



## Phytosociological Study of Ferns in the Central Caspian Forests of Iran

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### Abstract

The phytosociological studies were performed for an identification of the indicator fern the species of beech forests in the central Caspian Hyrcanian forests in Iran. For data analysis the Braun-Blanquet method with Ellenberg table was used. The results show that these beech forest have six associations; two sub associations and one variant. 12 fern species exist in the study area out of which 6 are indicator species of beech vegetation association. *Pteridium aquilinum* and *Asplenium adianthum nigrum* are indicator species of the Fageto-Carpinetum association. *Polystichum acleatum* is an indicator species of the Fagetum orientalis typical sub association. *Polystichum ofilliricum* is an indicator species of the Fagetum orientalis lathyretosum sub association. *Phyllitis scolopendrium* and *Asplenium adianthum* are indicator species of the Buxo-Fagetum association.

**Keywords:** *Beech, fern, Hyrcanian forests, indicator species, Iran.*

### INTRODUCTION

Ferns with a representation of 12,000 species in the world today are a diverse, highly-evolved group of plants, yet they retain many of the characteristics that were present when plants first ventured out of the sea and onto land over 400 million years ago. They were the dominant form of vascular plants until the mesozoic period (the age of the Dinosaurs) when seed bearing plants came into prominence. There is fossil evidence of ferns in the devonian period (345-395 million years ago) and they evolved from the first vascular plants that had evolved in the silurian period (395-435 million years ago). Ferns growing in many different habitats around the world have been with us for more than 400 million years and in that time the diversification of their form has been phenomenal. They were at their height as a dominant part of vegetation during the carboniferous. During this era some fern like groups actually evolved seeds (the seed ferns) making up perhaps half of the fern like foliage in the forests and much later gave rise to flowering plants., however most of them became extinct and some evolved into modern ferns.

The forest area of Iran in comparison with its land area is very low, covering only 7%. 12 million ha of Iranian forests form unique ecosystems and their conservation is a must (Ghahreman 1998). The valuable role of these forests and green space in water and soil preservation, wood production, sight seeing, fauna - flora preservation and many other aspects is not fully understood. The phytosociological studies in the forest ecosystems can help

managers in better planning and management practices, in particular the indicator species are very important for the identification of soil, climate, physiography and other site conditions. As such, present phytosociological studies for an identification of the indicator fern species in the Hyrcanian beech forests in Iran has been undertaken.

### Study Area

A part of the Chelave beech forests of the Amol Mazandarn province in the central Caspian Hyrcanian forests of Iran with an area of 2500 ha was investigated. The parent material of the study area is limestone, with brown forest soil of an acidic character (Abrari 1996).

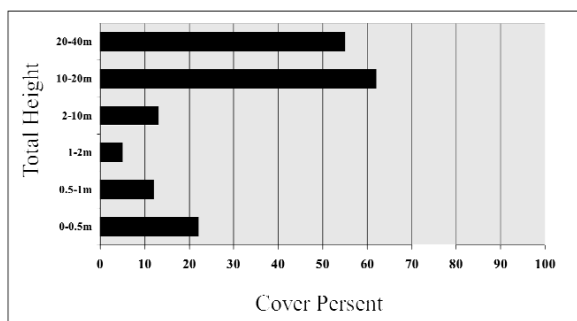
### MATERIAL AND METHOD

65 sample plots (relevés) with an area of 400 m<sup>2</sup> were selected on the basis of minimal area method, nested plots and surface- species curve. The quantitative and qualitative parameters of plants i.e., frequency, abundance, dominance, density, presence, affinity and vitality were recorded, together with the ecological characteristics of the area. For data analysis the Braun-Blanquet (1964), Ellenberg (1988), Bonham, (1989) and Ellenberg et al. (1992) methods were used. The biological spectrum and life form of species were classified according to Suzuki-Arakane (1968) and Raunkaier (1934) and are as follows;

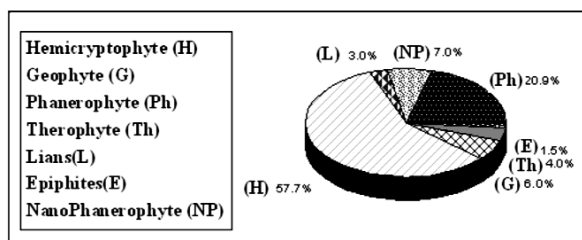
- 1-Phanerophyte, vegetative sprout are located 25 cm above the ground and plant is woody,
- 2-Chamephyte, sprout located below 25 cm and plant is herbaceous,
- 3-Hemicryptophyte, sprouts are located at

**Table 1.** Botanical structure of the study site.

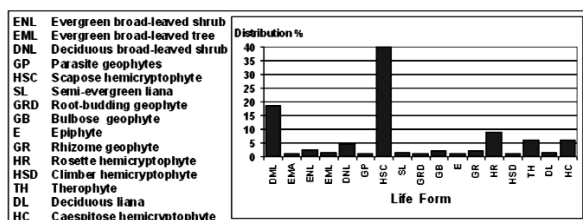
Classification	Trees	Shrubs and Woody Plants	Herbs	Total Number
Species	27	11	92	130
Genera	24	11	84	119
Families	14	10	42	65



**Fig. 1.** Biological spectrum of the plants according to Raunkiaer (1934).



**Fig. 2.** Biological spectrum of plants in the study area according to Suzuki and Arakanae (1968)



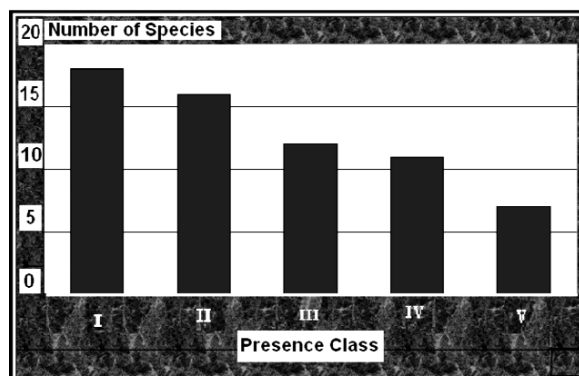
**Fig. 3.** The frequency histogram of Fagetum orientalis typical sub association.

ground level, covered by dry plant parts or snow under unfavourable conditions,

4-Cryptophyte or geophyte, spending unsuitable season under soil and

5-Therophyte, spending unsuitable season in the form of seeds.

The indicator and differential fern and other plant species of beech forest associations were also recognized.



**Fig. 4.** The frequency of per height class in Fagetum orientalis typical sub association.

**RESULTS AND DISCUSSION**

In all 130 plant taxa belonging to 119 genera and 65 families were determined during this study (Table 1, Figs. 1, 2).

The results show that the studied area of beech forests has six associations, two sub associations and one variant. These embody 12 fern species out of which 6 are the indicator species of beech forest associations.

1-The fern species of *Pteridium aquilinum* and *Asplenium adianthum nigrum* are indicator species of Fageto-Carpinetum association.

2-The fern species of *Polystichum acleatum* is indicator species of Fagetum orientalis typical sub association.

3-The fern species of *Polystichum ofilliricum* is indicator species of Fagetum orientalis lathyretosum sub association.

4-The fern species of *Phyllitis scolopendrium* and *Asplenium adianthum* are indicator species of Buxo-Fagetum association.

Our findings clearly show that these fern species are representative species for the identification of beech associations because there are six fern species as indicator species of "Fagus orientalis" in the study area. The percentage of hemicryptophytes in the area (58%) is similar to Europe as shown by Ellenberg (1988) and Raunkiaer (1934). We can thus conclude that hyrcanian temperate broad leaved forests are dominated by hemicryptophyte vegetational climate.

**REFERENCES**

Abrari K ( 1996 ) Identification of different types of beech forests soil of Khoshkab region and it's relation to character species of the forest. Master thesis, Tarbiat Modarres University, Mazandaran.  
 Birch CPD, Vuichard N, Werkman BR (2000) Modelling the effects of patch size on vegetation dynamics: bracken (*Pteridium aquilinum* (L) Kuhn) under grazing. *Annals of Botany* 85, 63-76.

- Birnie RV (1985) An assessment of the bracken problem in relation to hill farming in Scotland. *Soil Use and Management* 1, 2, 57-60.
- Bonham CD (1989) *Measurement for terrestrial vegetation*. John Wiley & Sons, New York.
- Braun-Blanquet J (1964) *Pflanzensoziologie*. 3 Aufl., Springer Verlag, Wien-New York.
- Ellenberg H, Weber HE, Dull R, Writh V, Werner W, Paulissem D (1992) *Zeigerwerte von Pflanzen in Mitteleuropa*.-Scripta Geobotanica. 18, Verlag Goltze KG, Göttingen.
- Ellenberg H (1988) *Vegetation Ecology of Central Europe*. 4<sup>th</sup> ed., Cambridge University Press, New York.
- Ghahreman A (1998) *The flora of Iran*. Vol. 18, Forest research Organization of Iran, Tehran.
- Martens SN, Breshears DD, Barnes FJ (2001) Development of species dominance along an elevation gradient: population dynamics of *Pinus edulis* and *Juniperus monosperma*. *International Journal of Plant Science* 162, 777-783.
- Pakeman RJ, Le Duc MG, Marrs RH (1998) An assessment of aerially applied asulam as a method of long-term bracken control. *Journal of Environmental Management* 53, 255-262.
- Raunkiaer C (1934) *The Life Form of plant and Statistical plant Geography*. Claredon Press, Oxford.
- Suzuki T, Arakanae M (1968) The flora of vascular plants of Kuju volcanic mountain. *Kuju journal* (In Japanese) 12, 87-123.