

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

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

Table 1. (Cont'd.).

Species	Life Form	Abundance	Phenological status	
			Flowering	Fruiting
Nyctaginaceae				
<i>Boerhaavia procumbens</i> Banks ex Roxb.	Chaemophyte	Infrequent	+	-
<i>Commicarpus boissieri</i> (Heinsen) Cufod.	Chaemophyte	Common	+	-
Papilionaceae				
<i>Indigofera oblongifolia</i> Forssk	Chaemophyte	Common	+	-
<i>Rhynchosia minima</i> (L.) DC.	Climber	Infrequent	+	+
<i>Tephrosia uniflora</i> Pers.	Chaemophyte	Infrequent	+	+
Poaceae				
<i>Aristida adscensionis</i> L.	Therophyte	Common	+	-
<i>A. hystricula</i> Edgew.	Therophyte	Common	-	-
<i>Cenchrus ciliaris</i> L.	Therophyte	Common	+	+
<i>Cenchrus setigerus</i> Vahl	Therophyte	Common	+	-
<i>Cryspogon aucheri</i> (Boiss.) Stapf.	Therophyte	Common	+	+
<i>Dicanthium annulatum</i> (Forssk.) Stapf	Therophyte	Common	+	-
<i>Eragrostis ciliaris</i> (L.) R.Br.	Hemicryptophyte	Infrequent	+	-
<i>Panicum turgidum</i> Forssk.	Chaemophyte	Common	+	-
<i>Tetrapogon villosus</i> Desf.	Chaemophyte	Infrequent	-	+
Polygonaceae				
<i>Polygonum plebium</i> R. Br.,	Therophyte	Rare	+	+
<i>Pteropyrum olivieri</i> Jaub. & Spach	Chaemophyte	Common	-	+
Resedaceae				
<i>Reseda aucheri</i> Boiss.	Chaemophyte	Infrequent	-	-
Rhamnaceae				
<i>Ziziphus numularia</i> (Burm.f.) W. & Arn.	Phanerophyte	V. Common	+	+
Salvadoraceae				
<i>Salvadora oleoides</i> Dcne.	Phanerophyte	V. Common	+	-
Scrophulariaceae				
<i>Anticharis linearis</i> (Benth.) Hochst. ex Aschers	Therophyte	Infrequent	+	-
Solanaceae				
<i>Datura innoxia</i> Mill.	Chaemophyte	Infrequent	+	-
<i>Solanum surattense</i> Burm.f.	Chaemophyte	Infrequent	+	+
<i>Withania coagulans</i> Dunal.	Chaemophyte	V. Common	+	+
Tamaricaceae				
<i>Tamarix dioca</i> Roxb. ex Roth	Phanerophyte	Common	+	+
<i>T. stricta</i> Boiss.	Phanerophyte	Common	+	+
Tiliaceae				
<i>Corchorus depressus</i> (L.) Stocks	Hemicryptophyte	Infrequent	+	-
<i>C. tridens</i> L., Mant.	Phanerophyte	Common	+	-
<i>Grewia tenax</i> (Forssk.) Fiori	Phanerophyte	V. Common	+	+
<i>Grewia villosa</i> Willd.	Phanerophyte	Common	-	-
Umbelliferae				
<i>Psammogeton cabulicus</i> (Wag.) E. Nasir.	Therophyte	V. Common	+	+
Verbenaceae				
<i>Chascanum marrubifolium</i> Fenzl. ex Walp.	Chaemophyte	Rare	+	+
Zygophyllaceae				
<i>Fagonia indica</i> 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
<i>Aristida adscensionis</i>	40	14.81	14.00	29.86	19.55
<i>Rhazya stricta</i>	45	16.66	18.66	20.76	18.69
<i>Convolvulus spionsus</i>	40	14.81	13.33	16.30	14.81
<i>Blepharis sindica</i>	35	12.96	24.66	3.35	13.65
<i>Echinops echinatus</i>	20	7.40	8.00	6.30	7.23
<i>Acacia senegal</i>	15	5.55	2.00	10.11	5.88
<i>Withania coagulans</i>	20	7.40	3.33	4.72	5.15
<i>Aerva javanica</i>	10	3.70	4.00	5.13	4.27
<i>Ziziphus nummularia</i>	10	3.70	1.33	7.10	4.04
<i>Fagonia indica</i>	10	3.70	2.66	2.63	2.99
<i>Trichodesma africanum</i>	10	3.70	1.33	1.95	2.32
<i>Grewia tenax</i>	5	1.85	1.33	0.195	1.12
<i>Cleome scaposa</i>	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
<i>Rhazya stricta</i>	27.60	40	14.28	20.53	20.80
<i>Indigofera oblongifolia</i>	18.40	40	14.28	16.90	16.52
<i>Grewia tenax</i>	13.80	30	10.71	5.27	9.92
<i>Periploca aphylla</i>	6.15	30	10.71	11.92	9.59
<i>Withania coagulans</i>	6.15	30	10.71	6.57	7.81
<i>Tamarix stricta</i>	7.69	20	7.14	7.47	7.43
<i>Acacia senegal</i>	3.07	20	7.14	8.05	6.08
<i>Capparis cartilaginea</i>	4.61	10	3.57	6.67	4.95
<i>Ziziphus nummularia</i>	1.53	10	3.57	5.62	3.57
<i>Cocculus pendulus</i>	3.07	10	3.57	2.50	3.04
<i>Leptadenia pyrotechnica</i>	1.53	10	3.57	3.13	2.74
<i>Rhyncosia minima</i>	1.53	10	3.57	1.17	2.09
<i>Boerhaavia procumbens</i>	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
<i>Capparis decidua</i>	26.41	70	26.92	40.27	31.20
<i>Salvadora oleoide</i>	7.54	30	11.53	16.55	11.87
<i>Ziziphus nummularia</i>	11.32	20	7.69	15.66	11.55
<i>Blepharis sindica</i>	15.09	30	11.53	3.53	10.05
<i>Aerva javanica</i>	11.32	20	7.69	5.33	8.11
<i>Hibiscus micranthus</i>	5.66	20	7.69	9.12	7.49
<i>Senna holosericea</i>	9.43	20	7.69	3.63	6.91
<i>Fagonia indica</i>	7.54	20	7.69	3.35	6.19
<i>Reseda aucheri</i>	3.77	10	3.84	1.69	2.53
<i>Heliotropium ophioglossum</i>	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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