

Changing of Botanical Composition and Canopy Coverage Ratio in Rangelands at Different Altitudes*

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ABSTRACT :This research was conducted at range sites with different altitudes (site I=2000 m, site II=2500 m, site III =3000 m) in Palandöken Mountain of Erzurum in 2006 and 2007 years. In this study, some plant and soil characters were investigated. Grasses and legumes had the highest ratio in site II, 64.05% and 11.75% respectively. Other families were the highest (42.65%) in site I. Canopy coverage was higher in site II (42.65%) than the other sites. Soil organic matter content was high in site II and III (4.10 % and 6.84%), moderate in site I (2.30%).Soil pH was neutral or slightly acidic, soil phosphorus content was poor while the potassium was very rich. Suitable grazing management plans should be taken in site I and III to increase of canopy and quality species ratio.

Keywords: Rangeland, altitude, botanical composition, canopy coverage.

Farklı Rakıma Sahip Meralarda Botanik Kompozisyon ve Toprağı Kaplama Oranının Değişimi

ÖZET: Bu araştırma, Erzurum Palandöken dağında farklı rakıma (I. Kesim:2000 m, II. Kesim: 2500 m, III. kesim: 3000 m) sahip üç farklı mera alanında 2006 ve 2007 yıllarında yürütülmüştür. Çalışmada mera kesimlerinin bazı bitki ve toprak özellikleri incelenmiştir. Botanik kompozisyonda buğdaygiller %64.05 ve baklagiller %11.75 oranıyla II. kesimde en yüksek, diğer familyalar ise %42.65 oranıyla I. kesimde en yüksek belirlenmiştir. Toprağı kaplama oranı ikinci kesimde (%42.65) diğer kesimlerden daha yüksek olmuştur. Toprakların organik madde içerikleri I., II. ve III mera kesiminde sırasıyla %2.30, %4.10, %6.84 olarak belirlenmiştir. Her üç kesimde toprakların, pH'sı nötr yada hafif asit karakterli, potasyum içeriği çok zengin, fosfor içeriği yetersiz bulunmuştur. Kaliteli bitki türlerinin oranını ve toplam bitki ile kaplılığı artırmak için I. ve II. sitede uygun otlatma yönetimi planları yapılmalıdır.

Anahtar Kelimeler: Mera, rakım, botanik kompozisyon, toprağı kaplama oranı.

INTRODUCTION

Rangelands are important supply for animal feeding but due to the suppression on the rangelands in Turkey resulting from heavy and uncontrolled grazing for continuing over a long time, the rate of quality plant species in rangeland vegetation has been close to extinction point in spite of the increase in the rate of low quality species. Overgrazing and some other extreme environmental conditions have more degradative effects on vegetation in high altitude rangeland.

Under consistent grazing conditions, species diversity and plant coverage rate decrease (White et al. 1991). Grazing pressure as well as altitude and topography may affect plant coverage rate (Bragg 1978). Plant coverage rate of soil is directly associated with soil moisture (Koç 1995). Heavy and untimely grazing can reduce the plant coverage ratio of soil and above ground vegetative parts of plants blocking the kinetic energy of rain drops, which increases the jumping power of water droplets and decreases the infiltration capacity of soil by compressing it and, in turn, causing erosion (Neath et al. 1991). Due to the erosion effect in which the weakening of plant coverage has a major role, the amount of soil carried to sea in stream-flows in Turkey is nearly 500 million tons a year (Günay 1995).

Soil formation level along a topographic surface altering depending on altitude can cause significant differences in soil properties, rangeland vegetation and yields. Plants growing at high altitudes have higher forage quality (Okatan 1987) due to higher metabolic activities they have (Strasia et al.1970). Species distribution in botanical composition may vary depending on direction and altitude (Gökkuş et al.1993). Increasing sloppiness with elevation inevitably causes soil erosion combining with weakened plant cover and this condition causes upper part of the soil profile in such areas to become poor due to the loss of nutrient elements. In the areas where the amount of nutrient elements is limited, grassy plants can grow better; legumes are seen less frequently (Öztaş et al. 2003).

It is an important issue to increase the yield and quality of rangelands in order to improve animal breeding, which is an important source for the economy and prevent from soil loss. Rangeland vegetation studies are carried out to determine the conditions of rangelands and suggest solution proposals. Present study was aimed to determine the changing of vegetation features in rangelands at different altitudes and to suggest some proper management principles for sustainable using of rangelands, similar with study areas.

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MATERIAL AND METHODS

The study was conducted in 2006 and 2007 in Palandöken Mountains, Erzurum, where Ejder Hill is located, considering three different elevation sites; 2000 m, 2500 and 3000 m site I, II and III, respectively. The first site is grazed heavier and earlier than the two others. Organic matter contents of the soils were found to be high in site II and site III (4.10%, 6.84%), and moderate in the site I (2.30%) by analyzed in Agriculture Faculty of Atatürk University. Soils in all sites are neutral or slightly acidic, rich in potassium, but poor in phosphor. Calcium contents are 0.07%; 0.05% and 0.09% respectively, in range sites and for textural classes, site I is loamy, site II is clay-loamy and site III is sandy-loamy. In order to determine botanical composition, line intercept method was used considering plant coverage areas (Canfield 1941) by measuring 10 lines in each site and 10 transect lines

in each lines, which means 300 transect lines were investigated.

After the application of arc sinus transformation for botanical composition and canopy coverage ratio obtained from three different sites, ANOVA test was applied and means were compared by LSD (SAS 2002).

RESULTS AND DISCUSSION

In study area total of 41 plant species was recorded; 13 grasses, 5 legumes and 23 other species. Sheep fescue (*F. ovina*) was the dominant grass in all sites. In site I had 7 grasses,1 legumes,13 other species, total of 21 plant species was recorded. In site II 7 grasses,4 legumes,13 other species number was 24. In site III 4 grasses,2 legumes,10 other species a total of plant species 16 was recorded.

Grasses were the most common and legumes were the least common species recorded (Figure 1).

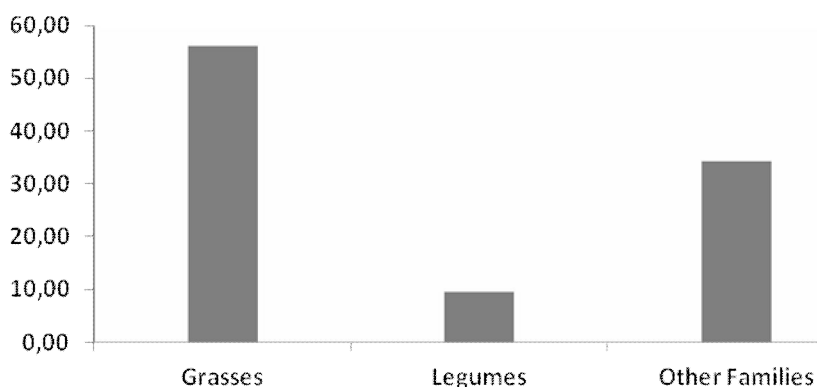


Figure 1. Average botanical composition values of study area

According to the two study years and means of year's, the highest grass ratio was in site II, the lowest was in site I; legume ratio was the lowest in site III, the highest in site II. Other families had the lowest value in site II; the highest in site I. Botanical composition values showed similar results in second study year to the first study year results and differences between sites were significant in both

years and means of study years dealing with families (Table 1, Figure 2). Based on two-year results, grasses had the highest ratio and legumes the lowest (Figure 2) in study area. There were not significant differences between the sites in terms of the ratio of grasses, legumes and other families (Table 1, Figure 3).

Table 1. Changing of botanical composition of range sites with different altitude in study years

	2006				2007			
	I	II	III	Mean	I	II	III	Mean
Grasses	45,54 C	65,20 A	58,00 B	56,25	46,40 C	62,90 A	58,95 B	56,08
Legumes	11,63 a	11,80 a	8,00 b	10,48	11,20 A	11,70 A	3,00 B	8,63
Other Families	42,83 A	23,00 C	34,00 B	33,28	42,40 A	25,40 C	38,05 B	35,28

Values shown in capital letters are significant at 1% ($P < 0.01$), small letters are significant at %5 ($p < 0.05$).

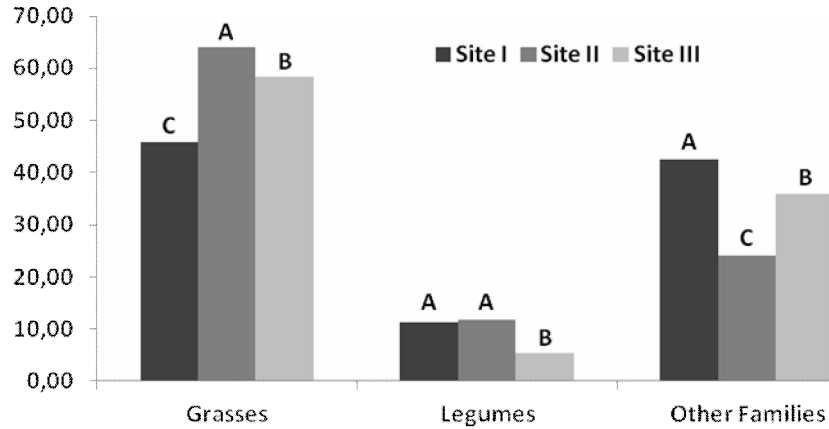


Figure 2. Changing of botanical composition of range sites with different altitude

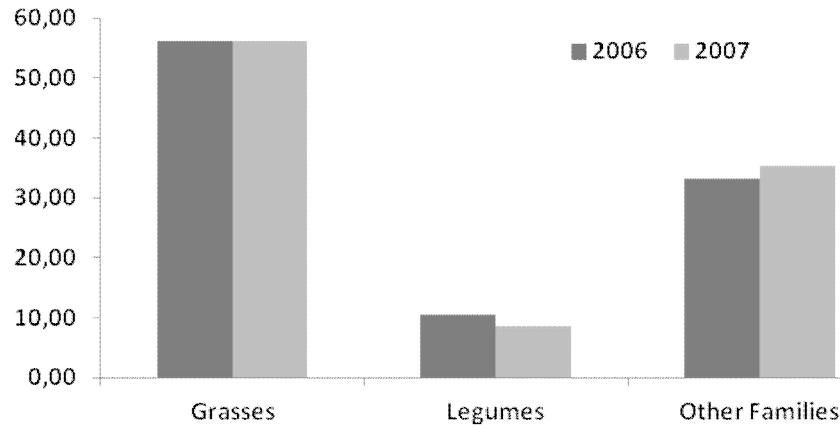


Figure 3. Changing of botanical composition of study area depending on study years

Since their ability resistance to extreme environmental conditions due to their hairy roots (Lauenroth 1979) grassy species are more common in the vegetation of rangelands in the areas where rainfall is relatively low (Herbel and Pieper 1991). In the present study it was also found that in all the sites grasses are the most common (56,17%), sheep fescue the dominant plant species in all sites. The same results were found in several studies carried out to investigate botanical composition of rangelands in Eastern Anatolia Region (Tosun 1968; Altın 1975; Gökkuş 1984; Andiç 1985; Koç et al. 1994; Koç 1995). Legumes ratio was lower than grasses and other families in all sites (with a mean of 9.56%). This result is supported by the previous studies about rangelands in Erzurum (Tosun 1968; Altın 1975; Gökkuş 1984; Koç 1995; Bakoğlu 1999; Çomaklı et al. 2008). The reason for the differences between the ratios of plants from other families in three sites were

found to be second highest (with mean ratio is 34.28%) may be depended on the fact that seeds of these species can be dispersed easily, extremely hard but suitable climatic conditions for them, irregular grazing and having resistance characteristics to grazing (Çomaklı and Menteşe 1999). The high other families in site I may be resulted from heavier and earlier grazing. Also, the lowest legumes ratio was determined in site III (3000 m), which can be attributed to the result of severe climatic conditions depending on high altitude.

Average canopy ratio in the study area was found to be 38.89% and the differences in coverage ratios between sites were significant ($p < 0.01$). The highest canopy ratio was found to be in site II (42.65%) while the lowest was in site III (34.95%), which was 39.07% in site I, in two study years and means of the years (Figure 4).

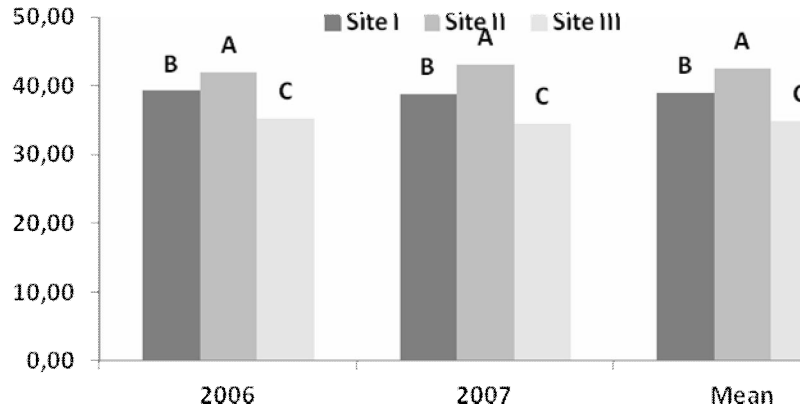


Figure 4. Changing of canopy ratio of range sites with different altitude in study years and means of the years

The reason that the lowest canopy ratio was found to be in site III may be caused by altitude. In this respect, Thilenius (1979); Gökkuş and Koç (1991) stated that high elevated areas have variable vegetation covers and plant species in these areas may be adversely affected by grazing. The reason for the higher coverage ratio in site II of the study area may be that the beginning of grazing period is later and finishing is earlier causing plants to store enough nutrient material and not to be affected by breaking off at later stages. Results of the present study are similar to other studies carried out in Erzurum (Tosun 1968; Altın 1975; Gökkuş 1984; Koç 1995; Bakoğlu 1999).

CONCLUSION

In the areas, untimely used and with high elevation (like site III-3000 m), rangeland improvement is needed more either for the increase in the rate of species from other families or decreases in the coverage ratio. In order to reduce the ratio of species from other families in site III sheep or goat types of animals can be used to graze these species. For these reasons suitable grazing management plans should be taken in site I and III to increase of canopy and quality plant species ratio.

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