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Floristic Composition and Vegetation of Wadi Talha, Aseer Mountains, South West Saudi Arabia

Hussien Al Wadie
Biological Sciences, Faculty of Science, King Khaled University, Abha, Saudi Arabia

Abstract: Vegetation was studied along Wadi Talha to the north of Zahran Al Janub (17 46′ N and 43 31 E, with an altitude ranges between 2284-2489 masl. A total of 30 species of vascular plants belonging to 17 families was identified. Chamaephytes, phanerophytes and therophytes are the dominant life forms. Three communities were recognized based on floristic and ecological features in the three ecogeomorphological sectors identified. They are, *Acacia tortilis* subsp. *Tortilis*, *Acacia asak* and *Fagonia brugieri* communities. This study describes the floristic composition of the plant communities where frutescent species form the main framework of the communities.

Key words: Flora, vegetation, plant distribution, Saudi Arabia, Aseer mountains

Introduction

During the last two decades, flora and vegetation of Saudi Arabia have attracted many scholars, like Mandaville (1965), Migahid (1996), Batanouny (1979), Batanouny and Baeshin (1978), Zahran (1983), Boulos (1985), Cope (1985), Collenette (1985), Fayed and Zayed (1989), Abd-el-Ghani (1993), Al-Turki (1997) and Hosni and Hegazy (1996). However, there are still many gaps in our knowledge concerning plant diversity and habitat features of the country. El Karemy and Zayed (1999) noted that studies on plant cover of western Saudi Arabia are scanty or descriptive. Vesey-Fitzgerald (1955) described the vegetation along the Red Sea coastal land, Batanouny and Baeshin (1978, 1983) gave lists of species recorded along Jeddah-Mecca road and along Medina-Badr road.

This study aims to monitor plant life in a semi-arid wadi, called wadi Talha crosses the southern most part of Aseer Mountains, west of Saudi Arabia. It explores also the pattern of plant communities and the factors affect their distribution.

Wadi Talha is 17 km north of Zahran Al Janub. It lies between 17°46′ N and 43° 31′ E with an altitude ranges between 2284-2489 masl (Fig. 1). Open sandy plains characterize the wadi. The area bordering the wadi is composed of tertiary sedimentary rocks to the north while eastern sections are surrounded by basement complex rocks outcrop. Soil is coarse textured and covered by gravel and rock fragments. Plant cover is sparse. Agriculture is being practiced in eastern depressions of the wadi. Cultivation depends on ground-water supplies, which are extracted by motor pumps. Among the main cultivated plants are pomegranate (*Punica granatum*), henna (*Lawsonia inermis*) and tomato (*Solanum lycopersicum*).

Meteorological data mentioned below are obtained from Anonymous (1984). The area under study lies within the semi-arid deserts. The records of Najran and Beishah climatic stations show that the highest average rate of rainfall is in spring (March-April), ranging between 14-30 mm/year. Summer (May-August), autumn (September-November) and winter (December-February) are characterized by low rainfall averages (0-9 mm/year). Air temperatures are high in summer. Available data on air temperatures for wadi Talha show that the mean monthly temperature ranges from 33 °C in December to 42 °C in May. Generally, the average relative humidity in the study area is moderate (70%). This could be attributed to the prevalence of the open desert. High evaporation rate reduces the natural accumulation of surface water.

Material and Methods

Five field trips were carried out to Wadi Talha between a period of 24 months (1998-2001). The collected plant specimens were identified according to, Collenette (1985), Migahid (1996), Miller and Cope (1996) Chaudhary (1989 and 1999). Herbarium specimens are deposited at the herbarium of King Khaled University. Nomenclature of all taxa is following Collenette (1998). The vegetation was studied sociologically according to the line-intercept method (Canfield, 1941), in which line transects of 30 m long were placed along the wadi. Each stand comprises of ten line transects, i.e. covering a total area of 300 m long. In selecting each stand, habitat uniformity and homogeneity were ensured. The cover value for each taxon have been obtained as follows:

Total of intercept length for a species/total of transect length x 100.

Then, Braun–Blanquet (1964) cover-abundance scale was adopted: 5 (above 75%), 4 (50-75%), 3 (25-50%), 2 (5-25%), 1 (up to 5%), + (few with small cover) and r (solitary, with small cover).

Results

Flora of wadi Talha includes 30 species of vascular plants belonging to 17 families. Chamaephytes constitute 43.30% of the floristic composition, followed by phanerophytes (26.60%) and therophytes (20.17) (Fig. 1). The dominance of these life forms over the others should be a response to the semi arid conditions combined with human and animal inimal interference in the area under study.

Plant community of the main wadi bed

***Acacia tortilis* subsp. *Tortilis* community**: Scrubs of *Acacia tortilis* subsp. *Tortilis* are widespread in northern and southern parts of the area surveyed. This community has been reported from the arid deserts of Arabia (Batanouny, 1987; Abd- el-Ghani, 1996, El Karemy and Zayed, 1999) and from the Red Sea coastal hills of Egypt (Zahran and Willis, 1992). This community abounds in main wadi bed and depressions, which have shallow coarse textured soil. Stones and gravel cover considerable part of the ground surface. The soil is fine textured, compact and covered by rocks with considerable part of silt and clay (9.7%). The total plant cover is ranging from 5-25%. Number of recorded species is 17. *Acacia tortilis* subsp. *Tortilis* dominates the tree and shrub layer.

The most common species in this community are *Ficus*, *Citrullus colocynthis*, *Fagonia brugieri* and *Peganum harmala*, *Pulicaria crispa* (Table 1). The herb layer is relatively sparse and may be enriched by ephemeral growth in the rainy season.

Plant community of the rocky plateau

Acacia asak community: Trees of *Acacia asak* dominate northeastern rocky slopes of wadi Talha. The type of the habitat is a gully penetrating the rocky complex, which surround the wadi from its northern borders. This community has a limited distribution and does not contribute to the vegetation in the area, being confined to rocky fissures where the soil is formed of silt with high water retaining capacity. The plant cover is low, being only 10% on average, with recognizable stratification of vegetation. *Fagonia brugieri*, *Lycium shawii*, *Ochradenus baccatus* and *Ziziphus spina-Christi*. Very sparse individuals of *Aerva lanata*,

Table 1: Cover-abundance estimates of species recorded within the recognized habitats in Wadi Talha

	Habitat			
	Wadi bed	Rocky slopes	Stony plateau	
Community dominated by	*Acacia tortilis*	*Acacia asak*	*Fagonia brugieri*	Life form
Acacia asak (Forssk.) Willd.		3		P
Acacia tortilis Hayne	5		3	P
Aerva lanata (L.) Juss. Ex Schult.		1	2	Ch
Aizoon canariensis L.		1	3	Th
Cynoglossum lanceolatum Forssk.		r	1	Th
Echiochilon sp.		r		Th
Calotropis procera (Aiton) W. T. Aiton			2	P
Citrullus colocynthis (L.) Schrad	2			Ch
Commicarpus helenae (Schult.) Meikle	1			Ch
Datura stramonium L.	1			Th
Fagonia brugieri DC	2	2	4	H
Ficus sycomorus L.	4			P
Forsskalea tenaccissima L.	2			H
Gypsophila capillaris (Forssk.) C. Chr.	r			Th
Indigofera arabica Jaub. et Spach	+			Ch
Kickxia sp.		1		Th
Lavandula citriodora A.G. Miller	1			Ch
Lavandula coronopifolia Poir.		2	1	Ch
Lycium shawii Roem. & Schult		2		P
Ochradenus baccatus Delile		2		P
Peganum harmala L.	2			Ch
Pulicaria crispa (Forssk.) Oliv.	2			Ch
Rosaceae		1		P
Solanum incanum L.	2			Ch
Solanum sp.		1		Ch
Verbesina encelioides A. Gray	+			Ch
Withania somnifera (L.) Dunal	1			Ch
Xanthium spinosum L.	1			Ch
Ziziphus spina-Christi (L.) Willd.		2		P
Phragranthera austroarabica A.G. Mill.	1			Pr

P = Phanerophyte, Ch = Chamaephyte, H = Hemicryptophyte, G = Geophyte, Th = Therophyte, Pr = Parasite cover-abundance : 5 = above 75%, 4 = 50-75%, 3 = 25-50%, 2 = 5-25%, 1 = upto 5%, + = Few with small cover, r = solitary with small cover

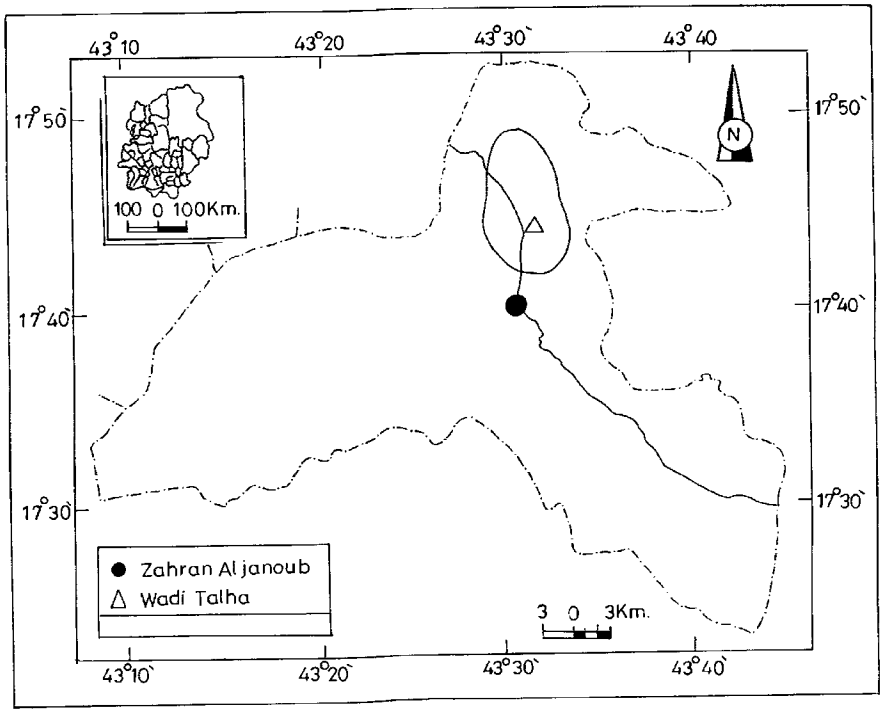

Fig.1: Map of the study area at wide Talha, SW Saudi Arabia

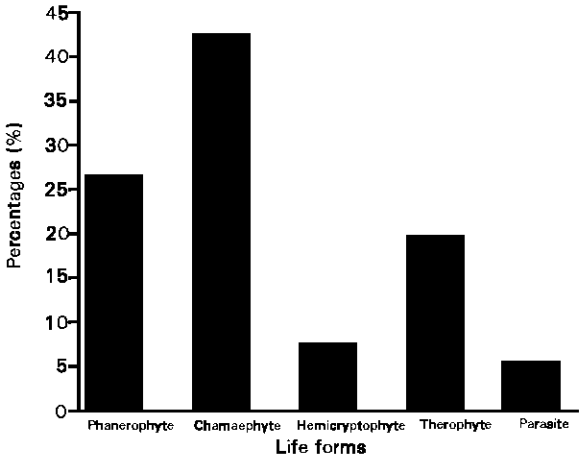

Fig. 2: Life form spectrum of vascular plants at wadi Talha, Saudi Arabia

Aizoon canariensis, *Cynoglossum lanceolatum*, *Echiochilon* sp., *Kickxia* sp. and *Lavandula coronopifolia*.

Plant community of the stony plateau

***Fagonia brugieri* community:** This community has a limited range of distribution confined to stony plateau bounds eastern parts of wadi Talha. Widespread populations of *Fagonia brugieri* dominate this community. It has a limited range of distribution confined to stony plateau covered with sandy soil. The texture of the sand varies in alternate layers but it is usually coarse wind borne material with occasional thin layers of soft water borne silt. The plant cover ranges 10-15%. The plant growth comprises three structural layers with *Acacia* and *Calotropis* providing with *Fagonia brugieri* and *Aizoon canariensis* the main frame of the plant cover. Scattered individuals of *Aerva lanata*, *Cynoglossum lanceolatum*, *Lavandula coronopifolia*, were recorded from the same habitat.

Discussion

Spatial distribution of plant species and communities over a small geographic area in desert ecosystems is related to heterogeneous topography and landform pattern (Kassas, 1952; Harniss and West, 1973). Heterogeneity of the local topography, edaphic factors, microclimatic conditions and degree of slope leads to variation of the distribution behavior of the plant associations of the study area. Three habitats were recognized, viz. main wadi bed, rocky slopes and stony plateau. A permanent framework of trees and shrubs characterizes each of these habitats, which supports special types of vegetation with characteristic floristic composition and plant cover. These habitats are relatively simple in structure hosting the growth of species capable of surviving in such harsh environment.

This is clear by preponderance of highly adapted species, i.e., drought resistant species like *Acacia tortilis*, *Acacia asak* and *Fagonia brugieri*. Abd-El-Ghani (2000) noted that there is a relative advantage of trees and shrubs over herbs in dry areas where water is a limiting factor, as in the study area. The upper dry layer of the soil surface acts as a protective layer, moisture is stored in subsurface layers, and the underlying sandstone provides added water storage capacity, especially in shaded areas below trees and shrubs. The presence of a sub-surface layer that is permanently wet is a well-known phenomenon in the desert (Kassas and Batanouny, 1984).

When the edaphic conditions are more favorable to plant growth that the vegetation becomes denser and numerous associates are encountered (Kassas, 1966; El Karemy and Zayed, 1999), the recognized community types showed different ecological, geographical and sociological distribution: *Acacia tortilis* occurs on deep sandy soil, especially in the main wadi bed, *Acacia asak* grows in rocky gullies, *Fagonia brugieri* abounds stony plateau. These species have repeatedly been recorded as abundant in phytosociological surveys in various habitats in Saudi Arabia and other adjacent Arab Gulf countries (Batanouny, 1987; Abdel Ghani, 1996, 1997, 1998; El Karemy and Zayed, 1999). Plant growth within the area under study shows remarkable seasonal and annual fluctuations. The notable aspects of these fluctuations are primarily due to the growth of annuals and ephemerals that are drought evaders. They usually appear in late winter and early spring in profuse number of individuals. This study shows that trees, shrubs and perennial herbs comprise more than 50% of the total species recorded in each habitat. This is could be attributed to the fact that favourable moisture balance and the higher content of silt and clay in the soil.

The degree of human interference seems also to play a prominent role in forming the characters of vegetation. Human factors contribute to the disruption of the natural equilibrium among the components of the ecosystem thus causing its deterioration (Abd-El–Ghani, 1997). Among the changes in the vegetation induced by human disturbances which lead to the retrogressive changes (Kassas, 1970) in the study area, the following can be mentioned:

- Continued destruction of grass-cover due to uncontrolled grazing increases soil erosion and soil impoverishment, changes the soil's mechanical composition and water relations.
- Construction activities, especially digging and widening the roads, result in the removal of vegetation from vast areas and enhance erosion.
- Severe cutting of trees and shrubs of *Acacia tortilis* either for fuel (charcoal production) or by over-grazing favours invasion of the habitat supporting this vegetation type by *Calotropis procera*. This may cause this plant, on the long-run to be endangered. The modification of species composition of the natural vegetation in the study area by continued human interference is inevitable and affects its diversity and potentiality.

References

Abd-el-Ghani, M., 1993. Habitat features and plant communities of the Holy places, Makkah, Saudi Arabia, Feddes Repertorium, 104: 417-425.

Abd-el-Ghani, M., 1996. Vegetation along a transect in the Hijaz mountains (Saudi Arabia), J. Arid Environ., 32: 289-304.

Abd-el-Ghani, M., 1997. Vegetation analysis and species diversity along an altitudinal gradient in the central Hijaz Mountians of Saudi Arabia, Arab Gulf J. Scientific Res., 15: 399-414.

Abd-el-Ghani, M., 1998. Environmental correlates of species distribution in arid desert ecosystems of eastern Egypt, J. Arid Environ., 38: 297-313.

Abd-el-Ghani, M., 2000. Floristics and environmental relations in two extreme desert zones of western Egypt. J. Global Ecology and Biography, 9: 499-516.

Al-Turki, T.A., 1997. A preliminary checklist of the flora of Qassim, Saudi Arabia. Feddes Repertorium, 108: 259-280.

Anonymous, 1984. Atlas of water resources in Saudi Arabia. Ministry of Agriculture and water resources. Riyadha. Saudi Arabia, pp: 111.

Batanouny, K.H., 1979. Vegetation along the Jeddah-Mecca road: Pattern and process as affected by human impact. J. Arid Environ., 2: 21-30.

Batanouny, K.H.,1987. Current knowledge of plant ecology in the Arab Gulf Countries. Catena, 14: 291-316.

Batanouny, K.H. and N.A. Baeshin, 1978. Studies on the Flora of Arabia. I. The Jeddah-Mecca Road, Saudi Arabia. Taeckholmia, 9: 76-81.

Batanouny, K.H. and N.A. Baeshin, 1983. Plant communities along the Medina-Badr road across the Hijaz mountains, Saudi Arabia. Vegetatio, 53: 33-43.

Boulos, L., 1985. A contribution to the flora of Aseer mountains. Saudi Arabia. Arab Gulf J. Sci. Res., 3: 67-94.

Braun-Blanquet, J., 1964. Pflanzensoziologie. Wien.

Canfield, R., 1941. Application of the line interception method in sampling range vegetation. J. Forestry, 39: 288-294.

Chaudhary, S.A., 1989. Grasses of Saudi Arabia. Riyadh.

Chaudhary, S.A., 1999. Flora of the Kingdom of Saudi Arabia, 1. Riyadh.

Collenette, S., 1985. An illustrated guide to the flowers of Saudi Arabia. London.

Collenette, S., 1998. A checklist of botanical species in Saudi Arabia. Kent, UK.

Cope, T., 1985. A key to the grasses of the Arabian Peninsula. Arab J. Sci. Res., Special Publication.

El Karemy, Z. and K. Zayed, 1999. Studies on the vegetation and soil seed bank in western Saudi Arabia: 1. Wadi Fatima, Taeckholmia, 19: 63-76.

Fayed, A. and K. Zayed, 1989. Vegetation along Makkah-Taif road (Saudi Arabia). Arab Gulf J. Sci. Res., 7: 97-117.

Harniss, R.O. and N.E. West, 1973. Vegetation of the national reactor testing station, southeastern Idaho. Northwest Sci., 45: 30-43.

Hosni, H. and A. K. Hegazy, 1996. Contribution to the flora of Aseer, Saudi Arabia. Candollea, 51: 169-202.

Kassas, M., 1952. Habitat and plant communities of the Egyptian deserts. I. Introduction. J. Ecol., 40: 342-351.

Kassas, M., 1966. Plant life in deserts. In E. S. Hills (ed), Arid lands: 145-180.

Kassas, M., 1970. Desertification versus potential in circum-Saharan territories In: H. E. Dregne (ed) Arid land in transition, pp: 123-142.

Washington Kassas, M. and K. H. Batanouny, 1984. Plant ecology. In: Cloudsley-Thompson, J.J. (ed) Sahara Desert. pp: 77-90. Pergamon Press, Oxford.

Mandaville, J.P., 1965. A contribution to the flora of Asir, Southern Arabia. Coconut Grove Miami Field Res. Publ., 4: 1-13.

Migahid, A.M., 1996. Flora of Saudi Arabia. 4th ed. Riyadh.

Miller, A.G. and T.A Cope, 1996. Flora of the Arabian Peninsula and Socotora. Vol 1. Edinburgh.

Vesey-Fitzgerald, D.F., 1955. The vegetation of Red Sea coast North of Jeddah, Saudi Arabia. J. Ecol., 43: 477-483.

Zahran, M., 1983. Introduction to plant ecology and vegetation types in Saudi Arabia. Jadah: King Abdulaziz University.

Zahran, M. and A.J. Willis, 1992. The vegetation of Egypt. Chapman and Hall. London.