The Comparison of Plant Species Diversity in Understory *Ramus-punica* and Grazed Area (Case Study: Miankaleh of Behshahr)

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**Abstract:** Natural cache is shelter for flora and fauna of every country. Therefore, analysis of their resources to collect scientific and correct management programs is very important. Miankaleh is one of the natural caches of Mazandaran province that is located in north of Behshahr city and northwest of Golestan province in Iran. In this study, the sampling area was determined such as understory *Ramus-Punica* section and grazed area. To determine of the species diversity in these parts, sampling was done by 4m² plots in systematic-random method. Species diversity was calculated by MC Arthur and Shancon-Winer indexes. Evenness and similarity were also determined by J. Pielsou and Jaccard indexes. The results showed that the phytodiversity of understory *Ramus-Punica* type was more than under grazing area. This showed that the upper story species can prevent to grazing and help to phytodiversity due to their spiny form and created microclimate in its sub space. In view of the role of phytodiversity in sustainability of this nature reserve, taking care of rare and native species from livestock and tourist is necessary and help to balance of the resource.

**Key words:** Phytodiversity • Vegetation • Grazing • Miankaleh

**INTRODUCTION**

Miankaleh nature reserve was first named as the conserved area of Eje in 1970. Then, it was promoted as a wild refuge due to its ecological characteristics and habitat of a large numbers of endangered species especially migrant water birds. It was also selected for scientific and educational purposes and was introduced as one the 18 international lagoons and 9 biosphere reserve in 1977. The UNESCO explained value of its characteristics by a certificate and determined that it should be conserved for scientific, research and educational purpose [1,2].

This area impresses the important part of fauna and flora in north of Iran. Therefore analyzing of their sources to collect scientific and exact management plans has very importance. So, determination of diversity indexes is suitable to evaluate a lot of biological information. Also, species diversity is a reflection to structural dynamics of a place and its distribution patterns. So, plant species diversity uses for knowing of dynamic of ecosystem and ecology of the species [3].

Today, extinction of plant and animal species, developing agricultural fields, urban area development and the change of social values in relation to species, ecosystems and natural resources has important role in decreasing of species diversity [4,5].

Other studies has been done in the world about the importance of diversity [6-11]. The results of a study in *Fagus* community of Toukan Italy showed that trees and bushy trees have the least richness due to ecological factors (a lot of shadow of *Fagus* cover and the pressure of winter cold and low pH of soil) whereas the grassy layer in understory *Fagus* had larger richness [12]. In Iran, some research has been done about the diversity of plants in planted forest [13-15]. The results of a study in planted forest by *Alnus* and a mixed forest of *Fraxinus-Acer* in Tiatian of Gilan province showed that the Shannon-Winner diversity index and richness and evenness indexes in *Fraxinus-Acer* was more than *Alnus* community [16].

Pourbabai [17] analyzed the diversity of the species groups of the over story and the understory in Gisom forest of Gilan province. The results showed that the flora in understory is out of the ideal diversity due to direct
pressure of human. Ejtehadi et al. [18] compared level of diversity of plant species in the two trees community and determined the relation between type of plant with phytodiversity. Hosseini et al. [19] indicated that of diversity in a mixed coniferous forest and mixed deciduous forest in Kelardasht of Mazandaran province showed that the greatest number of native species exists in the deciduous forest but, the richness and evenness was smaller than the mixed coniferous. Basiri et al. [20] classified 6 ecologic groups by the integral CA-TWINSPAN analysis and based on richness and evenness as the J. Pillow and Shannon-Wiener indexes were considered important for separation of the groups.

One of the destructive and harmful factors in pastures is the presence of livestock and grazing pressure. Matusz and Tothmeresz [21] in sandy pastures of Hungary concluded that grazing decreases the evenness of species and causes negative effects on species diversity. Also, Torok [22] showed that the grazing effect on species richness. Ejtehadi et al. [23] concluded that intensive grazing had the most richness whereas normal grazing had the least value.

As for the effect of plant variation on ecosystem diversity [24], this study is investigated the plant species diversity in different conditions of the Miankaleh ecosystem and compared the species diversity in the under story Ramnus-Punica with under grazing area. The results of this study can be used in this ecosystem planning, investigation of succession process and preservation of endangered species.

MATERIALS AND METHODS

Case Study: The region is located in the north of Behshahr and northwest of Gorgan province of Iran with 54°, 35°, 53° east latitude and 55°, 64°, 36° north longitude. This region high is 21-22m below sea level. Miankale is limited to the Caspian Sea in the north and Gorgan golf in the south. The Miankale area is 68800ha that its land regions are studied in this research (1800ha). The climate is semi-humid with cool winter. Annual mean temperature is between 0 to 3°C and annual mean precipitation is 83 mm [1,2].

Sampling Method: First, the vegetation types include understory Ramnus-Punica type and grazed area in out of this sections was determined based on physiognomic type. All of the areas were similar in their ecological factors such as climate, topography, lithology and soil characteristics. To determine of the species diversity in these parts, sampling was done by 4m² circle plots in systematic-random method [25]. Number of samples was 22 plots in Ramnus-Punica type and under grazing area. The names and numbers of the species were recorded in each plot. The data analysis was done by Shannon-Winner and MC Arthur for determination of diversity indexes. The value of evenness was also estimated by the J. Pillow index for each of two areas. The value of similarity between the two areas was obtained by Jaccard similarity index. Formulas are the followings [26,27]:

\[ H = \sum_{i=1}^{s} P_i \log P_i \]

\[ H: \text{Shannon-Wiener index;} \ S: \text{Number of species;} \ P_i: \text{Relative frequency of species} \]

\[ N_t = 2^{j/} \]

\[ N_t: \text{MC Arthur index that shows distribution of species in population} \]

\[ J = \frac{H'}{H_{MAX}} \]

\[ J_t: \text{J. Pillow index;} \ H_{MAX}: \text{Maximum of Shannon-Winner;} \]

\[ J(t-1) = \frac{a}{a+b+c} \]

\[ J(t-1): \text{Jaccard similarity coefficient;} \ a: \text{Number of common species in two areas;} \ b: \text{Species number in the first area;} \ c: \text{Species number in the second area.} \]

RESULT

The analysis of the data showed that the totally number of plant species (richness) in the understory Ramnus-Punica and grazing area was 48 and 22 respectively. The most important species in understory Ramnus-Punica and under grazing area were including Bromus tectorum, Anagalis arvensis, Rumex crispus, Trifolium angustifolium, Poa annua, Dactus litoralis, Taraxacum syriacum, Galium verum, Aegilops tauchii, Vicia villosa, Agropyron acheni. Also, the similarity coefficient Jaccard between two areas was 18%.
Fig. 1: Comparison of evaluated indexes in two studied area

Table 1: Data analysis in Shannon-Winner, MC Arthur and J. Pillow in understory *Ramus-Punica*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Biodiversity indexes</th>
<th>Max</th>
<th>Min</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H^*$</td>
<td></td>
<td>1.3</td>
<td>1.53</td>
<td>0.872</td>
<td>0.323</td>
<td>0.162</td>
</tr>
<tr>
<td>$N_1$</td>
<td></td>
<td>2.46</td>
<td>1.44</td>
<td>1.863</td>
<td>0.434</td>
<td>0.217</td>
</tr>
<tr>
<td>$J^*$</td>
<td></td>
<td>1.14</td>
<td>0.53</td>
<td>0.795</td>
<td>0.254</td>
<td>0.127</td>
</tr>
</tbody>
</table>

Table 2: Data analysis in Shannon-Winner, MC Arthur and J. Pillow in under grazing area

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Biodiversity indexes</th>
<th>Max</th>
<th>Min</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H^*$</td>
<td></td>
<td>0.73</td>
<td>0.44</td>
<td>0.58</td>
<td>0.205</td>
<td>0.145</td>
</tr>
<tr>
<td>$N_1$</td>
<td></td>
<td>1.65</td>
<td>1.35</td>
<td>1.5</td>
<td>0.212</td>
<td>0.15</td>
</tr>
<tr>
<td>$J^*$</td>
<td></td>
<td>0.7</td>
<td>0.52</td>
<td>0.61</td>
<td>0.127</td>
<td>0.9</td>
</tr>
</tbody>
</table>

The Shannon-Winner and MC Arthur indexes in understory *Ramus-Punica* were 0.87 and 1.86 whereas in under grazing area were 0.58 and 1.5 respectively (Table 1 and Figure 1). The value of evenness was obtained 0.79 in understory *Ramus-Punica* and 0.61 in under grazing area (Table 2 and Figure 1).

**DISCUSSION**

The findings of this research showed that the studied areas had inequality in species composition (low Jaccard index) in spite of having the common species and proximity of these areas. This shows that the grazing can change the plant composition in some sections of this ecosystem and create difference between these areas when other ecological factors were unchanged in this research.

Value of species diversity in understory *Ramus-Punica* is more than the area outside it (under grazing area). Whereas tree species prevent of some understory vegetation and decrease richness due to high shadow of the canopy cover and limitation of ecologic factors [12], this result is seducer. But, we think the effect of biotic factors on phytodiversity in out of this area is more important than the effect of trees on understory vegetation. These findings are congruous with the Etehadi *et al.* (2007) findings which showed that the species diversity decrease in the under grazing fields [28].

The result also showed that higher species evenness in understory *Ramus-Punica* in comparison with its out area. This means the spiny and horry canopy cover of *Ramus-Punica* cause to prevention of livestock intensive grazing in this region. Whereas the livestock consist of sheep and cattle and cattle mostly grazes in open fields, the existence of horry *Ramus-Punica* decreases livestock grazing.
According to the analyses and observations, Rammus-Punica cause to presence of the species such as Bromus Tectorum and Trifolium angustifolium which are native and palatable. This matter shows the positive effect of Rammus-Punica on conservation of the native species in understory vegetation. In fact, this region has balanced status and more ecological stability than under grazing area.

So, conservation of Rammus-Punica can decrease extinction danger of native and unique species in Miankaleh ecosystem. It seems help to sustainability of Miankaleh reserve in long term. Therefore, the Rammus-Punica community’s act as a microclimate and can be useful for continuance of some species survival in Miankaleh.

We suggested that due to high potential of the upper story vegetation such as bushy trees in conservation of native species and sensibility of out area to grazing, utilization of this ecosystem should be discreet. In addition, for keep of the balance and more preserving of this nature reserve, the management needs to control of utilization by rancher and tourists.

REFERENCES