Global Journal of Science Frontier Research
Biological Sciences
Volume 13 Issue 2 Version 1.0 Year 2013
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Plants Community Composition and Dynamism During Summer in Tehsil Takht-E-Nasrati Hills, District Karak, Pakistan

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Abstract - Plant life community structure is a key marker of long-term vegetation change in semi-arid ecosystems. In the present investigation overall 11 plant communities were recorded during summer. The number of plant species differs in different communities. As a whole in plains the Cenchrus-Zizyphus-Saccharum community was developed and composed of 36 species. There were 9 tree, 12 shrub and 15 herb species. The importance value contributed by three dominants species i.e., Zizyphus maurtiana, Aerua persica and Rhazya stricta was 63.34 while total importance value of 236.66 was provided by the remaining species. The contribution by tree was 47.76, shrubs (IV = 82.05) and herbs (IV = 170.20). The soil of the area had better calcium carbonate in the range of (12.3 – 12.7 %), with soil pH (6.06 – 8.13). The concentrations of P and K content were found in the range of (3.64-3.86 mg Kg-1) and (112-127 mg Kg-1). The EC was found in the range of (0.15-0.21 dS m-1). The soil texture was found from sandy clay to sandy clay loam. These results emphasize the continuous need for long-term ground-based ecological monitoring in conjunction with satellite-based monitoring of changes in plant life cover.

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GJSFR-C Classification : *FOR Code: 780105, 270402*

Strictly as per the compliance and regulations of :

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I. Introduction

The Tehsil Takht-e-Nasrati hills comprise one of the richest and most curious ecosystems on earth. The Tehsil Takht-e-Nasrati hills are characterized by low productivity, high intensity of solar radiation and high degree of resource seasonality. The vegetation of this fragile biome is adapted to the insignificant conditions occurring with thin populations. Tehsil Takht-e-Nasrati high altitude grazing area are very important being a wild life habitat, water catchment and a livelihood source for nomadic and transhumant inhabitants. The community structure and distribution patterns of Tehsil Takht-e-Nasrati and their hills have not been given due attention till the date by the plant ecologists, and hence poorly understood (Khan, 2012). The distribution and community structure of plant life is governed by adverse edaphic and climatic factors; mainly by rainfall and redistribution of water that decrease with the increase in altitude. Temperature is also one of the most important limiting factors controlling the distribution and community structure of Tehsil Takht-e-Nasrati plant life. Here the altitude has much greater effect on temperature than latitude. Mean annual temperature decrease with increase in elevation, more rapidly in summer than in winter. This altitude based temperature gradient is the vital factor shaping the plant life types and determining their diversity and distribution (Heaney and Proctor, 1989; Tanner *et al.*, 1998; Vazquez and Givnish, 1998).Hilly areas are characterized by scanty rainfall, high ultraviolet (UV) radiation, high wind velocity, blizzards, low temperature and snowstorms. The plants of this zone show an adaptation to these conditions and are generally dwarfed, stunted, wooly or spiny, and develop a mosaic patch of different forms. They possess an early growth initiation with a tiny vegetative period ranging from several days to a few months. The community as a whole usually exhibits seasonal fluctuations, and its structure and composition are strongly influenced by the extent to which periodic phenomena in the individuals are adjusted to each other (Kershaw, 1973). In Tehsil Takht-e-Nasrati, the hilly area cover 50% (Khan et al., 2011). These areas are used for grazing throughout the year. The hilly area are severely degraded due to nomadic and sedentary livestock overgrazing. Due to huge population increases and frighteningly increasing urbanization practices, existing reserve forests and grazing lands are overburdened with community rights making it impossible to reduce the grazing pressure (Gupta & Nanda, 1970; Gupta, 1977). Grazing practices are one of the important determinants of vegetation distribution patterns and having most obvious impact on the floral biodiversity of an area (Vallentine, 2001). Many researchers (Vigne, 1842; Duthie, 1892; Stewart, 1961; Dickore, 1995; Negi, 1995; Sardar, 1997; Stainton, 1998; Shinwari and Gillani, 2002) have studied different aspects of vegetation structure and distribution patterns in different parts of Pakistan. Phytosociology or plant sociology is an invaluable method for vegetation survey and assessment involving investigation of characteristics of plant communities using simple and rapidly employing field techniques (Rieley and Page, 1990). In the present study, an effort has been made to investigate and analyse correlation of vegetative attributes with key environmental factors i.e. altitude.

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II. Research Area

The Tehsil Takhti Nasratti is situated at 32.47° to 33.28° North and 70.30 ° to 71.30° East. The Tehsil is bounded by Tehsil Banda Dawood Shah on the North West, Tehsil Karak on the North East, District Mianwali and District Lakki Marwat on the South East, and Tribal area Adjoining District Bannu on the South West (Fig. 1). The total area of Tehsil is about 613.66 Sq. kilometer. Majority of the area consists of rigged dry hills and rough fields areas i.e. 323.97 Sq. kilometers and agriculture land is about 289.7 Sq. kilometer. The major income source of the people is Agriculture, which is rain depended. The area is situated at 340 m above the sea level. Environmental data showed that mean air temperature was high in month of June (39.5° C) and low in month of September (21.95° C), relative humidity was high (77.21%) in month of September and low (30.73 %) in May, rainfall (121.6 mm) was high in July and low (31.6 mm) in May, soil temperature (26.77° C) was high in month of July, wind speed was high in month of June (5.5 Km/h) and low (3.7 Km/h) in September, which indicated dry condition during summer. Summer season started from May to September in the area and 11 plant communities were recognized in plains. The investigated area shows altitudinal variation i.e. from 340m - 500m. This also caused deviation in plant life structure (Table 1).

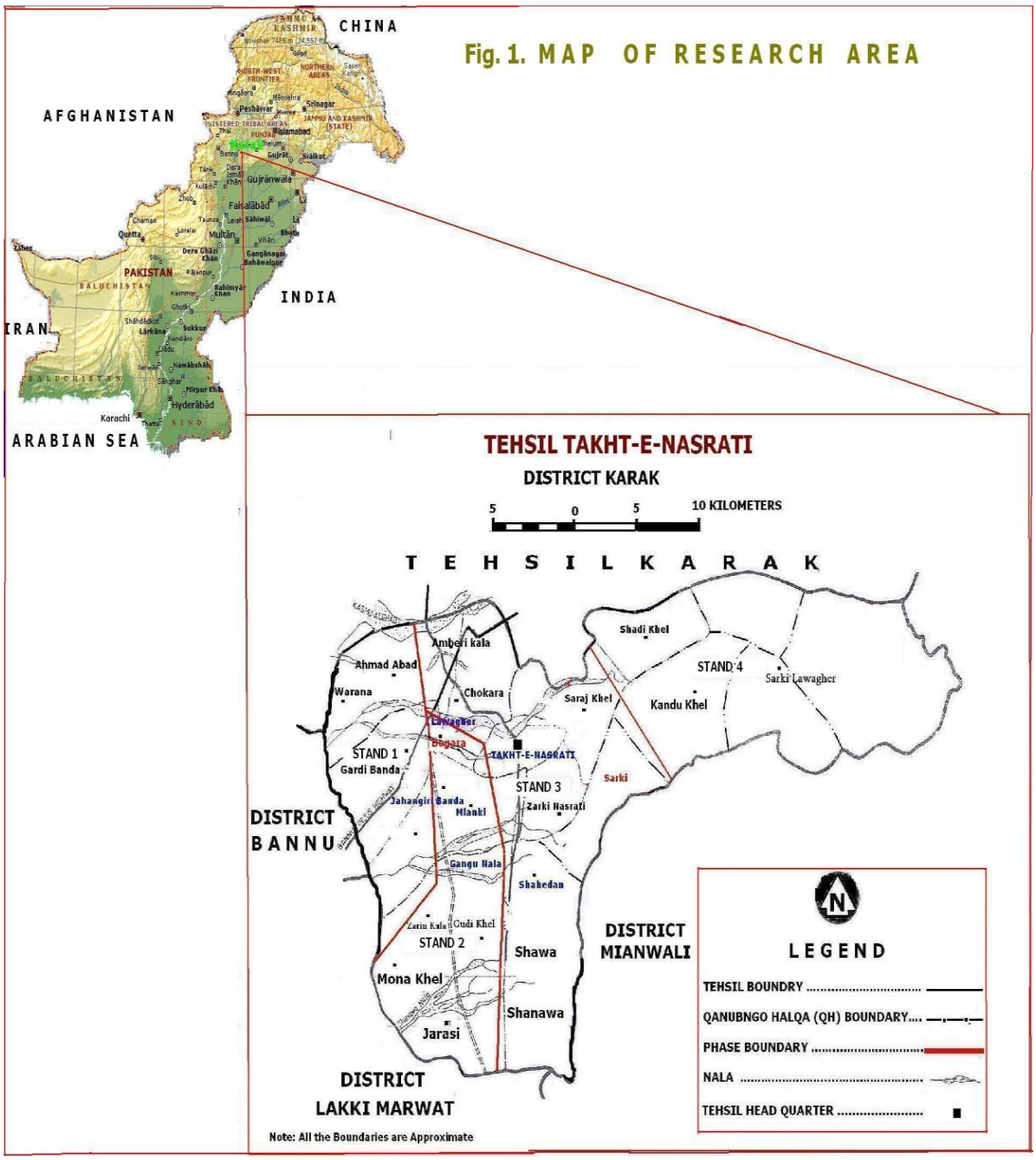

Figure 1 : Map of Tehsil Takht-e- Nasrati showing research spots

Some serious ecological operating problems facing to the area are as follows:

a) Deforestation

A serious ecologically operating problem is rapid cutting of plants (Fig. 2).

Figure 2 : Cutting of Acacia modesta for fuel and fodder purposes is common in the area

b) Over Grazing

Grazing, browsing, and trampling by domestic livestock is a serious problem in the area (Fig. 3). Grazing has caused to decline vegetation where palatable species have been reduced and non-palatable species increased.

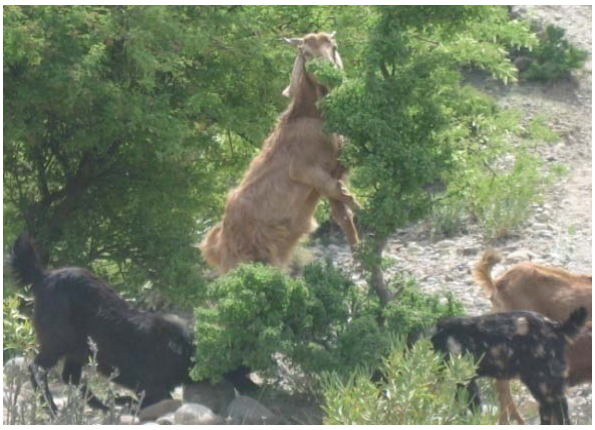

Figure 3 : Grazing of trees by goat

c) Shortage of Water

Water shortage is one of the most threatening factors for irrigation and drinking because the rainfall is scanty in the areaand it is transported from far off places by donkey, Camel etc or on heads (Figs. 4, 5).

Figure 4 : Drinking water is a serious problem in the area

Figure 5 : Open storage water tank for collection of rain water

d) Soil Salinity

Some areas like Warana is facing salinity hazard. The water is neither suitable for cultivation nor for drinking It has poor sparse vegetation.

e) Soil Erosion

Soil erosion by the seasonal torrential stream water / wind in the plain and by rainwater in sloping area is also a threat to habitat (Fig. 6).

Figure 6 : Soil erosion is common ecological problem in the area. See exposed hard bed rock

Table 1 : Meteorological data of Tehsil Takht -e -Nasrati for the year 2001 -2010

Months	Temperature (C°)		Humidity (%)		Rainfall (mm)	Soil temperature (C°) Average	Wind speed (Km Per Hour)
	Max	Min	Max	Min			
January	19.18	4.26	75.80	35.24	27.43	7.03	2.9
February	21.69	7.29	77.39	42.23	37.72	9.14	3.2
March	28.20	12.06	75.38	35.23	37.17	13.89	3.5
April	34.74	17.94	66.12	29.42	36.54	19.02	5.2
May	38.32	22.33	59.66	30.73	31.6	21.87	5.4
June	39.50	25.9	59.96	32.89	74.24	25.78	5.5
July	38.44	25.76	73.33	38.76	121.6	26.77	5.2
August	36.66	25.29	75.68	42.61	108.3	26.37	4.1
September	35.47	21.95	77.21	39.29	61.58	23.49	3.7
October	32.33	16.79	71.55	35.51	15.13	20.09	3.5
November	26.71	10.01	71.56	36.66	5.80	14.10	3.2
December	21.93	5.67	75.20	35.90	15.38	8.96	3.1
Mean	31.1	16.27	71.57	36.21	47.71	18.04	4.04

Source: Agricultural Research Farm Ahmad Wala Karak.

III. Materials and Methods

The phytosociological expeditions were carried out in the summer, 2010 -2011 to the Tehsil Takht-e-Nasrati. Quadrat method was used to study and analyse the plant life dynamics as well as to collect the primary data for statistical analyses. A total of 11 sites were laid in the study area. 10 Quadrats were laid in each selected sites having best representation of floral biodiversity and geographic extent of the area. Vegetation attributes including frequency, density and cover were recorded along with environmental coordinates like latitude, longitude, altitude and slope using GPS. The importance value of each species was compiled adding RD, RF and RC following Hussain (1989). On the basis of the highest importance values of the first three dominant species from each layer, the communities were established and named. Plants from the premises of sampling points as well as isolated vegetation patches were also collected to record maximum number of species and their distribution patterns. Collected samples were pressed, dried and transported to herbarium of University of Peshawar Khyber Pakhtun Khawa, Pakistan, where they were identified and classified following Stewart (1961) and Nasir and Ali (1972-1994).

IV. Edaphology

Two kg soil sample was collected from 11 sites of Tehsil Takht-e-Nasrati up to 15 cm depending upon the area situation using the outer periphery of plants canopy or at the centre of plants with the help of soil auger and mixed to make a composite sample. It was dried and passed through 2 mm sieve and stored in a polythene bag. There were 5 replicates from each site. These were analyzed for different chemical and physical parameters including soil texture, organic matter, lime contents, pH, EC, phosphorus and potassium as following standard methods (Bouyoucos, 1962; Hussain, 1989; Jackson, 1962).

V. Results

a) Stand – 1 (500 – 599 m)

In stand 1, total 7 sites were studied i.e. Chokara, Ambiri Kala, Takht-e- Nasrati, Siraj Khel, Shahidan Banda, Zarki Nasrati and Shawa in which 7 communities i.e. *Cymbopogon-Rhazya-Zizyphus* community (CRZ), *Cymbopogon-Saccharum-Zizyphus* community (SCZ), *Fagonia-Rhazya-Zizyphus* community (FRZ), *Cleome-Phoenix-Capparis* community (CPC), *Cenchrus-Cassia-Zizyphus* community (CCZ), *Capparus -Aerua-Acacia* community (CAA), *Boerhavia-Acacia-Capparus* community (BAC) were recorded respectively. Entirely 34 plant species consist of 6 trees, 12 shrubs, 13 herbs and 3 grasses were documented forming the *Zizyphus-Aerua-Rhazya* community (ZAR). The highest number of plant species (23) were present in CPC. The highest number of tree (4) were present in CRZ, SCZ and CPC while shrubs (8) in CAA and herbs (10) in CPC. The Importance value contributed by three dominants species was 63.98 while total importance value of 236.02 was provided by the remaining species. Furthermore, the highest TIV given by trees (65.83) was present in BAC, shrubs (103.72) in SCZ at Shawa and Ambiri Kala respectively while TIV of herbs (146.78) and grasses (116.29) were found high in CPC and CRZ respectively (Table 29).

i. *Cymbopogon-Rhazya-Zizyphus community (CRZ)*

Cymbopogon-Rhazya-Zizyphus community established at Chokara. A total of 18 species were recorded in the site which consisted of 4 tree, 5 shrub, 6 herb and 3 grass species. The Importance value contributed by three dominants species i.e. *Cymbopogon jwarancusa, Rhazya stricta* and *Zizyphus maurtiana* was 145.25 while total importance value of 154.75 was provided by the remaining species. The

contribution by tree was 28.33, Shrubs 84.82, herbs 70.56, and grasses 116.29 (Table 41). The qualitative examination of biological spectrum showed that hemicryptophytes (6 spp., 33.33 %) dominated followed by nanophanerophyte and megaphanerophyte (4 spp., 22.22 %) each. In leaf size examination, microphyll (10 spp., 55.55 %) was the dominant class in this community. The community preferred to grow on high percentage of clay (49 %) and low amount of sand (47 %) and silt (4 %) particles. The soil of the community had better lime contents (12.3 %) with soil pH (7.26). The concentrations of P and K content were initiated in the range of 3.81 and 121 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.15 dS m^{-1} and 1.31 % respectively. The soil texture was found sandy clay (Table 3).

ii. *Cymbopogon-Saccharum- Zizyphus community (SCZ)*

This community was developed at Ambiri Kala. The dominated plant species on the basis of importance value were *Cymbopogon jwarancusa* (IV = 64.8) in herbs stratum, *Saccharum bengalense* (IV = 39.6) in shrubby stratum and *Zizyphus maurtiana* (IV = 10.8) in tree stratum. Other important species included *Astragalus psilocentros* (IV = 39.2), *Aerua persica* (IV = 36.4) and *Acacia modesta* (IV = 8.64). In this community, 18 plant species were recorded which composed of 4 tree, 6 shrubs, 4 herb and 3 grass species. The Importance value contributed by tree was 27.52, shrubs (IV = 103.72), herbs (IV = 63.08), and grasses (IV = 105.69) (Table 42). The qualitative biological spectrum examination of leaf size showed that microphyll (9 spp., 52.94 %) was the dominant class. In life form examination, hemicryptophytes (6 spp., 33.33 %) dominated followed by nanophanerophyte and megaphanerophyte (4 spp., 22.22 %) each . The community preferred to grow on high percentage of clay (51 %) and low amount of sand (46 %) and silt (3 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.34). The concentrations of P and K content were initiated in the range of 3.84 & 123 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.16 dS m^{-1} and 1.19 % respectively. The soil texture was found sandy clay (Table 3).

iii. *Fagonia-Rhazya-Zizyphus community (FRZ)*

FRZ community (*Fagonia-Rhazya-Zizyphus*) was structured at Takht-e-Nasrati and composed of 18 species. There were 3 tree, 5 shrubs, 8 herb and 2 grass species. The dominated plant species on the basis of importance value were *Fagonia cretica* (IV = 46.8), *Rhazya stricta* (IV = 40.4) and *Zizyphus maurtiana* (IV = 28.3). Other important species included *Withania coagulans* (IV = 15.1) in shrubby stratum, *Cymbopogon jwarancusa* (IV = 31.1), *Carthamus oxycantha* (IV=27.5), *Eragrostis poaoides* (IV = 26.4) in herbaceous stratum and *Acacia modesta* (IV = 5.53) in tree stratum. The Importance value contributed by tree was 37.72, shrubs (IV = 76.16), herbs (IV=120.73) and grasses (IV = 65.88) (Table 43). The biological spectrum showed that hemicryptophytes were the leading life form classes (33.33 %) followed by therophyte (28.77%). Mirophyll and leptophyll were the dominant leaf size classes represented by (44.44%) and (27.78 %) plant species respectively . The community preferred to grow on high percentage of sand (56 %) followed by clay (38 %) and silt (6 %) particles. The soil of the community had better lime contents (12.5 %) with soil pH (7.21). The concentrations of P and K content were initiated in the range of 3.72 & 117 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.18 dS m^{-1} and 1.23 % respectively. The soil texture was found sandy clay (Table 3).

iv. *Cleome-Phoenix-Capparis community (CPC)*

This community was developed at Siraj Khel. Dominant plant species on the basis of important values were *Cleome viscosa* (IV = 35.1) in herbaceous stratum, *Phoenix dactylifera* (IV=30.9) in tree stratum and *Capparis decidua* (IV = 24.7) in shrubby stratum. In this community 23 plant species were recorded which composed of 4 tree, 6 shrubs, 10 herb and 3 grass species. The Importance value contributed by tree was 46.79, shrubs (IV = 71.35), herbs (IV = 146.74) and grasses (IV = 35.04) (Table 44). The biological spectrum showed that therophytes was the leading dominant life form class (7 spp., 30.43 %) followed by hemicryptophytes (5 spp., 21.74 %). Mirophyll (11 spp., 47.83 %) was dominant leaf size class followed byleptophyll (6 spp., 26.09 %) and nanophyll (4 spp., 17.39 %) in the community. The community preferred to grow on high percentage of sand (53 %) followed by clay (45 %) and silt (2 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.93). The concentrations of P and K content were initiated in the range of 3.64 and 112 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.15 dS m^{-1} and 1.23 % respectively. The soil texture was found sandy clay (Table 3).

v. *Cenchrus -Cassia-Zizyphus community (CRZ)*

In Shahidan the *Cenchrus-Cassia-Zizyphus* community was established and dominated by *Cenchrus biflorus* (IV = 38.2) in herbaceous stratum, *Cassia angustifolia* (IV = 35.7) in shrubby stratum and *Zizyphus maurtiana* (IV = 25.2) in tree stratum on the basis of important values. Other important plant species with respect to Importance values were *Rhazya stricta* (IV = 33.9), *Withania coagulans* (IV = 23.8), *Fagonia cretica* (IV = 28.5) and *Acacia modesta* (IV = 8.62). A total of 15 plant species in the site composed of 3 tree, 4 shrubs, 8 were included in herbaceous stratum. The Importance value contributed by tree was 38.4, shrubs (IV = 100.3), herbs (IV = 112.38) and grasses (IV = 48) (Table 45). Therophytes (4 spp., 26.67%) was the

dominating life form class. Mirophyll (10 spp., 66.67%) had comprised leading leaf form class followed by leptophyll (3 spp., 20 %) . The community preferred to grow on high percentage of clay (51 %) followed by sand (43 %) and silt (6 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (6.89). The concentrations of P and K content were initiated in the range of 3.67 & 115 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.17 dS m^{-1} and 1.26 % respectively. The soil texture was found clay (Table 3).

vi. *Capparis -Aerua -Acacia community (CAA)*

Capparis- Aerua- Acacia community was composed of 20 species comprising 2 tree, 8 shrubs, 7 herb and 3 grass species at Zarki Nasrati. Importance value contributed by three dominants species i.e. *Capparis spinosa, Aerua persica* and *Acacia modesta* was 87.35 while total importance value of 212.65 was provided by the remaining species. The contribution by tree was 36.89, shrubs 97.9, herbs 119.91 and grasses 45.3. The associated species in herbaceous stratum included *Cynodon dactylon* (IV = 31.6), *Tribulus terrestris* (IV = 29.6) and *Fagonia cretica* (IV=23), *Saccharum bengalense* (IV = 12.2) and *Astragalus psilocentros* (IV = 12) in shrubby stratum. In tree stratum, the important species was *Zizyphus maurtiana* (IV = 15.9) (Table 46). The life form spectrum showed that hemicryptophytes (5 spp., 25%) was dominant life form class followed by therophytes and chemophytes (4 spp., 20%) each. Microphyll (11 spp., 55 %) was dominant group of the leaf size class followed by leptophyll (4 spp., 20 %) . The community preferred to grow on high percentage of sand (57 %) followed by clay (39 %) and silt (4 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.18). The concentrations of P and K content were initiated in the range of 3.71 & 114 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.16 dS m^{-1} and 1.24 % respectively. The soil texture was found sandy clay (Table 3).

vii. *Boerhavia-Acacia-Capparis community (BAC)*

Boerhavia–Acacia-Capparis community was established at Shawa and is dominated by *Boerhavia diffusa* (IV = 50.5), *Acacia modesta* (IV = 41.2) and *Capparis spinosa* (IV = 34.3). Co dominant species included *Aerua persica* (48.21) in ground stratum; *Capparis decidua* (IV = 25.2) and *Withania coagulans* (IV=9.02) were making shrubby stratum. The associated species of he tree stratum included *Zizyphus maurtiana* (IV = 17.9). The community was composed of 12 species comprising of 3 tree, 5 shrubs and 4 herb species. The Importance value contributed by tree was 65.61, shrubs (IV=88.28) and herbs (IV = 146.10) (Table 47). Megaphanerophytes and chamophytes were the dominant class of the biological spectrum (3 spp., 25%) each. In leaf size classes, microphyll (8 spp., 66.67 %) followed by leptophyll (3 spp., 25%) . The community preferred to grow on high percentage of sand (63 %) followed by clay (32 %) and silt (5 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.41). The concentrations of P and K content were initiated in the range of 3.86 and 125 mg Kg^{-1}. The community preferred ECand SOM in the range of 0.16 dS m^{-1} and 1.28 % respectively. The soil texture was found sandy clay loam (Table 3).

b) Stand – 2 (600 – 699 m)

In stand 2, 4 communities i.e. *Zizyphus-Capparis-Phragmites* community (ZCP), *Aerua-Capparis-Zizyphus* community (ACZ), *Fagonia-Zizyphus-Saccharum* community (FZS), *Zizyphus-Aerua-Capparis* community (ZAC) consist of 36 plant species in which 6 trees, 11 shrubs, 15 herbs and 4 grasses were present in Kandu Khel, Shadi Khel, Sarki Lawager and Shnawa respectively. The highest number of herbs (7) and grasses (5) were present in ACZ and ZCP respectively. The highest TIV contributed by three dominant species is 132.56 present in ZAC at Shnawa while low (79.48) in FZS at Sarki Lawager. The highest TIV of trees (72.56), shrubs (IV = 97.73) were present in ACZ while herbs (IV = 107.59) and grasses (IV = 112.9) were present in FZS and ZCP respectively (Table 29).

i. *Eragrostis-Zizyphus-Capparis community (EZC)*

Eragrostis-Zizyphus-Capparis community was composed of 16 species included 2 tree, 7 shrubs, 5 herb and 2 grass species at Kandu Khel. The Importance value contributed by three dominants species i.e. *Eragrostis poaoides, Zizyphus maurtiana* and *Capparis decidua* was 132.79 while total importance value of 167.21 was provided by the remaining species. The contribution by tree was 50.94, shrubs (IV = 76.24), herbs (IV=103.36) and grasses (IV = 69.46). Other important plant species on the basis of important value were *Rhazya stricta, Astragalus psilocentros, Boerhavia diffusa* and *Cenchrus biflorus* (Table 48). The biological spectrum showed that hemicryptophytes and therophytes were the leading life form classes (4 spp., 25 %) followed by chamophytes (3 spp., 18.75%). Mirophyll and leptophyll were the dominant leaf size classes represented by 37.5 % and 31.25 % plant species respectively . The community preferred to grow on high percentage of clay (41 %) followed by sand (39 %) and silt (20 %) particles. The soil of the community had better lime contents (12.5 %), EC (0.19 dS m^{-1}) and SOM (1.27 %) with soil pH (7.64). The concentrations of P and K content were initiated in the range of 3.78 and 119 mg Kg^{-1} respectively. The soil texture was found clay (Table 3).

ii. *Aerua-Acacia-Capparis community (AAC)*

This community was established at Shadi Khel. The dominated species on the basis of important value were *Aerua persica* (IV = 48.3) in ground stratum, *Acacia modesta* (IV = 24.3) in tree stratum and

Capparis decidua (IV = 23.5) in shrubby stratum. In this community 20 plant species were recorded which composed of 4 tree, 7 shrubs, 7 herb and 2 grass species. The Importance value contributed by tree was 56.72, shrubs (IV = 79.76), herbs (IV=133.05) and grasses (IV = 30.42) (Table 49). Hemicriptophytes were the dominant class of the biological spectrum (6 spp., 30 %) followed by megaphanerophytes (5 spp., 25 %). In leaf size classes, microphyll (9 spp., 45 %) were dominant followed by leptophyll (5 spp., 25 %). The community preferred to grow on high percentage of sand (57 %) followed by clay (38 %) and silt (5 %) particles. The soil of the community had better lime contents (12.4 %), EC (0.2 dS m^{-1}) and SOM (1.28 %) with soil pH (7.74). The concentrations of P and K content were present in the range of 3.71 and 128 mg Kg^{-1}. The soil texture was found sandy clay (Table 3).

iii. *Tribulus -Periploca -Zizyphus community (TPZ)*

The TPZ community (*Tribulus–Periploca-Zizyphus*) was established at Sarki Lawger. This community was supported by 19 plant species including 4 tree, 7 shrubs, 7 herb and 3 grass species. The Importance value contributed by three dominants species i.e. *Tribulus terrestris, Periploca aphylla* and *Zizyphus maurtiana* was 83.78 while total importance value of 216.22 was provided by the remaining species. The classes. The community preferred to grow on high herbs (IV = 138.49) and grasses (IV = 33.88) (Table 50). The life form spectrum showed that hemicryptophytes (5 spp., 26 %) was dominant life form class followed by nanophanerophytes and chamophytes (4 spp., 21.05 %) each. Microphyll (10 spp., 52.63 %) was leading group of the leaf form contribution by tree was 39.42, shrubs (IV = 88.2), percentage of sand (59 %) followed by clay (33 %) and silt (8 %) particles. The soil of the community had better lime contents (12.5 %), EC (0.2 dS m^{-1}) and SOM (1.19 %) with soil pH (7.24). The concentrations of P and K content were present in the range of 3.79 and 109 mg Kg^{-1}. The soil texture was found sandy clay loam (Table 3).

iv. *Boerhavia-Zizyphus-Capparis community (BZC)*

This community was developed at Shanawa and composed of 11 species. There were 3 tree, 4 shrubs and 4 herb species Dominant plant species on the basis of important values were *Boerhavia diffusa* (IV = 61.84) in herbaceous strata, *Zizyphus maurtiana* (IV=42.6) in tree strata, and *Capparis spinosa* (IV = 34.93) in shrubby strata. The Importance value contributed by tree was 59.13, shrubs (IV = 78.82) and herbs (IV=162.05) (Table 51). Mirophyll was the dominant leaf size class represented by 8 plant species (72.73 %) and megaphenerophytes were the leading dominant life form classes (4 spp., 36.36%) . The community preferred to grow on high percentage of sand (56 %) followed by clay (37 %) and silt (7 %) particles. The soil of the community had better lime contents (12.5 %), EC (0.21 dS m^{-1}) and SOM (1.21 %) with soil pH (7.62). The concentrations of p and K content were present in the range of 3.69 and 131 mg Kg^{-1}. The soil texture was found sandy clay. Soil erosion was high resulted in low mineral composition in the soil (Table 3).

VI. Discussion

The investigated area comprised of 36 species in the 11 communities during summer. The environmental factors, habitat and different plant life determined communities' structure. Plants communities are useful in classification, naming and identification of plant life structure. Muller Dumbois & Ellenberg (1974) stated that plant community structure interpret and analyze the plant life at diverse revelation and offer immediate information regarding plant life and are origin for deduction of future alteration. Brinkmann *et al.* (2009) evaluated the plant life reaction to ecological situation of open woodlands along an altitudinal and animal palatability preference. The factors which influenced plant life structure are unplanted settlements, overgrazing, erosion, land sliding, habitat destruction, poverty and anthropogenic activities. In summer, 22 plant communities were identified at various parts of the investigated area at different altitudes. In summer, the plant number are limited due to unavailability of water and high temperature. The diverse plant communities documented in diverse seasons reflected different remains as recognized by Champion *et al.* (1965).

Soil is essential that has continued life on earth and it also helps the plants' growth that increased the competition of grazing animals and human. According to Turner *et al.* (2004) and Shameem *et al.* (2011) stated that the distinctive habitation altered due to increasing human transportation and population. Other progression results into increased the expected attack of organism has been happening the world over. Plant life changed the physical and chemical properties of soil. It improves the soil inliltration, structure and prevents erosion. Shameem *et al.* (2011) and Buckman & Brady (1967) described that the resources of soil is limited and its physical and chemical properties are restricted mostly by humus and clay. Several research works dealing with different features of plant life from diverse parts of the state have been taken out form time to time (Stewart, 1982; Dar *et al.*, 2001). The investigated area presents a limited number of animal and plant species. The investigated area is more suitable for the legume plant due the presence of high content of sand particles in the area. The mountains range present in the east of the consisted of sandy hills therefore it is called SHINGHAR (In local language Pashto; Shin: sand, Ghar: Hill). The water flow was occur from east to west due to altitudinal difference. Plant growth somewhat indirectly manipu-

lated through soil structure. It also effects the seedling growth which is very sensitive to physical condition of soil texture. The rigid compacted layer slows down the growth of the seedling for root cannot penetrate easily in such soil.

VII. Conclusion

The area still needs very detailed and comprehensive investigations regarding different vegetative attributes and their correlation with environmental as well as anthropogenic variables. A single study can not serve the whole purpose in such a large, diverse and geographically important area. Repeated and integrated explorations are recommended in all parts of Tehsil Takht-e-Nasrati to explore the dynamic and variations in floral biodiversity. Grazing practices need to be limited and monitored along with creating the awareness among the grazers about conservation and sustainable management of grasslands. Fenced vegetation plots should be designed at regular intervals to act as seed banks in whole Tehsil. Grazing practices should be synchronized with plant growth seasons so that damage to vegetation during flowering stage can be avoided. A great deal can be done about the ethnobotanical application of the local flora by identifying, investigating and evaluating the utilization practices of local folklore. The most important point to be considered is conservation of endemic flora, which has its restricted distribution in the study area and is posed with severe threats due to overexploitation by grazing, medicinal plant harvest and harsh environmental conditions.

VIII. Acknowledgements

The paper is a fraction of PhD thesis published as a mandatory towards the award of PhD degree. Authors are grateful to the local people of area who have revealed the precious information about plant species and assistance. We cannot forget all our class fellows and friends for all support they accorded us during the period we carried out this study.

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Table 2 : The number of species and share relative importance value of tree, shrubs, herbs and grasses among the different communities during summer of Tehsil Takht-e- Nasrati, District Karak

Stand	Sites	Communities	Total Species	Tree	Shrubs	Herbs	Grasses	TIV contribution by three dominant	TIV by remaining species	TIV by tree	TIV by shrubs	TIV by herbs	TIV by grasses
1	**As a whole**	**RCZ**	**34**	**6**	**12**	**13**	**3**	**63.98**	**236.02**	**40.11**	**88.9**	**112.48**	**58.39**
	Chokara	CRZ	18	4	5	6	3	145.25	154.75	28.33	84.82	70.56	116.29
	Ambiri Kala	SCZ	18	4	6	4	3	91.6	208.94	27.52	103.72	63.07	105.69
	Takht-e-Nasrati	FRZ	18	3	5	8	2	115.35	184.65	37.65	76.21	128.66	57.48
	Siraj Khel	CPC	23	4	6	10	3	90.69	209.31	46.79	71.35	146.78	35.08
	Shahidan	CCZ	15	3	4	6	2	99.1	200.9	38.4	100.3	112.38	48.92
	Zarki Nasrati	CAA	20	2	8	7	3	87.35	212.65	36.89	97.9	119.91	45.3
	Shawa	BAC	12	3	5	4	-	126.09	173.91	65.83	88.09	146.08	-
2	**As a whole**	**ZBC**	**29**	**6**	**11**	**9**	**3**	**84.41**	**215.59**	**51.55**	**80.76**	**134.24**	**33.44**
	Kandu Khel	EZC	16	2	7	5	2	132.79	167.21	50.94	76.24	103.36	69.46
	Shadi Khel	AAC	20	4	7	7	2	96.08	203.92	56.75	79.78	133.05	30.42
	Sarki Lawager	TPZ	19	4	7	7	3	83.78	216.22	39.4	88.2	138.5	3.9
	Shanawa	BZC	11	3	4	4	-	139.35	160.65	59.13	78.82	162.05	-

Table 3 : Physiochemical analysis of soil of Tehsil Takht-e-Nasrati, District Karak

Stand	Sites	Communities	PH (1:2)	EC dS m-1 (1:2)	Lime (%)	SOM(%)	P mg/Kg	K mg/Kg	Sand	Clay	Silt	Textural Class
1	Chokara	CRZ	7.26	0.15	12.3	1.31	3.81	121	47	49	4	Sandy Clay
	Ambiri Kala	SCZ	7.34	0.16	12.4	1.19	3.84	123	46	51	3	Sandy Clay
	Takht-e- Nasrati	FRZ	7.21	0.18	12.5	1.23	3.72	117	56	38	6	Sandy Clay
	Siraj Khel	CPC	7.93	0.15	12.4	1.23	3.64	112	53	45	2	Sandy Clay
	Shahidan	CCZ	6.89	0.17	12.4	1.26	3.67	115	43	51	6	Clay
	Zarki Nasrati	CAA	7.18	0.16	12.4	1.24	3.71	114	57	39	4	Sandy Clay
	Shawa	BAC	7.41	0.16	12.4	1.28	3.86	125	63	32	5	Sandy Clay Loam

	Average		7.32	0.16	12.4	1.25	3.75	118	52.1	43.6	4.3	Sandy Clay
2	Kandu Khel	EZC	7.64	0.19	12.5	1.27	3.78	119	39	41	20	Clay
	Shadi Khel	AAC	7.74	0.2	12.4	1.28	3.71	128	57	38	5	Sandy Clay
	Sarki Lawager	TPZ	7.24	0.2	12.5	1.19	3.79	109	59	33	8	Sandy Clay Loam
	Shanawa	BZC	7.62	0.21	12.5	1.21	3.69	131	56	37	7	Sandy Clay
	Average		**7.56**	**0.2**	**12.4**	**1.24**	**3.74**	**122**	**52.8**	**37.3**	**10**	**Sandy Clay**

Table 4 : The number of species and share relative importance value of tree, shrubs, herbs and grasses among the different communities during summer of Tehsil Takht-e- Nasrati, District Karak

S.No	Communities	CRZ	SCZ	FRZ	CPC	CCZ	CAA	BAC	EZC	AAC	TPZ	BZC
1	*Acacia modesta* Wall.	8.63	8.64	5.73	3.19	8.62	21	41.2	-	24.3	9.88	11.33
2	*Acacia nilotica* (L.) Delice	6.48	1.68	3.72	6.87	-	-	6.53	8.14	5.77	-	-
3	*Dalbergia sissoo* Roxb	3.38	5.53	-	-	-	-	-	-	4.24	-	-
4	*Gymnosporia royleana* Wall. ex M. A. Lawson	-	-	-	-	-	-	-	-	-	5.44	-
5	*Monotheca buxifolia* (falk) A.DC.	-	-	-	-	-	-	-	-	-	4.82	-
6	*Phoenix dactylifera* L.	-	-	-	30.9	4.66	-	-	-	-	-	-
7	*Prosopis juliflora* (Sw.) DC	-	-	-	-	-	-	-	-	-	-	5.177
8	*Punica granatum* L	-	-	-	-	-	9.75	-	-	10.1	-	18.84
9	*Zizyphus maurtiana* Lam	9.8	10.8	28.3	5.79	25.2	15.9	17.9	42.8	22.4	19.3	42.6
1	*Astragalus psilocentros* Fisch	-	39.2	-	3.66	-	12	11.2	8.29	16.2	-	-
3	*Calotropis procera* (Wild) R.Br.	-	3.72	-	8.64	-	1.8	-	5.26	7.04	9.63	-
4	*Capparis deciduas* (Forssk). Edge worth.	-	4.05	-	24.7	-	11.5	25.2	37.2	23.5	11.2	16.12
5	*Capparus spinosa* L.	-	-	-	-	-	33.6	34.3	-	-	-	34.93
6	*Cassia angustifolia* Vahl	-	-	-	-	35.7	-	-	-	-	-	-
7	*Periploca aphylla* Decne.	5.63	-	-	-	-	-	-	5.87	-	28.7	-
8	*Rhazya stricta* Dcne	60.3	11.3	40.4	15.4	33.9	5.72	8.53	11.9	12.8	10.2	8.933
9	*Saccharum bengalense* Retz.	6.53	39.6	10.3	-	-	12.2	-	4.04	3.7	-	-
10	*Saccharum spontaneum* L.	4.84	-	5.45	-	-	-	-	-	-	17.9	-
11	*Withania coagulans* (Stocks) Dunal	-	-	15.1	9.51	23.8	-	9.02	3.64	-	5.81	-
12	*Zizyphus nummularia* (Burm.f) W.&A	7.56	1.7	4.97	9.5	6.81	11.3	-	-	6.37	4.7	-
1	*Aerua persica* (Burm.f) Merrill	11.8	36.4	-	9.7	-	32.7	48.1	-	48.3	-	49.58
2	*Boerhaavia diffusa* auct plur.	13.3	6.29	5.89	3.25	11.1	5.33	50.5	32.4	7.58	20.6	61.84
3	*Carthamus oxycantha Bieb.*	-	4.21	3.93	7.56	11.5	12.9	19.6	-	17.9	-	27.51
4	*Cenchrus biflorus* Hook. f.	-	-	-	15.9	38.2	-	-	31.3	10.2	24.4	23.14
5	*Cleome viscosa* L.	5.61	-	-	35.1	-	-	-	-	-	-	-
6	*Cymbopogon jwarancusa* (Jones) Schult	75.2	26.9	31.1	8.87	-	4.9	-	-	7.85	13.6	-
7	*Cynodon dactylon* (L.) Pers	22.2	64.8	7.9	18.9	14	31.6	-	16.7	22.6	20.3	-
8	*Cyperus rotundus* L.	-	-	27.5	11.3	-	-	-	25.3	22.6	-	-
9	*Echinops echinatus* D.C.	-	-	-	-	-	11.1	-	-	-	17.1	-
10	*Eragrostis poaoides* Beauv	18.9	20.9	26.4	7.29	35	8.81	-	52.7	-	-	-
11	*Euphorbia prostrate* Ait.	-	-	8.92	18.9	-	-	-	-	-	-	-
12	*Fagonia cretica* L	16.8	-	46.8	33.4	28.5	23	-	4.81	-	20.3	-
13	*Salvia moorcroftiana* Wallich ex Benth.	-	-	21.9	-	-	-	-	-	-	-	-
14	*Solanum surattense* Burm .f.	14.2	-	-	7.55	17.5	5.33	-	-	12.3	20.4	-
15	*Tribulus terrestris* L	8.86	14.3	5.89	4.05	5.53	29.6	27.9	9.55	14.2	35.8	-

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