Al-Mukhtar Journal of Basic Sciences 22 (3): 289-298, 2024
Doi: https://doi.org/10.54172/t8ft5b75

Research Article **Open Access**

Life form and Chorological types spectrumof Succulent plants in Wadi Yabraq and its around, Al-Wadheia, Abyan Governorate-Yemen

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Received:
25 November 2024

Accepted:
30 December 2024

Publish online:
31 December 2024

Abstract

The present study was based on extensive surveys and field observation of the diversity of succulent plants in Wadi Yabraq and it's around, Al-wadheea Dist. In the present investigation, it is observed about 71 Species belonging to 37genera and 21 Families were identified. Most of families of plants that contributed in the investigated area were Apocynaceae and Euphorbiaceae. Analysis of the habit shows that Shrubs are dominat with 31 species followed by herbs with 29 species, Trees with 8 species, Liana with 3 species. Investigation of life forms species shows that Chamaephytes are the most important. (49.30%), followed by Therophytes (18.30%), phanerophyte (16.90%) HemicryptophyteS (8.45%) ,Geophytes (4.22%). Among the common regions vegetative, Sudano–Zambezian, were with the highest followed by Endemic and (Sudano–Zambezian Saharo–Arabian).

Keywords: Succulents Plants, Wadi Yabraq, Families , Life Forms, Chorophytes

INTRODUCTION

Succulent plants have a global distribution and are represented in nearly all habitat types. Over 30 botanical families have succulent plant species, ranging from tiny annual plants to trees. Succulents are the camels of the plant world. They take in water and store it in their fleshy interiors, allowing them to go long periods of time without additional life giving liquid. Some of our favorite plants are succulent like aloes and most cacti (Bhalerao V. U et al., 1996).

Succulence is an adaptive response to drought, rapid drainage in rocky and sandy soil and high evaporation in windy, hot environments and in salty or alkaline habitats. There are probably more than five thousand species worldwide (Newton & Chan, 1998). Succulence is a morphological adaptation to regular drought. It is broadly defined as the presence of water storing tissue (hydrenchyma) in one or more organs. Simple parenchyma cells containing a vacuole that may occupy >95% of the cell volume are the principal site of water storage (Al-Gifri & Al-Subai, 1994; Antony et al., 2008; Gibson, 2012). Characterizing such plastic and variable traits is one of the major challenges in the study of succulent plants. Several metrics have been proposed, integrating tissue volume, mass, surface area and anatomy for quantifying water storage or water content (Gibson, 2012; Males, 2017; Ogburn et al., 2012). The objective of the study is to recognize succulent plants and

ascertain their geographical distribution within the study area, as well as to understand their adaptations to arid and semi-arid environments.

MATERIALS AND METHODS

Study area

The study area is located in the Wadi Yabraq in the district of Al-Wade'e, Abyan Governorate, Yemen and cover about 2785 square Km (figure 1), at latitude between 13.92 and 13.51 and longitude between 46.04 and 46.68, the altitude rage between 70 - 1250 meters above sea level, the southern mountain ranges in the region overlook the Gulf of Aden (figure 1).

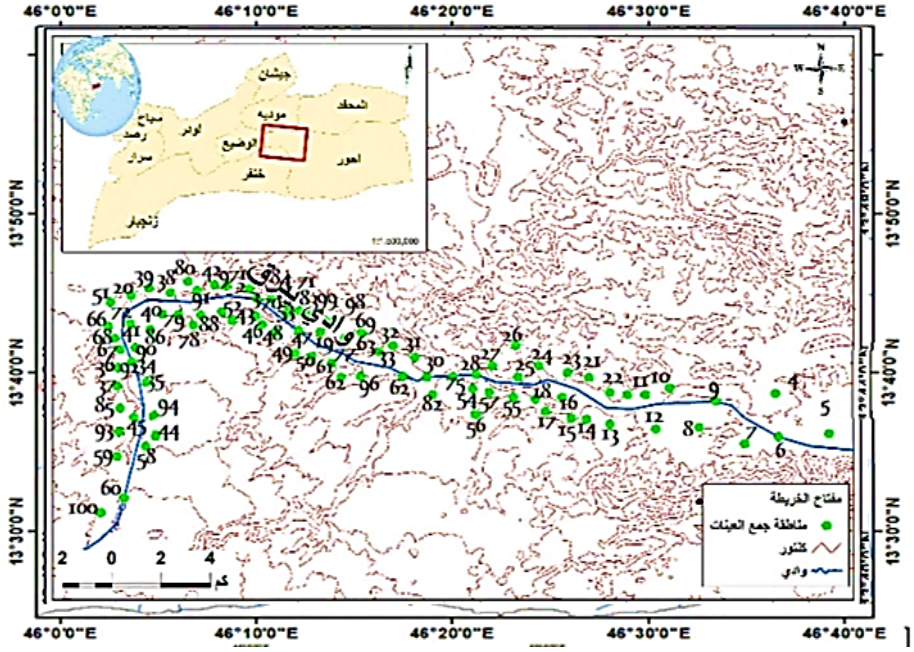


Figure: (1). Study area

The climate features of the study area are high temperature in the summer, the mean temperature was 25.5ºC in June, July and August and moderate temperature in the winter (the mean was 18ºC) in January. Rainy season mostly in the late summer (July- August and September.) with rainfall around 38.7 mm/year

The most important factors affecting the distribution of vegetation in the study area and Yemen in general are topography, the resulting presence of flat land and inclined slopes, altitude from the sea level (Al-Khulaidi & Mehdi, 1999; Al-Maisari & Hussein, 2022). A field survey was carried out through several trips from 2020 to 2022. on each trip, plant samples were collected. The plants were identified through the morphological description،the specimens were identified by (Abdullah et al., 2022; Al-Gifri & Saeed, 2017; Al-Khulaidi, 2013; Al-Gifri & Al-Subai, 1994; Giesen et al., 2007).

Identification and Nomenclature were revised for accepted names through the Plants of the (Al-Khulaidi, 2013) and world flora online Taxonomic Name Resolution Service (TNRS) Voucher specimens were deposited in the herbarium of the Biology Department, College of Sciences, Aden University. Life form categories were recognized (Al-Hawshabi et al., 2017; Al-Sodany et al., 2014; Alhood et al., 2020; Alhood & Sciences, 2024; Dahmash, 2015). Classification. Phytogeographicalcate- gories were distinguished based on World Online (POWO). The statistical analysis was performed using Microsoft Excel to create the charts and histograms.

RESULTSAND DISCUSSION

The present investigation has revealed that about 71species belong to 37genera and 2 1families have been reported from the study area (Table 1)

Habitat analysis:
Herbs and shrubs represent about 71 spp. of the total species, while the trees were represented by 8 spp. Analysis of the habit shows that shrubs are dominat with 31 species followed by herbs with 29 species, and Liana with 3 species as shown in table (2) and figure (2).

Table (2) : The contribution of various plant habits in Yabraq Valley

Life Growth	No of species	Percentage
Shrubs	31	43.66%
Herbs	29	40.84%
Trees	8	11,26%
Liana	3	4.22%

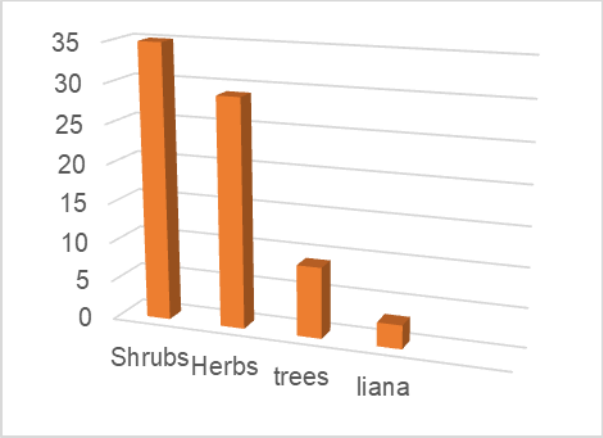


Figure (2): The Contribution of various plant habits

Table .3. and figure 3 show the biological spectrum or the life form spectrum of the given 71 species in Wadi Yabraq. The Chaemophytes have dominated the flora of the Succulent plants representing 35sp., (49.30%), followed by the therophytes 13 spp (18.30%), and Phanerophytes 12 sp. (16.90%), Hemicryptophytes 6 sp. (8.45 %) geophytes 3sp. (4.22%), parasites 2spp. (3. 27%). The life form spectra in the study area indicated that, Chamaephytes had the highest contribution. These results agree with (Al-Hawshabi et al., 2017; Alhood et al., 2020; Alhood & Sciences, 2024).

Table (3): Life forms spectrum of Yabraq Valley

N0	Life- form	Number of Taxa	Percentage (%)
1.	Chamaephyte	35	49.30%
2.	Therophyte	13	18.30%
3.	Phanerophyte	12	16.90%
4.	Hemicryptophyte	6	8.45%
5.	Geophytes	3	4.22%
6.	Parasites	2	2.81%

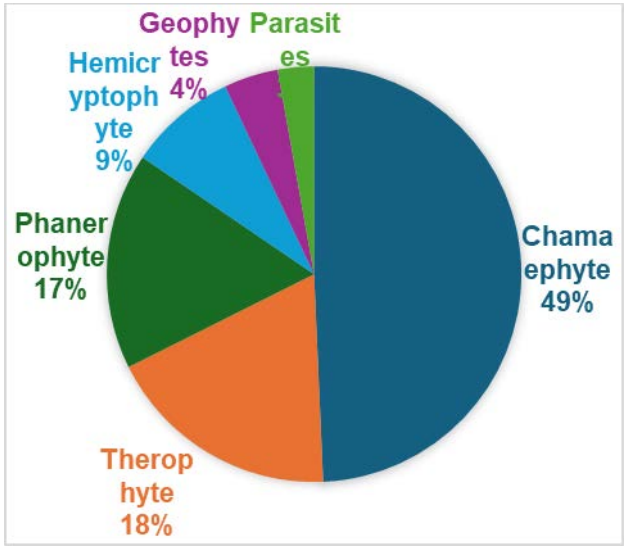


Figure (3): Different life –forms classes of WadiYabraq

In terms of chorotypes such as Sudano –Zambezian, Endemic, (Sudano –ZambezianSaharo –Arabian,) with amounts of, respectively were having in the highest and lowest levels between vegetative elements, Among the common regions vegetative, Sudano –Zambezian, were with the highest followed by Endemic, (Sudano –Zambezian, Saharo –Arabian), whereas Saharo -Arabian, Arabian, Iranian, Tropical, were with the lowest table (4) and figure. (4). the dominant Sudano -Zambenzian region confirms that the study area "as a part of Yemen" belongs to the African Horn region, and our results agree with (Alhood et al., 2020; Alhood & Sciences, 2024). Figure 5 illustrates several rare and endangered succulent plant species found within the study area.

Table (4): Chorological types spectrumof Succullent plants in Wadi Yabraq

Chorotype	Number of Species	Percentage (%)
	Mono-Regional	
TR	1	1.40%
END- N.END	16	22.53%
SA-Si	6	8.45%
Su-Za	26	36.61%
Subtotal	50	70.42%
	Bi-regional	
Su-Za,Sa-Si	9	12.67%
TR – SA-SI	1	1.40%
Su-Za , Med	3	4.22%
Su-ZA + IT	1	1.40%
Subtotal	14	19.71%
	Pluri-regional	
Su-Za, Med, Sa-Si,	1	1.40%
IT + Med. + Su - Za + Sa – Si	1	1.40%
IT + ME + Su - Za +	1	1.56%
Subtotal	3	4.22%
	Worldwide	
COSM	5	7.04%
Subtotal	4	5.63%
Total	71	100%

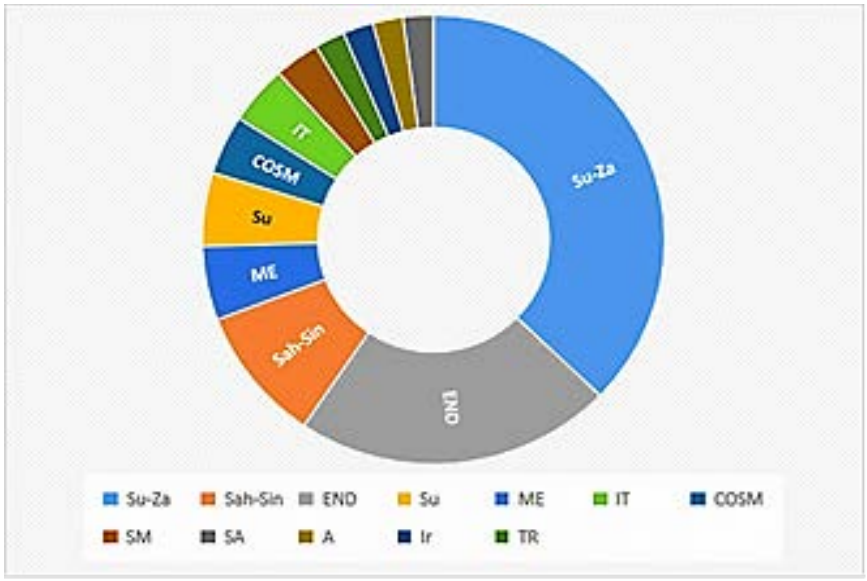


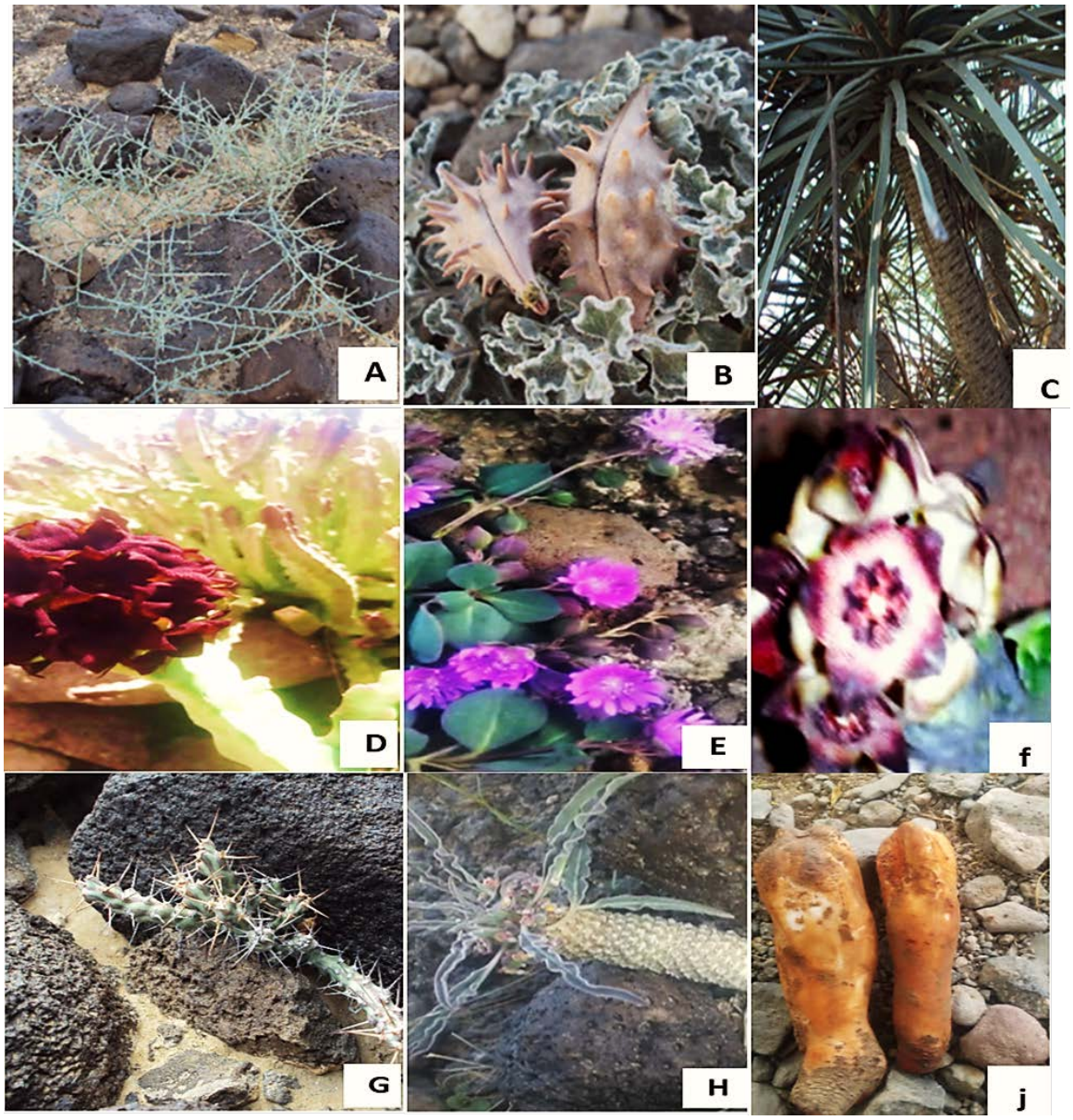
Figure (4): Chorological types spectrum of Succulent plants in WadiYabraq

Table (1):List of succulent plants species which recorded from Yabraq valley.

Family	Scientific names	Habit	Life-forms	Chorotypes
Aizoaceae	*Aizooncanarien*se L.	Herb	Th	Su-Za, Med, Sa-S,
	Trianthema crystallina (Forssk.) Vahl	Herb	Th	Su-Za
	T .portulacastrum L	Herb	Th	Su-Za
Aloeaceae	*Aloe splendens*lavranos	Shrub	Ch	END
	*A . inermis*Forssk	Shrub	Ch	N.END
	*A . vacillans*Forssk	Shrub	Ch	N.END
	A . lanata T.A.McCoy & Lavranos.	Shrub	Ch	END
Aristolochiaceae	*Aristolochiabracteolata* Lam.	Herb	Th	Su-za
Apocynaceae (Asclepiadaceae)	*Adeniumobesum* (Forssk.) Roem. &Schult	Tree	Ph	Su-Za, Sa-Si
	Caralluma adenensis (Defl.) Schum.	Herb	Ch	END
	C .awdaliana (Defl.) A. Berger	Shrub	Ch	END
	C . deflersiana (Defl.) Bergor.	Shrub	He	N.END
	C .edulis (Edgw.) Benth	Herb	He	IT + ME + Su - Za +
	*C .hexogona*lavranos	Herb	He	N.END
	C. penicillata (Defl.) N. E. Brown	Herb	Ch	Su-Za
	C .quadrangula (Forssk.) N. E. Brown	shrub	He	N.END
	Ceropegia subaphylla K. Schuhmann.	Liana	Ch	SA-SI
	C .variegata (Forssk.) Decne.	Liana	Ch	N.END
	Glossoniemavarians (Stocks) Benth. ex Hook. f.	Herb	Ch	Su-Za
	Leptadenia arborea (Forssk.) Schweinf	Shrub	Ch	Su – Za + Sa – Si.
	L .yrotechnica (Forssk.) Decne	Shrub	Ph	Sa-si.+ Ir.-Tur
	Pergulariatomentosa L.	Liana	Ch	SA-SI+SU-ZA
	*Rhytidocaulonmacrolobum*Lavranos	Shrub	Ch	Su-Za
	*Sarcostemma forskalianum*Schultes	Shrub	Ch	N.END
	S . viminale (L) R.Brown	Shrub	Ch	Su,-ZA
Asteraceae	*Kleiniaodora* (Forssk.) A. Berger.	Shrub	Ch	Su-Za
	K . semperviva (Forssk.) DC.	Shrub	Ch	Su-Za
	K .pendula (Forssk.) DC.	Shrub	Ch	Su-Za
	*Launaeahafunensis*Chiov.	Herb	G	Sa – Si.
	L .procumbens (Roxb.) Ramayya&Rajgopal.	Herb	Th	Sa – Si
	L. nudicaulis (L.) Hook. f.	Herb	Ch	Sa– Si
Buraceraceae	*Commiphoraafricana* (A.Rich.) Engl.	Tree	Ph	Su-Za
	C .kataf (Forssk.) Engl.	Tree	Ph	Su-Za
	C .myrrha(Nees) Engl.	Tree	Ph	Su-Za
	*C . schimperi (*O. Berg) Engl	Tree	Ph	Su-Za
Cactaceae	*Opuntia ficus-indica* (L.) Mill	Shrub	Ch	COSM
Capparaceae	*Cappariscartilaginea*Forssk.	Shrub	Ch	Su-Za, Sa Si.
	C .spinosa L.	Shrub	Ch	Su-Za , Sa-Si.

Family	Scientific names	Habit	Life-forms	Chorotypes
Chenopodiaceae	*Salsola forskali*Forssk.	Shrub	Ch	SA-SI, SU-ZA
	*S .spinescens*Moq	Shrub	Ch	Cosm
	Suaeda aegyptiaca (Hasselq.) Zohary	Herb	Ch	SA Si
	*S .monoica*Forssk.	Shrub	Ch	Su- Za
	*Halothamnusbottae*jaub&spack*subspniger*kathe Heinrich	Tree	Ph	N.END
Crassulaceae	*Kalanchoebentii* Hook. f. subsp. bentii	Shrub	Ch	N.END
Cynomoraceae	*Cynomoriumcoccineum*L.	Herb	P.	Su-Za,Sa-Si
Dracaenaceae	*Dracaena ombet*Kotschy&Peyr.	Tree	Ph	Su – Za
	*Sansevieriaehrenbergii*Schweinf. ex Baker	Herb	G	Su – Za
	Sansevieriaforskaoliana (Schult. f.) Hepper & J. R. I. Wood	Herb	G	Su – Za
Euphorbiaceae	*Euphorbia inarticulata*Schweinf.	Shrub	Ch	N.END
	E . balsamifera Ait. *subsp. Adenensis* (Defl.) Bally	Shrub	Ch	Su-Za
	E. cuneata Vahl subsp. cuneata	Shrub	Ch	Su – Za
	E .granulata Forssk. var. granulata	Shrub	Ch	TR
	E. greuteri N. Kilian, Kürschner& P. Hein	Herb	Ch	N END
	E .hirta L.	Herb	Th	COSM
	*E .hadramautica*E.G.Baker	Herb	Ch	END
	*E .indica*Lamk.	Herb	Th	Su-Za +Med.
	*E . larica*Boiss.	Shrub	Ph	TR – SA-SI
	*E .schimperi*Presl.	Shrub	Ch	N.END
	*E . serpens*Kunth.	Herb	Th	Su-Za ,Med.
Hydnoraceae	*Hydnorajohannis*Becc	Herb	P.	Su-Za
Lamiaceae	*Plectranthusmontanus*Benth.	Shrub	Ch	Su-Za
Molluginaceae	*Corbichoniadecumbens* (Forssk.) Exel	Herb	Th	Su-Za + IT
Polygonaceae	*Rumexvesicarius* L.	Shrub	Ph	Su-Za , Med.
Portulacaceae	*Portulaca oleracea* L. *subsp. oleracea*	Herb	Th	Cosm
	Portulacaqundrifida L.	Herb	Th	Cosm
Sterculiaceae	*Sterculiaafricana* (Lour.)Fiori	Tree	Ph	Su-Za
Vitaceae	*Cissusquadrangularis* L.	Shrub	He	Su-Za,Sa-Si
	C. rotundifolia (Forssk.)Vahl.	Shrub	He	Su-Za
Zygophllaceae	*Seetzenialanata* (willd) bull.	Herb	Th	SU
	Tetraena alba (L.F)Beier&Thulin	Herb	Ph	SA
	T. simplex (L.) Beier&Thulin	Herb	Th	IT + Med. + Su - Za + Sa– Si.

Life-form; ph = phanerophytes,Ch = chamaephytes, H = hemicryptophytes, Cr = cryptophytes, Th = therophytes, HE = hemiepiphytes, G = Geophytes, P.= Parasites.
The chorotypes are: Su-Za = Sudano –Zambezian, Sah-Sin= Saharo –Arabian, END= Endemic, N.END= Near Endemic, Su= Sudano, ME= Mediterranian, IT= Irano – Turanian, COMS= Cosmopolitan, SM Somali-anmasai, SA= Saharo-Arabian. A=Arabian, Ir= Iranian, TR= Tropical.



A. *Halothamnusbottae*jaub&spack*subspniger*kathe H
B. *GlossoniemaVarians*
C. *Dracaena ombet*
D. *Carallumaadenensis*
E. *Corbichoniadecumbens*
F. *Carallumahexogona*
G. *Euphorbia greuteri*
H. *Euphorbia Hadramautica*
I. *Hydnorajohannis*

Figure: (5). Some Succulent plants in theStudy area.

CONCLUSION

The succulent flora of Wadi Yabraq consist of 71 succulent taxa belonging to 37 genera the study area is characterized by its rich biodiversity, With 16 endemic and near-endemic species recorded. The predominant life form of the plants is Chamophyta, which is evidence of the plants tolerance to drought. Most of the plants belong to the Sudano –Zambezian, which is prevalent in dry desert areas. It was also found that most of the succulent plants are the local population utilizes these plants both as traditional remedies and as a food source. Consequently, the study suggests that further research should be undertaken on the succulent plants employed by residents for medicinal purposes.

Duality of interest: The authors declare that they have no duality of interest associated with this manuscript.

Author contributions : Contribution is equal between authors.

Funding: No specific funding was received for this work.

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