Some Vegetation Characteristics of an Upland Rangelandin Eastern Anatolia

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Abstract

The objective of the study was to provide information on the current situation of upland rangelands in eastern Anatolia. For this purpose, a transhumant area was selected and sampled in the years of 2000 and 2001, in Erzurum province. Two distinct range sites were determined in the experimental area, a dry site and a subirrigated one. Grasses were the dominant family in both sites but the dominant species were different. Sheep fescue was the dominant species in the dry site and matgrass in the subirrigated. Canopy coverage was over 40% in both sites. The range condition class for the dry and the subirrigated site was fair and poor, respectively. The carrying capacity in the dry and subirrigated site was 2.2 and 2.0, respectively, for the 2.5 months of the upland period. Although botanical composition and range condition of the sites was undesirable, these sites can be classified as healthy in the rangeland condition classes due to enough density and diversity. The result of the experiment indicates that it is essential to develop new management strategies in order to maintain or improve the current conditions of the upland rangelands in the area. It can be proposed that at least 2 ha of rangeland area should be allocated per animal unit during the upland period.

Key words: Upland rangelands, transhumance, botanical composition, range condition

Introduction

Rangelands cover 52% of the Eastern Anatolia region in Turkey. Rolling topography and unsuitable climatic conditions restrict the field crop area and production in the region, rendering animal husbandry dependent on rangelands important in agricultural production. Uneven topography causes significant differences in plant growth during the growing season. For instance, plants reach grazing stage in some areas, whereas in some others the plants might be just entering the growing stage. Thus, transhumant grazing system is more common in the region (Altin et al. 2011).

Grazing in uplands is an essential part of livestock feeding in the region. Livestock grazing alters the vegetation structure which is vital for the sustainable use of the rangelands. In general, overgrazing can reduce canopy cover, alter botanical composition and decrease range condition

class (Oztas et al. 2003). Additionally to grazing, site characteristics especially topography and soil moisture status are major factors in controlling distribution and abundance of species in the rangeland vegetation (Firincioglu et al. 2007). Due to uneven distribution of vegetation, spatial distribution of grazing changes during the grazing season. Grazing animals congregate and linger on the riparian areas due to supplying green forage and water through the summer dry period, hence, the detrimental effect of grazing is more severe in these areas (Holechek et al. 2004)

Although upland rangelands play a significant role in livestock production in this region, there is limited information about their vegetation structure. The aim of this study was to estimate the changes in botanical composition, canopy coverage, and range condition and health under current conditions and outline the implementation of possible rangelands rehabilitation techniques for the Eastern Anatolian uplands.

Material and Methods

This study was conducted at the upland rangelands of Tortum district of Erzurum province of Turkey in the years of 2000 and 2001, where transhumant grazing system is applied. Two major range sites, dry and subirrigated steppe, were determined in the area ($41^{o}18^{'}$ E, $40^{o}22^{'}$ N) before setup of the experiment. The dry range site was located at an average altitude of 2550 m with smooth rolling topography and having no ground water. The sub-irrigated range site was located at an average altitude of 2500 m with 10% slope from west to east and with the water table reaching up to surface in some places in the spring.

The climate of the study area is characterized by cold winters and slightly warm and dry summers with most precipitation occurring from late autumn to early summer. The annual total precipitation in the year of 2000 and 2001 was 305 mm and 424 mm respectively, below the long term average (450 mm). The long term annual average temperature of the experimental area was 6 °C. It was 5.4 and 5.9 °C during the experimental years, respectively.

Soil analysis performed according to Soil Survey Laboratory Staff (1992) procedures revealed that the dry and subirrigated range sites had sandy-clay and loam soil texture, 7.4 and 5.2 % of organic matter, 5.5 and 5.0 of pH, respectively. The soils of both sites were poor in lime and phosphorus but rich in potassium.

Botanical composition of the range sites was determined by the line intercept method developed by Canfield (1941) in July 2000 and 2001.

Measurements were performed using 8-line intercept transects (10 m long transect each) based on the basal area. The range condition score, condition and health classification were determined for each range site using the 2-year average botanical composition values according to the criteria suggested by Koc et al. (2003), consisting of a combination of range condition classification (Dyksterhius 1949) and rangeland health methods of the Committee on Rangeland Classification (National Research Council 1994). Forage production of the sites was not sampled because the sites were open to public grazing. Therefore, carrying capacity was determined based on ecological principles using a scale developed for Turkish rangelands based on botanical composition data (Koc et al. 2003). The results are presented as area per animal unit (500 kg live weight) for 75 days of the grazing season, as upland rangelands are grazed from mid June to beginning of September (Altin et al. 2011).

The data was evaluated by descriptive statistics using EXCEL software.

Results and Discussion

A total of 48 species consisting of 15 grasses, 5 legumes and 28 the other families in the dry site and 35 species consisting of 6 grasses, 6 legumes and 23 the other families in the subirrigated site were recorded. Grasses percentage in botanical composition was 46.81 and 58.01 in the dry and subirrigated site, respectively. Dominant species in the botanical composition was sheep fescue (*Festuca ovina*) with 21.73 percentage in the dry site, and matgrass (*Nardus stricta*) with 41.79 percentage in the subirrigated site. Legumes contributed 9.53% in the dry site and 2.27% in the subirrigated site to botanical composition. The contribution of the other families was 43.66% and 39.72% in the dry and subirrigated site, respectively.

The distribution of species based on response to grazing showed great differences between the sites. Therefore, the dry site was classified as fair and the subirrigated site as poor in the range condition classes. A total of 12 species belongingto a decreaser group, contributed a 26.86% in the botanical composition of the dry site whereas nine decreaser plants were recorded and their percentage in the botanical composition of the subirrigated site was 5.78. Increaser species were 28.78% and 11.79% in the botanical composition of the dry and subirrigated site, respectively. Invader species abundance in the botanical composition of the dry site was lower than in the one of the subirrigated site (82.43%). Canopy coverage was 40.33% and 46.69% in the dry and subirrigated site, respectively. Rangeland health was classified as healthy for both sites. The required range area for

an animal unit during the grazing period was 2.2 and 2.0 ha in the dry and subirrigated site, respectively.

Grasses were the most common family group in both sites. Light rains during the growing season favor grasses over the other families in semi-arid conditions (Herbel and Pieper 1991), thus, grasses are common in the dry site of the experimental area. Similarly, grasses were also the dominant species in the botanical composition of the subirrigated site. This is because plants with extensive root system are not well adapted to poorly aerated root areas due to excess water (Altin et al. 2011).

Sheep fescue, a drought resistant short grass, was the dominant plant species in the dry site, whereas matgrass a mesophyte short grass, dominated the subirrigated site. The high abundance of these plants is related to the heavy grazing pressure as heavy grazing shifted the composition of range vegetation from tall grass to short grass and from higher productive plants to low productive and unpalatable plants (Firincioglu et al. 2009). Another indicator of overgrazing in the experimental areas was the high abundance of invasive species in the botanical composition. It is well documented that these plants benefit over desired range plants under heavy grazing conditions (Holechek et al. 2004).

Canopy coverage on both sites was above the critical values, which require 30% of basal cover to prevent accelerated erosion (Marshall 1973). Both sites were classified as healthy in the range health class, as a consequence of the high canopy coverage. Although invader plant species were common in both sites, there was no serious erosion risk and plant diversity was adequate to implement ecosystem functions.

Animals congregate on wet areas during the summer drought period due to supplying green forage and water, hence, the detrimental effect of grazing is more severe on these areas (Holechek et al. 2004). Thus, the range condition class was lower for the subirrigated site compared to the dry one. There is a linear relationship between the range condition class and the carrying capacity (Koc et al. 2003), the lower carrying capacity in both sites originated from a lower range condition class in the experimental area. The botanical composition and range condition classes of the sites revealed that upland rangelands suffer from heavy grazing pressure as is also the case with similar areas all around the country (Koc and Gokkus 1998).

In conclusion, although upland rangelands do not suffer from early and late season grazing, heavy grazing pressure is a serious problem during the upland season on these rangelands. In order to at least maintain or even improve the current conditions, it is essential to improve the current

grazing practices. Under current conditions, at least 2ha of rangeland area should be allocated per animal unit during the 2.5 months of the upland period with respect to sustainable use of the upland rangelands in the study area.

Table 1. Botanical composition (%), basal coverage (%) and range condition and health class of the range sites

Attributes	Dry Site		Subirrigated Site	
	Species Number	Percentage	Species Number	Percentage
Plant Groups				
Grasses	15	46.81	6	58.01
Legumes	5	9.53	6	2.27
The others	28	43.66	23	39.72
Total	48		35	
Response to Grazing				
Decreaser	12	26.86	9	5.78
Increaser	7	28.78	3	11.79
Invader	29	44.36	23	82.43
Dominant Species	*Festuca ovina* (21.73%)		*Nardus stricta* (41.79%)	
Basal Coverage (%)	40.33		46.69	
Range Condition	Fair		Poor	
Health Class	Healthy		Healthy	
Carrying Capacity (Required area (ha)	2.2		2.0	

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