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Ecological study of different community's site from district Karak Khyber Pakhtun Khwa Pakistan

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Abstract

In the present research work the ecological community study was carried out of District Karak Khyber Pakhtun Khwa Pakistan. The ecological study showed that the selected area are very rich of plants flora. *Cynodon-Morus-Vitex* community comprises a total of 22 plants species. Among these 9 are herbaceous plants, 5 are shrubby plants, while the remaining 8 plants are tree species. The community is dominated by *Cynodon dactylon*, *Morus Alba* and *Vitex negundo*. The Species richness (S.R) of this community is 0.880643, Similarity index (S.I) is 25.806451 and its Maturity index (M.I) is 50.3703. *Dodonea-Quercus-Teucrium* community comprises a total of 29 plants species. Among these 11 are herbaceous, 14 are shrubby plants, while the remaining 4 plants are tree species. The community is dominated by *Dodonoea viscosa*, *Quercus incana* and *Teucrium stocksianum*. The species richness (S.R) of the community is 1.638466, similarity index (S.I) is 20.792079 and its Maturity index (M.I) is 51.9298. *Berberis-Olea-Ajuga* community comprises a total of 34 plants species. Among these 15 are herbaceous, 12 are shrubby plants, while the remaining 7 plants are tree species. The community is dominated by *Berberis lyceum*, *Olea ferruginea* and *Ajuga breacteosa*. The species richness (S.R) of the community is 1.23666, similarity index (S.I) is 15.384615 while its maturity index (M.I) is 46.9444. These work provide a better way to understand the flora of the District Karak and their composition of plants communities.

Keywords: District Karak, *Cynodon-Morus-Vitex*, *Dodonea-Quercus-Teucrium* and *Berberis-Olea-Ajuga*

1. Introduction

District Karak lies between 33°-6' to 33°-7' North latitudes and 71°-2' to 71°-7' East longitudes. It is bounded on North by district Kohat and Hangu, on South by district Lakki Marwat and on South-East by district Mianwali and on the West by district Bannu and Waziristan agency. Karak was upgraded to district on 1st July 1982 (Siddique *et al.*, 2013) [8]. Before the up-gradation, it was a sub-division of district Kohat. It is divided into three sub-divisions; Karak, Banda Daud Shah and Takht-e-Nasrati. District Karak consists of a series of small mountains ranges located from East to West (Siddique *et al.*, 2016) [7]. Other important hills are called "Range of Khattak tribe" initiates from the boundary of district with South Waziristan and goes on East-West side up to the River Indus. District has extreme of climate. June is the hottest month with mean minimum 27 °C and maximum 40 °C temperature. The cold season is very extreme because of the wind comes from the west side called "Breeze of Hangu" and rarely blow down the valley of Mirazai. January is the coldest month with mean minimum 6°C and maximum 18 °C temperature. Monsoon rainfall starts from May to September (Akhtar *et al.*, 2018) [1]. The highest monsoon rainfall (110mm) occurs in month of August. From December to February winter rains occur. The area is gifted with xeric and unique flora. The people of the area are mostly poor, educated and depends upon indigenous plant resources for their primary health care and domestic needs. Therefore the aim of the present study was to explore the ethnobotanical wealth of district Karak and its documentation (Badshah *et al.*, 2012).

1.2 Flora

Some of the rare species of plants of great ethnobotanical and especially medicinal value are found in Bajaur agency. A few of these are: Kharawa (*Cotoneaster affinis*), Khar Ghwag (*Verbascum Thapsus*), Batoora (*Datura Stramonium*), Maraghoonay (*Solanum surratense*), Koteelal (*Wlhania somnifera*), Dambara (*Zanthoxylem armatum*),

Markhanai (*Zizipus maurutiana*), Ghwarija (*Indigofera heterantha*), Khona (*Olea ferruginea*), Inzar (*Ficus palmata*), Palosa (*Acacia modesta*), Gooti (*Ajuga bracteosa*), Ghooz (*Juglans regia*), Seerai (*Quercus incana*), Geeray (*Alnus nitida*), Kwaray (*Berberis lyceum*), Spulmai (*Calatropis procera*), Gandiray (*Nerium oleander*), Sharghashay (*Saccharum spontaneum*), Nakhtar (*Pinus roxburghii*), Chinar (*Platanus orientalis*) and hundreds of others (Akhtar *et al.*, 2018)^[1].

2. Material and Method

2.1 Selection of Sample Stands

After the projection of all the stands in the specific proposed four sites towards North, East, West or South only those stands were selected which best represented a certain community vegetation and soil profile. After that the community nominated on the basis of most abundant species composition i.e. importance value.

2.2 Community attributes

The most important attributes of vegetation community were determined by different parameters which are given below.

2.3 Density

It is denoted by "D". It is the middling number of a particular species per unit area. It is gained by distributing the whole number of individuals of that specific species in all quadrates by the total area sampled and calculated as given below.

$$\text{Density (D)} = \frac{\text{No of individuals of a species present in a quadrat}}{\text{Total number of quadrat}}$$

2.4 Relative density

It is denoted by "RD". It is obtained by dividing the density of a particular species by total density of all species multiplying by 100.

$$\text{Relative density (RD)} = \frac{\text{Density of the particular species}}{\text{Total density for all the spp in a strand}} \times 100$$

2.5 Frequency

It is denoted by "F". It is defined as the percentage of sample quadrat in which a species exists. It is gained by dividing the number of quadrat in which a particular species appear by total number of quadrates.

$$\text{Relative density (RD)} = \frac{\text{Density of the particular species}}{\text{Total density for all the spp in a strand}} \times 100$$

2.6 Relative Frequency

It is denoted by "RF". It is gained by dividing the frequency of a particular species by total frequency for all the species in a stand, multiplying by 100.

$$\text{Relative Frequency (RF)} = \frac{\text{Frequency value of a particular spp}}{\text{Total frequency values for all the spp in a stand}} \times 100$$

2.7 Canopy coverage (C.C)

It is denoted by C.C. It is defined as the part of the ground occupied or shaded by a species. It is a vertical projection of crown or shoots area of a species to the ground surface expressed as fraction or percent of a surface area (Zeng *et al.*, 2008)^[9]. For determination of canopy coverage Daubenmire's cover scale was applied. (Daubenmire's, 1959). The coverage classes will be converted into mid points. It is obtained by

dividing sum of mid points of species in all quadrats by total area sampled.

$$\text{Canopy cover (C.C)} = \frac{\text{Sum of mid point of the species}}{\text{Total Canopy coverage of a species}}$$

2.8 Relative canopy cover

It is denoted by "R.C.C". It is obtained by dividing the canopy cover of a particular species by total by total area sampled of canopy cover in a particular stand.

$$\text{Relative canopy coverage (R.C.C)} = \frac{\text{Canopy cover of a particular species}}{\text{Total coverage for all the spp within a stand}} \times 100$$

2.9 Relative Basal area

It is obtained by dividing basal area of a spicific species by total basal area for all species within a stand, multiplying by 100.

$$\text{Relative Basal area (RBA)} = \frac{\text{Basal area of a particular species}}{\text{Total basal area for all species within a stand}} \times 100$$

2.10 Basal area

It is defined as the ground actually penetrated by a crown of a tree. It is a cross section area of a tree as diameter at breast height (DBH), or 1.5 m above the soil. It is measured in cm, and denoted by "BA". In order to obtain the cover, measuring tape is used for this purpose. By the help of following formula basal area can be calculated as (Lefsky *et al.*, 1999)^[4]:

$$\text{Basal Area} = \pi r^2$$

$$\text{Where } r = \frac{\text{circumference}}{2\pi}$$

$$\text{Basal Area (BA)} = \frac{\text{Area of a species calculated from circumference at DBH}}{\text{Total area sampled}}$$

2.11 Relative Basal area

It is obtained by dividing basal area of a spicific species by total basal area for all species within a stand, multiplying by 100.

$$\text{Relative Basal area (RBA)} = \frac{\text{Basal area of a particular species}}{\text{Total basal area for all species within a stand}} \times 100$$

2.12 Importance value

It is very important parameter in ecology on the basis of which plant communities established, the species which having high importance value would be dominant in that stand and the plant community was coined by that species. In a particular stand, importance value can be obtain by adding all the three relative values i.e. (R.D, R.F and R.C.C) (Mitsch, and Gosse link. 2000)^[6].

$$\text{Importance value (I.V)} = \text{RD} + \text{RF} + \text{RCC}$$

2.13 Naming of the Communities

On the basis of highest importance values of species, the plant communities were named in a specific stand. The name of the species with highest importance value must always leading first, go behind by the second and third one respectively of importance value descending order. The plant communities always dominated by a single species which have high

importance value, the second and third species might have low importance values. During naming the communities, the generic name used for naming the community, this is carried out when the number of dominant species two or three, but a full technical name will use in case of only one dominant species (Luo *et al.*, 2011)^[5].

3. Result and Discussion

3.1 Cynodon-Morus-Vitex community (CMV)

This community comprises a total of 22 plants species. Among these 9 are herbaceous plants, 5 are shrubby plants, while the remaining 8 plants are tree species. The community is dominated by *Cynodon dactylon*, *Morus Alba* and *Vitex negundo*. The Species richness (S.R) of this community is 0.880643, Similarity index (S.I) is 25.806451 and its Maturity index (M.I) is 50.3703. First dominant species of this community is *Cynodon dactylon* with importance value (IV) 118.6. It belongs to the family Poaceae and locally known as Kabal. *Cynodon dactylon* is found from 600 elevation. It is found both in sunny as well as Shaddy places. It is a prostrate and perennial grass which grow seasonally. It show maximum growth during summer season, but stops it during winter. It spreads by rhizomes and stolones. The leaf blade is short and is hairy or hairless. Flower is in the form of tuft and consist of 4-8 slender, 70mm long spikes which arranged on the axis terminally. *Cynodon dactylon* required at least 15 °C

temperature for its growth, while optimum growth occur at 25-36 °C temperature. The Second dominant species of this community is *Morus Alba* with importance value 103.5. It is locally known as Speen thooth, and belongs to the family Moraceae. It is a fast-growing, small to medium-size tree which grows 15–20m tall. Usually its lifespan is short, although some specimens having more than 250 years old. The leaves are up to 30cm long, and deeply and complicatedly lobed, 5–15cm broad, cordate at the base and rounded to acuminate at the tip, and serrated on the margins. It is deciduous in temperate regions, but ever green in tropical counties. The flower is unisexual, catkin, male catkins are 2–3.5cm long, while female catkins 1–2cm long. Both male and female flowers are usually on separate trees, although same tree may have both rarely. The fruit is 1–3cm long, purple, white or pink, sweet. Seeds are small, round and dispersed widely. The third dominant Species of this community is *Vitex negundo* with importance value of 66.9. It is a whitish to greyish tomatoes shrub. It is found from 600-2000m elevation mostly in dry places. It is locally called Warmandai or Marwandai. It have opposite and decussate leaves, 3-5 at each whorl. The flowers of *Vitex negundo* are small in size, blue in colour and found in opposite cyme. Calyx are green, 5-tothed, campanulate and persistant. Corolla is 5-lobed and form tube like structure. Stamens are 4 in number. Fruit is drope, black, round, and sub Globose.

Table 1: Cynodon-Morus-Vitex Community (CMV)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RC	IV
<i>Euphorbia hirta</i> L.	50	5	11.82033	40	11.4286	12.4	11.032	34.281
<i>Cynodon dactylon</i> (Linn.)	114	11.4	41.8	90	37.5	19.4	39.351	118.6
<i>Artemisia scorpi</i> a Waldst. & Kitam.	12	1.2	4.918033	50	6.49351	7.4	9.9759	11.75
<i>Lathyrus sativus</i> L.	20	2	8.196721	60	7.79221	7.4	3.928281	19.92
<i>Ipomea purpurea</i> (Linn.) Roth.	9	0.9	3.688525	60	7.79221	12.4	21.82318	33.3
<i>Avena sativa</i> L.	20	2	8.196721	60	7.79221	12.4	3.928281	19.92
<i>Cyperus rotundus</i> L.	7	0.7	2.868852	50	6.49351	7.4	3.498052	12.86
<i>Canabis sativa</i> L.	23	2.3	5.437352	20	5.71429	7.4	6.5836	17.735
<i>Nasturtium officinale</i> R. Br.	16	1.6	5.9	10	4.16667	7.4	1.0142	11.0
Shrubby layer								
<i>Calotropis procera</i> (Willd.) R.Brown	50	5	11.82033	30	8.57143	12.4	11.032	31.424
<i>Andrachne cordifolia</i> (Wall. ex Decne.) Muell. Arg.	32	3.2	7.565012	30	8.57143	7.4	6.5836	22.72
<i>Vitex negundo</i> L.	57	5.7	20.9	50	20.8333	12.4	25.152	66.9
<i>Malvastrum coromandelianum</i> L. Garcke	45	4.5	10.6383	40	11.4286	12.4	11.032	33.099
<i>Nerium oleander</i> L.	48	4.8	11.34752	40	11.4286	7.4	6.5836	29.36
Tree layer	No of plants	D	RD	F	RF	BA	RBA	IV
<i>Ricinus communis</i> L.	19	1.9	7.786885	50	6.49351	0.058953	0.33759	14.62
<i>Tamarix aphylla</i> L.	7	0.7	2.868852	50	6.49351	0.610865	3.498052	12.86
<i>Eugenia jambolana</i> (L.) Skeels.	17	1.7	7.377049	30	3.8961	0.80633	4.61736	15.99
<i>Juglans regia</i> Linn.	18	1.8	7.377049	30	3.8961	0.80633	4.61736	15.89
<i>Morus alba</i> L.	86	8.6	31.5	90	37.5	2.882789	34.483	103.5
<i>Ailanthus altissima</i> (Mill.) Swingle	13	1.3	5.327869	40	5.19481	1.71496	9.820534	20.34
<i>Robinia pseudo-acacia</i> Linn.	11	1.1	4.508197	40	5.19481	1.033983	5.920992	15.62
<i>Ficus carica</i> L.	27	2.7	11.06557	70	9.09091	1.109671	6.354412	26.51

3.2 Dodonea-Quercus-Teucrium community (DQT)

This community comprises a total of 29 plants species. Among these 11 are herbaceous, 14 are shrubby plants, while the remaining 4 plants are tree species. The community is dominated by *Dodonea viscosa*, *Quercus incana* and *Teucrium stocksianum*. The Species richness (S.R) of the community is 1.638466, similarity index (S.I) is 20.792079 and its Maturity index (M.I) is 51.9298 *Dodonea viscosa* is the first dominant species of this community with importance value (I.V) 40.1. It is an ever green dioecious shrub, normally grow upto 4m, but some time reach to a maximum height of 9m to form a

small tree. It belongs to the family Sapindaceae and locally known as Ghwarhaskay. It is found worldwide from 600-1400m elevation. The width and length of the leaf is 1–1.5 and 4–7.5cm respectively. The leaves are variable in shape, often sessile, obovate, rarely lanceolate, alternate and resinous. The apex of leaf is pointed or rounded. The texture of leaves is tough and leathery. *Quercus dialata* is the second dominant plant species of this community with importance value (I.V) 39.85. It belongs to the family Fagaceae and known as Pirgay or Serai by local people. *Quercus dialatata* found on dry slopes from 1500m-3000m altitude. It is a medium ever green tree. Its leaves have

great variation, may be elliptic to lanceolate, having spiny margins. *Teucrium stocksianum* is the third dominant species of this community on the basis of importance value (IV), which is 34.71. It is a perennial herb, belong to the family labiatae. Its local name is khmazoray or Konde Botay. It is an aromatic plant which grow in cluster or tufts form. It have simple erect,

branched and bifurcated stem with 5-20cm length. Furthermost its stem is leafy and white in colour. Leaves are greyish-white, narrow elliptic, oblong, sessile or subsessile and 5- 10 mm long. Flowers of *Teucrium stocksianum* are in racemose form, sessile, terminal, or lateral, oblong and are white in colour.

Table 2: Dodonea-Quercus-Teucrium community (DQT)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RC	IV
<i>Cymbopogon schoenanthus</i> Spreng.	17	1.7	5.29595	60	8.69565	3	3.7129	17.704
<i>Cynodon dactylon</i> (Linn.)	17	1.7	5.29595	40	5.7971	3	3.7129	14.806
<i>Teucrium stocksianum</i> Boiss.	12	1.2	15.78947	60	16.6667	19.4	2.249314	34.71
<i>Trianthema portulacastrum</i> L.	28	2.8	8.722741	40	5.7971	12.4	15.347	29.866
<i>Oxalis corniculata</i> L.	19	1.9	5.919003	40	5.7971	7.4	9.1584	20.875
<i>Plantago lanceolata</i> L.	27	2.7	8.411215	50	7.24638	3	3.7129	19.37
<i>Sonchus oleraceus</i> Linn.	17	1.7	5.29595	30	4.34783	3	3.7129	13.357
<i>Cuscuta reflexa</i> Roxb.	34	3.4	10.5919	60	8.69565	7.4	9.1584	28.446
<i>Thymus linearis</i> Benth.	24	2.4	7.476636	50	7.24638	7.4	9.1584	23.881
<i>Plantago major</i> L.	17	1.7	5.29595	30	4.34783	3	3.7129	13.357
<i>Duchesnea indica</i> (Andrews) Focke	20	2	6.23053	70	10.1449	12.4	15.347	31.722
Shrubby layer								
<i>Berberis lyceum</i> Royle	31	3.1	8.115183	70	7.86517	17	12.337	28.317
<i>Nerium indicum</i> Mill.	27	2.7	7.068063	40	4.49438	7.4	5.3701	16.933
<i>Myrtus communis</i> L.	35	3.5	9.162304	80	8.98876	12.4	8.9985	27.15
<i>Debregeasia salicifolia</i> (D. Don) Rendle	15	1.5	3.926702	50	5.61798	7.4	5.3701	14.915
<i>Hypericum dyeri</i> Rehder	12	1.2	3.141361	30	3.37079	3	2.1771	8.6892
<i>Hypericum perforatum</i> Linn.	32	3.2	8.376963	60	6.74157	7.4	5.3701	20.489
<i>Zanthoxylum armatum</i> DC.	11	1.1	2.879581	40	4.49438	3	2.1771	9.551
<i>Barleria cristata</i> L.	29	2.9	7.591623	70	7.86517	12.4	8.9985	24.455
<i>Staphylea emodi</i> Hedge	20	2	5.235602	50	5.61798	7.4	5.3701	16.224
Tree layer	No of plants	D	RD	F	RF	BA	RBA	IV
<i>Pinus roxburghii</i> Sargent	10	1	13.15789	50	13.8889	1.58784	1.586224	28.63
<i>Maytenus wallichiana</i> (springe) Raju & Bull.	4	0.4	5.263158	20	5.55556	1.38903	1.387613	12.21
<i>Quercus dilatata</i> Lindl. ex Royle	16	1.6	21.05263	60	16.6667	2.13784	2.135665	39.85
<i>Betula utilis</i> D. Don	7	0.7	9.210526	20	5.55556	1.95534	1.953346	16.72

3.3 Berberis-Olea-Ajuga community (BOA)

This community comprises a total of 34 plants species. Among these 15 are herbaceous, 12 are shrubby plants, while the remaining 7 plants are tree species. The community is dominated by *Berberis lyceum*, *Olea ferruginea* and *Ajuga bracteosa*. The Spcies richness (S.R) of the community is 1.23666, similarity index (S.I) is 15.384615 while its maturity index (M.I) is 46.9444. The first dominant species of this community is *Berberis lyceum* with importance value 42.321. It belongs to the family Berberidaceae. Its local name is Kwaray or Ziar largay. It is an erect or sub-erect ever green shrub with 2-5m long stem. The stem and branches are whitish to pale yellow in colour. Leaves are 5-12mm broad and 3-7cm long. These are oblanceolate to oblong-obovate, entire and having 2-4 spinules at the margins. Is flower is pale-yellow and having pedicle. Each raceme have 10-25 flowers. The fruit is berry, obovoid, sub globose, black in colour when ripened. All parts e.g root, stem, flower and fruit are medicinal. It is found from 100-2900m elevation.

Olea ferruginea is the second dominant species of this community which have 41.49 importance value. It belongs to the

family Oleaceae. Locally it is known as Khunau. It is found from 600-1800m long elevation and common on lower hills. It is an evergreen tree or large shrubs up to 5-10m long. Its bark is smooth when young but convert into strips when become old. Its leaves are dark green in colour. These are opposite, oblongated, ovate to lanceolate, with sharp and stiff apex, ranges from 4-10cm long. Its flowers are whitish in colour, form trichotomous cyme which is 2-4cm long and located on axial position. Calyx is cut into 4 small teeth. Corolla is short and with 4 lobes. Its fruit is drupe, oval, oily, and black in colour when ripened.

Ajuga bracteosa is the third dominant species of this community which have 36.552 importance value. It is annual or perennial herb which have short life span. It is an herbal plant belongs to the family Labiatae. The Stem of *Ajuga bracteosa* is 10-25cm long spreading or ascending, usually having no branches. Small minute hairs are present on its surface. Its leaves are 45 x 25mm long found in rosette condition. These are elliptic, entire and became narrowed into petiole. Multicellular hairs are present on their surface. Its flowers form Inflorescence which are unbranched. Fruits of *Ajuga bracteosa* known as Nutlets which are pale brown and have prominent ridges.

Table 3: Berberis-Olea-Ajuga community (BOA)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RCC	IV
<i>Polygonum plebeium</i> R. Br.	17	1.7	8.173077	60	11.7647	3	4.2614	24.199
<i>Rumex dentatus</i> L.	20	2	9.615385	30	5.88235	7.4	10.511	26.009
<i>Carbenia benedicta</i> (Linn) Bth & Hk	16	1.6	7.692308	50	9.80392	3	4.2614	21.758
<i>Verbascum thapsus</i> L.	11	1.1	5.288462	30	5.88235	3	4.2614	15.432
<i>Lathyrus sativus</i> L.	20	2	9.615385	60	11.7647	7.4	10.511	31.891
<i>Thymus linearis</i> Benth.	17	1.7	8.173077	40	7.84314	7.4	10.511	26.528
<i>Aconitum heterophyllum</i> Wall. ex Royle	11	1.1	5.288462	30	5.88235	3	4.2614	15.432
<i>Ajuga breacteosa</i> Wall. ex Benth	19	1.9	9.134615	50	9.80392	12.4	17.614	36.552
<i>Polygonatum verticillatum</i> (L.) Allioni	3	0.3	1.442308	20	3.92157	0.5	0.7102	6.0741
<i>Nasturtium officinale</i> R. Br.	17	1.7	8.173077	40	7.84314	3	4.2614	20.278
<i>Viola canescens</i> Wall. ex Roxb.	9	0.9	4.326923	40	7.84314	0.5	0.7102	12.88
<i>Amaranthus viridis</i> L.	17	1.7	5.29595	50	7.24638	7.4	9.1584	21.701
<i>Cuscuta reflexa</i> Roxb.	17	1.7	8.173077	10	1.96078	7.4	10.511	20.645
<i>Cynodon dactylon</i> (Linn.)	20	2	6.756757	70	11.6667	7.4	7.4	25.823
<i>Anagallis arvensis</i> L.	20	2	6.756757	50	8.33333	12.4	12.4	27.49
Shrubby layer								
<i>Rabdosia rugosa</i> (Wallich ex Benth.) Hara	17	1.7	5.29595	50	7.24638	7.4	9.1584	21.71
<i>Colerbrookea oppositifolia</i> Smith	21	2.1	7.094595	40	6.66667	7.4	7.4	21.161
<i>Dodonaea viscosa</i> (L.) Jacq.	43	4.3	14.52703	50	8.33333	12.4	12.4	35.26
<i>Debregeasia salicifolia</i> (D. Don) Rendle	26	2.6	8.783784	40	6.66667	7.4	7.4	22.85
<i>Berberis lyceum</i> Royle	31	3.1	14.90385	50	9.80392	12.4	17.614	42.321
<i>Buddleja crispa</i> Benth.	20	2	6.756757	70	11.6667	7.4	7.4	25.823
<i>Hypericum perforatum</i> Linn.	22	2.2	7.432432	50	8.33333	7.4	7.4	23.166
<i>Trachelospermum lucidum</i> (D. Don) Schum.	24	2.4	8.108108	40	6.66667	7.4	7.4	22.175
<i>Andrachne cordifolia</i> (Wall. ex Decne.) Muell. Arg.	23	2.3	7.77027	60	10	3	3	20.77
<i>Periploca aphylla</i> Decne.	11	1.1	3.716216	30	5	3	3	11.716
<i>Jasminium officinale</i> Linn.	12	1.2	4.054054	30	5	7.4	7.4	16.454
<i>Staphylea emodi</i> Hedge	33	3.3	11.14865	50	8.33333	12.4	12.4	31.882
Tree layer	No of plants	D	RD	F	RF	BA	RBB	IV
<i>Olea ferruginea</i> Royle	47	4.7	14.1994	80	13.7931	1.581427	13.49525	41.49
<i>Pyrus pashia</i> Ham ex. D. Done	34	3.4	10.2719	70	12.069	1.074929	9.172999	31.51
<i>Ficus palmata</i> Forssk.	37	3.7	11.17825	50	8.62069	1.141717	9.742944	29.54
<i>Celtis caucasica</i> Willd.	19	1.9	5.740181	50	8.62069	0.534461	4.560868	18.92
<i>Quercus dilatata</i> Lindl. ex Royle	47	4.7	14.1994	40	6.89655	0.845248	7.212998	28.31
<i>Juglans regia</i> Linn.	41	4.1	12.38671	80	13.7931	1.405264	11.99194	38.17
<i>Betula utilis</i> D. Don	9	0.9	2.719033	50	8.62069	0.916594	7.821837	19.16

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