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PLANT BIODIVERSITY AND PHYTOSOCIOLOGICAL ATTRIBUTES OF TIKO BARAN (KHIRTHAR RANGE)

MUHAMMAD ISHTIAQ HUSSAIN AND ANJUM PERVEEN

Department of Botany, University of Karachi, Karachi 75270, Pakistan.

Abstract

A study was conducted for the plant biodiversity and phytosociological attributes of the Tiko Baran, Khirthar range. Tiko Baran is located in Dadu district. The primary goal of this study is to provide inclusive inventory of the area. The study area was thoroughly surveyed throughout the year (2008) from time-to-time in order to study the plant biodiversity. Tiko baran has never been explored for its plant biodiversity. Plants were collected from the study area, in different parts of the year i.e., in winter, summer and monsoon. Phenological status of each species i.e. flowering and fruiting conditions were also observed. Quantitative analysis on species diversity in addition to phytosociological attributes analysis were conducted. Some ecological parameters such as life forms, species density, species cover, species relative density and frequency were calculated. Within the study area 70 plant species representing 59 genera and 31 families were found.

Introduction

The Khirthar range comprises of eastern part of Khirthar mountains. It is approximately 400 Km long and 30 Km wide. North-South oriented hill range and its altitude varies from about 1000 m in the south to 2400 m in the north. The area of Khirthar range is covered with calcareous rocks (Anon., 2005). The Khirthar range includes three types of protected areas the Khirthar National Park, Mahal Kohistan Wild life Sanctuary and the Sumbak Game reserve (Akhter, 2003). The entire Khirthar National Park falls under Saharo-Sindian region (Ali & Qaiser, 1986) or Sudanian region (Zohary, 1973). The vegetation of the whole area is xerophytic, sparse and dominated by spiny thorny shrubs, bushes and few tree species along with large number of ephemerals. The area, which is taken under consideration, has been visited in different parts of the year for plant collection, phytosociological attributes and ecological conditions of the study area. Species composition and their population level fluctuate from year to year depending on the rains.

The present paper summarizes one year of field and laboratory investigation on plants of Tiko baran. Every species name cited in this paper is documented and deposited in KUH. The material examined includes herbarium specimens present in KUH and field collections. This is the first attempt to compile and organize all the available data on Tiko Baran flora. There is no published report on flora of the region. However, Baseline study of Khirthar National Park was carried by University of Melbourne (Enright & Miller, 2000) and environmental impact assessment for the exploratory wells on Dumbar-Khirthar. Qaiser *et al*., (2002). Akhtar (2003) reported 502 plant species in Plant guide of Khirthar National Park.

The Tiko Baran lies 100 Km north of Karachi near the tehsil Taung in western Sindh Province. The area is 85,122 ha., series of mountain ridges running in a roughly north-south direction and adjacent plains with occasional rocky outcrops. The climate of the region is hot and arid with very little rainfall. The average rainfall is about 85 mm of

which maximum is received during the monsoon period i.e. from June to September. The winters are dry with a very little rainfall. The summer temperature averages between 45°C to 49°C and the winter temperature varies between 20°C to 25°C during day and 10°C –15°C during night (Enright & Miller, 2000). A number of springs that flows throughout the year exist in the study area. These springs along with a few water holes are the primary source of water for people, livestock and wildlife inhabiting the area. Tiko Baran is important for Urial, Ibex (International Union for Conservation of Nature Resources (Anon., 1998).

Materials and Methods

The study area was thoroughly surveyed throughout the year from time to time to study the botanical and ecological conditions. It provides an opportunity to make plant collections and field observations during the flowering and fruiting of maximum number of species. The area was sampled by quadrat method. Random stratified sampling was done using 10' x 10' quadrat and in each community 5 to 10 quadrats were taken.

Frequency and cover of each species were noted. The quadrats were laid down at regular intervals of 10 steps. Plants from each quadrat were collected and associate species even not present in the quadrats were also noted down and collected. Specimens were identified using available literatures and by comparison of the collections with specimens at KUH. Nomenclature followed here is that from Flora of Pakistan (Nasir & Ali, 1970–1989), Ali & Nasir (1989-1991) and Ali & Qaiser (1993- till todate). The Importance Value Index (IVI) of all the plant species noted in the quadrats was calculated (Tables 2-4).

Result and Discussion

The Tiko Baran is located in Pakistan about 25 Km from Taung (Dadu) in Sindh Province. Environmental condition of the study area is very severe, little rain fall and poor soil condition neither support rich species nor luxurious growth.

During vegetation survey, 70 plant species were recorded belonging to 31 families and 59 genera (Table 1). The largest family was Poaceae while other families were Paplionaceae and Asteraceae. No endemic species has been found from the study area. Four rare species are found from the study area i.e., *Justicia vahlii* Roth, *Evolvulus alsinoides* (L.) L., *Polygonum plebijum* R. Br. & *Chascanum marrubifolium* Fenzl. ex Walp. The life form of each species depending on the position of perenating buds has also been determined according to Raunkiaer system of classification (Raunkiaer, 1934). Chaemophytes are the most dominant class of life form in the study area followed by therophytes, phanerophytes, hemicryptophytes and climbers.

Within study areas following habitats have been found viz., Hill top, Rocky slope, Canyon, Stony plan and Dry stream bed. The common associates of hill top are *Grewia villosa* Willd., *Withania coagulans* Dunal., *Salvadora oleoides* Dcne., *Zizyphus nummularia* (Burm. f.) W. & Arn., *Dicoma tomentosa* Cass., and *Periploca aphylla* Dcne. The vegetation condition is slightly better, grazing pressure is less than the rest of the area due to higher altitude.

Table 1. List of the plant species found in Tiko Baran along with their life form, abundance and Phenological status.

Species	Life Form	Abundance	Phenological status	
			Flowering	Fruiting
Acanthaceae				
Barleria acanthoides Vahl	Chaemophyte	Common	-	-
Justicia vahlii Roth	Therophyte	Rare	+	-
Aizoaceae				
Corbinchonia decumbens Scop.	Therophyte	Common	+	+
Limeum indicum Stocks	Therophyte	Common	-	+
Amaranthaceae				
Aerva javanica (Burmi. f.) Juss. ex Schult.	Chaemophyte	Infrequent	+	+
Apocynaceae				
Rhazya stricta Dcne.	Phanerophyte	Common	-	+
Asteraceae				
Blainvillea acmella (L.) Philipson	Therophyte	Infrequent	-	-
Dicoma tomentosa Cass.	Chaemophyte	V. Common	+	+
Echinops echinatus Roxb.	Chaemophyte	Common	+	+
Iphiona grantioides (Boiss.) Anderb.	Chaemophyte	Common	+	-
Vernonia cinerascens Sch.-Bip.	Chaemophyte	Common	+	+
Asclepiadaceae				
Leptadenia pyrotechnica (Forssk.) Dcne.	Phanerophyte	V. Common	-	+
Periploca aphylla Dcne.	Phanerophyte	V. Common	-	+
Boraginaceae				
Heliotropium ophioglossum Boiss.	Chaemophyte	Common	+	+
Trichodesma africanum (L.) R. Br.	Therophyte	Common	+	+
Heliotropium crispum Stocks	Chaemophyte	Common	+	+
Burseraceae				
Commiphora wighlii (Arn.) Bhandri	Phanerophyte	Infrequent	-	+
Caesalpiniaceae				
Senna holosericea (Fresen.) Greuter	Chaemophyte	Common	+	-
Capparidaceae				
Capparis cartilaginea Decne.	Phanerophyte	Common	+	+
Capparis decidua (Forssk.) Edgew.	Phanerophyte	V. Common	+	+
Cleome scaposa DC.	Therophyte	Common	+	-
Cleome viscosa L.	Therophyte	Common	-	-
Convolvulaceae				
Seddera latifolia Hochst. & Stued.	Chaemophyte	Common	+	-
Convolvulus spinosus Burm. f	Chaemophyte	Common	-	-
Evolvulus alsinoides (L.)L.	Chamophytes	Rare	+	-
Cucurbitaceae				
Cucumis prophetarum L.	Therophyte	Infrequent	+	-
Euphorbiaceae				
Andrachne aspera Spreng.	Phanerophyte	V. Common	+	+
Euphorbia caudicifolia Haines.	Therophyte	Common	+	-
Euphorbia granulata Forssk.	Therophyte	Common	+	+
Euphorbia prostrata Ait.	Therophyte	Common	+	-
Labiatae				
Salvia santolinaefolia L.	Chaemophyte	Infrequent	+	-
Malvaceae				
Hibiscus micranthus L.f.	Chaemophyte	Common	+	-
Pavonia arabica Hochst.& Stued. ex Boiss.	Chaemophyte	Infrequent	+	+
Senra incana Cav.	Chaemophyte	Infrequent	+	-
Menispermaceae				
Cocculus pendulus (J. R. & G. Forst.) Diels	Chaemophyte	Infrequent	-	-
Mimosaceae				
Acacia jacquemontii Benth.	Phanerophyte	Infrequent	+	+
A.nilotica (L.) Delile	Phanerophyte	Common	+	-
A.senegal (L.) Willd.	Phanerophyte	V. Common	+	+

Table 1. (Cont'd.).

Species	Life Form	Abundance	Phenological status	
			Flowering	Fruiting
Nyctaginaceae				
Boerhaavia procumbens Banks ex Roxb.	Chaemophyte	Infrequent	+	-
Commicarpus boissieri (Heinsen) Cufod.	Chaemophyte	Common	+	-
Papilionaceae				
Indigofera oblongifolia Forssk	Chaemophyte	Common	+	-
Rhynchosia minima (L.) DC.	Climber	Infrequent	+	+
Tephrosia uniflora Pers.	Chaemophyte	Infrequent	+	+
Poaceae				
Aristida adscensionis L.	Therophyte	Common	+	-
A. hystricula Edgew.	Therophyte	Common	-	-
Cenchrus ciliaris L.	Therophyte	Common	+	+
Cenchrus setigerus Vahl	Therophyte	Common	+	-
Crysopogon aucheri (Boiss.) Stapf.	Therophyte	Common	+	+
Dicanthium annulatum (Forssk.) Stapf	Therophyte	Common	+	-
Eragrostis ciliaris (L.)R.Br.	Hemicryptophyte	Infrequent	+	-
Panicum turgidum Forssk.	Chaemophyte	Common	+	-
Tetrapogon villosus Desf.	Chaemophyte	Infrequent	-	+
Polygonaceae				
Polygonum plebijum R. Br.,	Therophyte	Rare	+	+
Pleropyrum olivieri Jaub. & Spach	Chaemophyte	Common	-	+
Resedaceae				
Reseda aucheri Boiss.	Chaemophyte	Infrequent	-	-
Rhamnaceae				
Ziziphus numularia (Burm.f.) W. & Arn.	Phanerophyte	V. Common	+	+
Salvadoraceae				
Salvadora oleoides Dcne.	Phanerophyte	V. Common	+	-
Scrophulariaceae				
Anticharis linearis (Benth.) Hochst. ex Aschers	Therophyte	Infrequent	+	-
Solanaceae				
Datura innoxia Mill.	Chaemophyte	Infrequent	+	-
Solanum surattense Burm.f.	Chaemophyte	Infrequent	+	+
Withania coagulans Dunal.	Chaemophyte	V. Common	+	+
Tamaricaceae				
Tamarix dioca Roxb. ex Roth	Phanerophyte	Common	+	+
T. stricta Boiss.	Phanerophyte	Common	+	+
Tiliaceae				
Corchorus depressus (L.) Stocks	Hemicryptophyte	Infrequent	+	-
C. tridens L., Mant.	Phanerophyte	Common	+	-
Grewia tenax (Forssk.) Fiori	Phanerophyte	V. Common	+	+
Grewia villosa Willd.	Phanerophyte	Common	-	-
Umbelliferae				
Psammogeton cabulicus (Wag.) E. Nasir.	Therophyte	V. Common	+	+
Verbenaceae				
Chascanum marrubifolium Fenzl. ex Walp.	Chaemophyte	Rare	+	+
Zygophyllaceae				
Fagonia indica Burm.f.	Chaemophyte	V. Common	+	-

Different life form occurring in	**Tiko Baran**
Life forms	**%age**
Chaemophyte	43
Therophyte	28
Phanerophyte	24.4
Hemicryptophyte	4.16
Climber	1.43

Table 2. Phytosociological attributes of plants occurring in Rocky-Slope.

Name of species	Locality: Tiko Baran				
	F1	F3	D3	C3	IVI
Aristida adscensionis	40	14.81	14.00	29.86	19.55
Rhazya stricta	45	16.66	18.66	20.76	18.69
Convolvulus spionsus	40	14.81	13.33	16.30	14.81
Blepharis sindica	35	12.96	24.66	3.35	13.65
Echinops echinatus	20	7.40	8.00	6.30	7.23
Acacia senegal	15	5.55	2.00	10.11	5.88
Withania coagulans	20	7.40	3.33	4.72	5.15
Aerva javanica	10	3.70	4.00	5.13	4.27
Ziziphus nummularia	10	3.70	1.33	7.10	4.04
Fagonia indica	10	3.70	2.66	2.63	2.99
Trichodesma africanum	10	3.70	1.33	1.95	2.32
Grewia tenax	5	1.85	1.33	0.195	1.12
Cleome scaposa	5	1.85	1.33	0.09	1.09

Table 3. Phytosociological attributes of plants occurring in Canyon communities.

Name of species	Locality: Tiko Baran				
	D3	F1	F3	C3	IVI
Rhazya stricta	27.60	40	14.28	20.53	20.80
Indigofera oblongifolia	18.40	40	14.28	16.90	16.52
Grewia tenax	13.80	30	10.71	5.27	9.92
Periploca aphylla	6.15	30	10.71	11.92	9.59
Withania coagulans	6.15	30	10.71	6.57	7.81
Tamarix stricta	7.69	20	7.14	7.47	7.43
Acacia senegal	3.07	20	7.14	8.05	6.08
Capparis cartilaginea	4.61	10	3.57	6.67	4.95
Ziziphus nummularia	1.53	10	3.57	5.62	3.57
Cocculus pendulus	3.07	10	3.57	2.50	3.04
Leptadenia pyrotechnica	1.53	10	3.57	3.13	2.74
Rhyncosia minima	1.53	10	3.57	1.17	2.09
Boerhaavia procumbens	3.07	10	3.57	1.80	2.30

Table 4. Phytosociological attributes of plants communities occurring in Dry stream bed.

Name of species	Locality: Tiko Baran				
	D3	F1	F3	C3	IVI
Capparis decidua	26.41	70	26.92	40.27	31.20
Salvadora oleoide	7.54	30	11.53	16.55	11.87
Ziziphus nummularia	11.32	20	7.69	15.66	11.55
Blepharis sindica	15.09	30	11.53	3.53	10.05
Aerva javanica	11.32	20	7.69	5.33	8.11
Hibiscus micranthus	5.66	20	7.69	9.12	7.49
Senna holosericea	9.43	20	7.69	3.63	6.91
Fagonia indica	7.54	20	7.69	3.35	6.19
Reseda aucheri	3.77	10	3.84	1.69	2.53
Heliotropium ophioglossum	1.88	10	3.84	3.84	2.20

D3= Relative density, F1= Frequency, F3= Relative frequency, C3= Relative cover, IVI= Important index value.

Dry stream bed is often notable in species-rich habitats and is responsible for higher rate of biomass production when compared with adjacent habitats (Brinson, 1990; Decamps & Tabacchi, 1994). The dominant species of dry stream bed are *Acacia senegal* (Linn.) Willd., and *Grewia tenax* (Forssk.) Fiori. *Rhazya stricta* Decne., *Zizyphus nummularia* (Burm. f.) W. & Arn., and *Fagonia indica* Burm.f.

Rocky slopes are very rich in vegetation along with hill top community with species like *Trichodesma africanum* (L.) R.Br., *Dicoma tomentosa* Cass., *Leptadenia pyrotechnica* (Forssk.) Dcne., *Euphorbia caudicifolia* Haines., and *Aristida adscensionis* L.

Canyon habitat occurs at a higher altitude. Due to its topographic position there is less grazing pressure, the vegetation is rich and dense. In Canyon habitat of study area the communities are dominated by *Rhazya stricta* Decne., *Grewia tenax* (Forssk.) Fiori., *Indigofera oblongifolia* Forssk., *Corchorus tridens* L., *Periploca aphylla* Dcne., *Zizyphus nummularia* (Burm. f.) W. & Arn., *Acacia senegal* Burm, f., *Corbichonia decumbens* Scop., and *Fagonia indica* Burm.f.,

The cutting of trees and shrubs by people and the digging of valuable medicinal herbs are increasingly altering the composition and distribution of plants in the study area and its surrounding valleys. Goats and sheep are the main threat for the vegetation of the study area. Grazing pressure, becoming more intense each year and the habitat is being modified as a result in many region of the Tiko Baran.

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References

Akhtar, R. 2003. A plant guide to Khirthar National Park and adjoining areas. Premier–Kufpec Pakistan B.V. Islamabad.

Ali, S.I. and M. Qaiser. (eds.). 1993-todate. Flora of Pakistan. 194-215.

Ali, S.I. and M. Qaiser. 1986. A phytogeographical analysis of phanerogams of Pakistan. *Proc. Roy. Soc. Edin*., 89B: 89-101.

Ali, S.I. and Y.J. Nasir. (eds.). 1989-1991. Flora of Pakistan. 191-193.

Anonymous. 1998. International Union for Conservation of Nature and Natural Resources, Rapid assessment of wildlife and its habitat in Dureji.

Anonymous. 2005. Khirthar Range. Encyclopaedia Britannica.Retrieved, Oct. 27, 2005, from Encyclopaedia Britannica Premium Service. http:// www.britannica.com/eb/article - 9045643

Brinson, M.M. 1990. Reverine Forests. In: *Ecosystems of the Worlds* 15. Forested Wetlands. (Eds.): M. Lugo, M. Brinson and S. Brown. Oxford: Elsevier.

Decamps, H. and E. Tabacchi. 1994. Species richness in vegetation along river margins. In: *Aquatic Ecology: Scale Patterns and Processes*. (Eds.): P.S. Giller, A. Hildrew and D.D. Rafaelli. Oxford: Blackwell Scientific Publications.

Enright, N.J. and P.B. Miller. 2000. Baseline study of Khirthar National Park, University of Melbourne.

Nasir, E. and S.I. (eds.). 1970-1989. Flora of Pakistan, 1-190.

Qaiser, M. 2002. Environmental impact assessment for exploratory wells on Dumbar–Khirthar (unpublished).

Raunkiaer, C. 1934. The life forms of plants and statistical plant geography, Oxford.

Zohary, M. 1973. GeobotanicalFoundations of the Middle East. vols. 2. Stuttgart.

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