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Research Article

Study of plant diversity in the Northern Zagros forest (Case study: Marivan region)

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ABSTRACT

Silvicultural operation needs to notice the species diversity. For this study Gomarlang district in marivan region, the northern Zagros forest was selected. In this study 30 circle sample plots (500 m2) were collected by random method. In every sample plot the kind of species and number of trees and shrub were recorded. In the sample plots the micro plots of 5 m by 5 m (i.e. area of 25 m2) were designed and Herbaceous and shrub information was recorded then. Species diversity indexes, including Shannon Wiener (H'), Simpson (1-D) and Margaleff (R_1) were used to evaluate plant diversity in each sample plot. Data analyzing was done by Past and Ecological Methodological software's. Results showed that 8 tree species, 8 shrub species and 64 herb species observed in the site study. The plant species that identified in the studied region belonged to 16 trees and shrub species in 9 families. Overall results showed that the presence of 80 plant species in the study area indicates the high biodiversity in the Northern Zagros forest and herbaceous layer had the highest richness, evenness and diversity.

Kay words: Northern Zagros, Marivan, Gomarlang, Species diversity, Tree, Shrub, Herb.

INTRODUCTION

Forests cover about 12 million ha in Iran, including 5 million ha in the mountainous Zagros region (Haidari *et al*, 2013). The main species in this region are *Quercus* spp. (oaks), *Pistacia mutica* (wild pistachio), *Crategus* spp. and *Pyrus* spp (Jazirehi and Rostaghi, 2003). Most of the forests of Iran involve some kind of conventional ownership, either communal (by villages) or among families within villages. In the Zagros Mountains, especially in the northern areas, the territory of Kurdish people, this kind of conventional ownership and relationships between humans and nature are extremely strong (Ghazanfari *et al*, 2004). Increasing population, low level of development and high dependence of local communities on forests for their primary livelihood needs, are the main reasons of this destruction (Fatahii, 1994). Biodiversity is defined as the kinds and numbers of organism and their patterns of distribution (Schuler, 1998). Generally, biodiversity measurement typically focuses on the species level and species diversity is one of the most important indices which are used for the evaluation of ecosystems at different scales (Ardakani, 2004). Local diversity can be studied with various indices, such as number of species per unit area (species richness) or the Shannon index, amongst others. These are used as

indicators of the degree of complexity of the understudy communities and provide information on the homeostatic capacity of the system to unforeseen environmental changes (Magurran, 1988). The study of plant diversity in the zagros forest showed in the northern Zagros Mountains since there is 165 woody species (tree and shrub) in Zagros and 182 bush and herbaceous species only in northern Zagros (Jazirehi and Rostaghi, 2003). Study of floristic and plant species diversity of the Lebanon oak site (*Quercus libani*) in the western Iran and results showed the mean diversities were found the highest in northern and northwestern and lowest in northeastern aspect in the shrub layer (Pourbabaei and Navgran, 2011). Researcher studied the Structural diversity of oak forests in Kurdistan Province and results showed that *Quercus libani* Oliv and *Quercus infectoria* Oliv were the most dominant woody plants. The results showed with increase of diameter and height classes species diversity decreased. A significant different was observed between tree diversity of the diameter and height classes (level of 1%). Thus, the study of biodiversity changes in different diameter and height category cause ecologically precise perspective in management of forest stands (Haidari *et al*, 2012). Researcher studied the impact of single selection method logging on the tree and shrub diversity in the Hyrcanian forests and results showed that Results showed that shrub layer had the higher diversity indices (richness, diversity and evenness). In total Single selection method Logging has negative effect in the tree and shrub diversity (Haidari *et al*, 2012). Researcher studied of the plant biodiversity in grazed and non-grazed areas in the Iran-o-Turanian Ecological zones and results showed that Gramineae, Compositae, Labiatae, Rosacae and Anacariaceae families have the highest number of species. *Pistacia atlantica* and *Amygdalus communis* were the most dominant woody plants for class of tree and Acantholimon sp. And Astragalus spp were the most dominant Shrub plants, respectively. *Bromus tectorum* and *poa sinacia* were dominant herbaceous species. Herbaceous layer had the highest richness, evenness and diversity (Haidari *et al*, 2012).The aim of this study is evaluating of the plant diversity in the Kurdistan province, Northern Zagros forest, and west of Iran.

MATERIALS AND METHODS

Site description

The Zagros Mountains are divided into two parts of northern and southern. The northern Zagros is consisted of the growing site of Quercus infectoria Oliv and somewhat Q.libani Oliv and Q.persica J. & Sp. (Q.brantii Lindl.) can be observed. The northern Zagros is wetter and cooler than the southern one (Jazirehi and Rostaghi, 2003). This research was investigated in the Komarlang district, Marivan region, northern Zagros forest, and western Iranian state of Kurdistan (Figure 1). Gomarlang village is located in north of Marivan city and the 200 hectare of conventional territory of this village was selected (figure 1). The forests are located between 1150 and 1920 m a.s.l. Mean annual precipitation is 909.5 mm, ranging from 590.8 to 1422.2 mm, Mean annual temperature is 13.3º C, and the length of dry season is 4 month (based on embrothermic curve) from June to August. Type of climate is sub humid with cold winters in the basis of Emberger's formula (Pourbabaei and Navgran, 2011).

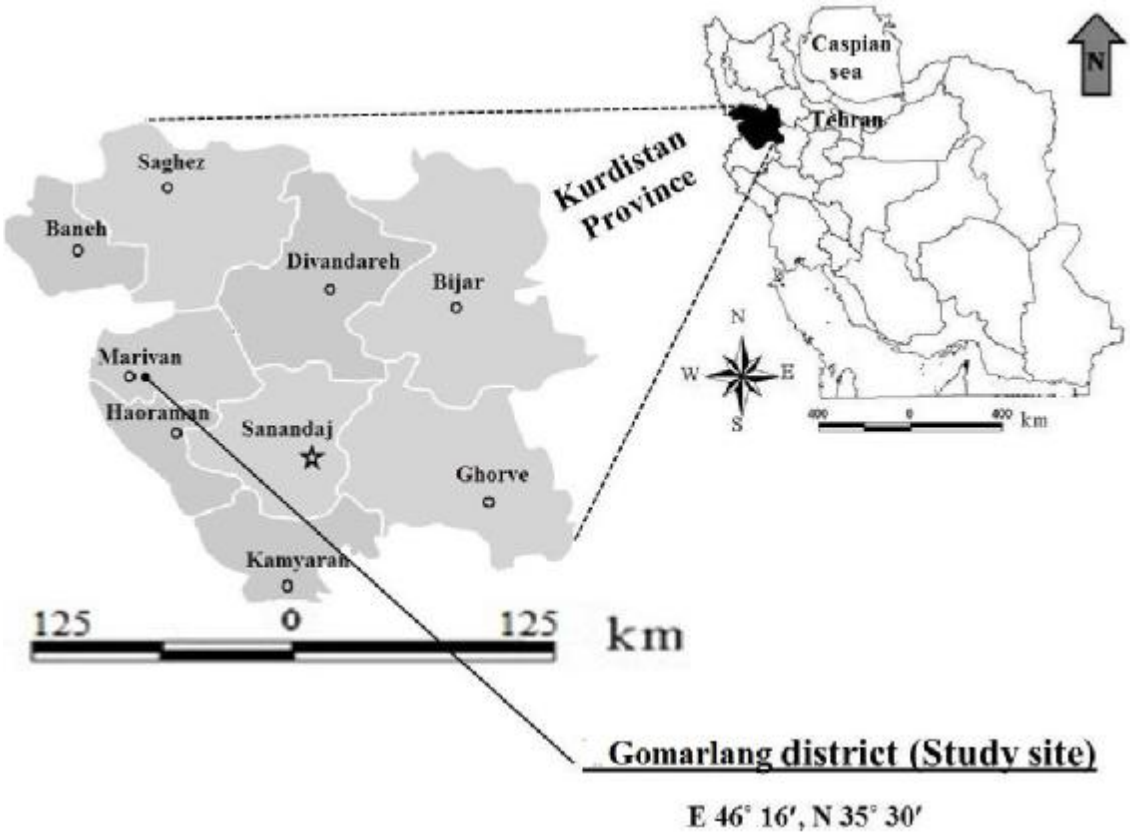

Figure 1. Study site location in the Kurdistan Province, Zagros region, Western Iranian state of Iran.

Field measurements

In this study 30 circle sample plots (500 m2) were collected by random method. In every sample plot the kind of species and number of trees and shrub were recorded. In the sample plots the micro plots of 5 m by 5 m (i.e. area of 25 m2) were designed and Herbaceous and shrub information was recorded then. Species diversity indexes including Shannon Wiener (H΄), Simpson (1-D) and Margaleff (R_1) were used to evaluate plant diversity in each sample plot. Data analyzing was done by Past and Ecological Methodological software's.

Table 1: Biodiversity Indices used in this paper

Indices	References	Equation*
Shannon′s (H′)	(Peet, 1974)	$H' = \sum_{i=1}^{S} pi \ln(pi)$
Simpson (1-D)	(Peet, 1974)	$1 - D = (\sum (pi)^2$
Margaleff (R1)	(Ejtehadi, 2009)	$M = \frac{S-1}{Ln\ (N)}$

*S and pi refer to total number of species in the sample and proportion of individuals in the species, respectively.

RESULT AND DISCUSSION

Calculation and comparison of different indices of diversity, as a favorite method is considered for study on biodiversity (Baev and Penev, 2005). The assessment of biodiversity in forest has become an important issue for studying ecosystems and their conservation (Aubert et al, 2004).

Table 2. List of tree and shrub species in the studied areas

No	Scientific name	Family name	Tree/Shrub
1	Quercus libani Oliv.	Fagaceae	T
2	Quercus infectoria Oliv.	Fagaceae	T
3	Quercus Brantii Lindl.	Fagaceae	T
4	Acer Monspessulanum L. Subsp. cinerascens (Boiss)	Aceraceae	T
5	Pistacia atlantica Subsp Kurdica.	Anacardiaceae	T
6	Amygdalus Communis L.	Rosaceae	T
7	Crataegus sp.	Rosaceae	T
8	Lonicera nummularifolia Jaub & spach.	Caprifoliaceae	S
9	Cotoneaster nummularius Fisch & Mey.	Rosaceae	S
10	Pyrus communis L.	Rosaceae	T
11	Daphne mucronata Royle	Thymelaceae	S
12	Fraxinus rotundifolia Miller.	Oleaceae	T
13	Sorbus graeca (Spach)	Rosaceae	S
14	Rhus coriaria L	Anacardiaceae	S
15	Juniperus sp.	Cupressaceae	S
16	Cerasus mahalab L.	Rosaceae	S

Results showed that richness of the species and were obtained numbers of 8 and 8 for trees, respectively. Table 2 showed of the tree species identified in the region studied belonged to eight tree species in the four Families. *Quercus libani Oliv* and *Quercus infectoria Oliv were the most dominant tree plants in this area.*

Table 3. List of Herbaceous species in the studied areas

No	Scientific name	Family name	No	Scientific name	Family name
1	Achillea millefolium L.	Compositae	33	Roemeria Medic.	Papaveraceae
2	Adonis sp.	Compositae	34	Scabiosa spp.	Dipsacaceae
3	Aegilops sp.	Gramineae	35	Heilanthemum ledifolium L.	Cistaceae
4	Agropyrum cristatum L.	Gramineae	36	Rosa canina	Rosaceae
5	Alcea sp.	Malvaceae	37	Smyrniopsis aucheri	Umbelliferae
6	Papaver orientalis	Papaveraceae	38	Hypericum sp.	Hypericaceae
7	Anemon sp.	Ranunculaceae	39	Lamium album L.	Labiatea
8	Vicia variabilis	Pappilionaceae	40	Lathyrus sp.	Pappilionaceae
9	Anthemis tinctoria L.	Compositae	41	Medicago spp.	Pappilionaceae
10	Arum elongatum Stev.	Araceae	42	Taeniatherum crinitum	Gramineae
11	Lactuca serriola	Compositae	43	Poa spp.	Gramineae
12	Astragalus sp.	Pappilionaceae	44	Polygonum sp.	Polygonaceae
13	Avena sp.	Gramineae	45	Stipa sp.	Gramineae
14	Trifolium repens	Pappilionaceae	46	Ziziphora tenuir L.	Labiatea
15	Boissiera sp.	Crucifereae	47	Vaccaria sp.	Caryophyllacea e
16	Bromus tectorum L.	Gramineae	48	Trifolium purpureum.	Pappilionaceae
17	Bellevalia pycantha	Liliaceae	49	Taraxacum sp.	Compositae
18	Carex sp.	Cyperaceae	50	Gundelia tournefortii	Compositae
19	Capsella draba L.	Crucifereae	51	Lotus sp.	Pappilionaceae
20	Alyssum sp.	Crucifereae	52	Fumaria asepala	Fumariaceae
21	Eryngium billardieri F.	Umbelliferae	53	Trapogon sp.	Compositae
22	Campanula sp.	Campanulacea e	54	Teucrium sp.	Labiatea

23	Hordeom violaceum	Gramineae	55	Phlomis sp.	Labiatea
24	Centaurea spp.	Compositae	56	Onobrychis cornuta L.	Pappilionaceae
25	Malva neglecta Wallr.	Malvaceae	57	Hibiscus sp.	Malvaceae
26	Rumex sp.	Polygonaceae	58	Cuscuta spp.	Cuscutaceae
27	Salvia sp.	Labiateae	59	Allium sp.	Liliaceae
28	Convolvolus arveniss L.	Convolvulacea e	60	Bellis sp.	Compositae
29	Crepis sp.	Compositae	61	Ferula spp.	Umbelliferae
30	Dactylis glomerata L.	Gramineae	62	Fibigia Medicus	Cruciferae
31	Geranium tuberosum L.	Graninaceae	63	Crepis sanctus	Compositae
32	Erodium sp.	Graninaceae	64	Salvia indica	Labiatea

Table 3 showed that in the study area have a 65 Herbaceous in the 24 family observed in the study area.

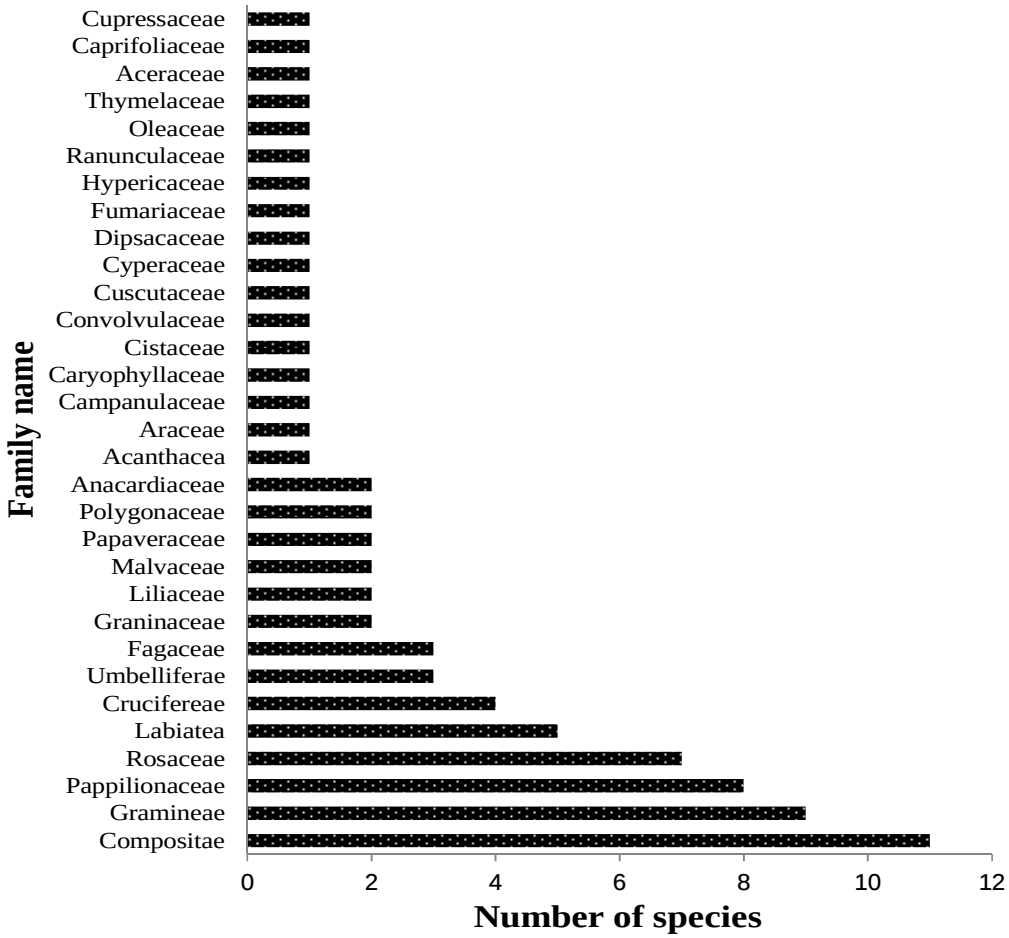

Figure 2: The number of species in the different family name in the study area

Figure 2 showed that in this forest have 80 plant species, which consist of 8 trees, 8 shrubs and 64 herbaceous species.

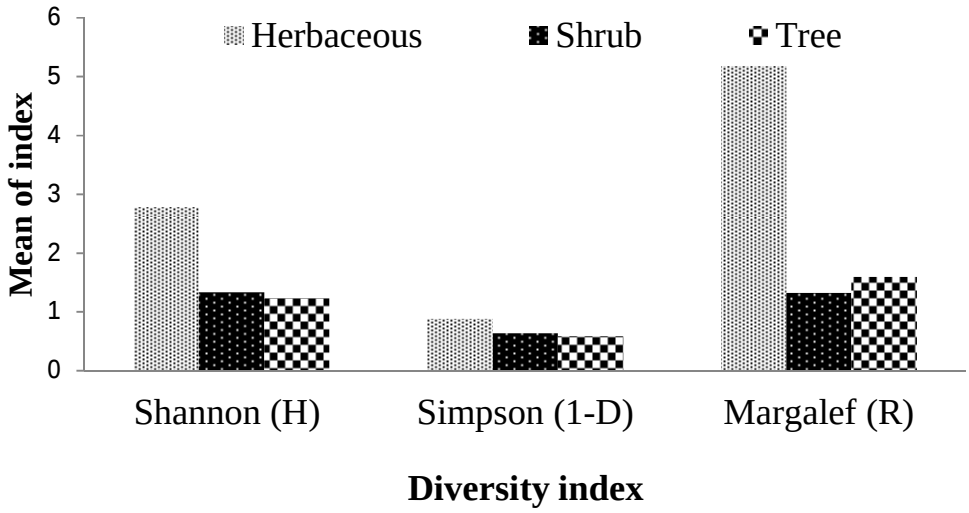

Figure 3: mean of diversity index in the tree, shrub and herbaceous layer

The results of Figure 3 showed that the computed tree species diversity indexes are as follows: 2.78, 0.88 and 5.18 in herbaceous layer; 1.33, 0.63 and 1.33 in the shrub layer and 1.23, 0.58 and 1.58 in the tree layer in the Shannon, Simpson and Margaleff index, respectively. Biodiversity measurement is recognized as guidance for conservation plans in local scale. Species biodiversity is used greatly in vegetation studies, and environmental evaluation is one of the main criteria to determine ecosystems condition (Mirdavoodi and Zahedi Pour, 2005). The plant species that identified in the studied region belonged to 16 trees and shrub species in 9 families. The presence of 16 tree and shrub species in study area indicates considerable plant diversity in the study area (table 2). Compositae family had high number of species (table 2 and 3; figure 2). Results showed of the tree species identified in the region studied belonged to eight tree species in the four Families. *Quercus libani Oliv* and *Quercus infectoria Oliv were the most dominant tree plants in this area (*Table 2). Results showed that in this forest have 80 plant species, which consist of 8 trees, 8 shrubs and 64 herbaceous species (Figure 2). Overall results showed that the presence of 80 plant species in the study area indicates the high biodiversity in the Northern Zagros forest, and Jazirehi and Rostaghi (2003) reached this result. The results showed that the computed tree species diversity indexes are as follows: 2.78, 0.88 and 5.18 in herbaceous layer; 1.33, 0.63 and 1.33 in the shrub layer and 1.23, 0.58 and 1.58 in the tree layer in the Shannon, Simpson and Margaleff index (Figure 3), and Herbaceous layer had the highest richness, evenness and diversity.

Conclusion

Biodiversity is defined as the kinds and numbers of organisms and their patterns of distribution. The plant species that identified in the studied region belonged to 16 trees and shrub species in 9 families. Overall results showed that the presence of 80 plant species in the study area indicates the high biodiversity in the Northern Zagros forest and herbaceous layer had the highest richness, evenness and diversity.

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