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AN INTRODUCTION TO THE FOREST ASSOCIATIONS OF ELIKA ECOTON AREA, N. IRAN

HASSAN NAZARIAN, AHMAD GHAHREMAN[1], MORTEZA ATRI[2] AND MOSTAFA ASSADI[3]

Department of Natural Sources,
Agricultural Higher Education Center,
Enghelab Ave., Daneshgah St., P.O.Box 13145/498 Tehran-Iran;
e-mail: ha_nazarian@ yahoo.com

Abstract

Eco-phytosociological method with emphasis on physiognomic-floristic-ecologic criteria have been employed to study the vegetation of Elika ecoton area. The establishment places of releves were determined at random in each determined endogenic milieus. The concerned floristic-ecologic data of each releve was entered in the forms related to releves, using Braun-Blanquet's Composition Coefficients A-D and S. The data analysis was performed by using Anaphyto Software in F.C.A. and A.H.C. methods. The following four formations were specified: (1) Linear arborescent formation in the river margin (class *Salicetea*) with *Salicetum aegyptiacae* association; (2) Forest formation that includes two classes which consist of class *Quercetea* with associations *Aceretum cappadocicii*, *Querco petraeae* ssp. *ibericae-Carpinetum betulii*, *Pyro mazanderanicae-Carpinetum orientalis*, *Pruno spinosae-Crataeginetum meyeri*, *Ulmetum minoris*, and sub association *Ulmetum minoris-Hippophaetosum rhamnoidis*, and class *Quercetea macrantherae* with association *Quercetum macrantherae*; (3) Calciphilous scrub formation (class *Ephedretea*) with *Rhamno pallasii-Ephedretum majoris* association; (4) Orophilous and coniferous wood formation (class *Juniperetea*) with *Juniperetum communis* ssp. *hemisphaericae* association, and *Aceretosum monspessulanii* ssp. *ibericii* sub association. The phytosociological table was prepared and the ecological factors of syntaxa were presented.

Introduction

During studies on the phytogeography of forest N. Iran (Bobek, 1951), geobotany of Iran (Zohary, 1963, 1973), Bioclima of Iran (Sabeti, 1969), vegetation map of Iran (Mobayen & Tregubov, 1970), forests of Gorgan (Dorostkar & Noirfalise, 1976), vegetaition of East of Hyrcanian Province (Frey, 1980), forest associations of Hyrcanian Province (Rastin, 1980), forest associations of Assalem (Assadollahi, 1980), forest associations of N. Iran (Mossadegh, 1981), forest ecosystems of Iran (Assadollahi *et al*., 1982), communities of Kheiroodkenar (Assadi, 1985), classification of vegetation of Iran (Frey & Probst, 1986), associations of Central Alborz (Klein, 1994), associations of Lessakuti forests (Hamzee, 1994), phytogeography of Hyrcanian Province (Shahsavari, 1997) and floristic study of Golestan National Park (Akhani, 1998), the floristic and phytosociologic data on such communities have been described. In the present study ecophytosociological method with emphasis on physiognomic floristic ecologic criteria have been employed to study the vegetation of Elika Ecoton Area of N. Iran.

[1]Central Herbarium of Tehran University, Department of Biology, Faculty of Science, Enghelab Ave., Tehran-Iran.
[2]Department of Biology of Bualisina University, Hamedan-Iran.
[3]Research Institute of Forests and Rangelands, P.O.Box 1318-116, Tehran-Iran.

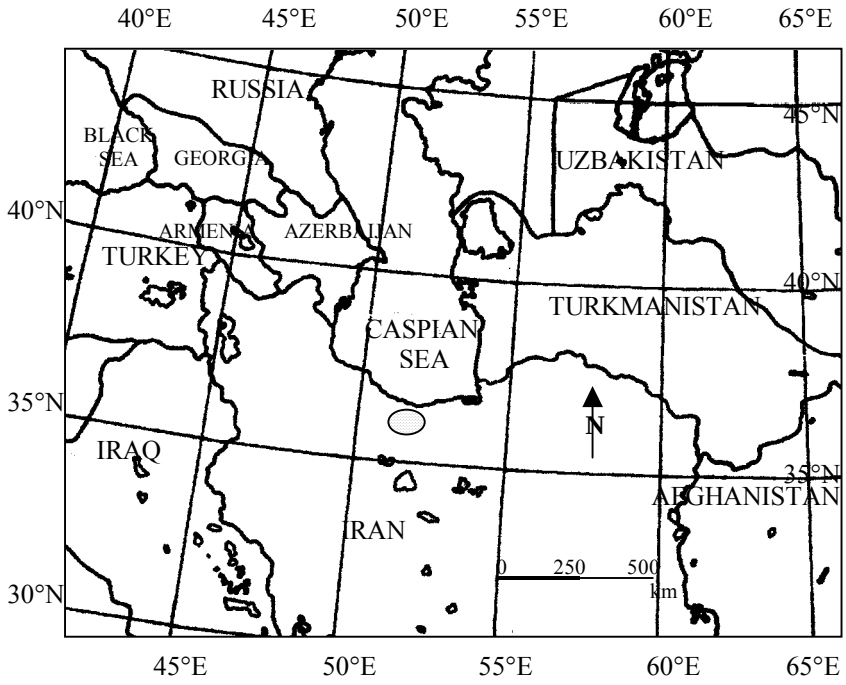

Fig. 1. Situation and map of N. Iran with the study area. The study area is shown by ⬭ .

The study area

The ecoton area is situated in the middle of Irano Turanian and Euro Siberian Regions, in the Central Alborz Mountain Chains, between 36°, 9', 20" to 36°, 16', 35" northern latitudes and 51°, 18' to 51°, 23' eastern longitudes (Fig. 1). The lowest altitude from sea level is 1860 meters and the highest is 3935 m. The average annual rainfall is 572.02 mm. The highest amount of rainfall is observed in autumn, winter and spring seasons and summer has the lowest rainfall (Fig. 2). The average day time temperature is 11.2°C. The maximum day time temperature in August is 25.7°C and the minimum temperature in February is –7°C (Anon., 1975-2002). According to the Emberger Climatographical Method, the area has cold sub-humid climate. About 79% of the geological structure of the region belongs to Jurassic Period which is related to Shemshak Formation and the other formations of the region belong to Terrias, Permian and Carboniferous Periods. Shale, sandstone, siltstone, limestone, claystone, quartzite, conglomerate, coal seams and lenses are of the most important formations of the region (Anon., 1991).

Methods

The delimitation map was prepared by using satellite and aerial photos as well as topographical and geological maps. Then necessary corrections were made by referring to the region and the base map was drawn accordingly.

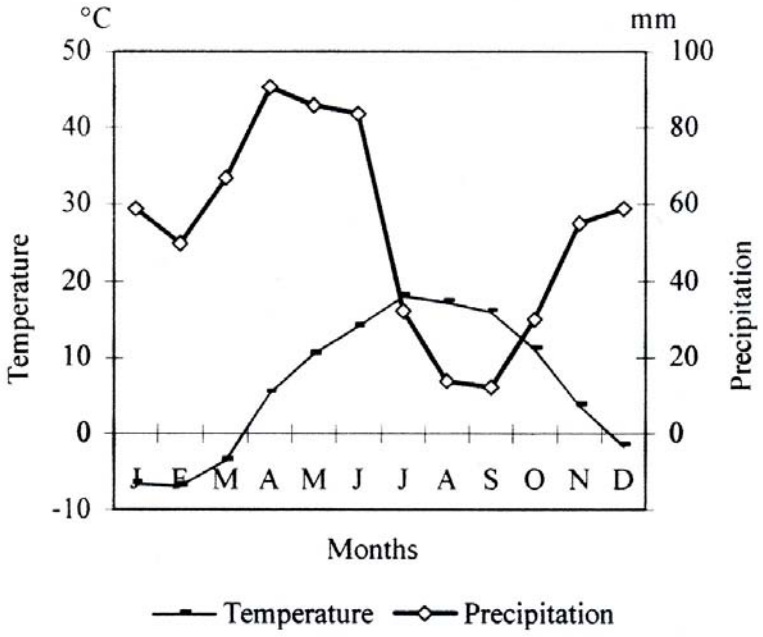

Fig. 2. The ombro-thermic diagram of polour meteorological station.

To determine the place of the releves establishment, the eco-phytosociological method was used with emphasis on physiognomic-floristic-ecologic criteria [Atri 1996]. In this method, by employing physiognomic criterion, the existing formations (principal and secondary formations) were specified. The homogenic areas were determined and were specified as association individuals by employing the floristic composition in each formation. Then, by using ecological criterion in each association individuals, based on observing any changes in one or more ecological factors, the existing endogenic milieu(s) (Atri 1996) a vegetation surface with floristic-ecologic homogeneity could be determined, and their ranges were specified at the base map. The releves were established at random in each determined endogenic milieus. To determine the minimal area of each releve, by using the Area-Species Method on the basis of area-species curve and Cain Method were applied (Cain 1959).

The necessary floristic-ecologic information and data (including plant species, texture class, percentage of organic material, pH, EC, moisture, percentage of lime of soil, altitude, exposition and slope degree) by Braun-Blanquet's Composition Coefficients (A-D and S [Mueller-Dombois & Ellenberg 1974]), were collected for each releves and written in the related forms. In the next stage, the species and samples of soil were identified and duly studied so that they would be prepared to be analyzed by computer software after labeling and coding of the releves.

The data analysis was performed by Aanaphyto Software (Briane, 1995) in both F.C.A. and A.H.C., methods. In the F.C.A. method, the releves were estimated and grouped together and at the same time based on the species available in them and the species in turn grouped on the releves basis. The results obtained by F.C.A. were grouped by employing C.A.H. method. The results obtained by data analysis in F.C.A. method,

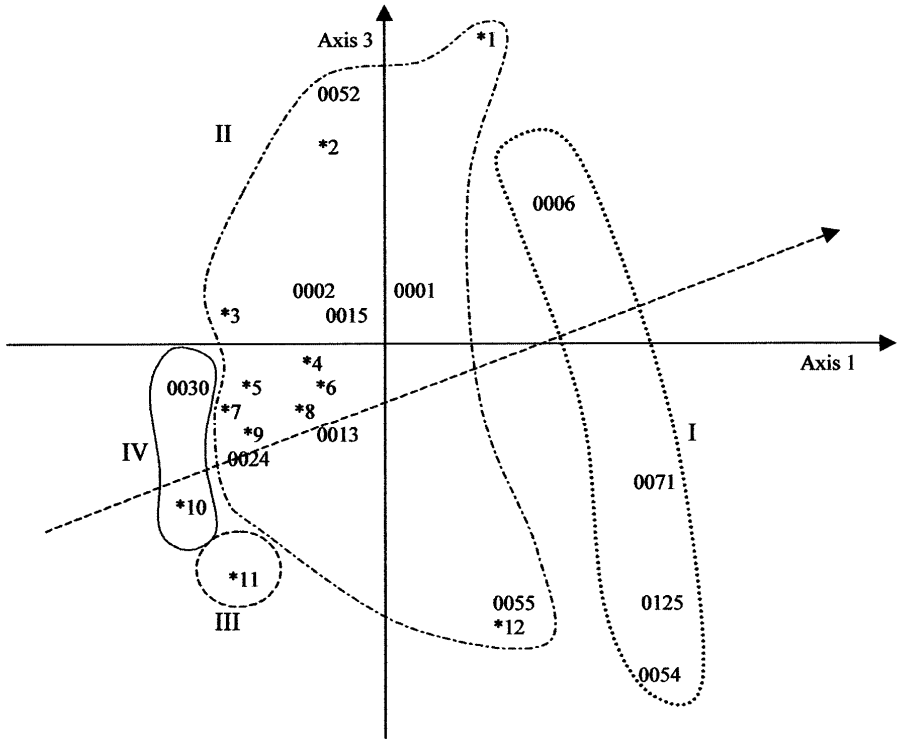

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Fig. 3. Releves ordination based on F.C.A. (axes 1-3)

were presented on the multiplex coordinate axes in various compositions, such as (1, 2), (1, 3), (1, 4), (3, 4)… axes. The study and comparison of the results on the multiplex coordinates, as obtained in F.C.A. and C.A.H. methods, made it possible to group the releves and making phytosociologic determination. The names of the syntaxa were corresponded with the codes of phytosociological nomenclature (Barkman *et al*., 1976) as well as other sources.

The ecological factors of each syntaxa were specified and presented, accordingly. Also, the chorotypes of each species were determined on the basis of methods presented by Zohary (1963 & 1973) and Takhtajan (1986), and the chorotypes percentage of the area were specified.

Results

A study and comparison of the multiplex coordinate axes resulted from F.C.A. and C.A.H., led to identification of vegetation formations of the study area as well as preparing the phytosociological table and identification of existing syntaxa and related ecological factors.

1. The vegetation formations of the study area: The results obtained from F.C.A. method were studied and four formations were specified in the study area, viz., (I) Linear arborescent formation in the river margin, (II) Forest formation, (III) Calciphilous scrub formation and (IV) Orophilous and coniferous wood formation (Fig. 3). Similarly, four species and releve clusters have been distinguished in the dendrograms obtained with C.A.H. method (Fig. 4).

2. The syntaxa of the study area: The phytosociological table was prepared in three stages; raw, processed and final (presentation), leading to identification of following syntaxa.

Class *Salicetea*

This class has *Salicetalia excelsae* order, *Salicion albae* alliance and *Salicetum aegyptiacae* association in the study area (Table 2). The characteristic species of this association are *Salix aegyptiaca* L., *Salix excelsa* S. G. Gmelin., *Populus nigra* L., ssp. *caudina* (Ten.) Bug., *Epilobium dodonaei* Vill., *Rorippa sylvestris* (L.) Besser and *Glyceria plicata* Fries (Table 1). This hydrophilic association is settled in the river margins of the area in linear form.

Class *Quercetea*

There are three orders in this class:

Order *Quercetalia*: This order has *Acerion cappadocicii* and *Ulmion minoris* alliances. *Acerion cappadocicii* alliance including *Aceretum cappadocicii* association in the study area (Table 2). The characteristic species of this association are *Acer cappadocicum* Gled., *Poa masenderana* Freyn. & Sint., *Libanotis transcaucasica* Schischk., *Vincetoxicum scandens* Sommier & Levier, *Cystopteris fragilis* (L.) Bernh (Table 1). This hygrophilic association is located in the low altitude and in the northern exposition of the area (Table 2). *Ulmion minoris* alliance includs *Ulmetum minoris* association (Table 2). The characteristic species of this association is *Ulmus minor* Miller (Table 1). This association is located between linear arborescent formation in the river margin and range formation. This association including *Hippophaetosum rhamnoidis* sub association. The differential species of this sub association is *Hippophae rhamnoides* L. The sub association has more soil moisture than the main association (Table 2).

Order *Querco petraeae* ssp. *ibericae-Carpinetalia betulii*: This order includes the *Querco petraeae* ssp. *ibericae-Carpinion betulii* alliance and *Querco petraeae* ssp. *ibericae-Carpinetum betulii* association in the study area (Table 2). The characteristic species of this association are *Carpinus betulus* L. var. *betulus*, *Quercus petraea* L. ex Liebl. ssp. *iberica* (Stev.) Krassilin., *Acer hyrcanum* Fisch. & C. A. Mey., *Evonymus latifolia* (L.) Mill. (Table 1). This association is located in the northern exposition and in 1860 to 2400 m altitudes of the study area, in form of a dense forest.

Order *Querco-Carpinetalia orientalis*: This order includes the *Carpinion orientalis* alliance and *Pyro mazanderanicae-Carpinetum orientalis* association in the study area (Table 2). The characteristic species of this association are *Carpinus orientalis* Miller. ssp. *orientalis*, *Pyrus mazanderanica* Schonbeck-Temesy, *Onobrychis masanderanica* Rech. f., *Lonicera floribunda* Boiss. & Buhse (Table 1). This association is located in the southern exposition of the study area.

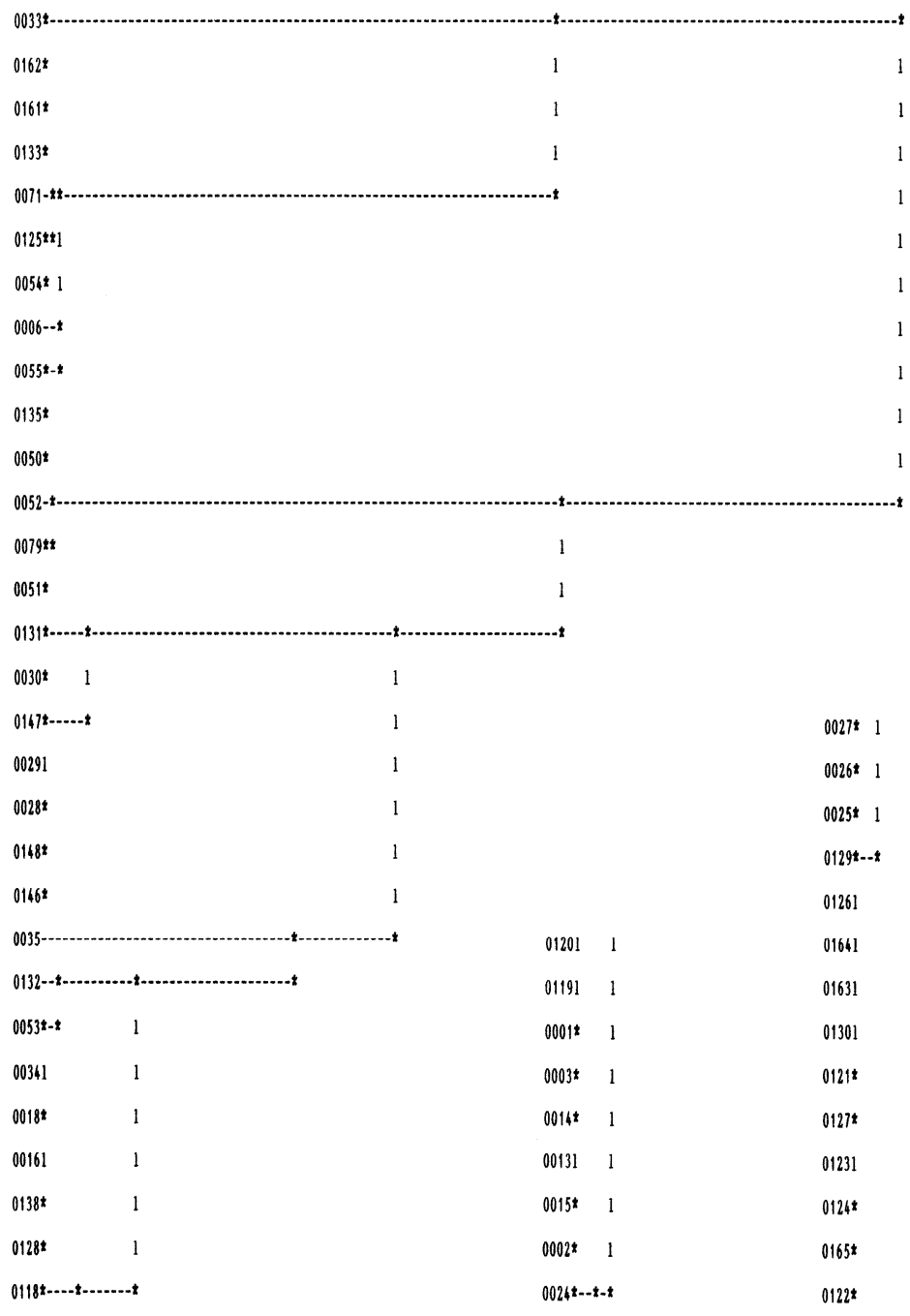

Fig. 4. Dendrogram produced from A.H.C. clustering.

Table 1. Forest associations and sub associations of the Elika ecoton area.

Code of species	Frequency	Number of releve	125	6	71	54	162	161	133	33	163	126	130	164	129	121	124	27	24	119	118	1	120	14	2	13	26	3	25	132	165	127	122	123	35	53	34	15	18	16	79	51	52	55	135	50	128	138	131	147	29	30	28	148	146
		Altitude (m)	2050	2600	2600	2450	2200	2150	2100	2150	1950	2000	2000	2050	1950	2400	2100	2400	2200	2500	2400	2400	2450	2600	2450	2500	2500	2500	2400	1900	2420	2000	2300	2200	2000	2200	2200	2450	2700	2450	2750	2700	2450	2500	2500	2500	2000	2000	2700	2700	2700	2750	2600	2600	2600
		Exposition	N	NE	S	W	N	N	N	N	N	NW	N	N	NW	NW	W	NW	NW	N	W	NE	W	W	N	W	W	SE	S	S	SW	SW	SW	SW	S	SW	SW	S	SE	W	S	S	S	S	S	S	SW	SW	S	S	S	S	N	N	N
		Slope degree	5	10	5	5	10	10	7	10	35	20	30	30	35	45	40	45	45	35	35	35	35	45	35	45	15	35	20	50	50	30	50	55	45	25	25	40	45	45	40	40	30	10	10	10	35	35	35	30	30	35	35	30	35
		Surface (m^2)	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	225	225	225	225	225	225	400	400	400	225	100	100	100	100	100	225	225	225
		Characteristic species of																																																					
		***Salicetum aegyptiacae* ass.**																																																				
6161	11.3	*Salix aegyptiaca* L.	3	3	2	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
6167	7.5	*Salix excelsa* S. G. Gmelin.	1	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5696	5.7	*Populus nigra* L. ssp. *caudina* (Ten.) Bug.	+	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3237	5.7	*Epilobium dodonaei* Vill.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6044	5.7	*Rorippa sylvestris* (L.) Besser.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3776	5.7	*Glyceria plicata* Fries.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Characteristic species of																																																				
		***Aceretum cappadocicii* ass.**																																																				
139	7.5	*Acer cappadocicum* Gled.	.	.	.	.	3	3	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5621	7.5	*Poa masenderana* Freyn. & Sint.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4519	7.5	*Libanotis transcaucasica* Schischk.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7649	7.5	*Vincetoxicum scandens* Sommier & Levier	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2881	9.4	*Cystopteris fragilis* (L.) Bernh.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Characteristic species of																																																				
		***Querco petraeae* ssp. *ibericae-Carpinetum betulii* ass.**																																																				
1956	17	*Carpinus betulus* L. var. *betulus*	.	.	.	.	.	.	.	.	3	3	3	3	2	2	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5894	17	*Quercus petraea* L. ex Liebl. ssp. *iberica* (Stev.) Krassilin.	.	.	.	.	.	.	.	.	2	1	2	1	+	+	+	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
140	11.3	*Acer hyrcanum* Fisch. & C. A. Mey.	.	.	.	.	.	.	.	.	1	.	1	1	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3458	13.2	*Evonymus latifolia* (L.) Mill.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Characteristic species of																																																				
		***Acero campestris-Quercetum macrantherae* ass.**																																																				

Table 1. (Cont'd.)

5893	54.7	*Quercus macranthera* Fisch. & Mey. ex Hohen.	. . . . + + + + 1 1 1 1 2 2 2 3 3 1 + 2 1 2 2 + + + + + 3 + 3 1 . . . . + ...
138	47.2	*Acer campestre* L.	. . . . + + 2 2 + 1 + + 1 1 2 2 2 1 . 1 . 1 2 + + + . + 3 1 3 + ...
5622	49.1	*Poa nemoralis* L.	. . . . + + + + + + + + + + + + + + + + + . + . + + + + + + + + ...
7362	47.2	*Trisetum flavescens* (L.) P. Beauv.	. . . . + + + + + 1 + + + + + + + + + . + + + . + . + + + + + + ...
6537	47.2	*Sedum stoloniferum* S. G. Gmel.	. . . . + + + + + + + + + + + + + + + . + + + . + . + + + + + + ...
5233	43.4	*Ornithogalum orthophyllum* Ten.	. . . . + + + + + + + + + + + + + + + . + . + . + . + . + + + + ...
7640	43.4	*Vicia variabilis* Freyn. & Sint.	. . . . + + + + + + + + + + + + + + + + + . . . + . + . + + + + ...
		Characteristic species of	
		***Pyro mazanderanicae-Carpinetum orientalis* ass.**	
1960	15.1	*Carpinus orientalis* Miller. ssp. *orientalis*	. . . . 1 + + + 2 + 2 3 . . . .
5881	11.3	*Pyrus mazanderanica* Schonbeck-Temesy	. . . . + . 1 . + + 1 1 . . . .
5095	15.1	*Onobrychis masanderanica* Rech. f.	. . . . + ... + + + + + + . + ...
4608	7.8	*Lonicera floribunda* Boiss. & Buhse.	. . . . + ... + + + ...
		Characteristic species of	
		***Pruno spinosae - Crataeginetum meyeri* ass. ....**	
2709	56.6	*Crataegus meyeri* A. Pojark.	. . . . + + + + 1 + 1 + 2 + 2 2 3 2 1 2 3 2 2 2 1 3 1 1 2 + + 2 2 1 . . . .
5789	56.6	*Prunus spinosa* L.	. . . . + 1 + + + 1 1 + + + 1 1 1 + + + + + + + 1 + 2 1 1 1 + + + ...
5788	52.8	*Prunus divaricata* Ledeb. ssp. *divaricata*	. . . . + 1 + + + 1 + + + 1 1 + 1 + + + . + + + + 1 + 1 1 + + + . + ...
2328	50.9	*Colutea buhsei* (Boiss.) Shap.	. . . . + 1 + + + 1 1 . + + + . 1 . . 1 + + + + 1 1 1 1 + + + + + + ... + ...
2715	41.5	*Crataegus turkestanica* A. Pojark.	. . . . 1 . . + + 1 . . 2 . . 1 . + + 1 + + + + 1 + + + + + + + + ...
6819	54.7	*Stachys byzantina* C. Koch.	. . . . + + + + + + + + . + 1 . + + + + + + + + + + + 1 1 1 + + ... + ... + . . .
2462	43.4	*Cotoneaster multiflorus* Bge.	. . . . + + + + + + 1 . + + + . + . . . + + + + + + + + + + . + ...
		Characteristic species of	
		***Ulmetum minoris* ass. ....**	
7415	11.3	*Ulmus minor* Miller	. . . + ... 2 2 1 2 2 3 . . . .
		Differential species of	
		***Ulmetum minoris-Hippophaetosum rhamnoidis* s/ass.**	
4088	7.5	*Hippophae rhamnoides* L.	. . . . 3 3 2 . . . .
		Characteristic species of	
		***Rhamno pallasii - Ephedretum majoris* ass. ...**	
3224	3.8	*Ephedra major* Host.	. . . . 3 3 . . . . . .
5997	3.8	*Rhamnus pallasii* Fisch. & Meyer. ssp. *pallasii*	. . . . 2 2 . . . . . .

Table 1. (Cont'd.)

		Characteristic species of *Juniperetum communis* ssp. *hemisphaericae* ass.																																																					
4294	17	*Juniperus communis* L. ssp. *hemisphaerica* (Presl.) Nyman.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	3	2	2	3	3	3	3
1265	13.2	*Astragalus (Alopecuroidei) kirrindicus* Boiss.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+
6265	9.4	*Salvia staminea* Montbr. & Auch. ex Benth.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		+	+		+	+	+
		Differential species of *Juniperetum communis* ssp. *hemisphaericae*-*Aceretosum monspessulanii* ssp. *ibericii* s/ass.																																																					
144	7.5	*Acer monspessulanum* L. ssp. *ibericum* (M. B.) Yaltirik	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	2
		Companion species																																																					
2432	83	*Coronilla varia* L. ssp. *varia*	+	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	+	+	+	.	.	+	+	+	+	+	+	+
1708	79.2	*Bromus tomentosus* Trin.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	2	+	3	2	+	2	2	1	3	+	1	+	+	1	1	1	1	1	2	2	2	3	3	3	3	2	1	1	1	2	2	3	3	3	3	2	2	2
2146	77.4	*Chaerophyllum aureum* L.	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	+	+	+	.	.	.	+	+	.	+	+	+
7363	75.5	*Trisetum rigidum* (M. B.) Roemer. & Schultes	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	.	+	+	.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+
5481	73.6	*Phleum iranicum* Bornm. & Gauba	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	2	+	.	1	+	.	+	+	+	+	+	+	+	+	+	.	+	+	+	+	+	+	+	+	.	.	.	+	+	+	+	+	+	+	+	+
4438	69.8	*Lathyrus roseus* Stev.	+	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	+	+	.	+	+	+	.	+	.	.	.	+	+	+	.	.	.	+	+	.	+	+	+
6273	69.8	*Salvia verticillata* L. ssp. *verticillata*	.	+	.	.	+	+	+	+	+	+	+	+	+	+	+	.	.	+	+	+	+	+	+	+	.	+	.	+	+	+	+	+	+	+	+	.	1	.	+	+	+	1	1	1	+	+	.	.	.	.	.	.	.
4349	69.8	*Koeleria cristata* (L.) Pers.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	+	+	+	+	.	+	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	1	+	+	+	+	.	.	.	+	+	+	+	+	+	+	+	+
6055	69.8	*Rosa iberica* Stev.	.	.	.	.	.	.	.	.	+	1	+	+	+	1	1	.	1	1	1	+	1	+	+	+	.	+	+	+	1	+	1	1	+	+	1	1	+	1	2	2	+	+	+	+	.	.	.	.	.	.	2	2	2
2884	67.9	*Dactylis glomerata* L. ssp. *glomerata*	+	.	.	.	.	.	.	.	+	+	+	+	+	+	1	+	+	1	1	.	1	+	+	+	+	.	+	+	+	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	+	+	+	+	+	+	+
1657	66	*Brachypodium pinnatum* (L.) P. Beauv.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	.	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	+	+	.	.	.	.	.	.	.	+	+	.	+	+	+
6050	66	*Rosa canina* L.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	.	+	+	.	+	.	+	+	+	.	+	+	+	+	+	+	+	+	.	.	+	+	+	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+
3694	62.3	*Galium verum* L. ssp. *glabrescens* Ehrendt.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.	+	+	+	+	+	+	+	+	1	+	.	+	+	+	+	.	+	+	+	+	+	+	+	.	+	+	+	+	+	.	.	.	.	+	+	+
7630	60.4	*Vicia persica* Boiss.	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	+	+	+	.	+	.	.	.	.	+	+	+	+	+	+	.	.	+	.	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.
4222	60.4	*Iris imbricata* Lindl.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	.	1	+	.	+	+	+	+	+	+	.	.	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+
2072	58.5	*Centaurea zuvandica* (Sosn.) Sosn.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	.	.	+	+	.	+	.	+	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+
4569	52.8	*Linum catharticum* L.	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	+	.	+	.	.	.	.	.	.	+	+	+	+	+	+	+	+	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.
2141	52.8	*Cervaria cervariifolia* (C. A. Mey.) M. Pimen	+	.	.	+	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	.	+	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	+	+	+
5780	50.9	*Primula macrocalyx* Bunge.	+	.	.	+	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	+	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	+	+	+
6289	50.9	*Sanguisorba minor* Scop. ssp. *muricata* (Spach.) Briq.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	.	+	+	+	.	+	.	.	.	.	+	+	.	+	+	+	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+
2128	50.9	*Cerasus microcarpa* (C. A. Mey.) Boiss. ssp. *microcarpa*	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	.	+	.	.	.	+	.	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+
4610	49.1	*Lonicera iberica* M. B.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	.	+	.	.	+	.	.	3	+	1	+	1	+	+	1	1	.	.	.	.	.	+	.	.	.	+	+	+	+	+	+	+	+	+
5629	47.2	*Poa trivialis* L.	.	.	.	.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
5574	47.2	*Plantago atrata* Hoppe.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	.	+	.	+	.	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+
2464	47.2	*Cotoneaster ovatus* A. Pojark.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	+	+	2	1	.	+	.	.	.	+	+	.	+	+	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	+	+	+
5876	45.3	*Pyrus boissieriana* Buhse.	.	.	.	.	.	.	.	.	+	1	+	+	+	+	1	+	+	.	.	1	+	.	.	.	1	.	+	+	+	1	+	1	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+

Table 1. (Cont'd.)

5426	45.3	*Pedicularis sibthorpii* Boiss.	
885	45.3	*Astragalus (Adiaspastus) aureus* Willd.	
1519	43.4	*Asyneuma mazanderanicum* Rech. f.	
3525	43.4	*Festuca ovina* L.	
5617	43.4	*Poa bulbosa* L. var. *vivipara* Koel.	
4607	41.5	*Lonicera caucasica* Pall.	
6990	41.5	*Tanacetum parthenium* (L.) Schultz-Bip.	
7086	39.6	*Teucrium chamaedrys* L.	
5634	37.7	*Polygala anatolica* Boiss. & Heldr.	
4406	37.7	*Lappula microcarpa* (Ledeb.) Gurke.	
1615	37.7	*Berberis vulrgaris* L.	
4025	37.7	*Heracleum persicum* Desf. ex Fischer	
1614	34	*Berberis orthobotrys* Bienert. ex C. K. Schneider	
7099	32	*Teucrium polium* L.	
6728	30.2	*Silene vulgaris* (Moench.) Garcke. ssp. *vulgaris*	
742	30.2	*Arrhenatherum elatius* (L.) P. Beauv. ex J. & C. Presl	
1511	30.2	*Astrodaucus orientalis* (L.) Drude var. *eriocarpus* (Boiss.) Woron.	
1845	30.2	*Campanula latifolia* L.	
5356	30.2	*Papaver bracteatum* Lindl.	
2523	28.3	*Cousinia crispa* Jaub. & spach	
2425	28.3	*Cornus australis* C. A. Mey.	
249	28.3	*Elymus transhyrcanus* (Nevski) Tzvelev	
6838	26.4	*Stachys pubescens* Ten.	
4436	26.4	*Lathyrus pratensis* L.	
750	26.4	*Artemisia chamaemelifolia* Vill.	
4702	26.4	*Marrubium astracanicum* Jacq.	
5993	24.5	*Rhamnus cathartica* L. var. *caucasica* Kusn.	
807	24.5	*Asperula setosa* Jaub. & Spach.	
8010	24.5	*Trifolium repens* L. var. *repens*	
5588	24.5	*Plantago lanceolata* L.	
161	22.6	*Achillea millefolium* L. ssp. *millefolium*	
6274	22.6	*Salvia virgata* Jacq.	
4621	22.6	*Lotus corniculatus* L. var. *corniculatus*	
366	22.6	*Alchemilla persica* Rothm.	
7594	20.8	*Viburnum lantana* L.	
3165	20.8	*Echinops pungens* Trautv.	
941	20.8	*Astragalus (Incani) campylosema* Boiss.	
7645	20.8	*Vinca herbacea* Waldst & Kit.	

Table 1. (Cont'd.)

Other species: 1703-*Bromus sterilis* L.(162,161,133,33,124,132,165,127,122,123,35); 6016-*Rhynchocorys maxima* C.Richter. (125,6,71,54,162,161,13,33,27,1); 5472-*Phalaris arundinacea* L. (125,71,54,162,161,133,33,55,135,50); 4414-*Lapsana communis* L. (125,71,54,162,161,133,33,55,135,50); 3258-*Equisetum arvense* L. *var. alpestre* wahlenb. (125,71,54,162,161,133,33,55,135,50); 7150-*Thymus fedtschenkoi* Ronniger (14,2,18,79,51,147,29,28,148,146); 2463-*Cotoneaster nummularioides* Pojark. (121,118,120,119,79,51,131,147,29,30); 5078-*Onobrychis cornuta* (L.) Desv. (16,79,51,131,147,29,30,28,148,146); 5491-*Phlomis cancellata* Bunge. (121,118,120,119,35,53,34,79,51,52); 4174-*Hypericum scabrum* L. (121,118,120,119,1,3,14,18,51); 4802-*Mespilus germanica* L. (163,130,164,124,132,165,127,122,123,35); 4682-*Malus orientalis* Ugl.(163,130,164,162,129,24,1,132,35); 6163-*Salix alba* L. (125,54,162,161,133,33,55,135,50); 4750-*Medicago lupulina* L. (54,14,13,18,55,135,50,131,30); 7285-*Trifolium pratense* L. (125,36,71,54,162,161,133,33,55); 4577-Linum nervosum Waldst. (6,162,161,133,33,12,15,16); 4173-*Hypericum perforatum* L. (162,161,133,33,26,132,35,18); 666-*Anthriscus nemorosus* (M.B.) Spreng. (162,161,133,33,27,28,148,146); 6138-*Rumex obtusifolius* L. (125,6,71,54,162,161,133,33); 5902-*Ranunculus brachylobus* Boiss. & Hohen. (125,6,71,54,162,161,133,33); 4971-*Nepeta racemosa* Lam. (1,35,18,79,51,52,131,30); 3572-*Fraxinus excelsior* L. *ssp. coriariifolia* (Scheele)E.Murray (163,130,164,24,132,28,148,146); 4511-*Leucopoa sclerophylla* (Boiss. & Hohen.) V.Krecz. & Bobrov. (121,118,120,119,53,34,79,51); 7514-*Verbascum speciosum* Schrader. (118,120,119,2,35,52,131,30); 2227-*Cirsium ciliatum* (Murray) Moench. (121,118,120,119,3,165,122,123); 4271-*Juglans regia* L. (163,130,164,121,132,123,35); 170-*Achillea vermicularis* Trin. (6,3,14,2,35,15,16); 3455-*Euphrasia pectinata* Ten. (125,71,54,162,161,133,33); 6829-*Stachys lavandulifolia* Vahl. (3,13,35,79,51,131,30); 7639-*Vicia truncatula* Fischer. ex M.B. (27,24,26,25,28,148,146); 4482-*Leontodon hispidus* L. *var. mazanderanicus* Rech. f. (125,71,54,18,55,135,50); 5223-*Origanum vulgare* L. (125,54,132,35,55,135,50); 2215-*Cichorium intybus* L.(125,54,79,51,55,135,50); 6455-*Scrophularia gaubae* Bornm. (162,161,133,33,53,34); 5642-*Polygonatum orientale* Desf.(27,26,132,28,148,146); 1778-*Calamagrostis pseudophragmites* (Hall.f.) Koel.(125,54,162,161,133,33); 6668-*Silene latifolia* Poir *ssp. persica* (Boiss. & Buhse.) Melizh. (125,6,54,55,135,50); 745-*Artemisia absinthium* L. (125,6,54,55,135,50); 5483-*Phleum paniculatum* Hudson. *var. ciliatum* (Boiss.) Bor. (125,71,54,55,135,50); 7355-*Tripleurospermum disciforme* (C.A.Mey) Schultz.Bip. (125,71,54,55,135,50); 3310-*Erigeron acer* L. (125,71,54,55,135,50); 1886-*Cardamine uliginosa* M.B. (125,71,54,55,135,50); 1874-*Capsella bursa pastoris* (L.) Medicus. (125,71,54,55,135,50); 6061-*Rosa pulverulenta* M.B. (26,147,29,28,148,146); 5554-Pimpinella tragium Vill.(3,18,131,147,29,30); 5615-*Poa araratica* Trautv. (2,15,18,79,51,52);1496-*Astragalus (Platonychium) verus* Olivier-Voy. (118,2,79,51,52,30); 3345-*Eryngium billardieri* Delaroche (132,35,53,34,18,52); 6023-*Ribes uva-crispa* L. (124,24,26,25,132); 6256-*Salvia staminea* Montbr. & Auch. ex Benth.(125,54,55,135,50); 6772-*Sonchus asper* (L.) Hill. *ssp. glaucescens* (Jordan) Ball. (125,54,55,135,50); 5956-*Rapistrum rugosum* (L.) All. (125,54,55,135,50); 5720-*Potentilla canescens* Besser (125,54,55,135,50); 4782-*Melilotus officinalis* (L.) Pall. (125,54,55,135,50); 8003-*Hypericum elongatum* Ledeb. (125,54,55,135,50); 2948-*Deschampsia caespitosa* (L.) P. Beauv. (125,54,55,135,50); 1704-*Bromus tectorum* L.125,54,55,135,50);2175; *Chenopodium foliosum* Aschers *ssp. montanum* Uotila (147,29,28,148,146); 3937-*Helianthemum nummularium* (L.) Miller (162,161,133,33,24); 4991-*Neslia apiculata* Fisch. & C.A.Mey. & Ave.-Lalle. (162,161,133,33); 3744-*Geum kokanicum* Regel. & Schmalh. ex Regel. (162,161,133,33,24); 6481-*Scrophularia variegata* M.B. *ssp. rupestris* (M.B.) Grau. (162,161,133,33); 6109-*Rubus hirtus* Waldest. & Kit. (162,161,133,33); 7205-*Tragopogon graminifolius* DC. (162,161,133,33); 8007-*Rumex scutatus* L. (125,71,15,16); 8001-*Cephalaria kotschyi* Boiss. & Hohen. (25,28,148,146); 223-*Aethionema grandiflorum* Boiss. & Hohen. (131,147,29,30); 2789-*Cruciata laevipes* Opiz. (53,34,131,30); 4769-*Melica jacquemontii* Decne. ex Jacquem. *ssp. Jacquemontii* (79,51,52,30); 2987-*Dianthus orientalis* Adams. *ssp. stenocalyx* (Boiss.) Rech.f. (3,79,51,52); 1751-*Bupleurum exaltatum* M.B. (53,34,79,51); 2358-*Consolida orientalis* (Gay) Schrod. (124,132,123,35); 1912-*Carex divulsa* Stokes (27,24,26,25); 824-*Asplenium trichomanes* L. (27,24,26,25); 4369-*Lactuca serriola* L. (121,165,122,123); 3015-*Digitalis nervosa* Steud. & Hochst. ex Benth. (121,120,119); 499-*Alyssum polycladum* Rech.f. (24,118,25); 4239-*Isatis buschiana* Schischk. (35,53,34); 2374-*Convolvulus cantabrica* L. (35,53,34); 6972-*Tanacetum abrotanifolium* (L.) Druce. (79,51,52); 5795-*Psathyrostachys fragilis* (Boiss.) Nevski (79,51,52); 2509-*Cousinia chamaepeuce* Boiss. (79,51,52); 1384-*Astragalus (Laguropsis) subsecundus* Boiss. (79,51,131); 7425-*Urtica dioica* L. (71,53,34); 2130-*Cerasus pseudoprostrata* Pojark. (18,131,30); 6134-*Rumex elbursensis* Boiss. (27,147,29); 6891-*Stipa kraschenninnikovii* Roshev. (131,30); 3359-*Erysimum cuspidatum* (M.B.) DC. (131,30); 7717-*Ziziphora clinopodioides* Lam. *ssp. pseudodasyantha* (Rech.f.) Rech.f. (131,30); 4087-*Hippomarathrum microcarpum* (M.B.) B.Fedtsch. (79,51); 3131-*Echinops elbursensis* Rech. f. (79,51); 2790-*Cruciata taurica* (Pallas ex Willd.) Ehrend. (79,51); 1701-*Bromus squarrosus* L. (79,51); 254-*Elymus hispidus* (Opiz) Melderis *var. podperae* (Nab.) Assadi (79,51); 181-*Acroptilon repens* (L.) DC. (79,51); 6856-*Stellaria media* (L.) Vill. (132,35); 4200-*Inula salicina* L. *ssp. aspera* (Poir.) Hayek (132,35); 3175-*Echium amoenum* Fisch. & C.A.Mey. (132,35); 2758-*Crepis sancta* (L.) Babcock (132,35); 7403-*Tussilago farfara* L. (132,35); 1670-*Bromus briziformis* Fisch. & C.A.Mey. (132,35); 4760-*Medicago sativa* L. (1,35); 6331-*Scabiosa columbaria* L. *ssp.* (118,35); 656-*Anthemis triumfettii* (L.) All. *ssp. khorasanica* (Rech.f.) Iranshahr-(35,18); 2032-*Centaurea kotschyi* (Boiss. ex Heldr.) Hayek. *var. persica* (Boiss.) Wagenitz. (35,16); 2803-*Cuscuta approximata* Babingt. (53,34); 3761-*Glaucium fimbrilligerum* Boiss. (15,16); 3099-*Dryopteris filix mas* (L.) Schott. (27,26); 5984-*Reseda lutea* L. (118,120); 704-*Arenaria gypsophiloides* L. (1,2); 5511-*Phragmites australis* (Cav.) Trin. ex steud. (125,54); 4895-*Myricaria germanica* (L.) Desv. (125,54); 1578-*Barbarea plantaginea* DC. (125,54); 7691-*Xanthogalum purpurascens* (Ave-Lall.) Boiss. (71); 6300-*Saponaria viscosa* C.A.Mey. (71); 6166-*Salix elbursensis* Boiss. (71); 3062-*Dodartia orientalis* L. (71); 2369-*Convolvulus arvensis* L. (71); 693-*Arctium lappa* L.(71); 4785-*Mentha longifolia* (L.) Huds.(54); 4284-*Juncus inflexus* L.(54); 5776-*Primula auriculata* Lam. (54); 7530-*Veronica anagalis aquatica* L. *ssp. oxycarpa* (Boiss.) A.Jelen. (54); 1902-*Carex caucasica* Stev. (54); 3240-*Epilobium hirsutum* L. (125); 521-*Amaranthus retroflexus* L. (125); 4829-*Minuartia lineata* Bornm. (28); 6882-*Myosotis lithospermifolia* (Walld.) Hornem. (52); 4033-*Herniaria glabra* L. *var. glaberrima* Fenzl (52); 2564-*Cousinia gmelini* C.Winkl. (52); 3415-*Euphorbia helioscopia* L. (35); 2950-*Descurainia sophia* (L.) Webb & Berth (35); 2697-*Crambe orientalis* L. (35); 2229-*Cirsium congestum* Fisch & C.A.Mey ex DC. (35); 6730-*Silybum marianum* (L.) Gaertn. (11); 378-*Allium capitellatum* Boiss. (11); 186-*Adonis aestivalis* L. *ssp. provincialis* (DC.) C.Steinb. (11); 6708-*Silene schafta* Gmel.Jun. ex Hohen. (11); 4201-*Inula thapsoides* (M.B. ex Willd.) Spreng (11); 2135-*Ceratocephalus falcata* (L.) Pers. (11); 1976-*Caucalis platycarpos* L. (11); 1964-*Carthamus lanatus* L. *ssp. turkestanicus* (M.Pop.) Hanelt (11); 1650-*Bongardia chrysogonum* (L.) Spach (11); 7537-*Veronica aucheri* Boiss. (18); 8009-*Taraxacum sp.* (18); 1310-*Astragalus (Caprini) pinetorum* emend. Podlech. (18); 2150-*Chaerophyllum macropodon* Boiss. (3); 6550-*Sempervivum iranicum* Bornm. & Gauba (2); 2622-*Cousinia nekarmanica* Rech.f. (14); 2849-*Cynoglossum creticum* Miller. (16); 5524-*Physospermum cornubiense* (L.) DC. (25); 4075-*Hieracium procerum* Fries. (25); 392-*Allium erubescens* C.Koch. (25); 6981-*Tanacetum coccineum* (Willd.) Grierson. (27); 251-*Elymus longe-aristatum* (Boiss.) Tzveiev (26); 7110-*Thalictrum minus* L. (24); 4606-*Lonicera bracteolaris* Boiss. & Buhse. (24); 790-*Asparagus persicus* Baker (126); 5648-*Polygonum arenastrum* Boreau. (121); 3431-*Euphorbia myrsinites* L. (118); 2068-*Centaurea virgata* Lam. *ssp. squarrosa* (Willd.) Gugler. (118); 7256-*Trifolium campestre* Schreb. (13); 5172-*Onosma microcarpum* DC. (13).

Table 2. Syntaxa of the Elika forest and the ecological factors subject of study.

Syntaxa					Exological factors								
Class	**Order**	**Alliance**	**Association**	**Sub-association**	**Soil texture class**	**Soil moisture %**	**Soil pH**	**Soil EC (µs/cm)**	**Soil line %**	**Soil organic materials %**	**Altitude (m)**	**Exposition**	**Slope degree**
Salicetea excelsae	*Salicetalia excelsae*	*Salicion alhae*	*Salicetum aegyptiacae*		Sa-Cl-Lo	25-35.5	6.5-7	0.6-0.7	12-16	4-5.5	1860-2600	N-NE-S-W	5-10
	Quercetalia	*Acerion cappadocicii*	*Aceretum capadocicii*		Sa-Cl-Lo	25-30	6.5-7	0.6-0.7	10-13	10-12	2100-2200	N	5-10
		Ulmion minoris	*Ulmetum minoris*		Sa-Lo	7-8	7.3-7.5	0.7-0.72	21-24	1-4	2400-2800	S-SE	10-50
				Hippopaetosum rhamnoidis	Sa-Lo	25-30	6.5-7	0.6-0.7	15-16	4-5.5	2400-2600	S	5-10
Quercetea	*Querco petraeae* spp. *ibericae-Carpinetalia betulii*	*Querco petraeae* spp. *ibericae-Carpinion betulii*	*Querco petraeae* spp. *ibericae-Capinetum betulii*		Sa-Cl-Lo	13.8-14.5	6.5-6.7	0.63-0.67	10-13	9.7-12.46	1860-2400	N-NW	10-50
	Querco-Carpinetalia orientalis	*Carpinion orientalis*	*Pyro mazanderanicae-Carpinetum orientalis*		Sa-Lo	9-13	7.3-8	0.75-0.78	20-25	7.5-8.79	1860-2400	S-SW	15-35
	Pruno spinosae-Crataeginetalia meyeri	*Pruno spinosae-Crataeginion meyeri*	*Pruno spinosae-Crataeginetum meyeri*		Sa-Lo	9-13	7-8	0.7-0.78	15-25	7.5-8.79	2100-2700	S-SE-SW-W	10-50
Quercetea macrantherae	*Quercetalia macrantherae*	*Quercion macrantherae*	*Acereto campestris-Quercetum macrantherae*		Sa-Lo	13-13.8	6.7-7	0.67-0.7	13-15	8.8-9.69	2100-2600	N-NW-NE-SW	10-50
Ephedretea	*Ephedretalia*	*Ephedrion majoris*	*Rhamno pallasii-Ephedretum majoris*		Sa-Lo	9-13	8.3-8.5	0.85-0.9	45-55	4-7.5	2000-2020	S-SW	30-35
Juniperetea	*Juniperetalia*	*Juniperion communis* spp. *hemisphaericae*	*Juniperetum communis* spp. *hemisphaericae*	*Aceretosum monspessulanii* spp. *ibericii*	Sa-Lo	5-7	8.1-8.3	0.82-0.85	25-40	1-4	2600-2800	S	10-50
					Sa-Lo	9-13	8-8.1	0.78-0.82	21-28	4-7.5	2600-2800	N	10-50

Order *Pruno spinosae-Crataeginetalia meyeri*: This order includes the *Pruno spinosae-Crataeginion meyeri* alliance and *Pruno spinosae-Crataeginetum meyeri* association. The characteristic species of this association are *Crataegus meyeri* A. Pojark., *Prunus spinosa* L., *Prunus divaricata* Ledeb. ssp. *divaricata*, *Colutea buhsei* (Boiss.) Shap., *Crataegus turkestanica* A. Pojark., *Stachys byzantina* C. Koch., *Cotoneaster multiflorus* Bge.. This association is expanded between the forest and range formations in the southern exposition.

Class *Quercetea macrantherae*

This Class includes the *Quercetalia macrantherae* order, *Quercion macrantherae* alliance and *Acero campestris-Quercetum macrantherae* association (Table 2). The characteristic species of this association are *Quercus macranthera* Fisch. & Mey. ex Hohen., *Acer campestre* L., *Poa nemoralis* L., *Trisetum flavescens* (L.) P. Beauv., *Sedum stoloniferum* S. G. Gmel., *Ornithogalum orthophyllum* Ten., *Vicia variabilis* Freyn. & Sint., (Table 1). This association prefers northern exposition to other expositions (Table 2).

Class *Ephedretea*

This Class includes the *Ephedretalia* order, *Ephedrion majoris* alliance and *Rhamno pallasii-Ephedretum majoris* association in the study area (Table 2). The characteristic species of this association are *Ephedra major* Host., *Rhamnus pallasii* Fisch. & Meyer. ssp. *pallasii* (Table 1). This thermophilic association is established on lime soil and in the southern exposition (Table 2).

Class *Juniperetea*

This Class includes the *Juniperetalia* order, *Juniperion communis* ssp. *hemisphaericae* alliance and *Juniperetum communis* ssp. *hemisphaericae* association in the study area (Table 2). The characteristic species of this association are *Juniperus communis* L. ssp. *hemisphaerica* (Presl.) Nyman., *Astragalus* (*Alopecuroidei*) *kirrindicus* Boiss., *Salvia staminea* Montbr. & Auch. ex Benth. This orophilous association is established on lime soil and in the southern exposition (Table 2). This association has *Aceretosum monspessulanii* ssp. *ibericii* sub association. The differential species of this sub association is *Acer monspessulanum* L. ssp. *ibericum* (M.B.) Yaltirik. This sub association is located in the northern exposition against the main association.

3. The ecological factors of identified syntaxa: The ecological factors subject of study of existing syntaxa in the area were specified as shown in Table 2.

4. The Chorotypes of the study area: The percentages of the chorotypes of species of the study area were specified on the basis of the methods presented by Zohary (1963 & 1973) and Takhtajan (1986). The results are shown in Fig. 5.

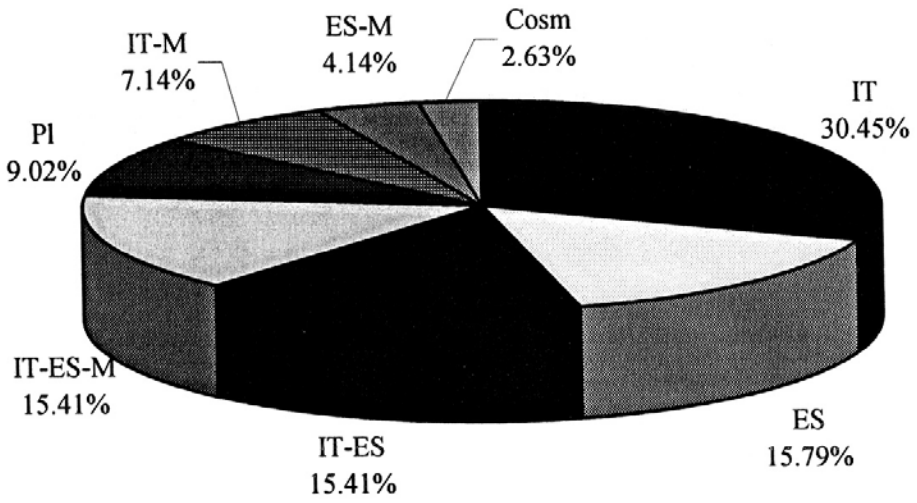

Fig. 5. Plant chorotypes of the Elika ecoton forest.

IT: Irano-Turanian Region, ES: Euro-siberian Region,
M: Mediterranian Region, Pl: Pluriregional, Cosm: Cosmopolite

Discussion

Guinoche & Vilmore (1973) have pointed out the alliance Salicion albae (Tx. 1955) Muller et Gors (1958), of order *Salicetalia purpureae* Moor (1958) and class *Salicetea purpureae* Moor (1958). Also *Anemono-Salicetum richardsonii*, *Valeriano-Salicetum pulchrae* and *Epilobio-Salicetum alaxensis* associations are introduced by Sichckhoff *et al*., (2002) for Alaska, when class *Salicetea purpureae* is proposed for them. From syntaxonomic point of view, with respect to the existence of characteristic species *Salix excelsa* S. G. Gmelin. (syn. *Salix fragilis* auct. fl. orient. non L.), *Populus nigra* L. and *Salix alba* L., in the alliance, order and class, and the presence of these species in *Salicetum aegyptiacae* association in the study area, can accept *Salicion albae* alliance from Muller & Gors (1958). With respect to the high dispersion of species *Salix excelsa* S.G. Gmelin. in Iran, *Salicetalia excelsae* order and *Salicetea excelsae* class are suggested for superior syntaxa..

Guinoche & Vilmore (1973) have pointed out the alliance *Acerion pseudoplatani* Oberd. (1957), of order *Fagetalia sylvaticae* Pawl.(1928), and class *Querco-Fagetea* Br. Bl. et Viegler (1937). Also, Quezel *et al*., (1980) have introduced *Carpino-Acerion* alliance of *Fagetelia sylvaticae* order and *Quercetea pubescentis* class for the vegetation of Anatolia of Turkey. Therefore, *Acerion cappadocicii* alliance, *Quercetalia* order and *Quercetea* class are suggested for the *Aceretum cappadocicii* association in the study area.

Guinoche & Vilmore (1973) have pointed out the alliance *Alno-Ulmion* Br. Bl. & Tx. (1943), for Europe. In this study *Ulmion minoris* alliance, *Quercetalia* order and *Quercetea* class are suggested for the *Ulmetum minoris* association in the study area.

Guinoche & Vilmore (1973) have pointed out the alliance *Quercion robori-petraeae* (Malcuit 1929) Br. Bl. (1931), of order *Quercetalia robori-petraeae* Br. Bl. et Tx.(1943), for Europe. *Querco petraeae* ssp. *ibericae-Carpinion betulii* alliance, *Querco petraeae* ssp. *ibericae-Carpinetalia betulii* order and *Quercetea* class are suggested for the *Querco petraeae* ssp. *ibericae-Carpinetum betulii* association in the study area.

Quezel *et al*., (1980) have introduced order *Querco-Carpinetalia orientalis* of class *Querco-Fagetea* for the vegetation of Anatolia of Turkey, and no alliance have been introduced for it. No syntaxon has been presented in the Iranian sources for the association *Pyro mazanderanicae-Carpinetum orientalis*. With respect to the specifications of the *Pyro mazanderanicae-Carpinetum orientalis* association, *Querco-Carpinetalia orientalis* order could be accepted from Quezel *et al*., (1980), and *Carpinion orientalis* alliance, and *Quercetea* class are suggested for the association in the study area.

Guinoche & Vilmore (1973) have pointed out the class *Querco-Fagetea* Br. Bl. et Viegler (1937) with characteristic species *Crataegus monogyna* Jacq., *Crataegus oxycantha* L., *Prunus spinosa* L., *Rhamnus cathartica* L., *Rosa* sp., and order *Prunetalia spinosae* Tx. (1952). *Pruno spinosae-Crataeginion meyeri* alliance is suggested for *Pruno spinosae-Crataeginetum meyeri* association in the study area. With respect to the similarity between the aforementioned association and class *Querco-Fagetea* Br. Bl. et Viegler (1937) and order *Prunetalia spinosae* Tx. (1952), in some of species, *Pruno spinosae-Crataeginetalia meyeri* order and *Quercetea* class are suggested for the study area. It has to be explained that, there is no *Fagus* in the floristic composition of the study area.

Djazirei (1965) and Dorostkar & Noirfalise (1976) have introduced *Quercion macrantherae* alliance for Iran; however they have not introduced any other syntaxa for it. With respect to the high dispersion of species *Quercus macranthera*, the *Quercion macrantherae* alliance, *Quercetalia macrantherae* order and *Quercetea macrantherae* class are suggested for the *Acereto campestris-Quercetum macrantherae* association of the study area.

Kojima (1990) for Nepal has introduced the *Ephedretum gerardianae* association. No superior syntaxon has been observed in the sources subject of study for the *Rhamno pallasii-Ephedretum majoris* association in the study area. Therefore, *Ephedrion majoris* alliance, *Ephedretalia* order and *Ephedretea* class are suggested for the study area.

Klein (1994) has reported its *Juniperetosum excelsae* sub-association from *Helichrysetum oligocephalii* association and *Prangetea* class for Iran. Also Guinoche & Vilmore (1973) have pointed out the alliance *Juniperion nanae* Br. Bl. 1939 of order *Vaccinio-Piceetalia* Br. Bl. 1939 and class *Vaccinio-Piceetalia* Br. Bl. 1939 for Europe. The *Juniperetum communis* ssp. *hemisphaericae* association and *Aceretosum monspessulanii* ssp. *ibericii* sub-association have been identified in the study area for which, the *Juniperion communis* ssp. *hemisphaericae* alliance, *Juniperetalia* order and *Junipereteae* class are suggested.

The gradient indicated in Fig. 3 can be interpreted ecologically as an overall soil moisture gradient ranging from xerophilous to hydrophilous formations. The study and comparison of the other ecological factors subject of study, such as pH, EC and lime of soil (Table 2), made it possible to interpret the gradient of these ecological factors.

Studying the chorotypes of species in the area shows that chorotypes Irano Turanian (30.45%), Euro Siberian (15.79%), Irano Turanian-Euro Siberian (15.41%) and Irano

Turanian-Euro Siberian-Mediterranian Regions are more than the other chorotypes. The higher values of these chorotypes reveal the special ecological conditions of the area. This shows the fact that the study area is located in the ecoton zone, and the reason is that the zone is situated at the end of vegetation of Euro Siberian Region (Hyrcanian Province) and its range is related to Irano Turanian Region.

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