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The effect of grazing and anthropogenic disturbances on floristic and physiognomic characteristics in oriental beech communities, Masal Forest, Iran

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ABSTRACT

This study aimed to investigate floristic and physiognomic characteristics of all plant species in relation to grazing and anthropogenic disturbances. So that, 100 ha beech communities were studied including 50 ha as protected and 50 ha as unprotected area of oriental beech communities in Masal forest, Guilan Province, Iran. The results indicated that the number of all species were higher in the protected area. The main family of the protected area was the Rosaceae, while in the unprotected area the Asteracea had the highest frequency. To identify and classify forest types in both areas, we used the proportion of each tree species larger than 7.5 cm in diameter to determine species dominance according to the classification method of Gorji Bahri. The applied tree classification method indicated that there were three main types and two secondary types in the protected area, whereas six main types were identified in the unprotected area. Physiognomic studies indicated that trees from both areas were in the same height classes, whereas, the total canopy cover percentage was higher in the protected area. Height classes and canopy cover percentage of deciduous broadleaf in shrub layer, were significantly higher in unprotected area than in protected one. In the latter area, the coverpercentage of herbaceous species was different. So that, forbs species had the highest coverpercentage. According to these results, destructive factors have altered the main composition in these communities. So that, avoid of livestock grazing and local people in these areas or livestock exclusion can be recommended as a management.

Key words: Composition, Destructive Factor, Forest Types, Hyrcanian Forest, Plant Physiognomy.

INTRODUCTION

In each plant community, floristic and physiognomic composition is the result of long-term variations on the earth's surface (Giliam 2007). Vegetative forms is a major criteria for the description and classification of plants, whereas physiognomy, structure, plant community dynamics and vegetation type of a given environment have been considered as basic criteria (Küchler & Zonneveld 1977). Forest communities represents the final or climax state of plants in the area with specific characteristics and conditions, while vegetation type indicated current status of plants (Marvi Mohajer 2007). Forests cover 12 million ha of the Iranian territory (7% of the total land area), of which about 1.8 million ha are located in the northern part of the country, i.e., the Hyrcanian or Caspian forest ecoregion. This forest type, composed of broadleaf deciduous trees, is located on the northern slopes of the Alborz Mountains overlooking the Caspian Sea (Sagheb-Talebi *et al.* 2004). Hyrcanian forests are one of the most important floristic regions of Iran with more than 80 tree species and 50 shrub species. The presence of deciduous trees, the wide range of forest mixture and structure, the diversity in plant communities, and the relatively steep slope are important characteristics which have provided suitable vegetative conditions for the establishment of these plant communities (Eshaghi Rad *et al*. 2009). *Fagus orientalis* Lipsky is the dominant species of these forests that include 25.3% of all plant species to form the richest forest communities of the country, a major carbon pool (Hall *et al*. 2001) as well as an important source of income, soil protection and recreational activities (Adel *et al.* 2012). Forest ecosystems are dynamics systems of different ages that are effected by biotic and abiotic factors (Portela & Santos 2009). Biotic factors such as human and livestock can significantly contribute to modify plant communities (Mirdavoodi *et al*. 2013). The presence of livestock, dairy farmers and local people in northern forests of Iran are associated with the degradation and even the destruction of ecological values. Livestock grazing is known to be one of the most destructive pressures on forest ecosystems in developing countries which can change structural characteristics of communities, the composition and abundance of plant species, the competitive balance between species and species dominance (Ausden *et al*. 2005). The effects of livestock grazing as a destructive factor on Hyrcanian forest diversity and structure have been studied by authors (Asadollahi 2000, Mohamadi Golrang *et al.* 2007, Aghakhani*et al*. 2010) but the main objectives of our study was study the effects of these factors on floristic and physiognomic characteristics that did not examine in this forest yet. Over the past 35 years, almost one-third of the Iranian forests have been eliminated (FAO, 2005). If this rate is maintained, the remaining forest will be destroyed during the next 30 to 40 years (Marvi Mohajer 2007). Considering the frequent disturbances in the studied forests, forest typology can be a practical tool to study the current ecological conditions as well as planning and providing management measures to protect and restore these forests. Physiognomic systems are associated with floristic systems because environmental conditions not only influence floristic characteristics, but also life forms (Mohamadi Golrang *et al.* 2007). Therefore, this study aimed to investigate floristic and physiognomic characteristics of vascular plants in relation to grazing and human disturbances. The specific objectives of this study were: (1) evaluate the effects of grazing and human activities on plant life forms, composition and dominance of trees, shrubs and herbaceous species, and (2) identify forest types based on tree composition in protected and unprotected areas.

MATERIALS AND METHODS

Study area

The study was conducted in June, 2012 in a 100-ha forested area located in the Masal of Guilan province in northern Iran (37˚ 14 ՝00˝ to 37˚ 19˚ 20˝ N and 48˚ 55՝ 19˝ to 49˚ 02՝ E). Elevation within the study area ranges from 300 to 2000 m a.s.l., and was largely restricted to the eastern aspects. Common forest soils are acidic with a pH varying between 5.5 and 6.5. Parent materials include shill, sand stone and calcareous. Mean annual precipitation and temperature are 990 mm and 16˚C, respectively (information from station of Hydrology and Meteorology Shanderman). While there is no permanent residential land in this area, dairy farmers and local people use the territory for animal husbandry during 2-4 months in spring and summer in each year. Over the years, the primary structure of these forests was modified by disturbances such as heavy grazing livestock, tree girdling, and excessive cutting of trees and shrubs to supply fuel wood. The forest is uneven-aged and is composed of mixed deciduous broadleaved trees and sometimes of unmixed beech (*F. orientalis* Lipsky). A protection program was initiated 7 years ago by fencing about 50 ha of these forests to reduce the effect of grazing pressure and the entry of livestock and humans.

Data collection

A protected area and an unprotected area of 50 hectares were selected on the sides of a road close to each other. These areas were similar in terms of altitude, slope and aspect. In each of the two sites, 25 1000-m² circular sampling plots were systematically positioned on a 100 m × 200 m grid (Zobeiri 2002). In each area, we used a random systematic 100 m × 200 m gird sampling plan to establish 25 1000-m² circular plots. Type of tree and shrub species were identified, then in each plot, the diameter at breast height (DBH) of trees larger than 7.5 cm in diameter was measured (Adel *et al.* 2013). Also, Whittaker's nested plot sampling and minimal area method were used to determine plots size for sampling of herbaceous species and percentage cover of each species was estimated according to Domin scale of cover/ abundance(Mueller & Ellenberg 1989). Finally, a sample of each herbaceous species was collected. The species collected in each area were dried and pressed before they identified using Iranica flora (Rechinger 1963-1998), Turkey flora (Davis 1965-1985), Iran flora and the colorful flora of Iran (Asadi *et al*. 2011).

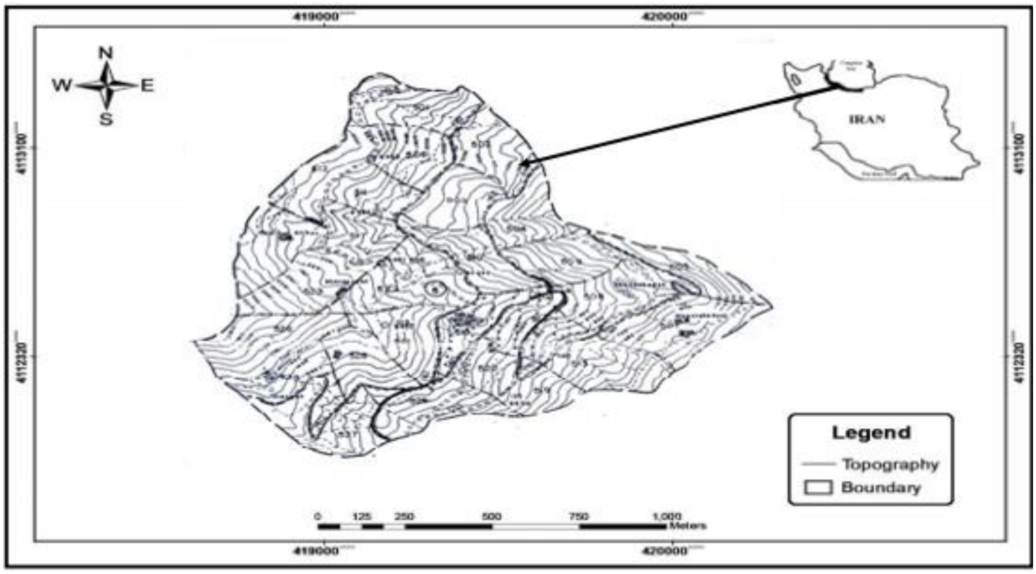

Fig. 1. Location of study area of Hyrcanian forest, north of Iran.

Data Analysis

To identify and classify forest types in both areas, we used the proportion of each tree species larger than 7.5 cm in diameter to determine species dominance (Table 1) according to the classification method of Gorji Bahri (2000). Kuchler's physiognomic method was used to study the physiognomy of each of these types. Finally, life form classes and structural classes (height and canopy cover) were determined for woody and herbaceous plants according to the method of Kuchler & Zoneveld (1977) (Table 2). For statistical analyses, at first, Kolmogorov–Smirnov tests were used to verify the normality of their distributions. Normality tests were followed by means comparisons between B and UB using two-sample t-tests or their non-parametric equivalents (Mann-Whitney U-tests) if the data were not found to be normally distributed. All statistical analyses were performed in SPSS (version 16.0, SPSS Inc., Chicago, IL). Significance levels were set to P = 0.05.

Table 1. Classification method of forest's types in protected and unprotected areas according to mixture percent of trees (Gorji Bahri 2000).

Type	Species	Species proportion (in number)		
		First species	**Second species**	**Third species**
Main	One species	≥ 90 %	-	-
	First species-second species	50-90 %	≤ 50 %	-
	First species-second species	≤ 50 %	≤ 50 %	-
Secondary	First species-second species and third species	50-90 %	≤ 50 %	≥ 10 %
	First species-second species and third species	≤ 50 %	≤ 50 %	≤ 10 %

Table 2. A description of the Kuchler's method to describe the structure of vegetation (Kuchler & Zoland 1977).

Life form classes				Structural categories	
Basic woody vegetation categories		**Special growth form categories**		**Height (stratification)**	**Coverage**
		Climbers (lianas)		**8= 35 m ≤**	
Broadleaf evergreen	B	Stems succulents	C	7= 20-35 m	Continuous= (≥ 75%)= c
Broadleaf deciduous	D	Tuft plants	K	6= 10-20 m	Interrupted= (50-75%)= i
Needleleaf evergreen	E	Bamboos	T	5= 5-10 m	Parklike= (25-50%)= p
Needleleaf deciduous	N	Epiphytes	V	4= 2-5 m	Rare= (6-25%)= r
Leaves absent or nearly so	O		X	3=0.5-2 m	Barren= (1-5%)= b
Semi-deciduous (B+D)	S	Leaf characteristics		2= 0.1-0.5 m	Almost absent= (≤ 1%)= a
Mixed (D+E)	M	Hard wood	h	1= 0.1 m ≥	
Basic herbaceous vegetation categories		Soft leaf	w		
Graminoids	G	Succulent	k		
Forbs	H	Large leaf (≥400 m²)	l		
Lichens and mosses (bryoids)	L	Small leaf (≤ 4 cm²)	s		

RESULTS

Floristic characteristics

We identified 60 species from 35 families (3 tree, 6 shrubs and 51 herbaceous species, respectively) and 58 species from 33 families (3 tree, 6 shrubs and 48 herbaceous species) in protected and unprotected areas, respectively. The Rosaceae was the most frequently encountered family in the protected area.

In contrast, the grazed plots were dominated by the family Asteracea. Three species including *Fagus orientalis* Lipsky, *Carpinus betulus* L. and *Alnus subcordata* C.A.Mey were present in both areas and broadleaf deciduous (D) was the only life form that was identified in areas (Table 3). Statistical analyses indicated that the density of trees was significantly higher in the protected area than in the unprotected area. Whereas, the mean number of shrubs per hectares and herbaceous cover percentage were greater in the unprotected area (Table 4).

Table 3. Life forms and families of woody and herbaceous species in the protected (P) and unprotected (UN) areas.

Family	Species	Life form	P	Un
Monilophyts				
Aspleniaceae	*Asplenium adianthum nigrum* L.	H	*	*
	Asplenium trichomanes L.	H	*	*
	Phyllitis scolopendrium L.	H	*	*
	Ceterach officinarum Willd.	H	*	*
Dennstaedtiaceae	*Pteridium aquilinum (*L.*)* Kuhn	H	*	*
Monocots				
Asparagaceae	*Polygonatum orientale* Mill.	H	*	*
	Ruscus hyrcanus Woronow	B	*	*
Cyperaceae	*Carex acutiformis*Ehrh.	H	*	*
Discoraceae	*Tamus communis* L.	H	*	*
Iridaceae	*Crocus sativus* L.	H	-	*
Orchidaceae	*Cephalanthera* sp.	H	-	*
Poaceae	*Hordeum* sp.	G	*	-
	Oplismenus undulatifolius (Ard.) Roem. & Schult.	G	*	*
	Hordeum spontaneum K.Koch	G	*	-
	Dactylis glomerata L.	G	*	*
	Cirsium congestum Cirsium congestum Fisch. & C.A.Mey.	G	-	*
	Microstegium vimenium (Trin.) A.Camus	G	*	*

	Bromus danthoniae Trin.	G	-	*
Eudicots				
Apiaceae	*Daucus* L.	H	*	*
	Sanicula europaea L.	H	*	-
Asteraceae	*Lapsana communis* L.	H	*	*
	Conyza canadensis (L.) Cronquist	H	*	*
	Petasites hybridus G.Gaertn. B.Mey. & Scherb	H	*	-
	Tanacetum abrotanifolium (L.) Druce	H	-	*
	Cirsium arvense (L.) Scop.	H	-	*
	Gundelia tourenfortii L.	H	-	*
	Acropetilon repens L.	H	-	*
	Taraxacum officinale Weber	H	-	*
Betulaceae	*Carpinus betulus* L.	D	*	*
	Alnus subcordata C.A.Mey.	D	*	*
Araliaceae	*Hedra pustuchovii* Woronow	H	*	-
Asclepiadaceae	*Vincetoxicum scandens* Sommier & Levier	H	*	*
Aquifoliaceae	*Ilex aquifolium* L.	B	*	*
Brassicaceae	*Cardamine* L.	H	*	-
	Nasturtium officinale R.Br.	H	*	-
Adoxaceae	*Sambucus ebulus* L.	H	*	*
Amaranthaceae	*Chenopodium album* L.	H	-	*
Companulaceae	*Campanula rapunculoides* L.	H	*	*
Convolvulacoae	*Calystegia silvesteris* (Willd.) Roem. & Schult.	H	*	-
Crassolaceae	*Sedum stoloniferum*	H	*	*
Euphorbiaceae	*Euphorbia amygdaloides* L.	H	*	*
Fabaceae	*Trifolium resupinatum* L.	H	*	*
	Lathyrus pratensis L.	H	*	-
Fagaceae	*Fagus orientalis* Lipsky	D	*	*
Geraniaceae	*Orobus* sp.	H	*	-
	Granium robertianum L.	H	*	*
Hypericaceae	*Hypericum androsaemum* (L.) Huth	H	*	*
	Hypericum perforatum L.	H	*	-
Lamiaceae	*Lamium album* L.	H	*	*
	Salvia glutinosa L.	H	*	*
	Prunella vulgaris L.	H	*	*
	Teucrium hyrcanicum	H	-	*
Onagraceae	*Circaea lutetiana* L.	H	*	*
Oxalidaceae	*Oxalis* sp.	H	*	*
Phytolaccaceae	*Phytolacca americana* L.	H	*	*
Polygonaceae	*Polygonum hydropiper* L.	H	*	-
	Rumex sp.	H	*	*
Primulaceae	*Primula heterochroma* Stapf	H	*	*
Malvaceae	*Malva sylvestris* L.	H	*	-
Rosaceae	*Fragaria vesca* L.	H	*	*
	Rubus fruticosus L.	H	-	*
	Potentila recta L.	H	*	-
	Crataegus microphylla K.Koch	D	*	*
	Crataegus ambigua Becker	D	*	*
	Mespilus germanica L.	D	*	*
	Prunus divaricata Ledeb.	D	*	*
Rubiaceae	*Asperula stylosa* (Trin.) Boiss.	H	-	*
	Galium rotundifolium L.	H	*	*
Solanaceae	*Atropa belladonna* L.	H	*	*
Urticaceae	*Solanum nigrum* L.	H	*	*
	Urtica dioica L.	H	*	*
Violaceae	*Viola sylvestris* Lam.	H	*	*

*Indicates the present and – indicates absence of species in each area.

Table 4. Density and cover percentage of vegetation layers in protected and unprotected areas.

Vegetation layer	Protected	Unprotected	*P*
Trees (N ha^{-1})	132.8	64	0.000**
Shrubs (N ha^{-1})	1092	2476	0.000**
Herbaceous (%)	91.56	99.01	0.5

Notes: **Indicate significant differences at the 99% level between protected and unprotected areas.

Physiognomy characteristics

Woody layer

The physiognomy studies in tree layer indicated that trees of both areas had same height classes (10 to 20 and 20 to 35 m classes), while the total percent canopy cover was significantly higher in the protected area than in the unprotected area. In the protected area, the canopy cover occupied by each tree species varied from 25 to 100% and was dominated by *F orientalis*. In the unprotected area, the canopy cover of each tree species was lower than 25% and was dominated by *C betulus* (Table 5).

In shrub layer, life forms of species were also similar between both areas. Deciduous broadleaf, including *Mespilus germanica* L., Prunus divaricate L., *Crataegus microphylla* K. Koch, *Crataegus ambigua* Becker, and evergreen broadleaf, including *Ruscus hyrcanus* Woronow and *Ilex aquifolium* L. were present in both areas (Table 6). In the unprotected area, shrub species were observed in height classes 0.5-2 m and 2-5 m and in canopy cover classes 6-25% and 25-50% but in the protected area, the height classes (0-0.5 m and 0.5-2 m) and canopy cover classes (1-5% and 6-25.5) of the shrub layer were lower than those of the unprotected area (Table 5). The applied tree classification method indicated that there were three main types and two secondary types in the protected area.

The most common type was the pure *Fagus orientalis* with covers 40% of the area, mostly on southwestern and northeastern slopes and secondary type was *Fagus orinetalis- Alnus subcordara* that covers 32% of this area. The *Fagus orientalis* Lipsky, *Ruscus hyrcanus* Woronow and *Ilex aquifolium* species were dominated species in these types. Whereas, the lowest cover percentage belonged to *Fagus orinetalis- Carpinus betulus- Alnus subcordara* and *Fagus orinetalis- Alnus subcordara- Carpinusbetulus* types that covers only 8% of the protected area. In the unprotected area, six main types and two secondary types were identified: *Fagus orinetalis- Carpinus betulus, Carpinus betulus- Alnus subcordara* and *Carpinus betulus- Fagus orinetalis* with 20% surface area each had highest cover in this area. *Fagus orinetalis, Carpinus betulus, Mespilus germanica* and *Prunus divaricata* Ledebwere dominated species in these types. whereas the lowest percent coverage were observed for *Fagus orinetalis- Carpinus betulus- Alnus subcordara* and *Carpinus betulus- Fagus orinetalis- Alnus subcordara* types (Table 5).

Finally, statistical analyses indicated that evergreen broadleaf species such as *Ilex aquifolium and Ruscus hyrcanus*had similar height and canopy cover in both areas. While, deciduous broadleaf species were different, significantly (Table 6).

Herbaceous layer

In herbaceous layer, life forms of grasses and forbs species in the protected area were similar to those in the unprotected area (Table 3). According to physiognomy formula in the protected area, herbaceous species were in the same height class (0.1-0.5 m class), but their percent covers were different. So that the percent cover of forbs and perennial species with an average 47%was between 25 and 100% class, whereas grass species was never higher than the 6-25% class (19.8%) (Tables 5 and 6). Herbaceous species were present in unprotected area with two storey, the first storey by height classes of 0.5-2 meter and canopy cover classes of 75-100%, 50-75% and 25-50% and second storey by height classes of 0.1-0.5 meter and canopy cover classes of 1- 5% and 6- 25% (Table 5).

Table 5. Dominant species (according to the mixture cover), cover percentage and physiognomy formula in each natural vegetation types identified in the study area.

Natural vegetation type	**Species**						
	Canopy layer	**Shrub layer**		**Cover percentage**		**Physiognomy formula**	
		P	Un	P	Un	P	Un
Fagus orinetalis	*Fagus orientalis* Lipaky.	*Ruscus hyrcanus*Woronow, *Ilex aquifolium* L.	*Prunus divaricata* Ledeb. *Crataegus ambigua* Becker *Mespilus germanica* L. *Ruscus hyrcanus* Woronow	40	12	$D7_{P}3_{b}B3_{r}G1_{r}H2_{C}1_{r}$ $D7_{p}3_{b}B3_{b}H2i1_{r}$ $D6_{i}3_{b}B3H2i1_{r}$ $D6_{P}2_{b}G2_{r}H2_{p}1_{r}$ $D6_{p}B3_{r}G2_{r}H2_{P}2_{r}2_{b}$ $D7_{c}2_{b}B2_{b}G2_{r}H2_{p}1_{p}$ $D6_{P}B3_{r}G2_{b}H2_{p},$ $D7_{p}B3_{p}2_{b}G2_{r}H2_{P}1_{P}$ $D6_{p}B3_{b}G2_{b}H2_{i}1_{b}$ $D7_{p}2_{b}G2_{b}H2_{p}$	$D7_{r}4_{r}B3_{r}H2_{b}1_{r}$ $D5_{r}4_{p}G1_{b}H2_{r}3_{i}1_{r}$ $D7_{r}3\ _{b}B3_{r}H2_{P}1_{b}$
Fagus orinetalis-Carpinus betulus	*Fagus orientalis* Lipaky. *Carpinus betulus*	*Ilex aquifolium* L. *Ruscus hyrcanus Woronow*	*Ilex aquifolium* L. *Prunus divaricata* Ledeb. *Mespilus germanica* L.	12	20	$D6_{p}3_{b}B3_{p}G2_{p}H2_{P}$ $D6_{i}6_{p}3_{b}B3_{r}G2_{r}H2_{P}$ $D6_{P}6_{r}B3_{i}G2_{r}H2_{P}1$	$D6_{p}6_{r}4_{p}B3_{b}G1_{b}H2_{r}1_{r}3_{r}$ $D7_{p}6_{r}4_{b}B3_{r}G1_{b}H2_{r}1_{r}3_{r}$ $D7_{r}6_{r}4_{r}B3_{b}G1_{b}H2_{r}3_{r}$ $D6_{r}3_{r}B3_{b}G1_{b}H_{1b}3_{i}$ $D6_{b}5_{b}3_{r}B3\ _{b}G1_{b}H1_{b}2_{r}3_{i}$
Fagus orinetalis- Alnus subcordara	*Fagus orientalis* Lipaky. *Alnus subcordara*	*Ilex aquifolium.* L. *Ruscus hyrcanus Woronow* *Mespilus germanica* L.	-	32	-	$D6_{i}6_{p}3_{r}B3_{r}G2_{r}H2_{C}$ $D6_{p}6_{r}3_{b}B3_{r}G2_{b}H2_{i}$ $D7_{i}6_{p}3_{b}B3_{r}H2_{C}$ $D7_{i}6_{b}6_{r}3_{b}G2_{P}H2_{r}1_{b}$ $D7_{r}6_{c}3_{b}G2_{b}H2_{p}1_{b,}$ $D7_{r}6_{p}3_{b}B3_{b}G2_{p}H2_{P}$ $D6_{p}6_{r}2_{b}B3_{b}H2_{P}$ $D6_{P}6_{r}3_{b}B3_{r}G2_{p}H2_{i}1_{b}$	
Fagus orinetalis-Carpinus betulus-Alnus subcordara	*Fagus orinetalis- Carpinus betulus*	*Prunus divaricata* Ledeb. *Ilex aquifolium* L.	*Ilex aquifolium* L *Ruscus hyrcanus Woronow* *Crataegus microphylla*K.Koch	8	4	$D6_{i}6_{p}2_{b}H2_{c}$ $D6_{p}7_{r}3_{b}B3_{r}G2_{r}H2_{P}$	$D7_{r}5_{r}3_{r}B3_{r}2_{b}G1_{b}H1_{r}$

Fagus orinetalis- Alnus subcordara- Carpinus betulus-	*Fagus orinetalis- Alnus subcordara-*	*Ilex aquifolium* L.		8	-	$D6_i6_p6_r2_rG2_rH2_P$ $D7_p6_r6_p2_rB3_bG2_bH2_p1$	
Carpinus betulus- Alnus subcordara	*Carpinus betulus- Alnus subcordara*	-	*Prunus divaricata* Ledeb *Crataegus ambigua* Becker *Crataegus microphylla K.Koch*	-	20	-	$D6_b5_b4_bB3_bG1_bH1_r3_c$ $D6_rG1_bH1_b3_c$ $D6_r4_rB3_bH1_r2_r$ $D6_b5_b3_b B3_r G1_bH1_b2_r3_i$ $D7_r6_r3_r B3_bH1_r$
Carpinus betulus	*Carpinus betulus*	-	*Prunus divaricata* Ledeb *Crataegus ambigua* Becker,	-	8	-	$D6_r3_rB3_rG1_bH1_r$ $D6_b4_rH1_b3_c2_r$
Carpinus betulus- Fagus orinetalis-	*Carpinus betulus- Fagus orinetalis-*	-	*Prunus divaricata Ledeb.* . Ledeb *Mespilus germanica* L. *Crataegus ambigua* Becker *Ruscus hyrcanus* Woronow	-	20	-	$D6_p7_bB3_bH2_r1_b3_i$ $D6_r3_r4_bB3_rG1_bH1_r3_c$ $D7_b6_b4_rB3_bG1_bH1_b3_i$ $D6_r4_r B3_rH1_r3_p$ $D7_b5_b4_p B3_rG1_bH1_r3_p$
Carpinus betulus- Fagus orinetalis- Alnus subcordara	*Carpinus betulus- Fagus orinetalis*	-	*Prunus divaricata* Ledeb *Mespilus germanica* L.	-	4	-	$D6_r7_r6_b4_pB3_bG1_aH1_r$
Pasture land	-	-	-	-	12	-	$G1_bH1_b2_b3_i$, $H2_b3_i1_a$, $H1_r3_c$

Table 6. Variability (Mean± SE) of structural categories of life form classes in protected and unprotected areas.

	Broadleaf deciduous (D)		Broadleaf evergreen (B)		Graminoids (G)		Forbs (H)	
	Height	Coverage	Height	Coverage	Height	Coverage	Height	Coverage
protected	24.3 ± 1.2	49.3 ± 2.2	1.55 ± 0.15	17.4 ± 3.47	0.4 ± 0.04	19.8 ±3.4	0.43 ± 0.03	47 ± 3.6
uprotected	13.1 ± 1.5	19.1± 2.3	1.53 ± 0.21	10.5 ± 2.26	0.1 ± 0.02	6.44 ± 1.7	0.77 ± 0.08	29.8 ± 2.9
P	0.000**	0.000**	0.6	0.1	0.000**	0.001**	0.001**	0.003**

Note: * indicate a significant difference at the 95 % level; ** indicate a significant differences at the 99 % level between protected and unprotected areas.

Also, the percent cover of palatable and forbs species was significantly higher in the protected area which was also composed of indicator species such as *Hordeum spontaneum* K. Koch, *Sanicula europaea* L., *Alium* L., *Malva* L., *Hypericum perforatum* L, *Lathyrus* L., *Orobus* L., *Solanum nigrum* L, and *Nasturtium officinal* W.T. Aiton (Tables 3 and 6). On the other hand, the unprotected area was characterized by higher percent covers of non-palatable and grazing- resistant species (*Crocus sativus* L, *Tanacetum* L., *Crisium arvense* (L.) Scop. *Cirsium congestum* Fisch. & C. Meyer ex DC, *Gundelia tourenfortti* L, *Acropetilon repens* (L) Hidalgo, *Asperula atylosa* (Trin.) Hook F ex BD Jacks, *Bromus* Dumort., *Teucrium hyrcanium* L, *Pimpinella affinis* L, *Rubus fruticosus.* L, *Taraxacum* F. H. Wigg., *Chenopodium album* L., as well as invasive species (*Sedum stoloniferum* L, *Asplenium trichomanes* L, *Pteridium aquilinum* (L.) Kuhn, *Rumex* L.) (Table 3).

DISCUSSION

Floristic characteristics

In most rural areas of northern Iran, people are closely linked to natural resources, especially forests.

The activities of most of these people, including agriculture and animal husbandry, are opposed to the conservation of the ecological integrity of these areas, resulting in short-time damage precluding the long-term population land use because of the destruction of the vegetation cover (Heydarpour Tutkale *et al*. 2008).

In the unprotected area, local people reduced the tree canopy cover by cutting down trees to provide firewood and girdling trees for fodder production and livestock grazing (Kumar *et al*. 2004).

Physiognomy characteristics

Changes in physiognomic characteristics are remarkable and obvious response to forest degradation. In tree layer, the life forms and height classes were similar between the protected and the unprotected areas likely because of the short period of protection of the protected area before sampling. This result is consistent with those of Sharp *et al.* (1990) and York *et al.* (1992). York *et al.* (1992) showed that the time scale necessary for the effective protection of tree height is longer than a human generation. In the protected area, the forest cover was dominated by the *Fagus orientalis* Lipsky type. Pure type of beech is characterized by high canopy densities and seed production (O'Brien *et al.* 2007) indicating that the area is near the climax state and promote the natural regeneration of shade tolerant seedlings of *Fagus orinetalis* Lipsky. Whereas in the unprotected area, human interference and grazing caused unfavorable conditions for the regeneration of beechand the forest climax state gradually disappeared (Pulido & Díaz 2005). On the other hand, *Carpinus betulus* developed in this area because of its high potential in seed production and its resistance to intensive grazing (Akbarinia & Hukusima 1995). The second most represented forest type in the protected area was *Fagus orinetalis- Alnus subcordara* type. *Alnus subcordara* is a light demanding species that is generally absent in climax state without the occurrence of partial disturbances (Rohi Moghadam *et al*. 2002). The presence of this pioneer species in the protected area may thus be the result of past disturbances (Brown & Pete 2003) that created forest structural heterogeneity. In shrub layer the height and percent cover of species were lower in the protected area and canopy density was different in herbaceous layer, this is in accordance with the results of Palmer *et al.* (2000) who studied the herbaceous cover changes in deciduous (*Quercus ellipsoidalis*) and conifer (*Pinus strobus*) forests, 14 years after the destruction by livestock grazing. Protection against livestock grazing and human disturbances considerably increased the species richness and the percent cover of forbs. The percent cover of sensitive species to livestock grazing *including Hedera helix* L, *Primula heterochroma* Stapf, *Urtica dioica* L. and *Cirsium vulgare* (Savi) Ten were higher in the protected area. Also, *Hedera helix* has been recognized as an indicator species in grazing-free areas (Kuiters & Slim 2003). Usual models of physiognomic changes describe the successive replacement of growth-forms by species of increasing stature (Clements 1916) such that early succession is dominated by low growing herbs which are then supplanted by taller shrubs (Halpern & Franklin 1990). In unprotected area, the presence of non- native shrub species such as *Mespilus germanica* L, *Prunus divaricata.* Ledeband *Crataegus ambigua* Becker with high height and density cover in the forest flora is one of the negative consequences of livestock which is known to be an important changing factor of environmental conditions (Gurevitch & Padilla 2004) and would suggest that grazing has created a marked change in the competitive balance of plant species with different survival strategies. In the unprotected area, *Pteridium aquilinum* (L.) Kuhn and *Sambucus ebulus* L composed the upper storey that reduced considerably the light availability for lower storey species, resulting in a reduced richness and percent cover of native species (Howard & Lee 2003). The high percent cover of the herbaceous layer in the unprotected area can be mainly explained by two factors. First, the morphology of grasses and their survival ability under grazing pressure is an important factor. Many common grass species are resistant to continuous grazing and can thus extend in these areas (McEvoy *et al.* 2006). Second, the reduced tree density in unprotected areas which promote the development and the expansion of several shade-intolerant grass species (Gill & Beardall 2001). Areas devoid of trees or of low tree density provide good conditions to increase richness of invasive species because of the low competition between shrubs and trees, as well as the important light penetration to the forest floor due to canopy openness (Rohi Moghadam 2002, Pourbabaei *et al.* 2005). Overall, grazing and human disturbances promoted the succession from long-lived to short-lived herbaceous species (Halpern & Franklin 1990) and provided appropriate conditions for the establishment of many weed and invasive species by increasing the area of bare soil, that lead to the creation of pasture lands by reducing plant diversity (Vvra *et al*. 2007). These species have been identified as indicator species of grazed areas, but it must be noted that not all species present in a grazed area can be considered as indicator species. Many species do not appear to be significantly affected by grazing. For example, the density of evergreen species did not significantly differ between areas because they have been used lessthan deciduous shrubs in the unprotected area (Cesa & Paruelo 2011) while their shade tolerance promoted their establishment and development under the closed canopy of the protected area (Légaré *et al.* 2002).

CONCLUSION

The study and the evaluation of natural ecosystems are very important to intensive management and protection programs. Our results indicated that grazing and human uses have created an increase of invasive species in both the shrub and herbaceous layers. Also, short-lived species tended to replace species with longer life. It should be expressed that the effect of livestock grazing and human activities on vegetation cover is dependent on stability and competitive ability of species against these destructive factors. The protected area had greater ecological sustainability due to a more balanced presence of species with different ecological characteristics. According to these results, an appropriate and efficient management is required in unprotected areas in order to decrease invasive shrub and herbaceous species density and increase the percent cover of native species.

Hence, the control of livestock and local people entrance in these areas or limiting livestock grazing timewere recommended.

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بررسی اثرات چرای دام و تخریب‌های انسانی بر خصوصیات فلوریستیک و فیزیونومیک جوامع راش، ماسال، شمال ایران

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چکیده

این مطالعه با هدف بررسی خصوصیات فلوریستیک و فیزیونومیک گونه‌های گیاهی در ارتباط با چرای دام و تخریب‌های انسانی انجام شد. برای این منظور صد هکتار از جوامع راش انتخاب شدند (۵۰ هکتار در منطقه حفاظت شده و ۵۰ هکتار در منطقه تخریب شده). نتایج مطالعه نشان داد که تعداد کل گونه‌ها در منطقه حفاظت شده بالاتر بود. در این منطقه خانواده Rosaceae غالب بود، اما در منطقه همراه با تخریب Asteracea بیشترین فراوانی را به خود اختصاص داد. برای تعیین و طبقه بندی تیپ‌های جنگلی در هر یک از دو منطقه، درصد آمیختگی درختان قطورتر از ۷/۵ سانتی متر در ارتفاع برابر سینه در هر یک از مناطق محاسبه شد. تیپ‌های جنگلی در قطعات نمونه بر اساس درصد آمیختگی درختان نامگذاری شد. بر اساس نتایج حاصل از تیپ‌بندی پوشش در منطقه حفاظت شده ۳ تیپ اصلی و ۲ تیپ فرعی شناسایی شد، در حالی‌که در منطقه حفاظت نشده در مجموع ۶ تیپ اصلی و ۲ تیپ فرعی شناسایی شد. نتایج حاصل از بررسی خصوصیات فیزیونومیک و فرمول-های فیزیونومی برای تیپ‌های گیاهی در لایه درختی نشان داد که هر دو منطقه از نظر فرم‌های حیاتی یکسان بوده و پهن برگ خزان کننده تنها فرم حیاتی مشاهده شده بود. در لایه درختچه‌ای، طبقات ارتفاعی و درصد تاج پوشش گونه‌های پهن برگ خزان کننده در منطقه حفاظت شده به طور معنی‌داری بالاتر بود. در منطقه حفاظت شده، درصد پوشش لایه علفی متفاوت بود و فورب‌ها بالاترین درصد پوشش را به خود اختصاص دادند. بر اساس نتایج، عوامل مخرب ترکیب اصلی جوامع گیاهی را تحت تاثیر قرار داده و جلوگیری از ورود دام و مردمان محلی به عنوان یک راهکار مدیریتی پیشنهاد می‌شود.

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