

## Plant Community Traits of Shohada Protected Area, West Azerbaijan, Iran

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### Abstract

Shohada Protected Area, consisting of Shohada Valley and its adjacent areas with an area of 577 hectares is located in south of Urmia, and is known as an important natural plant station of Urmia. It is studied with respect to the important factors which influence the vegetation cover in whole, particularly, with regard the composition and formation of plant communities. To study the area, Brown-Blanquet's method was used. Plant samples were taken from 77 sample plots. The study resulted in recognition of four herbaceous types and seven shrub types in the studied area. In addition, the investigation led to the fact that the most important factors which influence the vegetation cover, are: geographical orientation, altitude, gradient and soil texture. The study also resulted in preparation of a colored vegetation map with a scale of 1:20000.

**Keywords:** type, cover, plant community, biodiversity, forest, Shohadao valley

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### Introduction

Quantitative and qualitative investigation of plants and recognition of existent vegetation cover and environmental factors such as land resources, soil and climate, as altogether known as ecological conditions, is needed to determine the trend of the vegetation cover for maintaining and conserving vegetation cover and so being able to optimize management and reach a sustainable development (Naseri *et al.*, 1999). An important precondition for the above mentioned aim is having a protected area which at least for a few years will be out of the effects of external factors, particularly human interactions. Therefore, the studied area was selected as a protected area for recent research. The outcome of this study can be useful in managing natural resources (Fallah, 1999). Classification of plant communities and general community types has resulted from geobotanical researches by Humboldt (1805); Schow (1823); Heer (1835); Grisebach (1838); (Asri, 1995). Some of the studies with reference to phytosociology and plant ecology researches during recent years are listed below: Eco-phytosociological evaluation of vegetation cover of Dena (Kokhdan, 2002), Phytosociology of Forests in eastern Ardabil (Taimurzadeh *et al.*, 2003) Investigation of the plant communities of protected area in north West of Khorramabad (Mehrina *et al.*, 2003), Eco-Phytosociological evaluation of Elikaand Dona Watershed of Central Alboorz (Nazarian, 2003), Phytocociology of Kolahghazi National Park (Khageaddin, 2000). In protected areas, determination of vegetation cover and classification of different plant types is not only is useful as

a basic ecological investigation of the area, but is a suitable factor in the evaluation or even prediction of the future, which can lead to a better and more proper management of the area (Malayeri, 1984). Ecological and phytosociological studies investigate the relationship between different ecological factors and the distribution of plant communities, which in turn results to scientific and practical suggestions for improving the studied area (Batuli, 1997). This study mainly follows recognition of biodiversity and difference of habitats, which is the result of ecological difference of whole conditions and biotic and non-biotic resources. Overall, the main goals of the recent study are as follows:

- 1-Recognition of existent plant assemblies in studied area
- 2-Evaluation of the effects of environmental factors which cause the formation of assemblies
- 3-Developing the vegetation cover map of studied area as a base for assessing succeeding trends.

### Materials and methods

The studied area is situated between 37° 15' to 37° 20' Northern latitude and 45° 5' to 45° 10' Eastern longitude, its lowest and the highest heights are of 1420 and 2280 meters. Plant community studies in area have been done from late April to 2005 until the mid of September 2006. Present study used the Brown-Blanquet's methods (Braun-Blanquet, 1932). Initially, the studied area is limited on the topographical map to a region of 1:50000 scale. Secondary, the limited area on the map is adapted to the

physical situation on the field. Field studies were done by using floristic-physionomic method (Muller-Dombois, 1974), which led to the recognition of plant formations and relocating their locations on the map roughly. Then, by using a quadrat minimum area within the plots, plant sampling was done (Asri, 1995). For trees and shrubs, quadrat dimensions were 15 m × 15 m, and for herbs 2 m × 2 m. Sample plots are located randomly and systematically within plant assemblies. According to homology of plant assemblies and their area, 5-7 sample plots are randomly located within each plant unit. Within each sample plot the name of plant species (coding unknown species), canopy cover for each existent species and their numbers are measured and recorded. Meanwhile, for each sample plot, slope direction, slope steepness, and altitude from sea level were also recorded. For comparison of soil samples of plant communities, for each plant assembly three soil profile were developed on dominant slope. Finally, soil samples were collected and transported to the laboratory for some analyses, such as evaluation of pH, texture, structure and colour.

#### Developing plant map of studied area

To develop a plant map of the studied area, firstly, a 1:50000 topographical map is scanned and digitalized, then it's boarders are carefully digitalized, considering hydrological units and water ways and contour lines by using the software Arc view 3.2, Ilwice 2, which leads to the developing of physiographic map of area. Finally, mixing hypsometric, slope facing and slope direction maps by using proper software results in the plant map of the studied area (Fig. 1, 2, 3, 4).

### Results and discussion

Present study resulted in the fact that there are four herbal types and seven shrub types in the studied area, as follows:

#### 1-*Salix alba* L.

This community covers the area about 9.4 hectares in the east of the studied area, on the banks of Balanech river (Fig. 1). It is located at an altitude of 1420 m, with sandy-clay texture, granular structure which is firm and has brown-grayish color with a pH of 7.8. It's soil is also deep and has a slope facing mainly to the northeast. Canopy cover is about 80%, sand and gravel is about 10%, litter about 3%, unprotected and clear soil about 7%, with a positive succession rate (Fig. 5). The main species of this type includes:

<i>Salix alba</i>	61%
<i>Juglans regia</i>	7%
<i>Fraxinus rotundifolia</i>	6%
<i>Rosa canina</i>	4%
Other species	2%

#### 2-*Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik.-*Amygdalus pabotii* Browicz.-*Pistacia atlantica* Desf subsp. *Kurdica* (Zohary) Rech. f.

This community covers an area of 169 hectares, which is the most extended type (Fig. 1). It is also located at an altitude of 1420 m to 1940 m, and its slope steepness ranges from 40% to 60%, which is facing to the east. Its surface soil is of 57 cm deep with cubic structure and has a pH of 8. Soil color is reddish-brown and with loamy-clay texture. Canopy cover is about 60%, sand and gravel about 30%, litter around 5%, clear soil about 5%, altogether this type has positive succession rate (Fig. 6). This part of the study area includes the following species:

<i>Acer monspessulanum</i>	20%
<i>Amygdalus pabotii</i>	10%
<i>Pistacia atlantica</i>	6%
<i>Thymus kotschyanus</i>	9%
<i>Cerasus mahaleb</i>	3%
<i>Poa bulbosa</i>	3%
<i>Prangos uloptera</i>	7%
<i>Astragalus mollis</i>	3%
<i>Bromus tectorum</i>	2%
Other species	2%

#### 3-*Hordeum bulbosum* L.

This community covers the area of about 19.38 hectares in the east of the study area, on the banks of Balanech river (Fig. 1). It is located at an altitude of 1420 m to 1520 m, and it's slope steepness ranges from 20% to 40%, which is facing to the east. Its surface soil is of 60 cm deep with granular structure which is firm and its pH is 7.8. Soil color is brown and with loamy texture. Canopy cover is about 100%, sand and gravel about 0%, litter around 0%, clear soil about 0%, altogether this type has positive succession rate (Fig. 7). The main species of this type includes:

<i>Hordeum bulbosum</i>	49%
<i>Medicago sativa</i>	13%
<i>Gundelia tournefortii</i>	8%
<i>Aegilops cylindrica</i>	6%
<i>Taeniatherum crinitum</i>	5%
<i>Rumex tuberosus</i>	4%
<i>Bromus danthoniae</i>	7%
<i>Achillea millefolium</i>	6%
<i>Teucrium polium</i>	2%
<i>Poa bulbosa</i>	2%
Other species	2%

#### 4-*Thymus kotschyanus* Boiss.-*Festuca arundinacea* Schreb.

This community covers an area of 6.49 hectares in north and north-west, with slopes facing the study area, near Balanech river (Fig. 1).

It is located at an altitude of 1440 m to 1560 m, and it's slope steepness ranges from 40% to 60%. Its surface soil is of 73 cm deep with cubic structure and its pH is 7.4. In addition, soil color is reddish brown and with loamy-clay

texture. Canopy cover is about 70%, sand and gravel about 0%, litter around 5%, clear soil about 15%, altogether this type has a positive succession rate (Fig. 8). The main species of this type includes:

<i>Thymus kotschyanus</i>	40%
<i>Thymus migricus</i>	4%
<i>Festuca arundinacea</i>	10%
<i>Bromus tomentellus</i>	4%
<i>Teucrium polium</i>	6%
<i>Poa bulbosa</i>	6%
<i>Achillea millefolium</i>	5%
<i>Dactylis glomerata</i>	5%
<i>Hordeum bulbosum</i>	5%
<i>Eryngium billardieri</i>	4%
<i>Stipa barbata</i>	4%
Other species	1%

5-*Amygdalus pabotii* Browicz. – *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik.

This community covers an area of 12.21 hectares with a northern slope facing (Fig. 1).

It is located at an altitude of 1580 m to 1800 m, and its slope steepness ranges from 40% to 60%. Its surface soil is of 22 cm deep with cubic structure and its pH is 8. Soil color is reddish brown and with loamy-silty texture. Canopy cover is about 55%, sand and gravel is about 36%, litter around 4%, clear soil about 5%, altogether this type has a positive succession rate (Fig. 9). The main species of this type includes:

<i>Amygdalus pabotii</i>	20%
<i>Acer monspessulanum</i>	15%
<i>Pyrus glabra</i>	5%
<i>Rosa canina</i>	5%
<i>Daphne mucronata</i>	3%
<i>Cotoneaster nummularioides</i>	3%
<i>Pistacia atlantica</i>	2%
<i>Astragalus caryolobus</i>	4%
<i>Astragalus effusus</i>	4%
Other species	1%

6-*Juniperus excelsa* M.B.

This community covers an area of 113.24 hectares in the south of the studies area (Fig. 1).

It is located at an altitude of 1650 m to 2200 m, and its slope steepness exceeds 60% and is facing north-northeast and northwest. Its surface soil is of 35 cm deep with granular structure and its pH is 8. In addition, soil color is reddish brown and with sandy-clay texture. Canopy cover is about 50%, sand and gravel is about 40%, litter around 3%, clear soil about 7%, altogether this type has a positive succession rate (Fig. 10). The main species of this type includes:

<i>Juniperus excelsa</i>	25%
<i>Acer monspessulanum</i>	11%
<i>Amygdalus pabotii</i>	4%
<i>Rhamnus pallasii</i>	2%

<i>Pistacia atlantica</i>	2%
<i>Ferula communis</i>	2%
<i>Thymus kotschyanus</i>	2%
<i>Thymus migricus</i>	2%
<i>Astragalus kabristanicus</i>	3%
Other species	1%

7-*Amygdalus elaeagnifolia* spach. *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik.

This community covers an area of 13.44 hectares in the center of the studied area (Fig. 1).

It is located at an altitude of 1700 m to 1900 m, and its slope steepness ranges from 40% to 60% which is facing to the northeast. Its surface soil is of 31 cm deep with cubic structure and its pH is 7.5. In addition, soil color is dark reddish brown and with loamy-clay texture. Canopy cover is about 74%, sand and gravel is about 14%, litter around 4%, clear soil about 8%, altogether this type has a positive succession rate (Fig. 11). The main species of this type includes:

<i>Amygdalus elaeagnifolia</i>	36%
<i>Acer monspessulanum</i>	16%
<i>Amygdalus pabotii</i>	9%
<i>Juniperus excelsa</i>	4%
<i>Pistacia atlantica</i>	3%
<i>Cerasus microcarpa</i>	3%
<i>Astragalus effusus</i>	4%
<i>Festuca ovina</i>	4%
<i>Trifolium hybridum</i>	1%
Other species	1%

8-*Thymus kotschyanus* Boiss. – *Bromus tomentellus* Boiss.

This community covers an area of 103.05 hectares from west to southwest of the studied area (Fig. 1).

It is located at an altitude of 1800 m to 2280 m, and its slope steepness ranges from 40% to 60%, which is facing north and northeast. Its surface soil is of 81 cm deep with granular structure and its pH is 7.9. Soil color is yellowish brown and with silty-clay texture. Canopy cover is about 56%, sand and gravel is about 23%, litter around 7%, clear soil about 14%, altogether this type has a positive succession rate (Fig. 12). The main species of this type includes:

<i>Thymus kotschyanus</i>	21%
<i>Bromus tomentellus</i>	12%
<i>Poa bulbosa</i>	7%
<i>Astragalus effusus</i>	6%
<i>Acantholimon</i> sp.	5%
<i>Amygdalus kotschy</i>	3%
<i>Taeniatherum crinitum</i>	3%
<i>Bromus tectorum</i>	3%
<i>Stachys lavandulifolia</i>	1%
Other species	1%

9- *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik- *Amygdalus pabotii* Browicz.

This community with 84.31 hectares area is located in the central part of the studied area, so it extends from the margin of Khan Valley to central parts of study area and reaches to the Ashakchi Mountain (Fig. 1).

It is located at an altitude of 1450 m to 1750 m, and its slope steepness exceeds 60% and is north- and west-facing. Its surface soil is of 33 cm deep with cubic structure and its pH is 8.1. Soil color is yellowish brown and with loamy-sandy texture. Canopy cover is about 49%, sand and gravel is about 38%, litter around 5%, clear soil about 8%, altogether this type has a negative succession rate. The main species of this type includes:

<i>Acer monspessulanum</i>	19%
<i>Amygdalus pabotii</i>	9%
<i>Ceratagus pseudohetrophylla</i>	7%
<i>Pistacia atlantica</i>	5%
<i>Daphne mucronata</i>	5%
<i>Cotoneaster nummularioides</i>	3%
<i>Stachys lavandulifolia</i>	3%
<i>Poa bulbosa</i>	2%
<i>Agropyrum repens</i>	2%
<i>Bromus tectorum</i>	2%
Other species	1%

10- *Hordeum bulbosum* L. – *Medicago sativa* L.

This community covers an area of 24.33 hectares in the northwest of the study area, ranging to Khan Valley (Fig. 1).

It is located at an altitude of 1600 m to 1800 m, and its slope steepness ranges from 40 % to 60 % with slopes facing north and northeast. Its surface soil is of 64 cm deep with cubic structure and a pH of 7.6. Soil color is dark red-dish brown and with loamy-clay texture. Canopy cover is about 100%, sand and gravel is about 0%, litter around 0%, clear soil about 0%, altogether this type has a positive succession rate (Fig. 13). The main species of this type includes:

<i>Hordeum bulbosum</i>	33%
<i>Medicago sativa</i>	23%
<i>Trifolium pratense</i>	14%
<i>Vicia villosa</i>	6%
<i>Phlomis tuberosa</i>	4%
<i>Astragalus mollis</i>	7%
<i>Bromus danthoniae</i>	7%
<i>Festuca ovina</i>	6%
<i>Thymus kotschyanus</i>	5%
<i>Secale montanum</i>	5%
Other species	2%

11- *Salix alba* L. – *Juglans regia* L.

This community covers an area of 7.82 hectares in the north of the studied area in margin of Khan Valley (Fig. 1). It is located at an altitude of 1420 m, and its slope steepness ranges from 0% to 10%. Its surface soil is of 90 cm

deep with granular structure which is firm and its pH is 7.8. Soil color is yellowish brown and with loamy texture. Canopy cover is about 85%, sand and gravel is about 7%, litter around 4%, clear soil about 4%, altogether this type has a positive succession rate. The main species of this type includes:

<i>Salix alba</i>	40%
<i>Juglans regia</i>	33%
<i>Fraxinus rotundifolia</i>	4%
<i>Elaeagnus angustifolia</i>	3%
<i>Rhus coriaria</i>	2%
Other species	3%

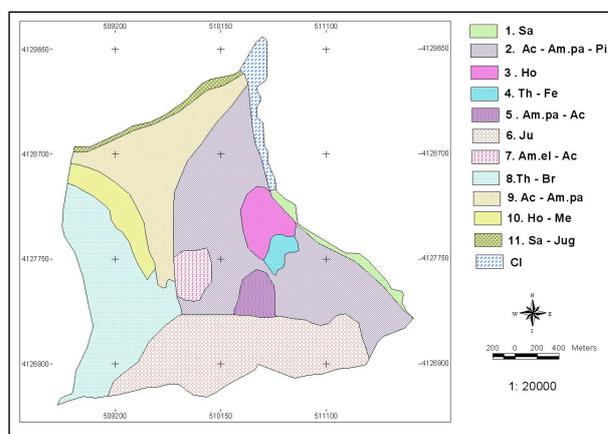


Fig. 1. Coloured vegetation map of study area

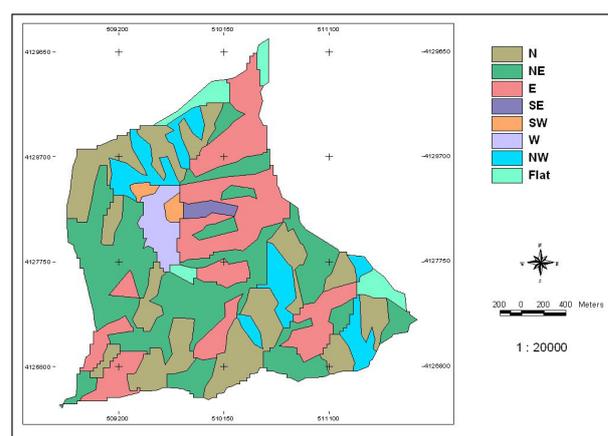


Fig. 2. Slopes facing map of study area

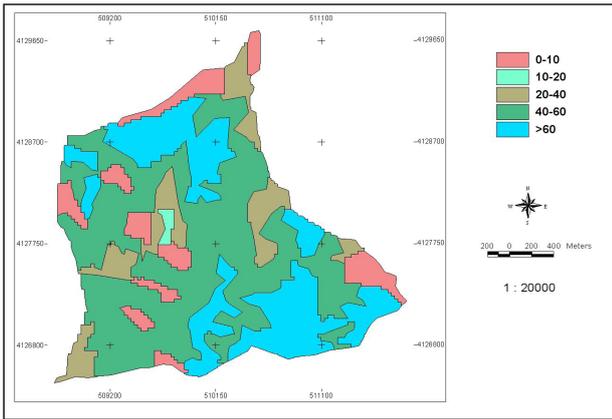


Fig. 3. Slopes steepness map of study area

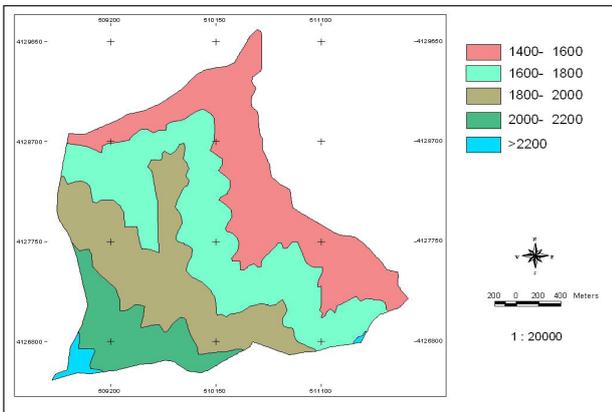


Fig. 4. Hypsometric map of study area



Fig. 5. *Salix* community



Fig. 6. *Acer-Amygdalus pabotii-Pistacia* community



Fig. 7. *Hordeum* community



Fig. 8. *Thymus-Festuca* community



Fig. 9. *Amygdalus pabotii-Acer* community



Fig. 10. *Juniperus* community

Fig. 11. *Amygdalus elaeagnifolia-Acer* communityFig. 12. *Thymus-Bromus* communityFig. 13. *Hordeum-Medicago* community

## Conclusions

By investigating the effects of ecological factors including altitude, slope steepness, slope direction, soil and biology on plant communities the study resulted to following results:

### 1) Altitude:

Altitude is known as one of the most influencing factors on plant distribution. Some plants don't like the high altitudes because of low temperatures and shortage of

growth period, and existence of severe winds in mountains also limits plant growth.

The studied area includes *Salix alba* community at an 1420 m altitude along the main river, *Juniperus* extended in 1650 m to 2200 m, and *Thymus-Bromus* at 1800 m to 2280 m. Edisho (1998), in Khoy-Salmas area introduced the *Juniperus* community at 2400 m to 2700 m. Naseri *et al.* (2002) reported the existence of the same community at 1500 m to 2650 m. *Thymus-Artemisia* community is seen by Aleyha and Shokuui (2003) at 2350 m to 2500 m height in Semnan. Karimi (1997) recognized the *Thymus-Agrophyron* community in Anzali-Khalkhal area at 1400 m-1800 m height.

### 2) Slope direction:

Slope direction is also known as one of the most important factors which affect plant distribution. North and south facing slopes have fully different vegetation covers. South facing slopes, because of intensive solar radiation, high temperature in comparison with north facing slopes have low humidity. In contrast, north facing slopes have low temperature and low radiation, has high humidity. As the *Juniperus* community is dominant in north facing slopes, and its lower limit is extended to 1650 m height, such a situation is resulted from the deficit of temperature and deficit of radiation. *Thymus-Bromus* and *Thymus-Festuca* is also dominant in north facing slopes.

Nazarian (2003), in Central Alborz, indicated the *Salix* community in north-northeast facing slopes, and the thorny assemblages on south, southwest, southeast, north and northwest and northeast slopes facing. In addition, Ghelichnia (1999) in Nardin region, Dianatnajat and Slami (1996) in Thouran reserve indicated the effect of slope direction in plant communities' distribution.

### 3) Slope steepness:

Slope steepness affects the vegetation cover on slopes. In the studied area *salix* community as a tree assemblage are located on gentle slopes, but *Juniperus* and *Acer-Amygdalus* communities are extended on steep slopes. Khageaddin (2000) in Kolah ghazi National Park reported the existence of *Amygdalus*, *Amygdalus haussknechtii* on high slopes of more than 100%. Jafari Kokhdan (2001) in Dena region indicated the *Salicetum excelsae* on gentle slopes. Nazarian (2003) in Central Alborz, reported tree assemblages on gentle slopes. Vakili (1988), in Shahreba-bak, indicated *Amygdalus* community on gentle and steep slopes.

### 4) Soil texture:

Soil texture is also important for planning distribution. In the studied area *Salix* is found on sandy-clay and loamy soils. *Hordeum* and *Hordeum-Medicago* are extended on soils with out sand and gravel. Also, in the studied area, *Hordeum* from *Hordeum-Medicago* and *Thymus-Festuca* from *Thymus-Bromus* and *Amygdalus-Acer* from *Acer-Amygdalus* are separated by soil texture.

Nazarian (2003) reported the *Salix* community on sandy-clay and loamy soils, Batoli (1997), indicates the

*Amygdalus* community on clay-loamy soils, and Masoomi (1993), also reports the *Amygdalus* community on clay-loamy soil.

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