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Ecological Study in Forest Reserve of Ghasemloo (Shohada) Valley and it's Adjacent Areas, Urmia- Iran

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Abstract: Forest reserve of Ghasemloo valley (Shohada) and it's adjacent areas with 577 hectare surface area has located in south of Urmia and is known as an important natural plant station of Urmia. It is studied with respect the important factors which influencing vegetation cover in whole, particularly, with refer to composition and Formation of plant communities. To study the area, Brown-Blanquet's method was used. Plant samples were collected from 77 sample plots. The study resulted in recognition of four herbaceous types and seven shrub communities in study area. In addition, the investigation led to the fact that the most important factors which influencing the vegetation cover, are: geographical orientation, altitude, gradient and soil texture. More over, the study also resulted to preparation of a colour vegetation map with 1/20000 scale.

Key words: Ecology, dominant species, vegetation cover, biodiversity, forest reserve, Ghasemloo valley, Iran

INTRODUCTION

Quantitative and qualitative investigation of plants and recognition of existant vegetation cover and environmental factors such as land resources, soil and climate which in whole is known as ecological conditions, is needed to determine the trend of vegetation cover situation for maintaining and conserving vegetation cover and so being able to optimize management and reach to 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 be out of the effects of external factors particularly human interactions. Therefore, the study area as a protected area selected for recent research. The out comings of this study can be usefull in managing natural resources (Fallah, 1999). Classification of plant communities has resulted from geobotanical researchs by Hamboldt (1805), Schow (1823), Heer (1835) and Grisebach (1838) (Asri, 1995). Some of the studies with refer to phytosociology and plant ecology during the recent years are as bellows: Schickhoff *et al*. (2002) introduced the following communities from Alaska: *Epilobio-Salicetum*, *Anemono-Salicetum richardsonii alaxensis*, *Valeriono-Salicetum pulchrae*. Frey and Probst (1986) suggested the classification of vegetation cover according to physiognomy and ecology. Eco-phytosociological evaluation of vegetation cover of Dena (Jafari Kokhdan, 2002), phytosociology of forests in eastern Ardabil (Taimurzadeh *et al*., 2003), investigation of plant communities of protected area in north west of Khorramabad (Mehrnia *et al*., 2003), eco-phytosociological evaluation of Elika and Dona watershed of central Alboorz (Nazarian, 2003), phytosociology of Kolahghazi national park (Khageaddin, 2000). In protected areas determination of plant species and classification of different plant communities, not only is useful as a basic ecological, but is a suitable factor for evaluation present situation and even prediction of future, which can lead to a better and proper management of area (Eshghi Malayeri, 1984). Ecological and phytosociological studies, determine the relationship between different ecological factors and the distribution of plant communities, which in turn results to scientific and practical suggestions for improving the study area (Batuli, 1997). This study mainly follows the recognition of plant biodiversity and the difference between habitats, which is the out comming of ecological differences of whole conditions and biotic and non-biotic resources. Overall, the main goals of the recent study are as follows:

- Recognition of existant plant assemblies in study area
- Evaluation of the effects of environmental factors which cause the formation of assemblies
- Developing the vegetation cover map of study area as a base for assessing successional trends.

MATERIALS AND METHODS

The study area is located between 37° 15' to 37° 20' northern latitude and 45° 5' to 45° 10' eastern longitude,

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the lowest and the highest of it's height are 1420 and 2280 m. Ecological study in study area started from late April 2005 until mid September 2006. Present study used the Brown-Blanquet (1932) methods. Firstly, the study area limited on topographical map of region with 1/50000 scale. Secondly, the limited area on the map configurated to physical situation on the field. Field studies were done by using floristic-physiognomic method (Muller-Dombois and Ellenberg, 1974), which led to the recognition of plant formations and improving their location on the map. Then, by using quadrate minimum area with in the plots plant sampling were done (Asri, 1995). For trees and shrubs quadrate dimentions were 15×15 m and for herbs 2×2 m. Sample plots located randomly and systematically within plant each assembly. According to homology of plant assemblies and their area 5-7 sample plots randomly located within each plant unit. As rocky and unhomogenous areas are unsuitable for sampling, so, the sampling points must have homogenous condition (Jongman and Jongeren, 1987; Kershaw, 1964). Within each sample plot the name of plant species (coding unknown species), canopy cover for each existant species and number of them counted and recorded (Greig-Smith, 1983). Meanwhile, for each sample plot, slope direction, slope steepness and altitude from sea level also, were recorded. For comparison of soil samples of plant communities, for each plant assembly three soil prophile were developed on main slope. Finally, soil samples collected and transported to laboratory for some analysis such as measuring the pH, texture, structure and colour of soil samples.

Developing plant map of study area: To develop plant map of study area, Firstly, 1:50000 topographical map scanned and digitized, then it's boarders carefully digitized by considering hydrological units and water ways and contour lines by using the soft wares of Arc view 3.2, Ilwise 2 which led to developing physiographic map of area. Finally, by mixing hypsometric, slope facing and slope direction maps and by using relevant soft wares the trend resulted to developing plant map of study area (Fig. 1-4).

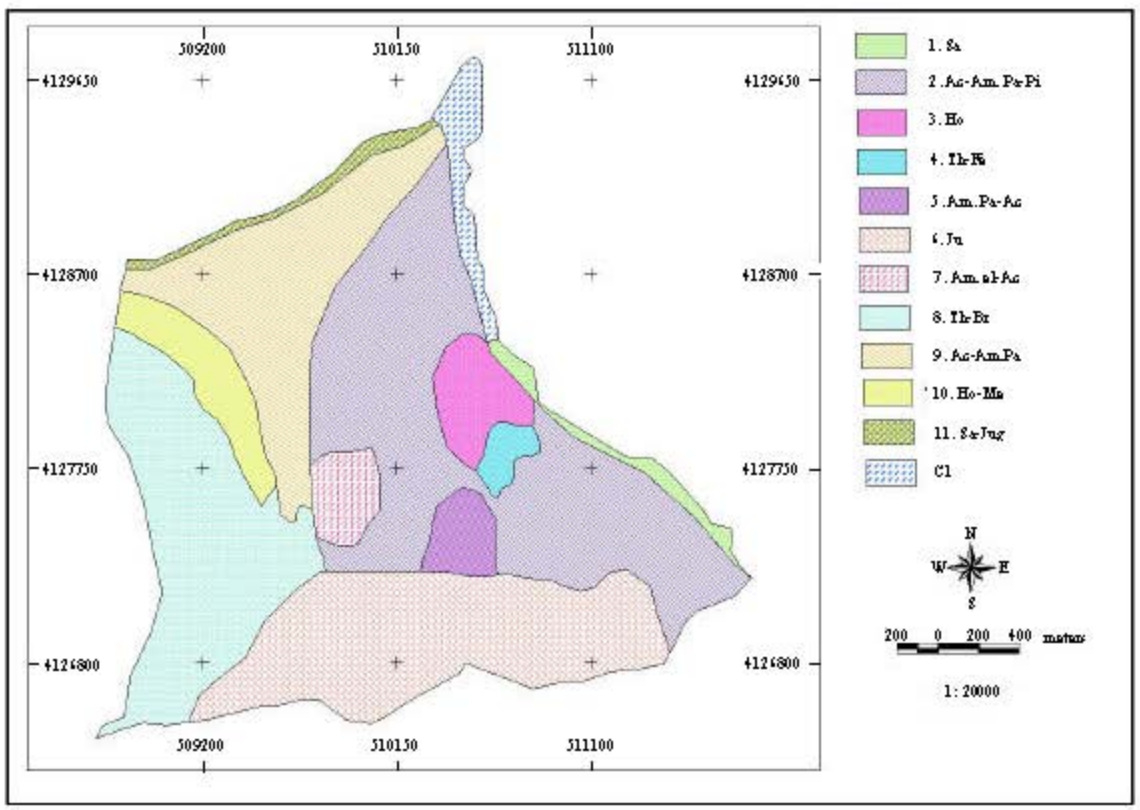

Fig. 1: Vegetation map of study area

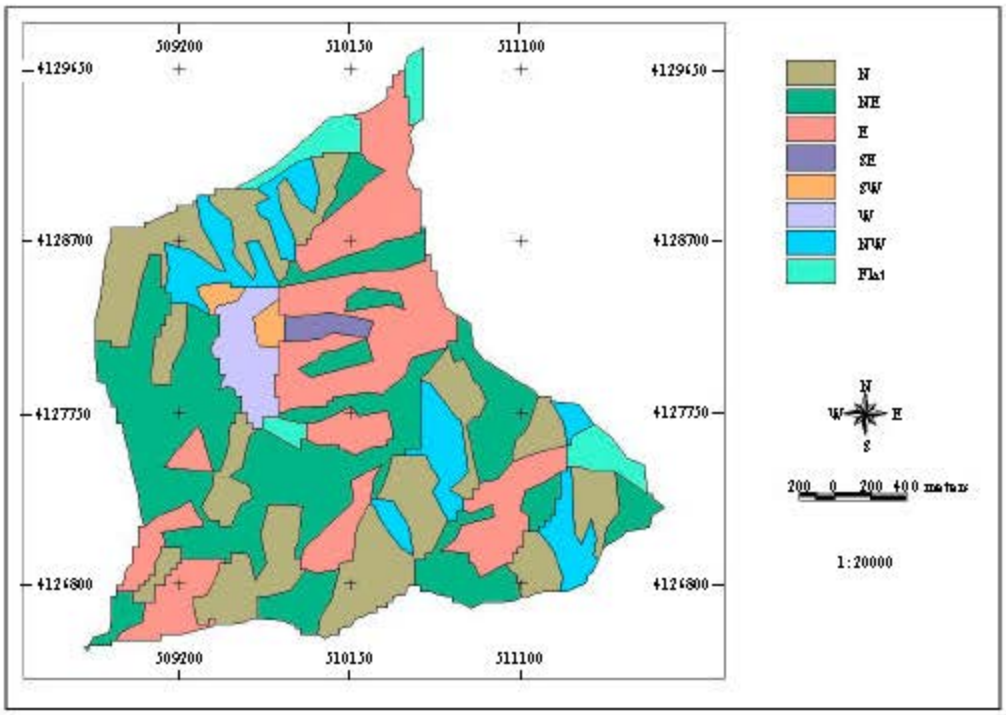

Fig. 2: Slopes orientation map of study area

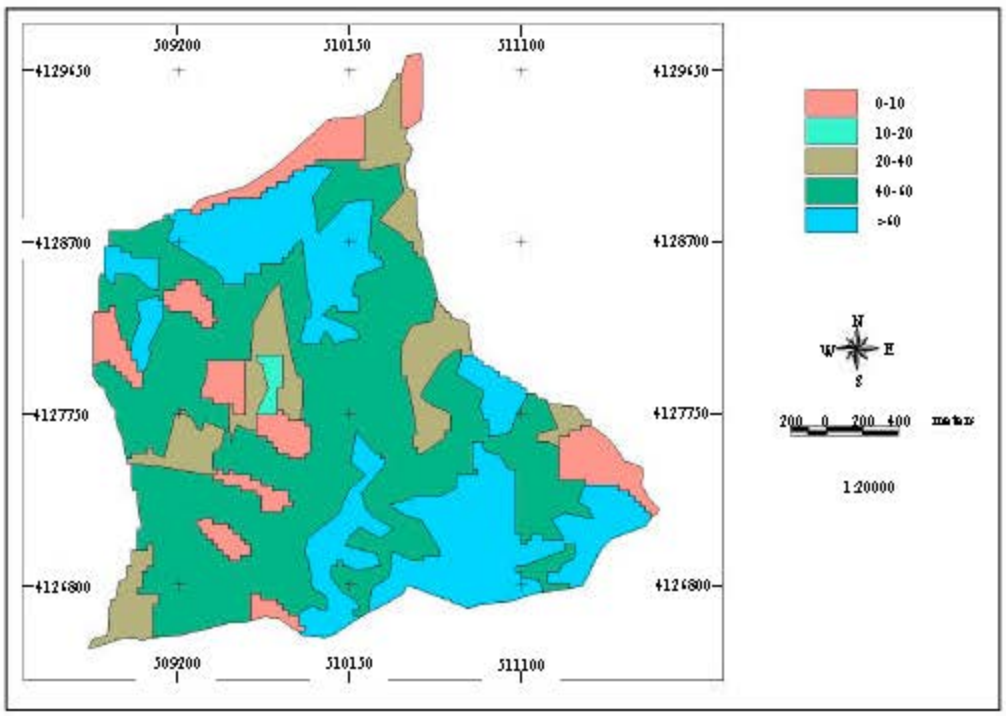

Fig. 3: Slopes steepness map of study area

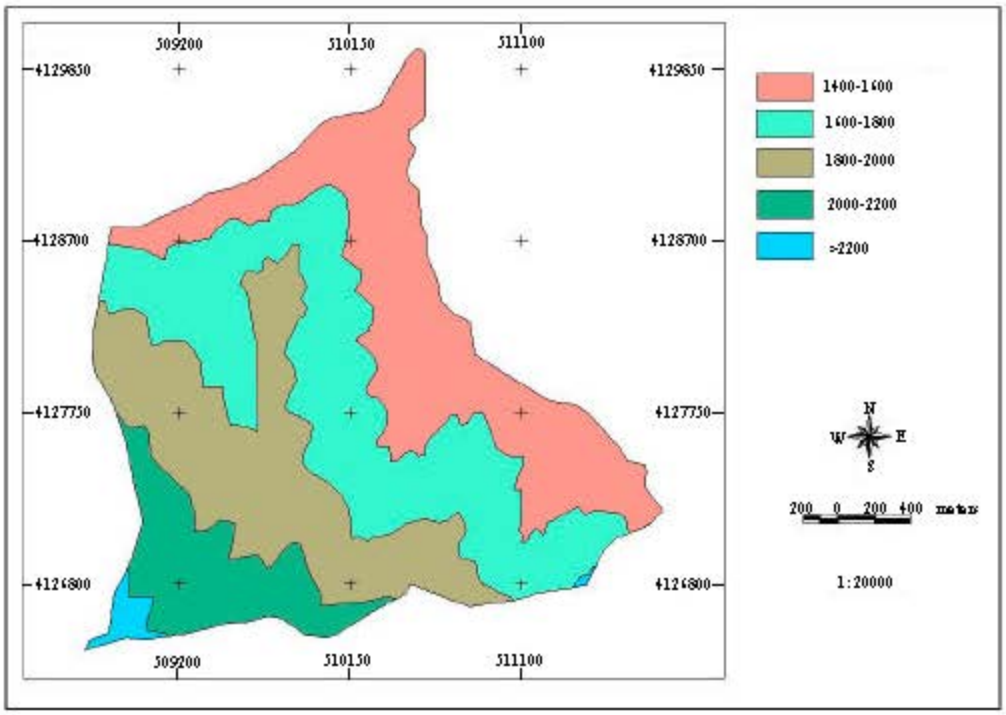

Fig. 4: Hypsometric map of study area

RESULTS

Present study resulted to the fact that there are four herbal communities and seven shrub communities in the study area as follows:

***Salix alba* L.:** This community covers the area about 9.4 ha in east of the study area, in margin of Balanech river (Fig. 1). It is located in altitude of 1420 m, with sandy-clay soil texture, granular structure which is firm and has brown-grayish colour with pH = 7.8. More over, it's soil is deep and has slopes mainly north east faced. Canopy cover is about 80%, sand and gravel about 10%, litter about 3%, unprotected and clear soil about 7%, with positive succession (Fig. 5). The main species of this communities includes:

Salix alba	61%
Juglans regia	7%
Fraxinus rotundifalis	6%
Rosa canina	4%
Other species	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 ha, which is the most extended communities (Fig. 1). It is also located in altitude of 1420-1940 m and it's slope steepness ranges from 40-60%, which is east facing slope. It's surface soil is of 57 cm depth with cubic structure and it's pH = 8. In addition, soil colour is redish brown and with loamy-clay texture. Canopy cover is about 60%, sand and gravel community about 30%, litter around 5%, bare soil about 5%, overally this community has positive succession (Fig. 6). This part of study area includes the following species:

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

***Hordeum bulbosum* L.:** This community covers the area about 19.38 ha in east of the study area, next to margin of Balanech river (Fig. 1). It is located in altitude of 1420-1520 m and it's slope steepness ranges from 20-40%,

which is east facing slope. It's topsoil is of 60 cm of depth with granular structure which is firm and it's pH = 7.8. In addition, soil colour is brown and with loamy texture. Canopy cover is about 100%, sand and gravel about 0%, litter around 0%, bare soil about 0%, overally this community has positive succession (Fig. 7). The main species of this community includes:

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

***Thymus kotschyanus* Boiss. - *Festuca arundinacea* Schreb.:** This community covers an area of 6.49 ha in north and north west facing slopes. of the study area, next to margin of Balanech river (Fig. 1). It is located in altitude of 1440-1560 m and it's slope steepness ranges from 40-60%. It's topsoil is of 73 cm depth with cubic structure and it's pH = 7.4. In addition, soil colour is redish brown and with loamy-clay texture. Canopy cover is about 70%, sand and gravel about 0%, litter around 5%, bare soil about 15%, overally this community has positive succession (Fig. 8). The main species of this community includes:

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

***Amygdalus pabotii* Browicz. - *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik.:** This community covers an area of 12.21 ha in north facing slope (Fig. 1).

It is located in altitude of 1580-1800 m and it's slope steepness ranges from 40-60%. It's topsoil is of 22 cm depth with cubic structure and it's pH = 8. In addition, soil colour is redish brown and with loamy-silty texture. Canopy cover is about 55%, sand and gravel about 36%, litter around 4%, bare soil about 5%, overally this community has positive succession (Fig. 9). The main species of this community includes:

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

***Juniperus excelsa* M.B.:** This community covers an area of 113.24 ha in south of the study area (Fig. 1). It is located in altitude of 1650-2200 m and it's slope steepness exceedes 60% which is north, north east and north west facing slopes. It's topsoil is of 35 cm depth with granular structure and it's pH = 8. In addition, soil colour is redish brown and with sandy-clay texture. Canopy cover is about 50%, sand and gravel about 40%, litter around 3%, bare soil about 7%, overally this community has positive succession (Fig. 10). The main species of this community includes:

Juniperus excelsa	25%
Acer monspessulanum	11%
Amygdalus pabotii	4%
Rhamnus pallasii	2%
Pistacia atlantica	2%
Ferula communis	2%
Thymus kotschyanus	
Thymus migricus	
Astragalus kabristanicus	3%
Other species	1%

***Amygdalus elaeagnifolia* spach. *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik.:** This community covers an area of 13.44 ha in center of the study area (Fig. 1). It is located in altitude of 1700-1900 m and it's slope steepness ranges from 40-60% which is north east facing slope. It's topsoil is of 31 cm depth with cubic structure and it's pH = 7.5. In addition, soil colour is dark redish brown and with loamy-clay texture. Canopy cover is about 74%, sand and gravel about 14%, litter around 4%, clear soil about 8%, overally this community has positive succession (Fig. 11). The main species of this community includes:

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* community

Fig. 12: *Thymus-Bromus* community

Amygdalus elaeagnifolia	36%
Acer monspessulonum	16%
Amygdalus pabatii	9%
Juniperus excelsa	4%
Pistacia atlantica	3%
Cerasus microcarpa	
Astragalus effusus	4%
Festuca ovina	
Trifolium hybridum	1%
Other species	1%

***Thymus kotschyanus* Boiss. - *Bromus tomentellus* Boiss.:** This community covers an area of 103.05 ha from west to south west of the study area (Fig. 1). It is located in altitude of 1800-2280 m and it's slope steepness ranges from 40-60% which is north and north east facing slopes. It's topsoil is 81 cm of depth with granular structure and it's pH = 7.9. In addition, soil colour is yellowish brown and with silty-clay texture. Canopy cover is about 56%, sand and gravel about 23%, litter around 7%, bare soil about 14%, overally this community has positive succession (Fig. 12). The main species of this community includes:

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

***Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yaltirik - *Amygdalus pabotii* Browicz.:** This community with 84.31 ha area is located in central part of study area, that is, extends from margin of Khan valley to central parts of study area and reaches to Ashakchi mountain (Fig. 1).

It is located in altitude of 1450-1750 m and it's slope steepness exceedes 60% which is north and west facing slopes. It's topsoil is of 33 cm depth with cubic structure and it's pH = 8.1. In addition, soil colour is yellowish brown and with loamy-sandy texture. Canopy cover is about 49%, sand and gravel about 38%, litter around 5%, bare soil about 8%, overally this community has negative succession. The main species of this community includes:

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

***Hordeum bulbosum* L. - *Medicago sativa* L.:** This community covers an area of 24.33 ha in northwest of the study area until adjacent of Khan valley (Fig. 1).

It is located in altitude of 1600-1800 m and it's slope steepness ranges from 40-60% which is north and north east facing slopes. It's topsoil is of 64cm depth with cubic structure and it's pH = 7.6. In addition, soil colour is dark redish brown and with loamy-clay texture. Canopy cover is about 100%, sand and gravel about 0%, litter around 0%, baresoil about 0%, overally this community has positive succession (Fig. 13). The main species of this community includes:

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

***Salix alba* L. - *Juglans regia* L.:** This community covers an area of 7.82 ha in north of the study area in margin of Khan valley (Fig. 1). It is located in altitude of 1420 m and it's slope steepness ranges from 0-10%. It's topsoil is of 90 cm depth with granular structure which is firm and it's pH = 7.8. In addition, soil colour is yellowish brown and with loamy texture. Canopy cover is about 85%, sand and gravel about 7%, litter around 4%, bare soil about 4%, overally this community has positive succession. The main species of this community includes:

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

Fig. 13: *Hordeum-Medicago* community

DISCUSSION

By investigation the effects of ecological factors including altitude, slope steepness, slope direction, soil and biologic on plant communities the study led to the following results:

Altitude: Altitude is known as one of the most effective factors on plant distribution. Some plants don't like the high altitudes because of deficit of temperature and shortage of growth period and in addition existence of severe winds in mountains limites the plant growth.

Study area includes *salix alba* community in 1420 m altitude alonge the main river, Juniperus community extended in 1650-2200 m and *Thymus-Bromus* in 1800-2280 m. Odisho (1998), in Khoy-Salmas area introduced the *Juniperus* community in 2400-2700 m. Naseri *et al*. (2002) reported the existence of the same community in 1500-2650 m. *Thymus-Artemisia* community is seen by Aleyha and Shokuii (2003) in 2350-2500 m highth in semnan. Karimi (1997) recognized the *Thymus-Agropyron* community in Anzali-Khalkhal area in 1400-1800 m highth.

Slope direction: Slope direction is also known as one of the most important factors that affecting plant distribution. North and South facing slopes have fully different vegetation covers. South facing slope, because of intensive solar radiation, high temperature in compare with north facing slope has low humidity. In contrast, north facing slope with low temperature and low radiation, has high humidity. As, the *Juniperus* community is dominant in north facing slope and it's lower limit is extended to 1650 m highth, so, such a situation is resulted from the deficit of temperature and radiation. Moreover, *Thymus-Bromus* and *Thymus-Festuca* is also dominant in north facing slopes.

Nazarian (2003), in Central Alborz, indicated the *Salix* community in north, north east facing slopes and the thorny assembeleges on south, south west, south east, north and northwest and north east, facing slopes. In addition, Ghelichnia (1999) in Nardin region, Dianatnajad and Slami (1996) in Thouran reserve indicated the effect of slope direction on plant communities distribution.

Slope steepness: Slopesteepness affects the vegetation cover on slopes. In study area *Salix* community as a tree

assemblage is 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 Shahrebabaki (1988), in Shahrebabak; indicated *Amygdalus* community on both gentle and steep slopes.

Soil texture: Soil texture is also important for plan distribution. In study area *Salix* is found on sandy-clay and loamy soils. *Hordeum* and *Hordeum-Medicago* are extended on soils without sand and gravel. Also, in study 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, Batuli (1997), indicated the *Amygdalus* community on clay-loamy soils and Masoomi (1993), also reported the *Amygdalus* community on clay-loamy soil.

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