens were collected from Toor Al-Baha district, Lahej governorate, alts. 783 m, 13° 12' 962" N, 44° 20' 245" E, 12. 10. 2009, Othman 2193; 829 m, 13° 13' 049" N, 44° 20' 351" E, 16. 11. 2009, Othman 3094 & 648 m, 13° 10' 465" N, 44° 17' 979" E, 3. 11. 2010, Othman 4986.

Habitat: Solitary or in small groups, parasitic on *Sorghum bicolor*, in a loamy soil.

Life form: Parasites.

Phytochory: Cosmopolitan.

Global distribution: China, India, Myanmar, Nepal, Sri Lanka, Vietnam, Tanzania, Malawi, Mozambique, Zambia, Zimbabwe and Oman (Mohamed *et al.*, 2001) and is known from Yemen, Al-Mahrah (Kilian *et al.*, 2002). New record for southwestern part of Yemen.

6. *Viscum cruciatum* Sieb. ex Boiss., Voy. Bot. Espagne 1 (9): 274 (1840). (Viscaceae).

Much-branched, dioecious, green, stem-parasitic shrub. Leaves coriaceous-succulent, oblong-elliptic to obovate, the margin entire, tapering at the base, obscurely 3-veined. Flowers green. Fruit red globose.

Occurrence: It was collected from Toor Al-Baha district, Lahej governorate, from only a single locality where it parasitizes several *Tamarix aphylla* trees, alt.709 m, 13° 12' 704" N, 44° 18' 023" E, 13. 10. 2009, Othman 2268.

Habitat: Hemiparasitic on branches of several *Tamarix aphylla* trees.

Life form: Epiphytic.

Phytochory: Mediterranean.

Global distribution: North Africa, Portugal, Spain, Algeria, Morocco, Palestine and Saudi Arabia (Chaudhary, 2001a). New record to Yemen.



*Striga angustifolia*



*Viscum cruciatum*

#### 4. Conclusion

After consulting most of the publications on the flora of Yemen, the present study reveals that there are four species viz; *Dipcadi serotinum*, *Hibiscus aristaevalvis*, *Pluchea ovalis* and *Viscum cruciatum* to be added as new to the flora of Yemen. In addition, there are two species viz: *Helianthemum stipulatum* and *Striga angustifolia* that

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## References

- Al-Hawshabi, O.S.S. (2014).** Two new records to the flora of the Arabian Peninsula from Yemen. *Journal of Biology and Earth Sciences*, **4**(2): B179-B184.
- Al-Hawshabi, O.S.S. (2015a).** *Euphorbia dracunculoides* Lam. (Euphorbiaceae): A New Record to the Flora of Yemen. *Assiut University Bulletin for Environmental Researches*, **18**(1):11-18.
- Al-Hawshabi, O.S.S. (2015b).** *Boerhavia erecta* L. (Nyctaginaceae): A new record to the flora of the Arabian Peninsula from Yemen. *International Journal of Advanced Research*, **3**(11):813-817.
- Al-Hawshabi, O.S.S. (2016).** A new alien record for the flora of Yemen: *Merremia dissecta* (Jacq.) Hallier f. (Convolvulaceae). *Journal of Pharmacy and Biological Sciences*, **11**(2):01-03.
- Al-Hawshabi, O.S.S.H., Abdul-Ghani, A., Hussein, M.A. & Dahmash, A.M.A. (2015).** *Indigofera trita* var. *subulata* (Fabaceae=Papilionaceae): A New Record to the Flora of Yemen. *International Journal of Science and Research* **4**(9):894-897.
- Al-Hubaishi, A.A. & Muller-Hohenstein, K. (1984).** An Introduction to the vegetation of Yemen: Ecological basis, floristic composition and human influence. Published by Deutsche Gesellschaft Technische Zusammenarbeit (GTZ), Eschborn, West Germany. Pp. 209.
- Al-Khulaidi, A.A. (2013).** Flora of Yemen. Sustainable Natural Resource Management Project (SNRMP) II, Sana'a, Yemen, Pp. 266.
- Al-Rehaily, A., Thomas, J., Yusuf, M., Mayandy, S., Alfahhan, A.H., et al., (2015).** Taxonomy and distribution of two newly recorded genera in Saudi Arabia. *Kuwait Journal of Science* **42**(3):158-169.
- Boulos, L. (1988).** A contribution to the flora of South Yemen (PDRY). *Candollea*, **43**:549-585.
- Boulos, L. (2000).** Flora of Egypt. Vol. 2, Al-Hadara Publishing, Cairo, Egypt, Pp. 352.
- Chaudhary, S.A. (1999).** Flora of the Kingdom of Saudi Arabia illustrated. Vol. 1, National Herbarium, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Riyadh, Kingdom of Saudi Arabia, Pp. 692.
- Chaudhary, S.A. (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.
- Chaudhary, S.A. (2001a).** Flora of the Kingdom of Saudi Arabia illustrated. Vol. 2 (1), National Herbarium, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Riyadh, Kingdom of Saudi Arabia, Pp. 675.
- Chaudhary, S.A. (2001b).** Flora of the Kingdom of Saudi Arabia illustrated. **2** (2), National Herbarium, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Riyadh, Kingdom of Saudi Arabia, Pp. 542.
- Chaudhary, S.A. (2001c).** 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.
- Ghazanfar, S.A. (1996).** The genus *Dipcadi* (Hyacinthaceae) in the Arabian Peninsula. *Kew Bulletin*, **51**(1):803-807.
- Kilian, N., Hein, P. & Hubaishan, M.A. (2002).** New and noteworthy recorded for the flora of Yemen, chiefly of Hadhramout and Al-Mahrah. *Willdenowia*, **32**:239-269.
- Kilian, N., Hein, P. & Hubaishan, M.A. (2004).** Further notes on the flora of the southern coastal mountains of Yemen. *Willdenowia*, **34**: 159-182.
- King-Jones, S. (1999).** Studies in the Compositae of the Arabian Peninsula and Socotra – 4. The Arabian species of *Pluchea* (Compositae, Plucheeae). *Willdenowia*, **29**:203-220.
- Miller, A.G. & Nyberg, J.A. (1991).** Patterns of endemism in Arabia. *Fl. Veg. Mundi*, **9**:263-279.
- Mittermeir, R.A., Turner, W.R., Larsen, F.W., Brooks, T.M. & Gascon, C. (2004).** Global biodiversity conservation: The critical role of hotspots. 3-7.
- Mohamed, K.I., Musselman, L.J. & Riches, C.R. (2001).** The genus *Striga* (Scrophulariaceae) in Africa. *Annals of the Missouri Botanical Garden*, **88**(1):60-103.
- Mohamed, S.S., Al-Hawshabi, O.S.S., Atef, M.A.A. & Aulqi, W. A. (2014).** *Syzygium jambos* (L.) Alston (Myrtaceae), a new record introduced to the flora of Yemen. *Journal of Biology and Earth Sciences*, **4**(1): B52-B56.
- Myers, N., Mittermeir, R.A., Mittermeir, C.G., Da Fonseca, G.A. B. & Kent, J. (2000).** Biodiversity hotspots for conservation priorities. *Nature*, **403**:853-858.
- Raunkiaer, C. (1937).** The plant life forms and statistical plant Geography. Oxford University, Clarendon press. Pp. 162.
- Thulin, M. (2002).** A new species and new records of *Helianthemum* (Cistaceae) from the Horn of African region. *Nordic Journal of Botany*. **22**(1):41-43.
- Thulin, M. (2006).** Flora of Somalia. Vol. 3, Royal Botanic Gardens, Kew, Pp. 626.
- Thulin, M., Al-Gifri, A.N., Hussein, M.A. & Gabali, S. (2001).** Additions to the Yemen flora. *Biologiske Skrifter*, **54**:137-153.
- Wood, J.R.I. (1997).** A handbook of the Yemen flora. Royal Botanic Gardens, Kew, UK, Pp. 434.

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## إضافة بعض نباتات كاسيات البذور إلى النباتات البرية Flora في اليمن

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### خلاصة

يتناول البحث الحالي ستة أنواع من النباتات الزهرية كإضافة للنباتات البرية اليمنية والمعلن عنها من خلال الرحلات الحقلية التي أجريت خلال الفترة من 2008-2012. وجد منها أربعة أنواع (*Dipcadi serotinum*، *Hibiscus aristaevalvis*، *Pluchea ovalis* و *Viscum cruciatum*) لم يسبق تسجيلها في الفلورا اليمنية من قبل، بينما نوعين هما (*Striga angustifolia* و *Helianthemum stipulatum*) سجلتا لأول مرة للجزء الجنوبي الغربي من اليمن أو أجزاء أكبر فيها. تم توفير وصف مورفولوجي، حضورها، موائلها، شكل الحياة، الانتماءات الجغرافية النباتية، التوزيع العالمي وصور خاصة بكل نوع من الأنواع لتسهيل التعرف عليها.