

AN INVESTIGATION ON INVENTORY OF SUB-STEPVIC MEADOWS IN NORTHWESTERN IRAN

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ABSTRACT

The meadows of the Ardabil region with an area of 77,000 hectares, make up about 50% of the total areas scattered in central and western parts of Ardabil. The objectives of this research were to identify and classify the meadows based on vegetation. It was observed that among eight representative stands, Vagah-sara and Samian were more diverse compared to the other stands. The richness increases as soil moisture increases. From the standpoint of life form, hemicryptophytes and therophytes dominated. Productions of dry matter were 3900 and 3700 kg/ha at Arjestan and Khatampoulaghi respectively, and were decreased to 1500 kg/ha at Kouh-sangar stand. Cluster analysis of stands showed that at 40% of similarity, two clusters fused which was consistent with the results of ordination. It was concluded that soil moisture was the most critical factor in heterogeneity of meadow vegetation.

KEYWORDS

meadow, life form, diversity, production, cluster analysis, ordination

INTRODUCTION

Sound management of natural ecosystems requires detailed studies of vegetation. Besides the study of autecology of different species, synecological studies are also important. The objectives of this research were:

- to provide the distribution map of the meadows in the Ardabil region;
- to identify important species and to compare the life forms and the species richness of different stands;
- to determine the forage production and economic values of the meadows;
- and the ultimate goal is to find some guidelines for optimal use of natural meadows.

BACKGROUND AND GEOGRAPHY OF STUDY AREA

Location: The study area is located at 47°, 45' to 48°, 43' longitude and 37°, 51' to 38°, 38' altitude. It has an area of 77,000 hectares. Its boundary from north is restricted by Dashed-e Moghan and Republic of Azerbaijan, from east to Talesh mountains, from south to the cities of Khalkhal and Miayana, and from west it is restricted by Sabalan mountains and the city of Meskinshaher. The elevation of study area ranges from 1300 to 4800 m at Sabalan peak. Generally, five kinds of soil can be distinguished in study area. Brown soils with calcic lithosol dominated.

Climate: The study area is located in sub-steppic region with approximately 400 mm annual precipitation. It has relatively dry and short summers.

METHODS

By the aids of topographic maps (1:250000) and satellite images, the boundaries of meadows were located on a map (Fig. 1). In each meadow a representative stand was selected. The characteristics of these stands are summarized in Table 1. The species diversity of different stands were measured using the Whittaker's plot (Shamida, 1984). The mathematical model of diversity was:

$$S = b_0 + b_1 \log x + e$$

where: S was species richness and x was plot sizes of 0.1, 1, 10, 100, 1000 m².

To determine forage production, double sampling procedure was used. The model of production sampling was:

$$y = b_0 + b_1 x + e$$

where: x was the clipped and weighed plots and y was the estimated plots. The plot size was 1/4 m². In 1-m² plots, the canopy coverage percentages of species were estimated in different stands.

CONCLUSION

General condition of the Ardabil meadows: As it was shown in Figure 1, the Ardabil meadows were classified into plain and mountain meadows. Plain meadows with low elevations surrounded by high mountains and with high water tables. The tall bunchgrasses are dominated in the plain meadows and these meadows usually are harvested by the villagers as hay for winters. Vegetation of plain meadows are in good condition. The vegetation types of these meadows are *Carex* sp., *Hordium violaceum* and *Trifolium pratense*, *H. violaceum* and the other associated species are *Alopecurus arundinaceus*, *Trisetum flavescens*, *Trifolium repens*, *Alopecurus aucheri*, *Poa pratensis*, *Lotus corniculatus*, *Dactylis glomerata*, *Festuca heterophylla*, *Agropyron trichophorum*, *Pheum paniculatum*, and *Sanguisorba minor*.

According to soil moisture, gradient, slope, and terrain, plain meadows may be classified into 1) plain meadows which are quite flat, 2) plain meadows which have good drainage system, with low soil moisture and 5 to 10 percent slope. Most of these meadows converted to croplands, and 3) plain meadows located on stream beds where hydrophytes such as sages and rushes were dominant. These meadows are to be grazed by cattle of villages.

Mountain meadows are divided into high and flat mountain grasslands. Flat mountain meadows located between 1500 to 2000 m and are dominated by tall bunchgrasses. The high mountain meadows located over 2000 m are dominated by shortgrasses. The important species of these meadows are *Bromus tomentellus*, *Hordeum violaceum*, *Poa pratensis*, *Festuca rubra*, *Medicago sativa*, *Alopecurus arundinaceus*, *Lotus corniculatus*, *Trisetum flavescens*, *Sanguisorba minor*, *Trifolium repens*, *Trifolium pratense*, *Festuca ovina*, *Trifolium caescens*, and *Trifolium montanum*.

Quantitative measurement of vegetation: The results of life form classifications showed that all meadows on average have 6 species of therophyte, 23 species of hemicryptophytes and 1 species of chamaphytes. In general, hemicryptophytes (mostly the perennial grasses) and Therophytes (mostly annual forbs and grasses) were dominant in most stands and geophytes and chamaphytes had no contribution in vegetation of meadows. The results of species diversity are summarized and regression equations of species diversity are shown in Figure 2. The stands of Vargah-sara and Samian with slopes of 8.4 and 7.4 are the richest meadows. The results of forage production are shown in Figure 3. The production of dry matter ranged from 3900 at Arjestan to 1500 kg/ha at Kouh-sangar.

Meadow use in study area: Two groups of people use the meadows. The first group is sedentary villagers which traditionally use the surrounding plain meadows as pastures. Early season and continuous grazing is the main method of use by these villagers. They also utilize

the summer ranges illegally; the right of their use belongs to the nomads. Early season use of these pastures damages the plants. Total range use of sedentary villagers is 8 to 9 months and they keep their livestock in feedlots for 3 to 4 months in winter. The Shavsavan nomads are the main migratory groups which use the meadows as summer pastures. The seasonal use by nomads is restricted to 3 to 4 months, so the mountain meadows are usually in better conditions than the plain pastures. Besides grazing as a direct use, some of the moist and irrigated meadows are harvested as hay. The villagers usually employ a watchman for protection of meadows and after full growth of grass, they will harvest the meadow by sickles. About 2500 m² meadows are harvested by a man, so for harvesting one hectare, 4-man days are required.

Economic value of meadows: By comparing the productions of meadows to cash crops like wheat and barley, it is quite evident that besides high production, meadows are very important for soil and water conservation, recreation and wildlife management. The average dry matter production of meadows is 2500 kg/ha while the price of one kg dry forage is about \$20, so the gross income of a hectare is \$500 which is much higher than wheat and barley (1100 kg/ha x \$20 = \$220).

Degradation factors in meadows: The deterioration of pastures can be summarized as follows:

- 1) Conversion of meadows to croplands;
- 2) Continuous and heavy grazing especially in early season;
- 3) Poor distribution of grazing due to lack of water resources.

REFERENCES

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 Shmida, A. 1984. Whittaker's plant diversity sampling method. Israel J. Botany 33:41-46

Figure 3
Regression equations of different stands.

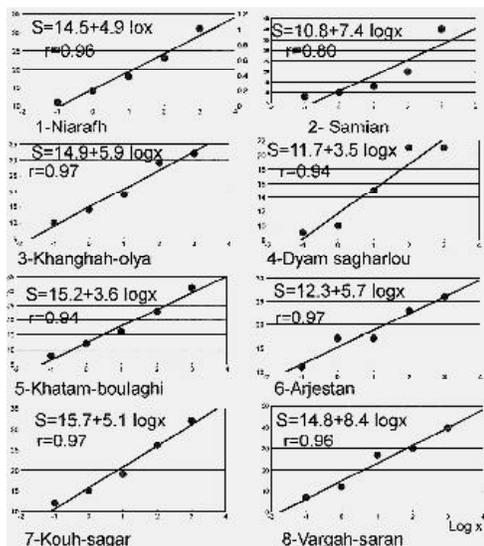


Figure 1
The distribution map of meadows with the locations of representative stands.

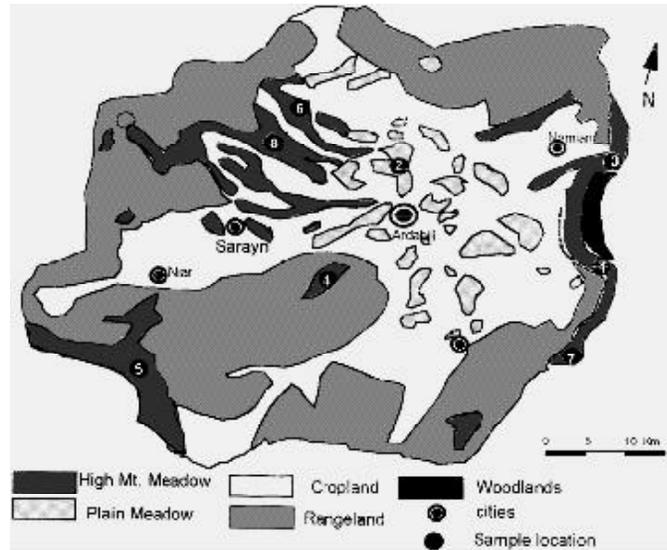


Figure 2
Dry matter production of different stands.

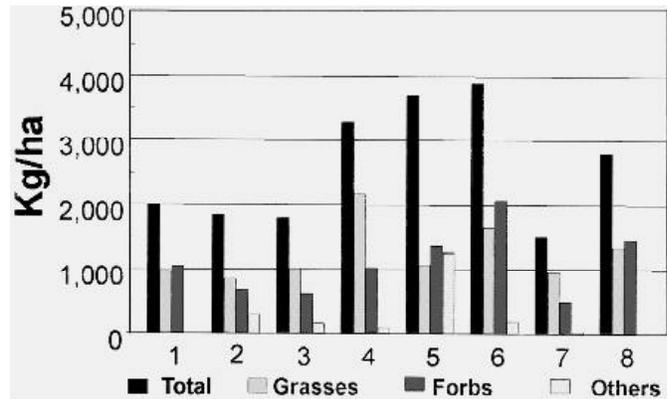


Table 1
The main characteristics of representative stands selected for sampling.

Name of Meadow	Kind of Meadow	Terrain	Kind of Soil	Elevation (m)	Precipitation (mm)
Niaragh	shortgrass	high mt.	forest brown	1380-1800	400
Samian	tallgrass	plain	alluvial	1350	350
Khanghah-olya	shortgrass	high flat mt.	forest brown	1500-1700	400
Dym-sagharlou	shortgrass	high mt.	brown	1600-1750	350
Khatam-boulaghi	tallgrass	high mt.	brown with lissol	1600-1750	400
Arjestan	tallgrass	high mt.	brown	>2000	500
Kouh-sanger	shortgrass	high flat mt.	brown with lissol	2000-2300	500
Vargah-sara	tallgrass	high mt.	brown	>2000	600