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Degree of Homogeneity of Plant Life in Tehsil Takht-E-Nasrati, Pakistan

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Abstract - The present investigation explains the homogeneity of plant life on the basis of frequency classes during 2009-2010 in Tehsil Takht-e-Nasrati, District Karak, Pakistan. The result shows that no homogeneity in the region among the phases and seasons. The value of frequency class is high (9) of class B and low in E (1) in phases 1 during spring season. In summer class C has high value (4.75) while it is low in A. (1). The value of class A is high (14.8) in winter. In phase 2 the class B has high value during spring (9.86) and summer (7.29) while the value of class A is high (8.86) in winter. In phase 3 and 4 the class B has high value throughout all season as compare to other classes. So the equation of homogeneity will be in phase 1; A < B > C > D > E., A < B < C > D < E., A < B < C < D > E.; in phase 2; A > B < C < D < E., A > B < C < D > E., A < B < C < D > E.; In Phase 3; A > B < C < D < E., A > B < C < D > E., A > B < C < D > E. and in Phase 4 ; A > B < C < D < E., A > B < C < D < E., A > B < C < D > E. in spring, summer and winter respectively. The heterogeneity of plant life shows that the area is under heavy biotic pressure owing to consumers and soil erosion.

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I. Introduction

The homogeneity of community distribution presents precious information regarding development, competition and predation and life history of plant. It is accepted that human activities and man's way of life have altered the global cycles of plant life resulting in numerous environmental changes. Degree of homogeneity: Abundance distribution explains the presence of plant availability in area and different seasons. Raunkiærian (1934) postulated that mature homogeneous plant life could be documented by means of this model. Plants give the pattern on which communities and ecosystems are gathered and on which food webs are arranged. So, considerate the reasons that find out plant division and abundance is central for our perceptive of natural balance at large. Consumers, as key components of mainly ecology and constant representatives of plant spoil, include vast prospective to primarily change plant homogeneity. Different worker have done their effort in the field of ecology such as Stokes, et al., (2004); Rand, (2002); Behera & Roy (2005); Li et al., (2007); Gairola et al., (2008);Hussain & Durrani (2008); Santos et al., (2008); Zhu et al., (2010); Ahmad et al., (2010 & 2011); Khan et al., (2011); Shaheen et al., (2011). Consequently, the amplified levels of consumer may harm the ecosystem, and could affect the plant life of the region. As part of the necessary background to the detailed studies on the frequency classes of plant life in a Takht-e-Nasrati in Pakistan, this describes and compares the preliminary results on the background homogeneity levels of different community in different phase and seasons. In this study, particular attention was paid to the systematic characteristics of the frequency classes to determined homogeneity of plat life in the area. A little work was done on the area in different fields i.e. Khan, (2004 & 2007); Khan et al., (2011). No work was done on the homogeneity of the plant life in the research area. It is very unique method to determine the interaction of plant life with one another, consumers, biodiversity and conservation.

II. Material and Methods

a) Research Area

The Tehsil Takht-e- Nasrati is situated at 32.47o to 33.28o North and 70.30 o to 71.30o East. The research area is bounded by Tehsil Karak on the North East, District Mianwali on the East, District Lakki Marwat on the South West and Tribal area Adjoining District Bannu on the West (Fig.1). The total area of Tehsil is about 613.66 square Km. Majority of the area consists rigged dry hills and rough field areas i.e. 323.97 square Km. Agriculture land is about 289.7 square Km. The major income source of the area is agriculture, which is rain depended. Although the hills are dry residual exposes yet they contain precious minerals like coal, gypsum, uranium and gas etc. Takht-e- Nasrati is situated at 340 m above the sea level. The area is located in semi-arid climatic region, having hot summer and very cold winter. The rainfall is scanty and uncertain. Winter rains are generally of long duration and of low intensity. Summer monsoon rains are torrential in heavy shore intensity. In the year 2001 - 2010, 121.6 mm of rainfall per 10 year was recorded on District level (Table 1). June and July are the hottest months, where as December and January are the coldest months. In the year 2001 - 2010 the mean maximum temperature was 39.5 C o, in the month of the June, where as the mean minimum temperature was as low as 4.26 C o, in the month of January, recorded on District level (Table. 1).

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The climate and weathers are also influenced by wind. In hottest months especially June swivel winds are developed on the plain area an after noon due to local heating and convectional uprising. Sometimes strong, dry and hot winds with huge dust enter the area from different sides (Khan et al., 2011).

Table 1 : Climatic 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

III. Experimental Protocol

a) Collection and Identification of plants

Four distinct microhabitats such as Phase 1, Phase 2, Phase 3 and Phase 4 at altitude of 340-399 m., 400-499 m., 500-599 m. and 600-700 m. were described respectively based on physiognomic features. The study was conducted by frequently surveying in winter, spring and summer during 2009 to 2010. Plants species were collected, preferably in duplicate or triplicate form. They were pressed, dried, preserved and mounted on herbarium sheets for identification. Plants were identified with the help of available literature and voucher specimens have been deposited in herbarium, Department of Botany, University of Peshawar, Khyber Pakhtunkhwa, Pakistan.

b) Quadrats Methods

Based on species area curve, the suitable size of the quardrat for trees, shrubs and herbs were determined, which were 10X10m, 5X5m and 1X1m respectively. Combinations of systematic and random quadrats were used as it gives better results. Thus, at lower altitude quadrats were laid systematically while in hilly sites they were laid randomly. The distances between the two adjacent stands were approximately 100 meters.

c) Degree of Homogeneity

The degree of homogeneity in vegetation was determined by classifying plants into various frequency classes by applying Raunkiaerian (1934) law of frequency as follows:

Table 2 : Raunkiaerian (1934) law of frequency classes

Frequency Class	Range
1	01-20
2	21-40
3	41-60
4	61-80
5	81-100

The normal distribution of the frequency percentage derived from such classification is expressed as A>B>C=D<E. and this has been termed as Raunkiaer's law of frequency.

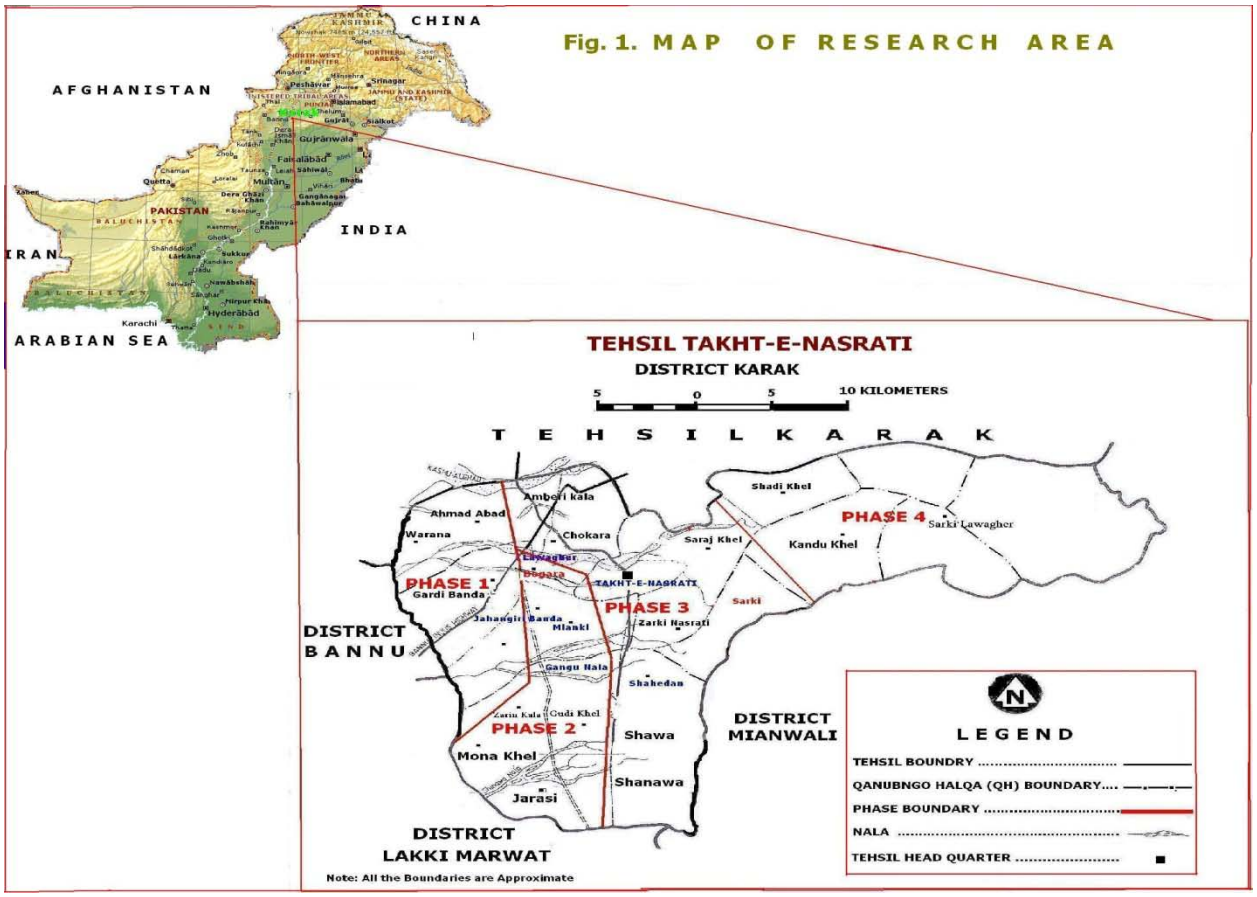


Fig. 1 : Map of Tehsil Takht-e-Nasrati

d) Frequency

It is a percentage of sampling plots in which a given species occurs. The frequency was measured in each stand for each specimen through following formula.

$$F = \frac{NQ}{TQ}$$

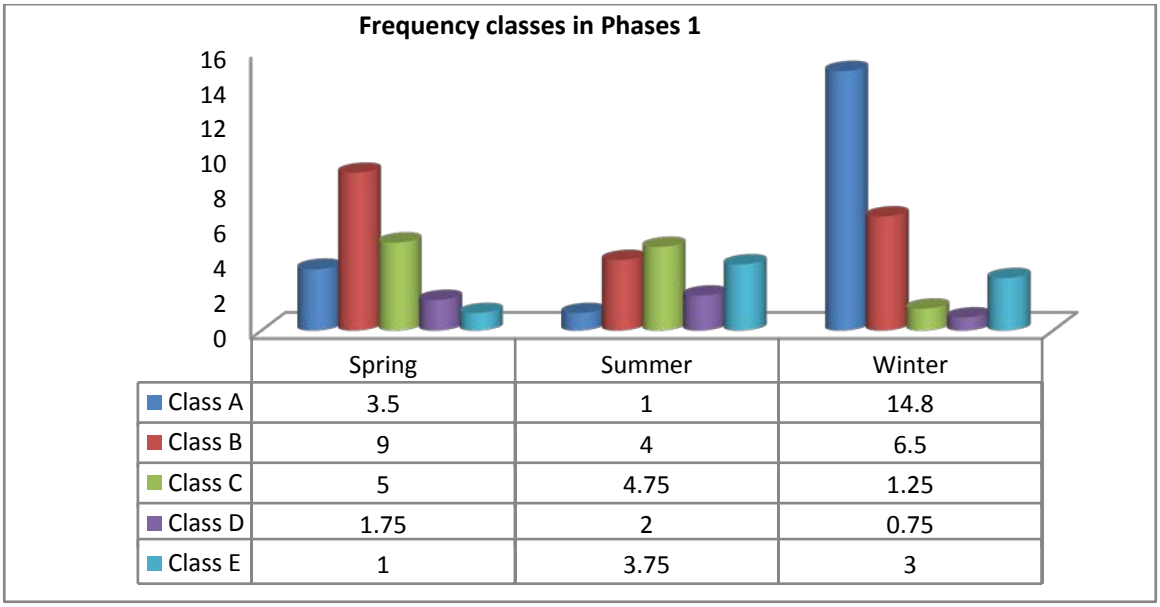
F=Frequency

NQ=Number of quadrats in which a species occur

TQ= Total number of quadrats

IV. Result and Discussion

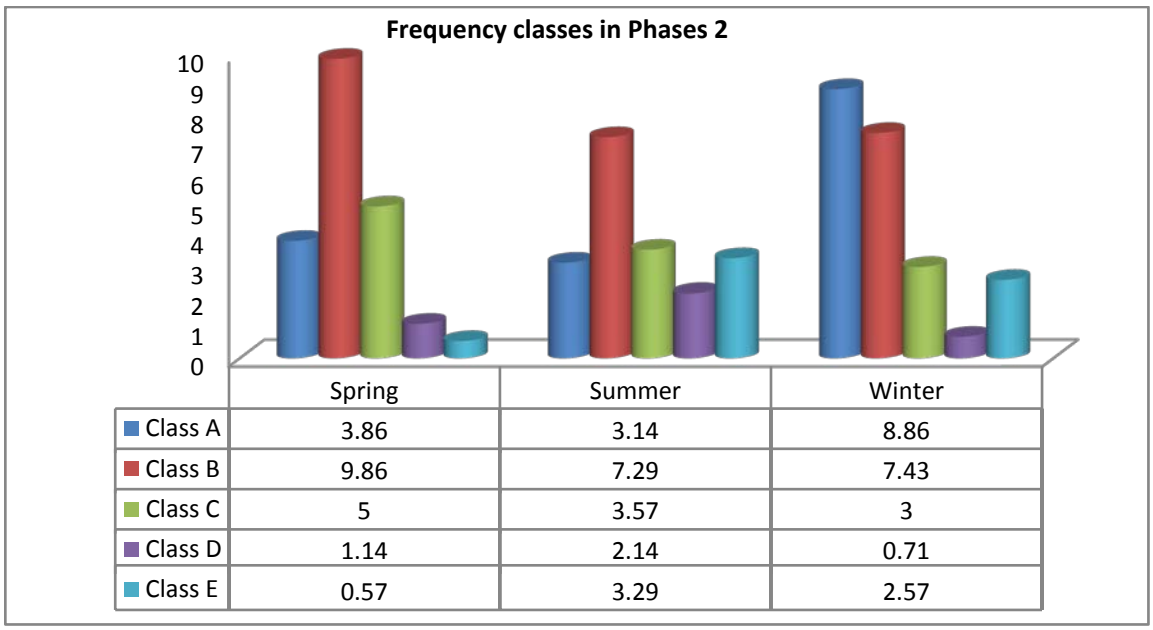
In phases 1 the value is high of class B and low in E as compare to other classes in spring so the equation of homogeneity will be A < B > C > D > E. In summer class C has high value while it is low in A; A < B < C > D < E. The value of class A is high in winter so equation takes form as A < B < C < D > E. (Fig.2). Our result is similar only in winter with that of Raunkiærian (1934) law of frequency. It means that in winter the plant become mature and the grazing and herbivory become low due farming. While in other seasons the grazing rate and herbivory is very high. The mean value showed that the area is under biotic pressure i.e. grazing and uprooting of plants species in the area. The area is rain depended and high grazing pressure so the plant availability also affected (Khan et al., 2011).



	Spring	Summer	Winter
Class A	3.5	1	14.8
Class B	9	4	6.5
Class C	5	4.75	1.25
Class D	1.75	2	0.75
Class E	1	3.75	3

Fig. 2 : Frequency classes in phase 1

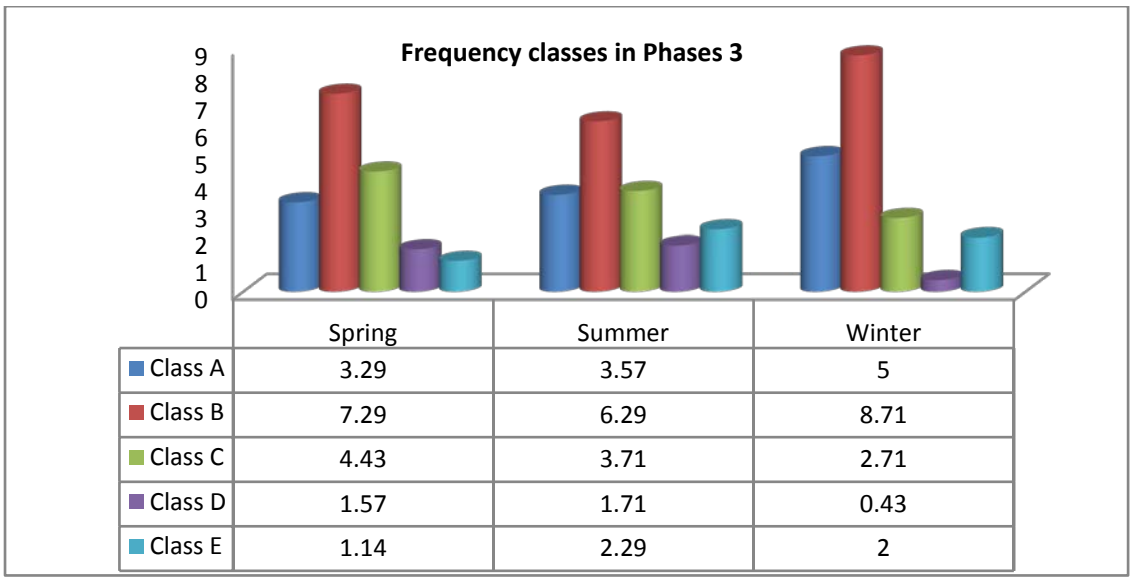
In phase 2 the class B has high value (9.86, 7.29) in spring and summer while the value of class A is high (8.86) in winter. Therefore, following equations may be derived A > B < C < D < E, A > B < C < D > E and A < B < C < D > E in spring, summer and winter respectively (Fig.3). In phase 2, the winter value is similar with that of Raunkiærian (1934) law of frequency while other values are different. The area is sandy, therefore, the plant grow in the area have more low frequency class in winter due to cultivation and stopping of grazing in the area. People used plant for fuel and for food in spring and summer. Therefore, the plant appearance became low as compare to winter. Our result is similar with that of Khan et al., (2011).



	Spring	Summer	Winter
Class A	3.86	3.14	8.86
Class B	9.86	7.29	7.43
Class C	5	3.57	3
Class D	1.14	2.14	0.71
Class E	0.57	3.29	2.57

Fig. 3 : Frequency classes in phase 2

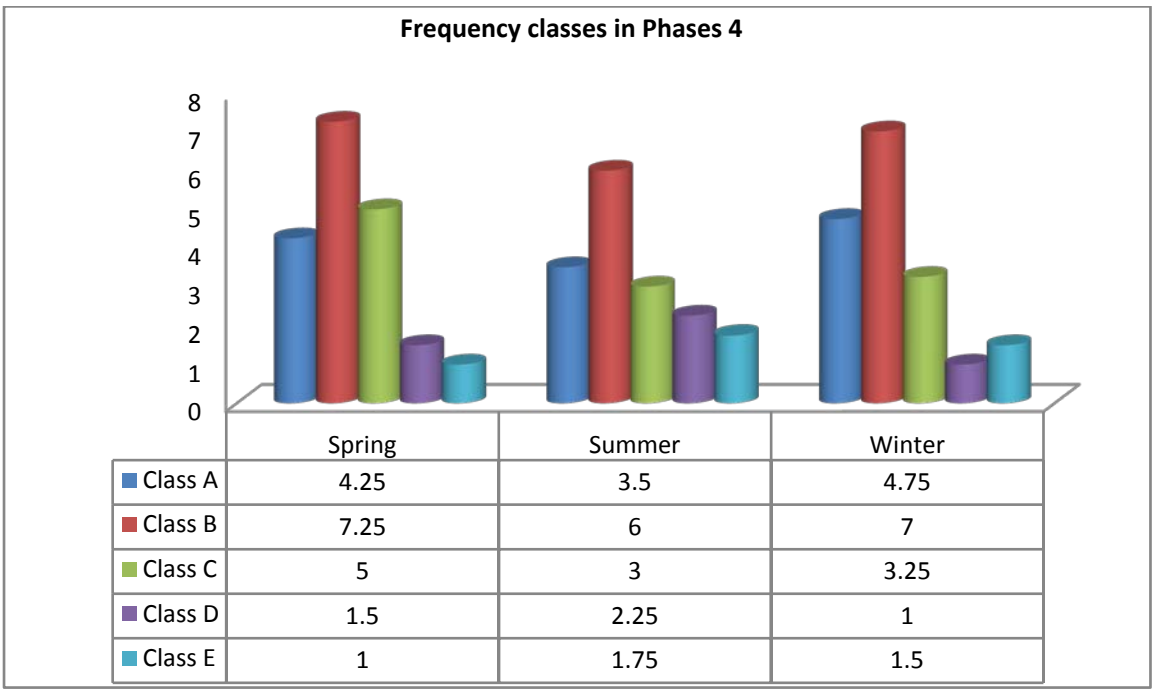
In phase 3 the class B has high value in all season as compare to other classes so following equations are obtain in spring, summer and winter A > B < C < D < E, A > B < C < D > E and A > B < C < D > E respectively (Fig.4). In this phase all equations are different from Raunkiærian (1934) law of frequency. The area is composed of hilly area and people used them as natural grass lands. Therefore, the frequency class of B is more than A. The consumer feeds plants with roots while in summer they also some time eat a nonpalatable plant due to unavailability of plant. The area is unprotected so the people also cut plants for fuel purposes and for economy view point.



	Spring	Summer	Winter
Class A	3.29	3.57	5
Class B	7.29	6.29	8.71
Class C	4.43	3.71	2.71
Class D	1.57	1.71	0.43
Class E	1.14	2.29	2

Fig. 4 : Frequency classes in phase 3

The value of class B is high in all seasons in phase 4. The equation derived for spring, summer and winter are A > B < C < D < E, A > B < C < D < E and A > B < C < D > E respectively (Fig.5). The people of the area are very poor. Therefore, most of the people depend on plant species. The equations of the frequency classes are similar with that of Raunkiærian (1934) law of frequency because the area is also under biotic pressure. On hills the plant are either absent or present with small quantity because hills are composed of sand and wind and water bring upper superficial portion with plants from these hills.



	Spring	Summer	Winter
Class A	4.25	3.5	4.75
Class B	7.25	6	7
Class C	5	3	3.25
Class D	1.5	2.25	1
Class E	1	1.75	1.5

Fig. 5 : Frequency classes in phase 4

Comparison between plain and hilly area, it was found that the distribution of plant rate was high in plain area. There seems no homogeneity in both areas. The low rate of frequency classes in hilly area, it means that plant variety was less due to the considering them as a natural grass land and consumer lost variety of palatable plant species in the area. The area is under heavy biotic pressure (Khan et al., 2011). The distribution of plant species are also affected with area position.

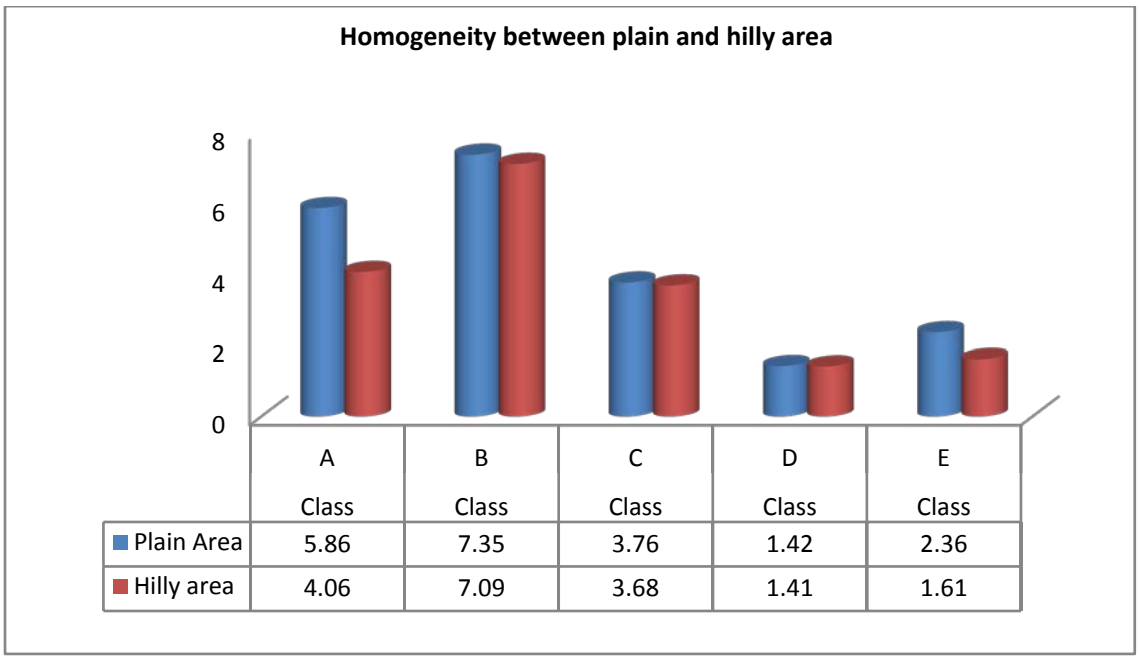


Fig. 6 : Homogeneity between plain and hilly area

In plain and hilly area, the highest value was found 7.35 and 7.09 in class B respectively while in hilly area the value was found 7.09. Frequency class's distribution is crucial and an important machination of plant life study and analysis of a species population structure. Comparison of community succession of frequency classes provides data on conscription, development, transience and plant life in the area. Frequency distribution of a plant species normally is the size of the present individuals from which all supposition about population dynamics should be consequential. Homogeneity of a plant life with respect to a frequency classes in an area is a necessary prerequisite for reliable determination. Sample homogeneity is of particular importance in communities and plant life analysis. Homogeneity (or the distribution of a particular plant life) of a region can easily be determined by law of frequency classes.

On soil having high Nitrogen content are found Malva neglecta, Chenopodium album etc, as occurring near human dueling, on compost heaps and in back yards. The most important factors disturbing the Flora of area are light, temperature, humidity, soil conditions, topography, elevation from sea level, rain fall and other forms of precipitation (Khan, 2004 and Khan et al., 2011). The medicinal plants like Withania coagulans, Aloe vera and Peganum hermala are very common in the area. The fruit of Zizyphus spp is transported to other parts of the country. Mostly of the Xerophytes such as Temarix aphylla, Calotropis procera, Zizyphus spp. and Acacia nilotica are found on road sides while Capparis decidua and Salvadora oleoides are commonly found in Grave-yards Aloe vera is also very common in Grave-yards (Khan et al., 2011).

Fig.7 : View of Southern Bogara vegetation

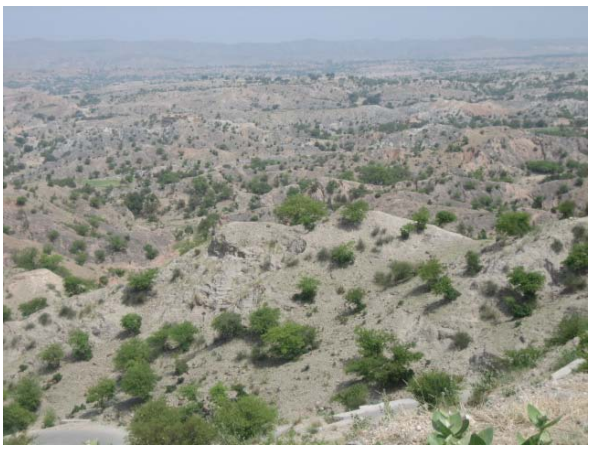


Fig.8 : View of Shadi Khel vegetation

Fig. 9 : View of Kandu Khel vegetation

Fig. 10 : Consumer pressure on hilly area

Fig. 11 : View of Shadi Khel vegetation

Fig. 12 : View of Warana vegetation

Fig.13 : View of Ahmad Abad vegetation

Fig. 14 : View of protected area

Fig.15 : Soil erosion through water

Fig.16 : View of Amberi Kala Vegetation

Fig.17 : View of Takhte Nasrati vegetation

Fig. 18 : Cutting and view of Saraj Khel vegetation

V. Conclusion

The range of homogeneity helps us skillfully in evaluating the biodiversity and conservation of entire habitat and plant life. This study pointed out that the climatic environment of region has privileged conscription of area and the frequency was changed with the change of seasons and altitude. Plant ecologists have commonly been conscious that vegetation show a discrepancy over a broad variety of particular scales and area and have build up methods for studying the degree of vegetation deviation.

VI. Acknowledgment

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