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 moocraftiana* 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 swath 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 (*Whania 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 lycium*), 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.

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

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.

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

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

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).

\[
\text{Basal Area} = \pi r^2
\]

Where \( r = \frac{\text{circumference}}{2\pi} \)

\[
\text{Basal Area (BA)} = \frac{\text{Area of a species calculated from circumferance at DBH}}{\text{Total area sampled}}
\]
2.11 Relative Basal area

It is obtained by dividing basal area of a specific 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 ºC temperature. The third dominant species of this community is *Berberis lyceum* with importance value 35.396. It belongs to the family Berberidaceae. Its lacal 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    |
|------------------|--------------|---|------|-------|------|----|----|-------|
| *Verbascum thapsus* L. | 20           | 2 | 5.509642 | 50 | 5.95238 | 7.4 | 5.0443 | 16.506 |
| *Cichorium intybus* Linn. | 35           | 3.5 | 9.641873 | 60 | 7.14286 | 17 | 11.588 | 28.373 |
| *Circium veratum* (D. Don) Sprengel | 32          | 3.2 | 8.815427 | 60 | 7.14286 | 7.4 | 5.0443 | 21.003 |
| *Salvia moocroftiana* Wall. ex Benth. | 24           | 2.4 | 18.46154 | 50 | 15.625 | 17 | 21.964 | 56.05 |
| *Lathyrus sativus* L. | 29           | 2.9 | 7.988981 | 60 | 7.14286 | 7.4 | 5.0443 | 20.176 |
| *Cirsium falconeri* (Hook. f.) Petrak | 33          | 3.3 | 9.090909 | 70 | 8.33333 | 17 | 11.588 | 29.013 |
| *Ajuga breacteosa* Wall. ex Benth. | 37          | 3.7 | 10.19284 | 70 | 8.33333 | 17 | 11.588 | 30.114 |
| *Echinops cornigerus* DC. | 32          | 3.2 | 8.815427 | 60 | 7.14286 | 12.4 | 8.4526 | 24.411 |
| *Filago hurdwarica* (Wall. ex DC.) Wagenitz | 43          | 4.3 | 11.84573 | 70 | 8.33333 | 19.4 | 13.224 | 33.403 |
| *Cymbogon schoenanthus* Spreng. | 19          | 1.9 | 5.23416 | 50 | 5.95238 | 3 | 2.045 | 13.232 |
| *Cynodon dactylon* (Wall.) | 23          | 2.3 | 17.69231 | 40 | 12.5 | 7.4 | 9.5607 | 39.753 |
| *Medicago lupulina* L. | 28          | 2.8 | 7.713499 | 50 | 5.95238 | 12.4 | 8.4526 | 22.119 |
| *Alternanthera pungens* Kunth. | 7           | 0.7 | 1.928375 | 50 | 5.95238 | 7.4 | 5.0443 | 12.925 |
| *Carthamus oxycantha* M. Bieb. | 9           | 0.9 | 2.479339 | 50 | 5.95238 | 12.4 | 8.4526 | 16.884 |
| *Achyranthes aspera* L. | 13          | 1.3 | 3.581267 | 50 | 5.95238 | 3 | 2.045 | 11.579 |
| *Viola canescens* Wall. ex Roxb. | 7           | 0.7 | 1.928375 | 20 | 2.38095 | 0.5 | 0.3408 | 4.6502 |

Shrubby layer
Viscum cruciatum Sieber ex Springe.

| Species                        | Vital Value | Importance Value | Height | Leaf Type          | Flower Type | Fruit Type   | Maturity Index |
|--------------------------------|-------------|------------------|--------|--------------------|-------------|--------------|----------------|
| Opuntia monocantha (Willd) Ham.| 11          | 1.1              | 8.461538 | 40                 | 12.5        | 3            | 24.838         |
| Phragmites australis Trin. ex Steud. | 15          | 1.5              | 11.53846 | 30                 | 9.375       | 3            | 30.474         |
| Calotropis procera (Willd.) R.Brown | 6           | 0.6              | 4.615385 | 30                 | 9.375       | 3            | 17.866         |
| Berberis lyceum Royle          | 13          | 1.3              | 9.375   | 30                 | 12.4        | 16.021       | 35.396         |
| Maytenus willichiana (Springe) Raju & Bull. | 35          | 3.5              | 9.641873 | 60                 | 7.14286     | 17           | 28.373         |
| Withania sominifera (L.) Dunal   | 12          | 1.2              | 9.230769 | 30                 | 9.375       | 7.4          | 28.166         |
| Oeotostegia limbata (Benth.) Boiss. | 7           | 0.7              | 1.928375 | 50                 | 5.95238     | 7.4          | 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 lanceolate, 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      |
|----------------------------------------------|--------------|----|--------|-----|-----|-------------|------|---------|
| Cymbogon schoenanthus Spreng.                | 21           | 2.1| 10.9375| 50  | 9.25926| 7.4         | 10.482| 30.678  |
| Verbascum thapsus L.                         | 33           | 3.3| 30    | 80  | 28.5714| 7.4         | 22.024| 80.595  |
| Allium griffithianum Boiss.                  | 17           | 1.7| 8.854167| 40  | 7.40741| 3           | 4.2493| 20.511  |
| Moraea sisyrinchium (L.) Ker Gawl.           | 25           | 2.5| 13.02083| 60  | 11.1111| 17          | 24.079| 48.211  |
| Ajuga breacteosa Wall. ex Benth              | 10           | 1  | 5.208333| 30  | 5.55556| 0.5         | 0.7082| 11.472  |
| Amaranthus virdis L.                         | 17           | 1.7| 8.854167| 40  | 7.40741| 7.4         | 10.482| 26.743  |
| Chrozophora tinctoria (Linn.) Raffin.         | 11           | 1.1| 5.729167| 40  | 7.40741| 3           | 4.2493| 17.386  |
| Cynodon dactylon (Wall.)                     | 8            | 0.8| 4.166667| 40  | 7.40741| 0.5         | 0.7082| 12.282  |
| Mirabilis jalapa Linn.                       | 13           | 1.3| 6.770833| 50  | 9.25926| 12.4        | 17.564| 33.594  |
| Ipomea purpurea (Linn.) Roth.                | 14           | 1.4| 7.291667| 50  | 9.25926| 3           | 4.2493| 18.948  |
| Shrubby layer                                | 14           | 1.4| 7.291667| 40  | 7.40741| 3           | 4.2493| 18.948  |
| Cotoneaster microphylla Wall. ex Lindley     | 15           | 1.5| 13.63636| 60  | 21.4286| 7.4         | 22.024| 57.089  |
| Vitex negundo L.                             | 8            | 0.8| 7.272727| 10  | 3.57143| 3           | 8.9286| 19.773  |
| Calotropis procera (Willd.) R.Brown          | 13           | 1.3| 6.770833| 50  | 9.25926| 12.4        | 17.564| 33.594  |
| Opuntia monacantha (Willd) Ham.              | 4            | 0.4| 3.636364| 20  | 7.14286| 0.5         | 1.4881| 12.267  |
| Phragmites australis Trin. ex Steud.         | 12           | 1.2| 10.90909| 30  | 10.7143| 7.4         | 22.024| 43.647  |
| Withania sominifera (L.) Dunal               | 13           | 1.3| 11.81818| 30  | 10.7143| 0.5         | 1.4881| 24.021  |
| Buddleja crispa L.                           | 25           | 2.5| 23.02273| 50  | 17.8571| 7.4         | 22.024| 62.608  |
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 *Cyperus 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 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 fleshly 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   |
|----------------------------------------------|--------------|----|-------|-----|------|-----|-----|------|
| Solanum surattense Burm. f.                  | 46           | 4.6| 7.055215 | 90  | 7.69231 | 17  | 8.5729 | 23.32 |
| Fragaria nubicola Lindle. Ex Lacaita          | 27           | 2.7| 4.141104 | 50  | 4.2735 | 7.4 | 3.7317 | 12.146 |
| Lathyros sativus L.                           | 38           | 3.8| 5.828221 | 60  | 5.12821 | 7.4 | 3.7317 | 14.688 |
| Achillea millefolium L.                      | 37           | 3.7| 5.674847 | 70  | 5.98291 | 7.4 | 3.7317 | 15.389 |
| Anagallis arvense L.                          | 28           | 2.8| 4.294479 | 60  | 5.12821 | 12.4| 6.2532 | 15.676 |
| Avena sativa L.                               | 12           | 1.2| 1.840491 | 30  | 2.5641 | 3   | 1.5129 | 5.9175 |
| Artemisia santolinifolia Turcz. Ex Krasch.    | 33           | 3.3| 5.06135  | 60  | 5.12821 | 7.4 | 3.7317 | 13.921 |
| Cynodon dactylon (Wall.)                     | 56           | 5.6| 8.588957 | 90  | 7.69231 | 19.4| 9.7832 | 26.064 |
| Euphorbia hirta L.                            | 25           | 2.5| 3.834356 | 30  | 2.5641 | 3   | 1.5129 | 7.9113 |
| Cypress rotundus L.                           | 24           | 2.4| 23.52941 | 70  | 21.875 | 19.4| 26.95592 | 72.36 |
| Xanthium strumarium L.                        | 10           | 1  | 1.533742 | 20  | 1.7094 | 0.5 | 0.2521 | 3.4953 |
| Ipomea purpurea (Linn.) Roth.                 | 33           | 3.3| 5.06135  | 60  | 5.12821 | 12.4| 6.2532 | 16.443 |
| Lathyros apaca Linn.                          | 25           | 2.5| 3.834356 | 60  | 5.12821 | 7.4 | 3.7317 | 12.694 |
| Species                                              | Diam. | H  | Dbh  | CHH  | SH  | R  |
|------------------------------------------------------|-------|----|------|------|-----|----|
| Sylibum marianum (L.) Graertn                        | 25    | 2.5| 3.834356 | 60 | 5.12821 | 7.4 | 3.7317 | 12.694 |
| Capsella bursa-pestoris Medic.                       | 15    | 1.5| 2.300613 | 30 | 2.5641 | 3   | 1.5129 | 6.3776 |
| Centaurea iberica Trev. ex Spreng.                   | 34    | 3.4| 5.214724 | 60 | 5.12821 | 17  | 8.5729 | 18.916 |
| Eruca sativa Mill.                                   | 41    | 4.1| 6.288344 | 60 | 5.12821 | 17  | 8.5729 | 19.989 |
| Moraea sisyrinchium (L.) Ker Gawl.                   | 27    | 2.7| 4.141104 | 50 | 4.2735 | 7.4 | 3.7317 | 12.146 |
| Oxalis corniculata L.                                | 29    | 2.9| 4.447853 | 70 | 5.98291 | 3   | 1.5129 | 11.944 |
| Salvia moocroftiana Wall ex Benth.                   | 57    | 5.7| 8.742331 | 70 | 5.98291 | 19.4| 9.7832 | 24.508 |
| **Shrubby layer**                                    |       |    |       |     |     |    |       |       |
| Calotropis procera (Willd.) R.Brown                  | 26    | 2.6| 25.4902 | 60 | 18.75 | 12.4| 13.6116 | 57.85 |
| Nerium indicum Mill.                                 | 51    | 5.1| 14.01099| 70 | 10.4478 | 12.4| 11.832 | 36.291 |
| Gymnosporia royleana Wall. ex M.A. Lawson            | 32    | 3.2| 8.791209 | 70 | 10.4478 | 7.4 | 7.0611 | 26.3  |
| Zanthoxylum armatum DC.                              | 23    | 2.3| 6.318681 | 40 | 5.97015 | 7.4 | 7.0611 | 19.35 |
| Barleria cristata L.                                 | 16    | 1.6| 4.395604 | 40 | 5.97015 | 3   | 2.8626 | 13.228 |
| Datura stomonium L.                                  | 28    | 2.8| 7.692308 | 60 | 8.95522 | 7.4 | 7.0611 | 23.709 |
| Staphylea emodi Hedge                                | 17    | 1.7| 4.67033  | 50 | 7.46269 | 3   | 2.8626 | 14.996 |
| Berberis jaeschkeana Schneid.                        | 45    | 4.5| 12.36264 | 70 | 10.4478 | 12.4| 11.832 | 34.642 |
| Debregeasia salicifolia (D. Don) Rendle              | 17    | 1.7| 4.67033  | 30 | 4.47761 | 7.4 | 7.0611 | 16.209 |
| Hypericum dyeri Rehder                               | 14    | 1.4| 3.846154 | 20 | 2.98507 | 3   | 2.8626 | 9.6938 |
| Hypericum perforatum 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 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 tarrokey. 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 canascence* 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   |
|-----------------------------------|--------------|-------|--------|----|------|------|------|------|
| *Geranium ocellatum* Camb.        | 27           | 2.7   | 8.059701 | 80 | 8.16327 | 7.4   | 7.8473 | 24.07 |
| *Ixolarion tetaricum* (Pall.) Herb.| 10           | 1     | 2.985075 | 30 | 3.06122 | 0.5   | 0.5302 | 6.5765 |
| *Cynodon dactylon* (Wall.)        | 16           | 1.6   | 4.776119 | 40 | 4.08163 | 3     | 3.1813 | 12.039|
| *Adiantum venustum* D. Don        | 26           | 2.6   | 7.761194 | 60 | 6.12245 | 7.4   | 7.8473 | 21.731|
| *Avena sativa* L.                 | 10           | 1     | 2.985075 | 30 | 3.06122 | 0.5   | 0.5302 | 6.5765 |
| *Bergenia ciliata* (Haw.) Sternb. | 18           | 1.8   | 5.373134 | 60 | 6.12245 | 3     | 3.1813 | 14.677|
| *Artemisia scopia* Waldst. & Kitam.| 14           | 1.4   | 4.179104 | 40 | 4.08163 | 3     | 3.1813 | 11.442|
| *Abutilon fruticosum* Guill.      | 15           | 1.5   | 4.477612 | 40 | 4.08163 | 7.4   | 7.8473 | 16.407|
| *Tulipa clusiana* DC.             | 25           | 2.5   | 7.462687 | 70 | 7.14286 | 12.4  | 13.15 | 27.755|
| *Viola canescens* Wall.           | 18           | 1.8   | 17.30769 | 40 | 16    | 19    | 33.86769 | 67.18 |
| *Gogea uliginosa* Siehe et Pascher | 16           | 1.6   | 4.776119 | 40 | 4.08163 | 3     | 3.1813 | 12.039|
| *Chenopodium album* Linn.         | 13           | 1.3   | 3.880597 | 40 | 4.08163 | 3     | 3.1813 | 11.144|
| Species                                | Density | Height (m) | Diameter (cm) | Density (m) | Height (m) | Diameter (cm) | Coverage (cm²) | Density (m) | Height (m) | Diameter (cm) | Coverage (cm²) | Density (m) | Height (m) | Diameter (cm) | Coverage (cm²) | Density (m) | Height (m) | Diameter (cm) | Coverage (cm²) | Density (m) | Height (m) | Diameter (cm) | Coverage (cm²) |
|----------------------------------------|---------|------------|---------------|-------------|------------|---------------|----------------|-------------|------------|---------------|---------------|-------------|------------|---------------|----------------|-------------|------------|---------------|----------------|-------------|------------|---------------|----------------|
| *Limonium cabulicum* (Boiss.) O. Kuntze, Rev. Gen. | 18      | 1.8        | 5.373134      | 50          | 5.10204    | 7.4           | 7.8473         | 18.322      |
| *Salvia moocruftiana* Wall             | 20      | 2          | 5.970149      | 30          | 3.06122    | 12.4          | 13.15          | 22.181      |
| *Polygonatum verticillatum* (L.) Allioni | 23      | 2.3        | 6.865672      | 90          | 9.18367    | 3             | 3.1813         | 19.231      |
| *Fumaria indica* (Hausskn.) pugsley    | 13      | 1.3        | 3.880597      | 40          | 4.08163    | 3             | 3.1813         | 11.144      |
| *Urtica dioca* L                       | 4       | 0.4        | 1.19403       | 20          | 2.04082    | 0.5           | 0.5302         | 3.7651      |
| *Teucrium stocksianum* Boiss.          | 16      | 1.6        | 4.776119      | 40          | 4.08163    | 7.4           | 7.8473         | 16.705      |
| *Rumex dentatus* L.                    | 8       | 0.8        | 2.38806       | 20          | 2.04082    | 0.5           | 0.5302         | 4.9591      |
| *Origanum vulgare* L.                  | 13      | 1.3        | 3.880597      | 50          | 5.10204    | 3             | 3.1813         | 12.164      |
| *Amaranthus spinosus* L.               | 5       | 0.5        | 1.492537      | 30          | 3.06122    | 0.5           | 0.5302         | 5.084       |
| *Euphorbia wallichii* Hook. f.         | 12      | 1.2        | 3.58209       | 50          | 5.10204    | 3             | 3.1813         | 11.865      |
| **Shrubby layer**                      |         |            |               |             |            |               |                |             |
| *Dodonaea viscosa* (L.) Jacq.          | 28      | 2.8        | 11.66667      | 50          | 11.3636    | 12.4          | 13.405         | 36.436      |
| *Rumex hastatus* D. Don                | 23      | 2.3        | 22.11538      | 60          | 24         | 1.104219      | 24.72922       | 70.84       |
| *Periploca aphylla* Decne.             | 8       | 0.8        | 3.333333      | 20          | 4.54545    | 3             | 3.2432         | 11.122      |
| Species                          | No of plants | D   | RD  | F   | RF  | BA  | RBA | IV   |
|---------------------------------|--------------|-----|-----|-----|-----|-----|-----|------|
| *Barleria cristata* L.          | 24           | 2.4 | 10  | 40  | 9.09091 | 0.5 | 0.5405 | 19.631 |
| *Staphylea emodi* Hedge         | 21           | 2.1 | 8.75| 40  | 9.09091 | 7.4 | 8    | 25.841 |
| *Indigofera heterantha* (Brandis.) Baker | 15          | 1.5 | 6.25| 30  | 6.81818 | 7.4 | 8    | 21.068 |
| *Ziziphus nummularia* (Burm. f.) Wight & Arn. | 12          | 1.2 | 5   | 30  | 6.81818 | 12.4 | 13.405 | 25.224 |
| *Maytenus willichiana* (Springe) Raju & Bull. | 16          | 1.6 | 6.666667 | 30  | 6.81818 | 7.4 | 8    | 21.485 |
| *Berberis lyceum* Royle         | 30           | 3   | 12.5| 50  | 11.3636 | 12.4 | 13.405 | 37.269 |
| *Daphne oloides* Linn.          | 25           | 2.5 | 10.41667 | 30  | 6.81818 | 7.4 | 8    | 25.235 |
| *Colerbrookea oppositifolia* Smith | 24           | 2.4 | 10  | 40  | 9.09091 | 7.4 | 8    | 27.091 |
| *Nerium oleander* L.            | 24           | 2.4 | 10  | 50  | 11.3636 | 7.4 | 8    | 29.364 |
| **Tree layer**                  |              |     |     |     |     |     |     |      |
| *Juglans regia* Linn.           | 53           | 5.3 | 50.96154 | 90  | 36  | 0.795755 | 17.8211 | 104.8 |
| *Platanus orientalis* L.        | 10           | 1   | 9.615385 | 60  | 24  | 1.052992 | 23.58198 | 57.2  |

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