
**Ecological Study of Different Communities Site from District Lower Dir
Laram Timargara Khyber Pakhtun Khwa Pakistan**

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Abstracts

In the present research work the ecological community study was carried out of District Lower Dir Laram Timargara Khyber Pakhtun Khwa Pakistan. *Salvia- Cynodon-Berberis* community (SCB). This community comprises a total of 24 plants species. Among these 16 are herbaceous plants, 8 are shrubby plants, while there is no single tree species found in this community. The community is dominated by *Salvia moocruftiana* Wall, *Cynodon dactylon* and *Berberis lyceum*. The Species richness (S.R) is 1.31055873, similarity index (S.I) is 33.33333 and its Maturity index (M.I) is 49. *Verbascum-Buddleja-Cotoneaster* community (VBC). This community comprises a total of 23 plants species. Among these 10 are herbaceous, 8 are shrubby plants, while the remaining 5 plants are tree species. The community is dominated by *Verbascum thapsus*, *Buddleja crispa* and *Cotoneaster nummularia*. Species richness (S.R) of the community is 1.499237, similarity index (S.I) is 30.188679 while its Maturity index (M.I) is 46. *Cyperus-Calotropis- Ziziphus* community (CCZ). This community comprises a total of 32 plants species. Among these 20 are herbaceous, 8 are shrubby plants, while the remaining 5 plants are tree species. The community is dominated by *Cypres rotundus*, *Calotropis procera* and *Cotoneaster nummularia*. The Species richness (S.R) of the community is 1.146771, similarity index (SI) is 24.39024 and its Maturity index (M.I) is 58.3783. The aim of the present study to explore the flora of Laram Timargara Mountains.

Key words: *Calotropis- Ziziphus*, Maturity index, *Berberis lyceum*, *Buddleja crispa*

1. Introduction

Study area (lower Dir) is located in Khyber Pakhtunkhwa, northwestern part of Pakistan. It is lying in the natural vegetated area of the Himalayas. Lower Dir is the lower part of the old District Dir. At the time of independence, Dir was a state ruled by Nawab Shah Jehan Khan (Shuaib *et al.*, 2014). It was merged in Pakistan in 1969 and later on declared as district in 1970. In 1996, it was bifurcated into Upper and Lower Dir districts. District Lower Dir is located in the north-western part of Khyber Pakhtunkhwa province and is spread over an area of 1583 square kilometers (Hassan *et al.*, 2014). Apart from small areas in the south-west, the District is mostly a rugged mountainous terrain. The District borders with swat District on its East, Afghanistan on its West, Upper Dir and Chitral on its North & north-west respectively and Malakand & Bajaur Agency on its South. The district is administratively subdivided into two Tehsils which contain a total of 37 UCs. The district is represented in the provincial assembly by four elected MPAs (Ali *et al.*, 2017). The short route that links District Lower Dir to the provincial capital is the one that passes through District Charsda and Malakand Districts. For the people coming from down country, however, the more convenient approach is through the Mardan and Malakand Districts. There is no railway tract leading to the District (Ahmad *et al.*, 2015).

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 (Khan *et al.*, 2014).

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.

$$\text{Frequency (F)} = \frac{\text{No of quadrates in which a particular species occurs}}{\text{Total number of quadrat sampled}}$$

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). 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 spicipific 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).

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

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

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

2.11 Relative Basal area

It is obtained by dividing basal area of a spicipific 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).

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

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).

3. Result and Discussion

3.1 *Salvia*- *Cynodon*-*Berberis* community (SCB)

This community comprises a total of 24 plants species. Among these 16 are herbaceous plants, 8 are shrubby plants, while there is no single tree species found in this community. The community is dominated by *Salvia moorcroftiana* Wall, *Cynodon dactylon* and *Berberis lyceum*. The Species richness (S.R) is 1.31055873, similarity index (S.I) is 33.33333 and its Maturity index (M.I) is 49. *Salvia moorcroftiana* is the first dominant species of this community which belongs to family Labiatae. The importance value of this species is 56.05. It is a perennial, herbaceous and medicinal plant. It grow up to 3 feet long. It is indigenous to the mountains Himalaya. It grows between 1100-2900m elevation on open slopes and disrupted areas. *Salvia moorcroftiana* grows up to 2.6 feet tall. Leaves are soft like cotton and heart shaped. These having toothed margin which are covered with white wool. The flowers are bisexual, pale-blue in colour and grow on many inflorescences that enlarge above the leaves. Pollination carried out by insects and bees. Loose soil, (sand loamy), proper pH, full exposure to sun light, good drainage of water after rain and regular watering are required for their cultivation. It is used for the treatment of cough and cold, seed is used for dysentery, piles and bowl pain. The leaves are used for dressing of wounds. Second 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 600m 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 third dominant species of this community is *Berberis lyceum* with importance value 35.396. It belongs to the family Berberidaceae. Its lacial 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. Its flower is pale-yellow and having pedicle. Each raceme have 10-25 flowers.

Table. No. 1 Salvia-Cynodon-Berberis community (SCB)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RC	IV
<i>Verbascum thapsus</i> L.	20	2	5.509642	50	5.95238	7.4	5.0443	16.506
<i>Cichorium intybus</i> Linn.	35	3.5	9.641873	60	7.14286	17	11.588	28.373
<i>Cirsium verutum</i> (D. Don) Sprengel	32	3.2	8.815427	60	7.14286	7.4	5.0443	21.003
<i>Salvia moocroftiana</i> Wall. ex Benth.	24	2.4	18.46154	50	15.625	17	21.964	56.05
<i>Lathyrus sativus</i> L.	29	2.9	7.988981	60	7.14286	7.4	5.0443	20.176
<i>Cirsium falconeri</i> (Hook. f.) Petrak	33	3.3	9.090909	70	8.33333	17	11.588	29.013
<i>Ajuga breacteosa</i> Wall. ex Benth	37	3.7	10.19284	70	8.33333	17	11.588	30.114
<i>Echinops cornigerus</i> DC.	32	3.2	8.815427	60	7.14286	12.4	8.4526	24.411
<i>Filago hurdwarica</i> (Wall. ex DC.) Wagenitz	43	4.3	11.84573	70	8.33333	19.4	13.224	33.403
<i>Cymbogon schoenanthus</i> Spreng.	19	1.9	5.23416	50	5.95238	3	2.045	13.232
<i>Cynodon dactylon</i> (Wall.)	23	2.3	17.69231	40	12.5	7.4	9.5607	39.753
<i>Medicago lupulina</i> L.	28	2.8	7.713499	50	5.95238	12.4	8.4526	22.119
<i>Alternanthera pungens</i> Kunth	7	0.7	1.928375	50	5.95238	7.4	5.0443	12.925
<i>Carthamus oxycantha</i> M. Bieb.	9	0.9	2.479339	50	5.95238	12.4	8.4526	16.884
<i>Achyranthes aspera</i> L.	13	1.3	3.581267	50	5.95238	3	2.045	11.579
<i>Viola canescens</i> Wall. ex Roxb.	7	0.7	1.928375	20	2.38095	0.5	0.3408	4.6502
Shrubby layer								

<i>Viscum cruciatum</i> Sieber ex Springe.	13	1.3	10	40	12.5	7.4	9.5607	32.061
<i>Opuntia monacantha</i> (Willd.) Ham.	11	1.1	8.461538	40	12.5	3	3.876	24.838
<i>Phragmites australis</i> Trin. ex Steud.	15	1.5	11.53846	30	9.375	7.4	9.5607	30.474
<i>Calotropis procera</i> (Willd.) R.Brown	6	0.6	4.615385	30	9.375	3	3.876	17.866
<i>Berberis lyceum</i> Royle	13	1.3	10	30	9.375	12.4	16.021	35.396
<i>Maytenus willichiana</i> (Springe) Raju & Bull.	35	3.5	9.641873	60	7.14286	17	11.588	28.373
<i>Withania somnifera</i> (L.) Dunal	12	1.2	9.230769	30	9.375	7.4	9.5607	28.166
<i>Oetostegia limbata</i> (Benth.) Boiss.	7	0.7	1.928375	50	5.95238	7.4	5.0443	12.925

3.2 *Verbascum-Buddleja-Cotoneaster* community (VBC)

This community comprises a total of 23 plants species. Among these 10 are herbaceous, 8 are shrubby plants, while the remaining 5 plants are tree species. The community is dominated by *Verbascum thapsus*, *Buddleja crispa* and *Cotoneaster nummularia*. Species richness (S.R) of the community is 1.499237, similarity index (S.I) is 30.188679 while its Maturity index (M.I) is 46.

Verbascum thapsus is the first dominant species of this plant community which have 80.5595 importance value. It is an erect annual or perennial plant which belong to family Scrophulariaceae. Locally this plant is known as Khar ghwag. It have 2m tall or more or long stem. It have two types of leaves, upper and lower leaves. Upper leaves are small, oblong and laceolate, while lower leaves are radical, large and have stalk. The large leaves reach upto 50cm long. The flowers of *Verbascum thapsus* are small, yellow, rosette, sessile or with a small stalk, grouped on a tall stem. Its fruits are small, oval shaped and capsulated, 6 mm long. Each capsule containing large numbers of small brown seeds. It found up to 3600m long altitude, in a wide variety of habitats, but prefers well-litter, disturbed soils, where it can appear soon after the soil

take light. It is a medicinal plant, widely used in herbal treatments. It have emollient and acerbic properties. Mullein remedies are especially recommended for coughs and related problems. In tropical applications it is used against a variety of skin problems. It also used to make torches and dyes.

Buddleja crispa is the second dominant species of this community having 62.608 importance value. It is tomentose shrub which belong to family Buddlejaceae and locally known as Spera botay or Spera panrhay. Its leaves are apetiolate or shortly petiolate (0.6-1.3cm), ovate, lanceolate and reaches up to 8cm long. The margins of leaves are sinuate or dentate. Its flowers are small, sessile, fragrant and of purple colour. Its flower bear 5mm long calyx, 8mm long orbicular and pubescent corolla and 4 sessile stamens. Its fruit form 4-6mm long capsule. Its seeds are round, membranous and 0.5mm long. It is found from 1000-2300m elevation mostly in sunny and dry places toward South poles.

Cotoneaster nummularia belongs to the family Rosaceae is the third dominant species of this community which have 57.089 importance value. It is locally called Mamanrha. It is an evergreen shrub having 1m tall rigid scattering branches. Branches are divided into reddish brown to blackis branchlets. Its Petioles are 2-4mm long, pubescent having stipules. Its leaves are up to 8mm wide and 10 long. Leaf blade is obovate or oblonge. Its flower are in cluster form or Inflorescence which have up to 3 flowers of 10mm. Its fruit is globose, red in colour and that of 10mm in diameter. The flowering season start from May to June and long up to August and September. Found on slopes, rocks and high mountainous areas from 1500-4000m elevation.

Table No. 2. Verbascum-Buddleja-Cotoneaster community (VBC)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RC	IV
<i>Cymbogon schoenanthus</i> Spreng.	21	2.1	10.9375	50	9.25926	7.4	10.482	30.678
<i>Verbascum thapsus</i> L.	33	3.3	30	80	28.5714	7.4	22.024	80.595
<i>Allium griffithianum</i> Boiss.	17	1.7	8.854167	40	7.40741	3	4.2493	20.511
<i>Moraea sisyrinchium</i> (L.) Ker Gawl.	25	2.5	13.02083	60	11.1111	17	24.079	48.211
<i>Ajuga breacteosa</i> Wall. ex Benth	10	1	5.208333	30	5.55556	0.5	0.7082	11.472
<i>Amaranthus viridis</i> L.	17	1.7	8.854167	40	7.40741	7.4	10.482	26.743
<i>Chrozophora tinctoria</i> (Linn.) Raffin.	11	1.1	5.729167	40	7.40741	3	4.2493	17.386
<i>Cynodon dactylon</i> (Wall.)	8	0.8	4.166667	40	7.40741	0.5	0.7082	12.282
<i>Mirabilis jalapa</i> Linn.	13	1.3	6.770833	50	9.25926	12.4	17.564	33.594
<i>Ipomea purpurea</i> (Linn.) Roth.	14	1.4	7.291667	50	9.25926	3	4.2493	20.8
Shrubby layer	14	1.4	7.291667	40	7.40741	3	4.2493	18.948
<i>Cotoneaster microphylla</i> Wall. ex Lindley	15	1.5	13.63636	60	21.4286	7.4	22.024	57.089
<i>Vitex negundo</i> L.	8	0.8	7.272727	10	3.57143	3	8.9286	19.773
<i>Calotropis procera</i> (Willd.) R.Brown	13	1.3	6.770833	50	9.25926	12.4	17.564	33.594
<i>Opuntia monacantha</i> (Willd) Ham.	4	0.4	3.636364	20	7.14286	0.5	1.4881	12.267
<i>Phragmites australis</i> Trin. ex Steud.	12	1.2	10.90909	30	10.7143	7.4	22.024	43.647
<i>Withania somnifera</i> (L.) Dunal	13	1.3	11.81818	30	10.7143	0.5	1.4881	24.021
<i>Buddleja crispa</i> Benth	25	2.5	22.72727	50	11.8571	7.4	22.024	62.608

<i>Oetostegia limbata</i> (Benth.) Boiss.	25	2.5	13.02083	60	11.1111	17	24.079	48.211
Tree layer	No of plants	D	RD	F	RF	BA	RBA	IV
<i>Melia azedarach</i> Linn.	22	2.2	9.053498	70	8.86076	2.976733	10.98908	28.9
<i>Ziziphus jujuba</i> Mill.	15	1.5	6.17284	50	6.32911	2.55553	9.434143	21.94
<i>Ailanthus altissima</i> (Mill.) Swingle, Jour.	11	1.1	4.526749	50	6.32911	2.450668	9.047026	19.9
<i>Robinia pseudo-acacia</i> Linn.	8	0.8	3.292181	40	5.06329	1.631123	6.021546	14.38
<i>Platanus orientalis</i> L.	11	1.1	4.526749	50	6.32911	0.747397	2.759135	13.61

3.3 Cyperus- Calotropis- Ziziphus community (CCZ)

This community comprises a total of 32 plants species. Among these 20 are herbaceous, 8 are shrubby plants, while the remaining 5 plants are tree species. The community is dominated by *Cypres rotundus*, *Calotropis procera* and *Cotoneaster nummularia*. The Spcies richness (S.R) of the community is 1.146771, similarity index (SI) is 24.39024 and its Maturity index (M.I) is 58.3783

The first dominant species of this community is *Cyperus rotundus* which have 72.36 importance value. It belongs to the family Cyperacea and locally known as Deela. It is an herb and may reach up to a height 150 cm. It is found at 500m elevation in fields, ditches and costliness, in tropical and subtropical continents. Like other member of Cyprus its leaves are sprout in three lines from the base of the plant. The length of their leaves approximately from 5–20cm. The flower is hermaphrodite having three stamen and three carpel. Its head having 3–9 unequal waves. Its fruit is small, dry, hard and one seeded.

With the importance value 57.85 *Calotropis procera* is the second dominant species of this community. It is locally known Spalmay. It is called milk weed because the latex it produces is just like milk in colour. It belongs to the family Apocynaceae and can grow up to a height of 1-

2m long. Its leaves are sessile and sub sessile, opposite, ovate and cordate at the base. Flowers are fragrant and are about 1.5-2 inches (3.8-5.1cm) in size, with umbellate lateral cymes and have white to pink colour. Seeds are compressed, broadly ovoid with tufted micropylar coma of long silky hair. Pollination occur through insects. Stigma and androecium are fused to form gynoecium. Plant is contains alkaloids which have strong antimicrobial activity.

The third dominant species of the community is *Ziziphus nummularia*. Its importance value is 53.73. Locally it is known as Karkanra and belongs to the family Rhamnaceae. It is a thorny shrub. Its stem is pale yellow. Leaves are simple, alternate and ovate having deep green color. Its lowers are small, hermaphrodite, pale yellow and pentamerous. Fruits are red or black fleshy drupe and are less than one centimeter. Seed are smooth, brownish and soft. It blooming season is from July to September while fruiting takes place from November to December.

Table No. 3. Cyperus –Calotrophis-Ziziphus community (CCZ)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RC	IV
<i>Solanum surattense</i> Burm. f.	46	4.6	7.055215	90	7.69231	17	8.5729	23.32
<i>Fragaria nubicola</i> Lindle. Ex Lacaita	27	2.7	4.141104	50	4.2735	7.4	3.7317	12.146
<i>Lathyrus sativus</i> L.	38	3.8	5.828221	60	5.12821	7.4	3.7317	14.688
<i>Achillea millefolium</i> L.	37	3.7	5.674847	70	5.98291	7.4	3.7317	15.389
<i>Anagallis arvensis</i> L.	28	2.8	4.294479	60	5.12821	12.4	6.2532	15.676
<i>Avena sativa</i> L.	12	1.2	1.840491	30	2.5641	3	1.5129	5.9175
<i>Artemisia santolinifolia</i> Turcz. Ex Krasch.	33	3.3	5.06135	60	5.12821	7.4	3.7317	13.921
<i>Cynodon dactylon</i> (Wall.)	56	5.6	8.588957	90	7.69231	19.4	9.7832	26.064
<i>Euphorbia hirta</i> L.	25	2.5	3.834356	30	2.5641	3	1.5129	7.9113
<i>Cypres rotundus</i> L.	24	2.4	23.52941	70	21.875	19.4	26.95592	72.36
<i>Xanthium strumarium</i> L.	10	1	1.533742	20	1.7094	0.5	0.2521	3.4953
<i>Ipomea purpurea</i> (Linn.) Roth.	33	3.3	5.06135	60	5.12821	12.4	6.2532	16.443
<i>Lathyrus apaca</i> Linn.	25	2.5	3.834356	60	5.12821	7.4	3.7317	12.694

<i>Sylibum marianum</i> (L.) Graertn	25	2.5	3.834356	60	5.12821	7.4	3.7317	12.694
<i>Capsella bursa-pestoris</i> Medic.	15	1.5	2.300613	30	2.5641	3	1.5129	6.3776
<i>Centaurea iberica</i> Trev. ex Spreng.	34	3.4	5.214724	60	5.12821	17	8.5729	18.916
<i>Eruca sativa</i> Mill.	41	4.1	6.288344	60	5.12821	17	8.5729	19.989
<i>Moraea sisyrinchium</i> (L.) Ker Gawl.	27	2.7	4.141104	50	4.2735	7.4	3.7317	12.146
<i>Oxalis corniculata</i> L.	29	2.9	4.447853	70	5.98291	3	1.5129	11.944
<i>Salvia moocroftiana</i> Wall ex Benth.	57	5.7	8.742331	70	5.98291	19.4	9.7832	24.508
Shrubby layer								
<i>Calotropis procera</i> (Willd.) R.Brown	26	2.6	25.4902	60	18.75	12.4	13.61116	57.85
<i>Nerium indicum</i> Mill.	51	5.1	14.01099	70	10.4478	12.4	11.832	36.291
<i>Gymnosporia royleana</i> Wall. ex M.A. Lawson	32	3.2	8.791209	70	10.4478	7.4	7.0611	26.3
<i>Zanthoxylum armatum</i> DC.	23	2.3	6.318681	40	5.97015	7.4	7.0611	19.35
<i>Barleria cristata</i> L.	16	1.6	4.395604	40	5.97015	3	2.8626	13.228
<i>Datura stomonium</i> L.	28	2.8	7.692308	60	8.95522	7.4	7.0611	23.709
<i>Staphylea emodi</i> Hedge	17	1.7	4.67033	50	7.46269	3	2.8626	14.996
<i>Berberis jaeschkeana</i> Schneid.	45	4.5	12.36264	70	10.4478	12.4	11.832	34.642
<i>Debregeasia salicifolia</i> (D. Don) Rendle	17	1.7	4.67033	30	4.47761	7.4	7.0611	16.209
<i>Hypericum dyeri</i> Rehder	14	1.4	3.846154	20	2.98507	3	2.8626	9.6938
<i>Hypericum perforatum</i> Linn.	31	3.1	8.516484	60	8.95522	7.4	7.0611	24.533

3.4 Juglans-Rumex-Viola community (JRV)

This community comprises a total of 37 plants species. Among these 22 are herbaceous, 12 are shrubby plants, while the remaining 3 plants are tree species. The community is

dominated by *Juglans regia*, *Rumex hastatus*, and *Viola canescens*. The species richness (S.R) of this community is 1.4583077, the similarity index (S.I) is 19.178082 and its maturity index (M.I) is 43.9473. *Juglans regia* which is locally known as Ghooz is the first dominant plant species of this community having 104.8 importance value. It belongs to the family Juglandaceae. It is a deciduous tall tree, grow up to 25m long. The young shoots are closely covered with down ward hairs like structures. The leaves of *Juglans regia* are opposite, tomentose, imparipinnate, large and up to 40 cm long. It have separate male and female flower (unisexual) which are small in size. Male flower is catkin with 10-20 stamens. Female flowers arise on short terminal spikes and 1-2 in number. Its fruit is round, having green glandular epicarp while endocarp is 2-valved. It have 2-4 lobed seed. It is found booth wild and cultivated. It is found from 1000-2800m elevation. *Juglans regia* Linn is an edible medicinal plant. It is used for many purposes. It is valued for its wood and edible fruit. Wood is good for furniture and gun stocks. The bark which is locally known as Dandasa used for mouth and teeth cleanliness. Its seeds rich in oil which is used for cooking. The second dominant species of this plant community is *Rumex hastatus* which having 70.84 importance value. It belongs to the family polygonaceae and locally known as Tarrokey or Ghra tarokey. This is a very common bushy, perennial herbs or small shrub found up to 3000m elevation. The leaves of this plant are pale green in colour. These are broadly triangular, stalked and wedge shaped. Its flowers are in cluster, bisexual, or unisexual, small, white or green in colour and found on terminal position. Its seeds are three-sided and achene. It is an edible medicinal plant uses for many purposes. The leaves of *Rumex* contains oxalic acid and tannin, and many have styptic substance. This is also use in leather tanning, while leaves and stems are used dye.

With importance 67.18 *Viola canescence* is the third dominant species of this community. It belongs to the family Violaceae. It is very familiar plant to local people and known as Banafsha. It is a stem less perennial herb which have stolon. The leaves of this plant are heart shape or kidney shape with a blunt apex. The lamina of leaves are soft and light green, having 5 number of leaves which are not fused and lanceolate. Its flower is blue, having a structure known as spur, which is straight or curved slightly. Its fruit is globose and having hairs.

It is found from 950-2700m elevation in hilly regions.

Table. No.4. Juglans-Rumex-Viola community (JRV)

Herbaceous layer	No of plants	D	RD	F	RF	CC	RCC	IV
<i>Geranium ocellatum</i> Camb.	27	2.7	8.059701	80	8.16327	7.4	7.8473	24.07
<i>Ixolarion tetaricum</i> (Pall.) Herb.	10	1	2.985075	30	3.06122	0.5	0.5302	6.5765
<i>Cynodon dactylon</i> (Wall.)	16	1.6	4.776119	40	4.08163	3	3.1813	12.039
<i>Adiantum venustum</i> D. Don	26	2.6	7.761194	60	6.12245	7.4	7.8473	21.731
<i>Avena sativa</i> L.	10	1	2.985075	30	3.06122	0.5	0.5302	6.5765
<i>Bergenia ciliata</i> (Haw.) Sternb.	18	1.8	5.373134	60	6.12245	3	3.1813	14.677
<i>Artemisia scorpioides</i> Waldst. & Kitam.	14	1.4	4.179104	40	4.08163	3	3.1813	11.442
<i>Abutilon fruticosum</i> Guill.	15	1.5	4.477612	40	4.08163	7.4	7.8473	16.407
<i>Tulipa clusiana</i> DC.	25	2.5	7.462687	70	7.14286	12.4	13.15	27.755
<i>Viola canescens</i> Wall.	18	1.8	17.30769	40	16	19	33.86769	67.18
<i>Gogonanthus uliginosa</i> Siehe et Pascher	16	1.6	4.776119	40	4.08163	3	3.1813	12.039
<i>Chenopodium album</i> Linn.	13	1.3	3.880597	40	4.08163	3	3.1813	11.144

<i>Limonium cabulicum</i> (Boiss.) O. Kuntze, Rev. Gen.	18	1.8	5.373134	50	5.10204	7.4	7.8473	18.322
<i>Salvia moocrufiana</i> Wall	20	2	5.970149	30	3.06122	12.4	13.15	22.181
<i>Polygonatum verticillatum</i> (L.) Allioni	23	2.3	6.865672	90	9.18367	3	3.1813	19.231
<i>Fumaria indica</i> (Hausskn.) pugsley	13	1.3	3.880597	40	4.08163	3	3.1813	11.144
<i>Urtica dioica</i> L	4	0.4	1.19403	20	2.04082	0.5	0.5302	3.7651
<i>Teucrium stocksianum</i> Boiss.	16	1.6	4.776119	40	4.08163	7.4	7.8473	16.705
<i>Rumex dentatus</i> L.	8	0.8	2.38806	20	2.04082	0.5	0.5302	4.9591
<i>Origanum vulgare</i> L.	13	1.3	3.880597	50	5.10204	3	3.1813	12.164
<i>Amaranthus spinosus</i> L.	5	0.5	1.492537	30	3.06122	0.5	0.5302	5.084
<i>Euphorbia wallichii</i> Hook. f.	12	1.2	3.58209	50	5.10204	3	3.1813	11.865
Shrubby layer								
<i>Dodonaea viscosa</i> (L.) Jacq.	28	2.8	11.66667	50	11.3636	12.4	13.405	36.436
<i>Rumex hastatus</i> D. Don	23	2.3	22.11538	60	24	1.104219	24.72922	70.84
<i>Periploca aphylla</i> Decne.	8	0.8	3.333333	20	4.54545	3	3.2432	11.122

<i>Barleria cristata</i> L.	24	2.4	10	40	9.09091	0.5	0.5405	19.631
<i>Staphylea emodi</i> Hedge	21	2.1	8.75	40	9.09091	7.4	8	25.841
<i>Indigofera heterantha</i> (Brandis.) Baker	15	1.5	6.25	30	6.81818	7.4	8	21.068
<i>Ziziphus nummularia</i> (Burm. f.) Wight & Arn.	12	1.2	5	30	6.81818	12.4	13.405	25.224
<i>Maytenus willichiana</i> (Springe) Raju & Bull.	16	1.6	6.666667	30	6.81818	7.4	8	21.485
<i>Berberis lyceum</i> Royle	30	3	12.5	50	11.3636	12.4	13.405	37.269
<i>Daphne oloides</i> Linn.	25	2.5	10.41667	30	6.81818	7.4	8	25.235
<i>Colerbrookea oppositifolia</i> Smith	24	2.4	10	40	9.09091	7.4	8	27.091
<i>Nerium oleander</i> L.	24	2.4	10	50	11.3636	7.4	8	29.364
Tree layer	No of plants	D	RD	F	RF	BA	RBA	IV
<i>Juglans regia</i> Linn.	53	5.3	50.96154	90	36	0.795755	17.8211	104.8
<i>Platanus orientalis</i> L.	10	1	9.615385	60	24	1.052992	23.58198	57.2

References

Ahmad, L., Semotiuk, A., Zafar, M., Ahmad, M., Sultana, S., Liu, Q., ... Yaseen, G. (2015). Ethnopharmacological documentation of medicinal plants used for hypertension among the local communities of DIR Lower, Pakistan. *Journal of Ethnopharmacology*, 175, 138-146. doi:10.1016/j.jep.2015.09.014

- Ali, K., Khan, S., Khan, N., Khan, W., Rahman, I. U., Ullah, F., ... Nisar, M. (2017). Ethnobotanical and ecological study of *Punica granatum* in Dir district, Khyber Pakhtunkhwa, Pakistan. *Regulatory Mechanisms in Biosystems*, 8(4), 656-661. doi:10.15421/0217101
- Daubenmire, R. F. (1942). An Ecological Study of the Vegetation of Southeastern Washington and Adjacent Idaho. *Ecological Monographs*, 12(1), 53-79. doi:10.2307/1948422
- Khan, I., Abdelsalam, N. M., Fouad, H., Tariq, A., Ullah, R., & Adnan, M. (2014). Application of Ethnobotanical Indices on the Use of Traditional Medicines against Common Diseases. *Evidence-Based Complementary and Alternative Medicine*, 2014, 1-21. doi:10.1155/2014/635371
- Lefsky, M., Cohen, W., Acker, S., Parker, G., Spies, T., & Harding, D. (1999). Lidar Remote Sensing of the Canopy Structure and Biophysical Properties of Douglas-Fir Western Hemlock Forests. *Remote Sensing of Environment*, 70(3), 339-361. doi:10.1016/s0034-4257(99)00052-8
- Luo, X. L., Zhu, J. Y., Gleisner, R., & Zhan, H. Y. (2011). Effects of wet-pressing-induced fiber hornification on enzymatic saccharification of lignocelluloses. *Cellulose*, 18(4), 1055-1062. doi:10.1007/s10570-011-9541-z
- Mitsch, W. J., & Gosselink, J. G. (2000). The value of wetlands: importance of scale and landscape setting. *Ecological Economics*, 35(1), 25-33. doi:10.1016/s0921-8009(00)00165-8
- Shuaib, M., Ahmed, S., Ali, K., Ilyas, M., Hussain, F., Urooj, Z., ... Hussain, F. (2019). Ethnobotanical and ecological assessment of plant resources at District Dir, Tehsil Timergara, Khyber Pakhtunkhwa, Pakistan. *Acta Ecologica Sinica*, 39(1), 109-115. doi:10.1016/j.chnaes.2018.04.006
- Ul Hassan, H., Murad, W., Tariq, A., & Ahmad, A. (2014). Ethnoveterinary study of medicinal plants in Malakand Valley, District Dir (Lower), Khyber Pakhtunkhwa, Pakistan. *Irish Veterinary Journal*, 67(1), 6. doi:10.1186/2046-0481-67-6
- Zhi-Qiang Zeng, Hong-Bin Yu, Hua-Rong Xu, Yan-Qi Xie, & Ji Gao. (2008). Fast training Support Vector Machines using parallel sequential minimal optimization. *2008 3rd International Conference on Intelligent System and Knowledge Engineering*. doi:10.1109/iske.2008.4731075.