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Study of herb diversity in the zagros forest (Case study: Kurdistan province)

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ABSTRACT

Silvicultural operation need to notice the plant species diversity in forest. To this study Gomarlang district in marivan region, northern zagros forest was selected. Selected 100 ha area because have similar physiography condition (north aspect and 1650 to 1800 m s.a.l. In study area 100 micro plots of 5m by 5 m (25 m^2) including the species and the numbers of this species randomized-systematic method in the 100×100 Net. Diversity index including Shannon Wiener (H′), Simpson (1-D) and Margaleff (R_1) were used. To analysis of the data, use was Ecological Methodological software. Results showed that 65 herb species observed in the site study. Results indicated that Gramineae, Pappilionaceae and Compositae highest number of species. *Bromus tectorum* L, *Poa* spp and *Avena* sp were dominant herbaceous species, respectively. Herbaceous layer had the highest richness, evenness and diversity. Authors suggested approaching the sustainable forest management focused on the dominant plant in the study area.

Kay words: Northern zagros, Marivan, Komarlang, Species diversity, tree, shrub, herb

INTRODUCTION

The forests of Iran cover an area of about 12.4 million ha and comprise 7.4% of the area of the whole country, and the Zagros woodlands, with an area of around 5 million ha, and account for almost 40% of the country's forests (Haidari *et al*, 2012 and Sagheb-Talebi *et al*, 2004).These woodlands, provide a home and livelihood for approximately 10% of Iran's population (Haidari *et al*, 2013 and DoE/GOIRI, 2004). These primary oak woodlands stretch along the Zagros Mountains in western Iran from north to south. Based on the differences in oak species and climatic conditions, the Zagros vegetation zone can be divided into two distinct regions, where the southern region has lower humidity than the northern region. These woodlands are classified as semiarid forests, sometimes referred to as dry forests (Haidari et al, 2012; Sagheb-Talebi *et al*, 2004 and Jazirehi and Ebrahimi, 2003). The lack of regeneration in these woodlands because of increased grazing pressure on regenerating trees is a major concern, and there are no commercial-sized trees left in Zagros (Pourhashemi *et al*, 2004). Moreover, in many areas utilization of no timber forest products is of greater value than utilization of timber (Sagheb-Talebi *et al*, 2004 and Jazirehi and Ebrahimi, 2003). Forests and rangelands in Iran are under governmental authority and the supervision of the Forest, Range and Watershed Management Organization (FRWO). Biodiversity has so wide meaning and consists of genetic diversity up to ecosystems diversity. Species diversity is known equal to biodiversity that is limited to diversity in local or regional surface (Krebs, 1989). Diversity of organisms, measurement of diversity and examination of some hypothesis about reasons of diversity are some cases that have been

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favored by ecologists for a long time (Barens *et al*, 1989). Biological diversity is the richness and evenness of species amongst and within living organisms and ecological complexes (13). Biodiversity is mostly studied in species level. There are different indices to measure biodiversity. The most commonly considered facet of biodiversity is species richness. Evenness is another important factor of biodiversity (Kharkwal *et al*, 2004). Evenness has been considered as a fundamental fact in habitats with more than one species (Hashemi, 2010). Nowadays, numerous efforts to incorporate biodiversity into forests management and planning are encouraging (Brockway, 1998). Many studies have been carried out on plant biodiversity indices in Iran and around the world. Ravanbakhsh *et al*, (2007) Studied under-story and overstore plant biodiversity in Gisoom reserved forest in Guilan province, north of Iran and they showed that understory vegetation was disturbed and affected by human impacts. Abase *et al*, (2009) investigated the effects of conservation on woody species diversity in protected regions of Oshtorankooh in Lorestan province, west of Iran. They expressed that trees and shrubs living in the protected regions species have significantly higher diversity, richness, evenness and better living condition than they living in non-protected region. Comparison of species richness and Hill's diversity indices showed that total species richness was higher in natural stands. Also, more fertile sites have significantly higher values of Hill's diversity index in mature stands of spruce plantation and natural stands in Southeaster New Brunswick, Canada Roberts (2002). Measurement of Shannon-Wiener and evenness indices on Pinus massoniana communities in Conservation project of plant biodiversity in Yangtze Three Gorges reservoir area, China showed that biodiversity of shrubs layer was the highest, followed by grass layer and the middle, while tree layer was the lowest (Tian *et al*, 2007). In this research, the aim of biodiversity is the diversity of species and the diversity of species is the amounts of diversity indices are calculated with dependent on the number of species (as richness). Main objective of this study was to analysis of plant diversity in the Komarlang forest north of Marivan city, Kurdistan province, northern Zagros forest, Iran.

MATERIALS AND METHODS

Gomarlang forest north of Marivan city, Kurdistan province, northern Zagros forest, Iran (Figure 1). Selected 100 ha area because have similar physiography condition (north aspect and 1650 to 1800 m s.a.l. In study area 100 micro plots of 5m by 5 m (25 m^2) including the species and the numbers of this species randomized-systematic method in the 100×100 Net. Diversity index including Shannon Wiener (H′), Simpson (1-D) and Margaleff (R_1) were used. To analysis of the data, use was Ecological Methodological software.

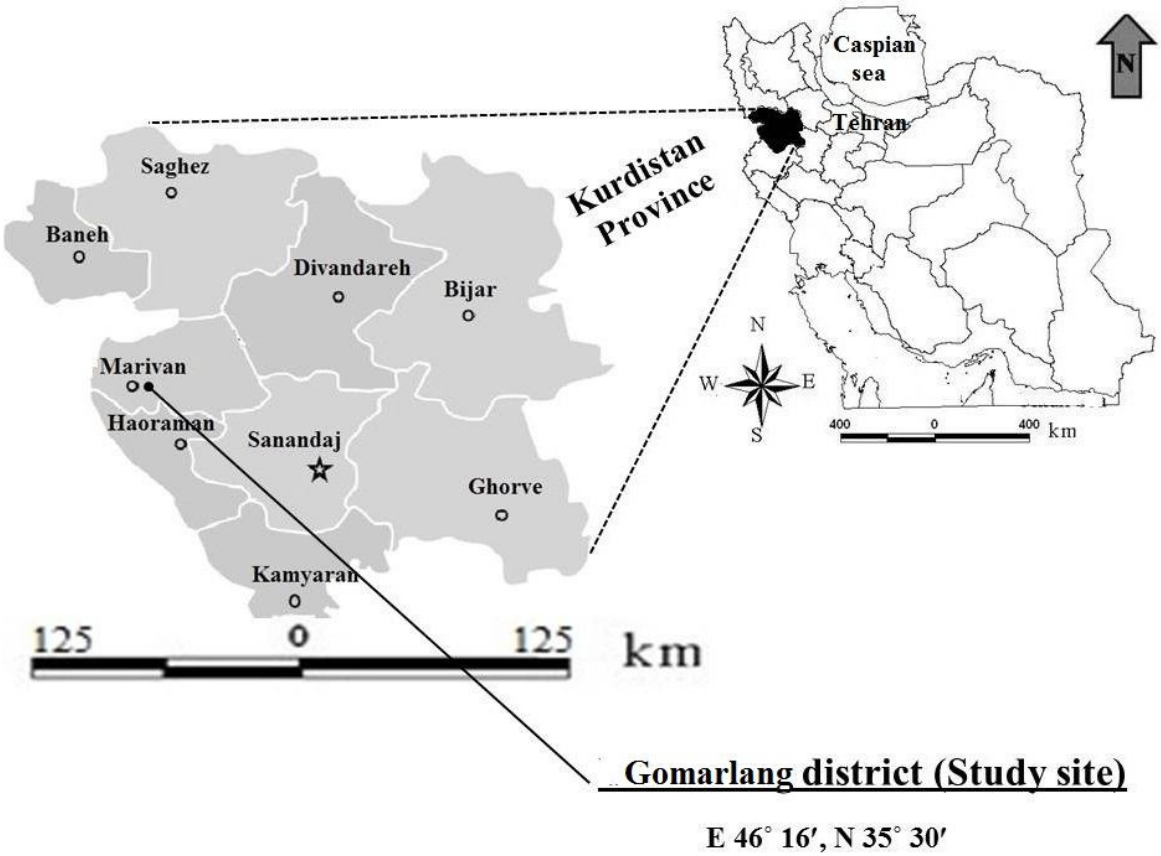

Figure 1. Study site location in the Kurdistan Province, Zagros region, Western Iranian state of Iran

Table 1: Biodiversity Indices used in this paper

Indices	References	Equation
Shannon′s (H′)	Peet, 1974 [20]	$H' = \sum_{i=1}^{S} pi \ln(pi)$
Simpson (1-D)	Peet, 1974 [20]	$1 - D = (\sum (pi)^2$
Margaleff (R_1)	Peet, 1974 [20]	$M = \frac{S-1}{Ln\ (N)}$
S: the total number of species in the sample pi: the proportion of individuals in the its species		

RESULTS AND DISCUSSION

100 sample plots were located in the study area according to randomized-systematic method sampling method. Species composition and their abundance were recorded.

Table 2. List of plant species in the studied areas

Scientific Names	Family Names	
Compositae	*Achillea millefolium L.*	1
Compositae	*Adonis sp.*	2
Gramineae	*Aegilops sp.*	3
Gramineae	*Agropyrum cristatum L.*	4
Malvaceae	Alcea sp.	5
Papaveraceae	*Papaver orientalis*	6
Ranunculaceae	*Anemon sp.*	7
Pappilionaceae	*Vicia variabilis*	8
Compositae	*Anthemis tinctoria L.*	9
Araceae	*Arum elongatum Stev.*	10
Compositae	*Lactuca serriola*	11
Pappilionaceae	*Astragalus sp.*	12
Gramineae	*Avena sp.*	13
Pappilionaceae	*Trifolium repens*	14
Crucifereae	*Boissiera sp.*	15
Gramineae	*Bromus tectorum L.*	16
Liliaceae	*Bellevalia pycantha*	17
Cyperaceae	*Carex sp.*	18
Crucifereae	*Capsella draba L.*	19
Crucifereae	*Alyssum* sp.	20
Umbelliferae	*Eryngium billardieri F.*	21

Campanulaceae	Campanula sp.	22
Gramineae	*Hordeom violaceum*	23
Compositae	*Centaurea spp.*	24
Malvaceae	*Malva neglecta Wallr.*	25
Polygonaceae	*Rumex* sp.	26
Labiateae	Salvia sp.	27
Convolvulaceae	*Convolvolus arveniss L.*	28
Compositae	*Crepis sp.*	29
Gramineae	*Dactylis glomerata L.*	30
Graninaceae	*Geranium tuberosum L.*	31
Graninaceae	Erodium sp.	32
Umbelliferae	*Ferula spp.*	33
Cruciferae	*Fibigia Medicus*	34
Compositae	*Crepis sanctus*	35
Labiatea	*Salvia indica*	36
Papaveraceae	*Roemeria Medic.*	37
Dipsacaceae	*Scabiosa spp.*	38
Cistaceae	*Heilanthemum ledifolium L.*	39
Rosaceae	*Rosa canina*	40
Umbelliferae	*Smyrniopsis aucheri*	41
Hypericaceae	*Hypericum sp.*	42
Labiatea	*Lamium album L.*	43
Pappilionaceae	Lathyrus sp.	44
Pappilionaceae	*Medicago spp.*	45
Gramineae	*Taeniatherum crinitum*	46
Gramineae	*Poa spp.*	47

Polygonaceae	*Polygonum sp.*	48
Gramineae	*Stipa sp.*	49
Labiatea	Ziziphora tenuir L.	50
Caryophyllaceae	*Vaccaria sp.*	51
Pappilionaceae	*Trifolium purpureum.*	52
Compositae	*Taraxacum sp.*	53
Compositae	*Gundelia tournefortii*	54
Pappilionaceae	*Lotus sp.*	55
Fumariaceae	*Fumaria asepala*	56
Compositae	*Trapogon sp.*	57
Labiatea	*Teucrium sp.*	58
Labiatea	*Phlomis sp.*	59
Pappilionaceae	*Onobrychis cornuta L.*	60
Malvaceae	*Hibiscus sp.*	61
Cuscutaceae	*Cuscuta spp.*	62
Liliaceae	*Allium sp.*	63
Compositae	*Bellis sp.*	64
Acanthacea	Acanthus sp.	65

Results indicated that Gramineae, Pappilionaceae and Compositae highest number of species. *Bromus tectorum* L, *Poa* spp and *Avena* sp were dominant herbaceous species, respectively.

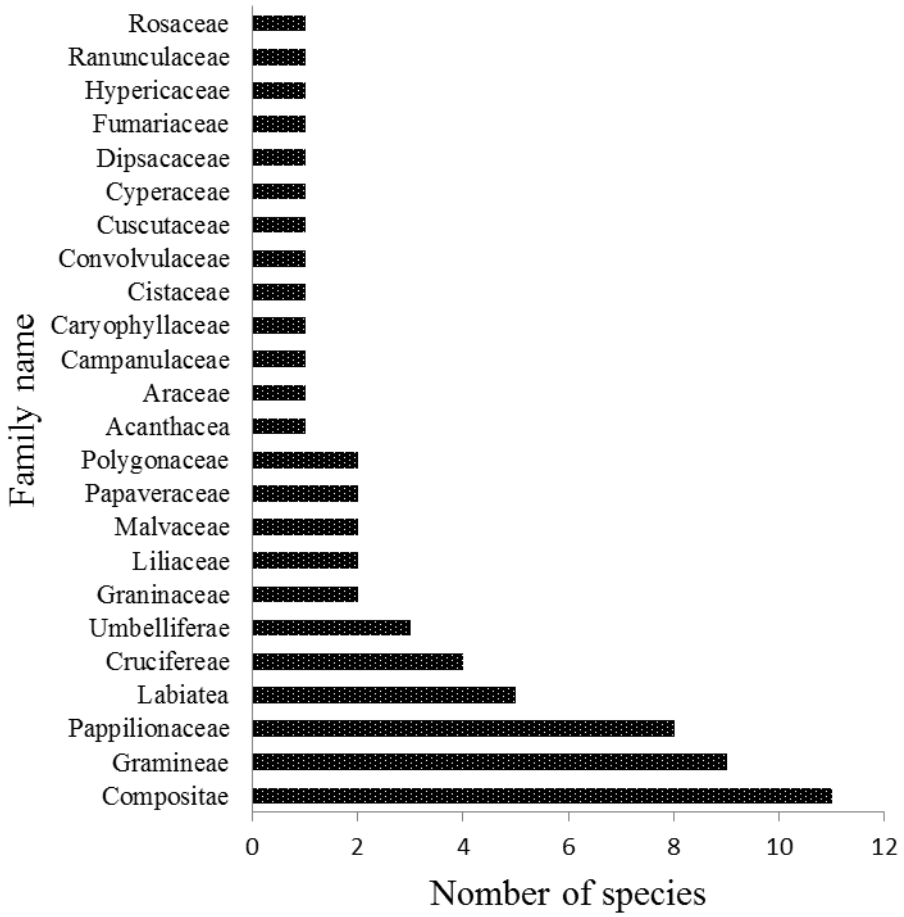

Fig. 2: number of species in the different Family in the study area

The results of Fig. 2 showed that Compositeae, Gramineae and Pappilionaceae families have the highest number of species. The results of Fig. 3 showed that *Po asp.* And *Bromus sp.* were the most dominant herb plants classes.

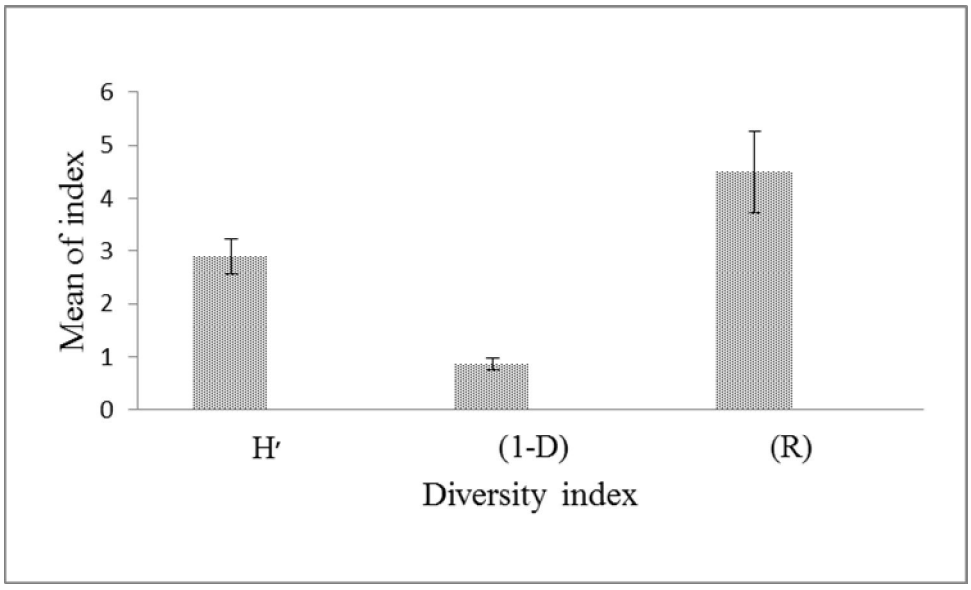

Fig 3: Diversity index in the herb species

The results of Fig 3 showed that the computed species diversity indexes are as follows: mean species Shannon index: 2.9, Simpson index: 0.87 and 0.90 and Margaleff index: 4.50 in the herb layer. The aim of this study was to quantify plant species diversity in the in Central Zagros forest of Iran. The assessment of biodiversity in forest has become an important issue for studying ecosystems and their conservation (2). 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. So that, many research considered that high species diversity is equal to stability in ecological systems (12). Results indicated that Gramineae, Pappilionaceae and Compositae highest number of species. *Bromus tectorum* L, *Poa* spp and *Avena* sp were dominant herbaceous species, respectively. The presence of 65 herb species in the area indicates considerable plant diversity in the study area. The results of Fig. 3 showed that Gramineae, Pappilionaceae and Compositae highest number of species. The results of Fig. 3 showed that *Bromus tectorum* L, *Poa* spp and *Avena* sp were dominant herbaceous species. Herb species diversity has suitable condition because the human and livelihoods pressure reduce and forest destruction is minimum quantity. The results of Fig 5 showed that the computed species diversity indexes are as follows: mean species Shannon index: 2.9, Simpson index: 0.87 and 0.90 and Margaleff index: 4.50 in the herb layer. Therefore, prevention of livestock grazing, irregular tree cutting and traditionally utilization in the degraded forest stands can be suggested as a suitable approach for natural restoration and increasing tree diversity in the Northern Zagros Forest. Improved forest management requires attention to the livelihoods of people living in forests because of the links between their livelihoods and the forests Long term programs for the preservation, conservation, and sustainable use of the Zagros woodlands. Reducing the direct dependency of inhabitants' livelihoods is suitable management solution in Zagros forest.

CONCLUSION

Overall results showed that the presence of 65 herb species in the study area indicates the high biodiversity in the Northern Zagros forest.

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