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DETERMINATION OF BOTANICAL COMPOSITION, NUTRIENT CONTENT, FEED VALUE AND QUALITY PARAMETERS BETWEEN MAY-AUGUST MONTHS OF NATURAL GRASSLANDS OF ANKARA PROVINCE

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Abstract

This study was carried out to determine change in botanical composition, nutrient content, feed value and some quality parameters of natural grasslands in Ankara, for 4 months May, June, July and August. The study was carried out in the natural rangeland areas of 3 villages within the borders of Ayaş (1 and 2) and Nallıhan (3) in Ankara province in 2016. The botanical composition, nutrient contents fibrous materials, mineral substances, with In vitro gas production: GP, dry matter digestibility: DMD, and organic matter digestibility: OMD, energy values, and methane production:MP capacities, in vitro neutral detergent fiber digestibility: dNDF, relative feed values: RFV and relative forage quality index:RFQI determined by taking feed samples every 15 days in May, June, July and August. The botanical diversity of rangelands was found different from each other. The proportion of legumes compared to weight in rangeland 1 was higher compared to grassland 2 and 3, and the proportion of the wheatgrain and others was lower. While wheatgrain and legumes ratio was close to each other on rangeland 2, the proportion of cereals was found higher than legumes on the rangeland 3. In all three rangelands, while the CP, NFE, N, Ca, GP, DMD, OMD, dNDF and RFV RFQI values of the plants were high in May, it was determined that these features decreased significantly until August ($P<0.05$). CF and ADF, NDF and ADL contents, were low in May, but increased significantly towards August ($P<0.05$). Ash content was higher in August and July than in May and June ($P<0.05$). While MP in rangeland 1 and 2 was high in May, June and July, and low in August ($P<0.05$), but in rangeland 3 was highest in May compared to other months ($P<0.05$). RFV and forage quality of plants in rangeland were highest in rangeland 1 followed by 2 and han rangeland 3. Angora goats can be grazed easily in May and June.

Keywords: Botanical composition, Feed value, Nutrient content, Rangeland, Quality

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1. Introduction

Roughage are important for saliva secretion, healthy rumen physiology, and economic nutrition in the nutrition of ruminants. The most important source of roughage for an economical livestock is rangeland areas. The feeding value of rangelands is not the same all year round. Since most of the plants grown in the rangelands develop in the spring season, animals graze most efficiently in the rangelands for 3-4 months (Saricicek, 2007).

Rangeland vegetation is a mixture of different varieties of wheatgrass and legumes and other families (Valentine, 2000). Knowing the nutritional values of rangeland plants is important for animal nutrition. The vegetative presence of each rangeland is unique and the nutritional values of the pasture and rangeland plants differ from the mono culture forage plants (Vázquez de Aldana et al., 2000). Quality of rangeland-pasture depends on the nutrient content of the feed, the digestibility of the nutrients and the amount of feed grazed by animals (George et al., 2001). The feeding values of rangeland-pasture forage crops are flora climate condition, altitude, irrigation, fertilization, soil structure and under the influence of plant vegetation period (Buxbaum and Vanderbilt, 2007). All plants communities change over time, regardless of their location. Environmental variables affect the distribution and composition of plant species in rangeland (He et al., 2007).

There are a total of 412.404,00 ha rangeland, plateaus and overwintering and public pasture and grasslands in Ankara. It is in the weak and middle class due to the characteristics of Central Anatolia precipitation belt. The average annual rainfall in Ankara Province is low and the area covered with plants has decreased by 10-40% in the meadows and pastures due to irregular grazing in the last 10 years (Anonymous, 2017). There has been insufficient information about the nutrient composition and feed values of the feeds in rangelands belonging to Ankara.

The purpose of this study is to compare by months (May, June, July and August) changes in botanical composition, nutrient content, and feed value and quality of natural rangelands in three villages in the districts where Ankara goat breeding enterprises are located and compare the rangelands in terms of their feed quality and to determine their quality.

2. Materials and Methods

2.1 Material

The feed material of the study consists of natural rangeland feeds. In Ankara province, among the rangeland in the area where 30 enterprises producing Ankara goat breeding were determined total 3 rangelands including 2 in the district of Ayaş (Başbereket and Ilıca) and 1 in Nallıhan (Çayırhan) district by observing the frequency and diversity of vegetation in the rangelands.

The study was carried out in Ankara in May, June, July and August in 2016. Ankara is a province with an average annual temperature of 11.9 °C with an altitude of 39.92° N, 32.85° D, 850 m in the Central Anatolia region. The annual average highest temperature is 17.8 °C, the lowest temperature is 6.2 °C. The average annual rainfall is 383 mm. The average number of rainy days is 101.8 days. The driest month is August, with 10 mm of rain. With an average of 52 mm of precipitation, the highest amount of precipitation is observed in May (Anonymous, 2016). Working area: Ankara province Ayaş (Principality: 40° 5' 59.6112" N and 32° 24' 9.0540" E, altitude 1200m (1) and Ilıca: 40° 3' 23.6592" N and 32° 15' 31.4748" E, altitude 750m) (2) and Nallıhan (Çayırhan 40° 5 ' 49.4736" N and 31° 40' 41.5668" E, altitude 503m) are the natural rangelands areas belonging to the village (3).

2.2. Method

In each rangelands, 4 sampling areas of 400 m² (20×20 m) were created to determine the botanical diversity, nutrient content, feed quality and value of the 3 rangelands in Ankara Province. In these areas, measurement points were determined with 4 mark piles on 4 lines.

Circles of 1 m² (100cm×100cm) were laid every 15 days from the determined measurement areas of each rangelands in May, June, July and August, the plants left in circles were collected by harvesting at a height of 3-5 cm from the ground level and labeled by putting them in locked bags. The leaves and branches at the height that animals can eat and reach from the bushes and trees were collected from lower, middle and upper parts.

For each group of plants taken from each rangeland, classification was made according to their botanical composition by weight (Koç and Çakal, 2004; Tosun and Altın, 1986). Identification of plants, were done by the methods of Davis (1965, 1985) and Davis et al., (1988)

The first dry matter was determined for nutrient analysis of the plant samples, and then the plants were dried in the oven at 45 °<C for 48 hours, kept open in the air and prepared for analysis as dry feed in air. Then, analysis of nutrients in dry air samples (dry matter; DM, crude protein; CP, ether extract; EE, ash were made according to A.O.A.C. (1998), each analysis was done in 3 replications; nitrogen free extracts:NFE by calculating, raw fiber CF, acid detergent fiber: ADF, neutral detergent fiber: NDF and acid detergent lignin; ADL analysis according to the method specified by Van Soest and Robertson (1991) using ANKOM-200 Fiber Analyzer (ANKOM Technology Corp. Fairport, NY, USA). Minerals in the ash (Ca, P, Mg, Na, K, Fe Zn Si, N) were made according to Boss and Fredeen (2004) and were read with ICP (Optima 2100 DV ICP / OES, PERKIN ELMER) at appropriate wavelengths (Optima 2100 DV ICP / OES, PERKIN ELMER). In vitro gas production (GP), metabolizable energy (ME) (Menke et al., 1979) and net energy lactation(NE_L) (Menke and Steingass, 1988), dry matter digestibility (DMD) and organic matter digestibility (OMD) and neutral detergent fiber digestibility (dNDF) of rangeland plants analyzed in Daisy incubator (ANKOM Techology Corp., Fairport, NY. USA) (Menke et al., 1979). Infrared methane analyzer (sensors Europa Analysentechnik GmbH, Erkrath, Germany) was used to determine the methane production (MP) of plants (Goel et al., 2008), and the relative feed value (RFV) was calculated according to Rohweder et al. (1978) and Relative forage quality (RFQ) index of

rangelands plants was made according to Undersander and Moore (2002).

2.3. Statistical Analysis

The normality assumption of the data on the nutrient content, in vitro gas production and digestibility of plants was determined to be suitable for the analysis of variance analysis of the data measured by the Levene test with the ShapiroWilk test (P>0.05). Therefore, one-way analysis of variance was used in the analysis of all data. The differences between pastures and months were determined by Duncan multiple comparison test (Önder, 2018; Genç and Soysal, 2018). The interaction was analyzed according to factorial trial pattern by variance analysis. SPSS 22 package program was used in the analysis of datas.

3. Results

3.1. Botanical Composition of Grasslands

The botanical structure was the first examined in plant samples taken from three different rangelands in May, June, July and August. The botanical structure of the rangeland plants is given in Table 1. As can be seen from the table, the botanical structure of the plant has changed according to the rangelands. When the botanical composition of rangeland 1 by weight is analyzed, it is determined that the rate of wheatgrass is lower compared to other rangelands and the rate of legumes is higher. On grassland 2, the proportion of the wheatgrass and legumes were found close to each other. Astragalus varieties from legumes were more common in rangelands 1 and 2. On the rangeland number 3, it was determined that the rate of legumes was less than that of wheatgrass. In rangelands, generally *Agropyron, Bromus, Festuca, Poa, Elymus, Triticale*, *Hordeum* and *Sorghum* species were found mostly from wheatgrass.

The most common legume varieties in the rangelands are *Astragallus* varieties, *Medicago rigidula, Onobrychus oxyodonta, Trifolium arvense, Lotus corniculatus, Lathyrus Fabales, Lotus aegaeus.* Others in the rangelands included mostly herbaceous and flowering plants. Mostly *Lamiaceae L., Galium aparine, Thymus, Artemisia fragrans, Euphorbia Rosidae, Convolvulus, Euphorbia Rosidae, Peganum harmala, Onopending acanthium, Centaurea iberica, Aethionema Dumanii, Cota tinctoria L., Cirsium arvense, Rumex acetovica,* has been widely encountered.

Table 1. The botanical structure of rangelands and proportion on the basis of weight

Rangeland 1	%	Rangeland 2	%	Rangeland 3	%
		Wheatgrass			
Aegilops ovata	1.27	*Agropyron intermedium*	1.15	*Agropyron cristatum*	1.77
Agropyron intermedium	1.65	*Bromus japonicus*	1.52	*Avena fatua*	1.25
Avena fatua	2.55	*Bromus tectorum L*	1.09	*Bromus tomentellus*	0.75
Andropogan griyllus	1.75	*Chrysopogon gryllus*	2.05	*Elymus repens*	1.55
Bromus erectus	1.25	*Dactylis glomerata*	2.15	*Festuca valesiaca*	1.58
Cynodon dactylon	1.85	*Elymus junceus*	1.27	*Hordeum murinum*	0.67
Dactylis glomerata	1.75	*Elymus repens*	2.55	*Poaceae Stipa*	1.21
Elymus repens	1.85	*Festuca ovina*	2.25	*Secale montanum*	1.62
Festuca ovina	1.56	*Festuca valesiaca*	1.73	*Chrysopogon gryllus*	1.65
Hordeum murinum	1.68	*Hordeum murinum*	0.75	*Cynodon dactylon*	1.77
Poa pratensis	1.30	*Secale montanum*	1.15	*Hordeum bulbosum*	1.89
Stipa lagascae	1.23	*Poa nemoralis*	2.27	*Poaceae Stipa*	1.17
Sorghum halepense	1.00	*Poa bulbosa var. Vivipara*	1.18	*Triticale*	1.16
Total	20.69		21.12		22.04
		Legumes			
Astragalus densifolius subsp. ayashensis	2.11	*Astragallus angustifolius*	2.45	*Astragalus beypazaricus*	2.05
Astragalus cicer L.	2.25	*Astragalus beypazaricus*	2.71	*Astragalus fabaceus*	3.44
Astragalus densifolius	2.64	*Astragalus densifolius subsp. ayashensis*	2.25	*Astragalus trichostigma*	2.12
Astragalus fabaceus	2.52	*Astragallus glycyphyllos*	1.78	*Ebenus hirsuta*	2.82
Astragalus microcephalus	2.23	*Astragalus microcephalus*	2.18	*Lotus corniculatus L. Va*	2.14
Astragalus turcicus	1.80	*Ebenus hirsuta*	1.55	*Onobrychis oxyodonta Boiss*	1.73
Medicago rigidula	1.15	*Medicago rigidula*	1.85	Trifolium hybridum	1.78
Cicer arietinum	1.17	*Onobricus armena*	1.57	Trifolium pallidum	2.52
Lathyrus Fabales	1.65	*Trifolium incarnatum*	1.00		
Lolium perenne	0.67	*Trifolium repens*	1.16		
Lotus aegaeus,	0.67	*Triticale*	1.50		
Lotus corniculatus	0.77	*Vicia cracca*	1.06		
Onobrychis oxyodont	0.75		1.15	*Agropyron cristatum*	1.77
Onobrychis elata	1.50		1.52	*Avena fatua*	1.25
Trifolium arvense	1.15		1.09	*Bromus tomentellus*	0.75
Triticale	0.25		2.05	*Elymus repens*	1.55
Total	23.28		21.06		18.6

Table 1. The botanical structure of rangelands and proportion on the basis of weight (continuing)

Rangeland 1	%	Rangeland 2	%	Rangeland 3	%
		Others			
Acroptilon repens	1.07	*Adonis aestivalis*	1.55	*Achillea millefalium*	1.01
Aethionema dumanii.	1.95	*Adoxaceae Sambucus ebulus L.*	1.19	*Adoxaceae Sambucus ebulus L.*	0.73
Alopecurus arandinaceus	1.28	*Aethionema dumanii,*	0.75	*Alyssum niveum*	1.55
Amaranthus sp.	0.06	*Amygdalus orientalis*	0.98	*Anthemis cretica*	0.33
Anthemis cretica,	2.11	*Berberis crataegina*	0.75	*Amygdalus orientalis*	1.00
Artemisia fragrans	1.50	*Brassica juncea*,	1.02	*Artemisia santonicum*	1.15
Asperula bornmuelleri	1.05	*Campanula damboldtiana.*	1.55	*Asyneuma linifolium nallıhanicum*	1.11
Artemisia santonicum	1.22	*Carduus nutans*	1.01	*Brassica juncea*	1.27
Brassica juncea	0.68	*Carthamus sp*	0.84	*Carduus nutans*	1.38
Campanula damboldtiana.	1.15	*Centaurea solstitialis*,	0.68	*Campanula latifolia* L.	1.26
Campanula latifolia L.	0.02	*Centaurea iberica Trev. ex Sprenge.*	0.57	*Carduus nutans*	1.28
Carex sp	1.00	*Chenopodiaceae Album L.*	0.75	*Centaurea iberica Trev. Ex Sprenge*	0.76
Carthamus lanatus	1.45	*Cirsium arvense*	1.05	*Cichorium intybus*	1.25
Centaurea iberica	0.05	*Convolvulus arvensis*	1.00	*Cirsium arvense*	0.78
Centaurea solstitialis	2.45	*Cota tinctoria L*	0.06	*Cotoneaster nummularia*	1.17
Chenopodiaceae Album L.	0.85	*Cotoneaster nummularia*	1.00	*Cornus mas L.*	1.12
Cirsium arvense	0.73	*Cupressaceae JuniperusL.*	0.79	*Crataegus pentagyna Waldst*	1.78
Conium maculatum L.	1.33	*Crataegus orientalis*	1.15	*Cynanchum acutum* L	1.11
Convolvulus arvensis	1.75	*Crataegus monogyna*	1.02	*Cytisus scoparius*	1.07
Crataegus monogyna	1.05	*Cota tinctoria L.*	1.63	*Ebenus hirsuta*	1.21
Crepis purpurea	0.95	*Cynanchum lineatus*	1.15	*Elymus hispidus*	0.79
Cynanchum lineatus,	2.15	*Cyticus scoparius*	1.58	*Erodium cicitarium*	1.18
Euphorbia Rosidae	0.05	*Dorycnium pentaphyllum*	1.27	*Euphorbia esula*	1.17
Fagaceae Quercus	1.79	*Erodium cicutarium*	1.55	*Galium aparine*	1.51
Galium aparine	2.15	*Euphorbia Rosidae*	1.47	*Hodan*	1.27
Hedysarum varium	2.17	*Fabaceae Acacia*	1.29	*Lappaceum,*	1.41
Juncus sp	1.00	*Fagaceae Quercus*	1.23	*Lolium rigidum*	1.12
Koelaria cristata	0.05	*Galium aparine*	1.32	*Malabaila secacu*	0.17
Lamiaceae L.	0.08	*Hedysarum varium*	0.61	*Muscari adilii*,	0.09
Lavandula stoechas	2.15	*Hypericum perforatum*	0.75	*Onopordum acanthium*	1.38
Malvaceae Alcae	2.25	*Juniperus oxycedrus*	0.56	*Onopordum illyricum*	0.99
Onopordum acanthium	1.01	*Logfia arvensis*	0.08	*Ornithogalum narbonense L.*	1.56
Onopordum illyricum	1.14	*Lamiaceae L.*	0.61	*Paliurus spina*	1.28
Ophiopogon japonicus	0.83	*Linum nodiflorum*	1.57	*Peganum harmala*	1.55
Paliurus spinosa	0.07	*Marrubium parviflorum*	0.54	*Plantaginaceae veronica*	1.37
Papaver arenarium	0.27	*Minuartia hamata*	0.09	*Plantago lanceolata* L	1.53
Peganum harmala	0.34	Minuartia anatolica	0.06	*Potentilla recta*	1.09
Pelargonium graveolens	0.22	*Ophiopogon japonicus*	0.05	*Poterium sanguisorba*	1.17
Plantago lanceolata	0.66	*Ornithogalum Umbellatum*	0.15	*Pyrus elaeagnifolia*	1.77
Plantaginaceae veronica	1.52	*Paliurus spina-christi*	1.75	*Rumex acetosella*	1.62
Prunus cocomilia	1.05	*Papaver arenarium Bieb.*	0.06	Rosaceae Rubus	0.88
Prunus spinosa,	0.15	*Peganum harmala*	1.25	Salsola ruthenicca	0.84
Quercus L.	0.08	*Pelargonium graveolens*	1.38	*Salvia sp.*	0.06
Quercus cerris	1.23	*Phleum bertolonii*	1.02	*Scabioosa sp.*	0.11
Rosa foetida,	56.03	Plantaginaceae *veronica*	1.06	*Slybum marianum*	0.78
Rosaceae Rubus	100.0	*Pyrus elaeagnifolia*	0.75	Sinapis arvensis	0.66
Rosa hemisphaerica	1.07	*Prunus spinosa,*	1.16	*Spartium junceum*	1.23
Rumex acetocella	1.95	*Quercus pubescens*	0.88	*Taraxacum officinale*	1.56
Sanguisorba officinalis	1.28	*Rosaceae Rubus*	0.06	*Teltaria auiacea*	0.79
Sinapis arvensis	0.06	*Rumex acetosella*	2.17	*Thymus sepyllum*	1.05
Stipa holosericea	2.11	*Silybum marinum*	1.16	*Thymus squarrosus*	1.10
Sonchus sp	1.50	*Sinapsis arvensis*	1.07	*Xanthium spinosum L.*	1.22
Taraxacum officinale	1.05	*Spartium junceu*,	1.22	*Verbascum lydium*	0.89
Taraxacum scaturiginosum	1.22	*Taraxacum serotinum*	1.00	*Verbascum thapsus L.*	1.85
Teucrium chamaedrys	0.68	*Teltaria auiacea*	1.10		
Thymus squarrosus,	1.15	*Thymus sipyleus Boiss.*	2.75		
Tragopogon buphthalmoides	0.02	*Thymus squarrosus*	1.40		
Xanthium spinosum	1.00	*Tragopogon reticulatus*	0.83		
Verbascum thapsus L.	1.45	*Tragopogon dubius*	0.11		
Viscum albüm L.	0.05	*Tripleurospermum sevanense*	0.06		
Zantedeschia aethiopica	2.45	*Urtica*	1.21		
Total	0.85		58.82		59.36
General total	0.73		100		100

In addition to fodder and flowering plants, *Fagaceae Quercus, Prunus spinosa, Fabaceae Acacia, Rosaceae Rubus, Cornus mas L., Cotoneaster nummularia, Cupressaceae JuniperusL. Shrubs,* trees and thorny plants such as *Xanthium spinosum* are also found. When general appearance of rangelands was examined, it is determined that although there was more plant diversity in rangelands 1 and 2, there was less plant diversity in rangeland 3.

3.2. Nutrient Contents of Rangelands

The change of nutrient contents of rangeland plants by months are given in Table 2. Grassland X month interaction was found significant for all variables mentioned in Table 2 (P<0.05).

Table 2. Change of nutrient composition by months of grasslands (100% DM)

Grassland no	Nutrients	May	June	July	August	Sig
1	CP	16.85 ± 0.69ᵃ	15.24 ± 0.62ᵃ	13.49 ± 0.63ᵇ	12.64 ± 0.09ᵇ	<0.001
	EE	1.45 ± 0.02ᶜ	1.44 ± 0.06ᶜ	1.54 ± 0.08ᵇ	1.75 ± 0.05ᵃ	0.007
	Ash	1.58 ± 0.07ᵈ	3.47 ± 0.64ᶜ	4.58 ± 0.37ᵇ	5.75 ± 0.87ᵃ	<0.001
	NFE	49.01 ± 0.73ᵃ	43.9 ± 1.40ᵇ	38.21 ± 0.60ᶜ	37.43 ± 0.89ᵈ	<0.001
	CF	31.12 ± 0.24ᶜ	35.91 ± 0.33ᵇ	42.18 ± 0.96ᵃ	42.43 ± 2.65ᵃ	<0.001
	ADF	34.32 ± 0.29ᵈ	37.75± 0.32ᶜ	42.00 ± 2.48ᵇ	56.67 ± 0.09ᵃ	<0.001
	NDF	41.39 ± 0.96ᵈ	45.71 ± 0.95ᶜ	51.94 ± 2.64ᵇ	67.27 ± 1.79ᵃ	<0.001
	ADL	4.57 ± 0.07ᵈ	6.50 ± 0.33ᶜ	14.24 ± 0.62ᵃ	10.71 ± 1.36ᵇ	<0.001
	Ca	5.43 ± 0.26ᵃ	3.92 ± 0.07ᵇ	3.71 ± 0.24ᵇ	2.72 ± 0.028ᶜ	<0.001
	P	0.10±0.001ᵇ	0.11 ± 0.001ᵃ	0.10 ± 0.001ᵇ	0.10 ± 0.001ᵇ	<0.001
	Mg	0.44±0.005ᶜ	0.27 ± 0.001ᵈ	1.04 ± 0.001ᵃ	0.68 ± 0.020ᵇ	<0.001
	Na	0.24±0.002ᶜ	0.14 ± 0.011ᵈ	0.35 ± 0.005ᵇ	0.41 ± 0.010ᵃ	<0.001
	K	1.32±0.005ᶜ	1.41 ± 0.001ᵇ	1.11 ± 0.000ᵈ	1.62 ± 0.01ᵃ	<0.001
	N	2.12±0.002ᵃ	2.14 ± 0.020ᵃ	1.25 ± 0.027ᶜ	1.32 ± 0.002ᵇ	<0.001
	Fe	0.55 ± 0.003ᵇ	0.33 ± 0.012ᶜ	0.82 ± 0.001ᵃ	0.52 ± 0.034ᵇ	<0.001
	Zn	0.025±0.002ᵇ	0.031±0.000ᵃ	0.032± 0.000ᵃ	0.026±0.001ᵇ	0.007
	Si	0.05±0.001ᵇ	0.04 ± 0.002ᶜ	0.08 ± 0.003ᵃ	0.03 ± 0.002ᵈ	<0.001
2	CP	16.23 ± 0.27ᵃ	13.26 ± 0.35ᵇ	13.20 ± 0.53ᵇ	12.20 ± 0.24ᶜ	<0.001
	EE	1.46 ± 0.03ᶜ	1.52 ± 0.12ᵇ	1.91 ± 0.15ᵃ	1.75 ± 0.15ᵃᵇ	0.078
	Ash	4.12± 0.28ᵇ	3.60 ± 0.28ᵇ	9.33 ± 2.98ᵃ	11.41 ± 1.05ᵃ	0.010
	NFE	44.61±0.52ᵃ	44.48 ± 2.37ᵃ	37.22±4.40ᵃᵇ	28.38± 1.48ᵇ	0.008
	CF	33.58±1.94ᵇ	37.14 ± 1.60ᵇ	38.34 ± 0.25ᵇ	46.26 ± 0.89ᵃ	0.027
	ADF	36.32±2.02ᵈ	41.99 ± 1.48ᶜ	44.19 ± 0.24ᵇ	48.49 ± 0.21ᵃ	0.047
	NDF	43.35±2.52ᵇ	53.62 ± 2.24ᵇ	54.02 ± 0.50ᵇ	59.20 ± 1.00ᵃ	0.030
	ADL	5.41±0.10ᵈ	8.48 ± 0.62ᶜ	10.62 ± 0.24ᵇ	12.72 ± 0.08ᵃ	0.001
	Ca	4.15± 0.03ᵃ	2.21 ± 0.02ᵈ	2.67 ± 0.07ᶜ	3.22 ± 0.13ᵇ	<0.001
	P	0.09±0.003ᵇ	0.12 ± 0.003ᵃ	0.08 ± 0.005ᵇ	0.08 ± 0.007ᵇ	<0.001
	Mg	0.76±0.003ᵇ	0.23 ± 0.019ᵈ	0.93 ± 0.027ᵃ	0.63 ± 0.014ᶜ	<0.001
	Na	0.31±0.012ᵇ	0.17 ± 0.002ᶜ	0.43 ± 0.004ᵃ	0.19 ± 0.006ᶜ	<0.001
	K	1.14 ± 0.003ᶜ	1.49 ± 0.008ᵃ	1.12 ± 0.005ᶜ	1.20 ± 0.029ᵇ	<0.001
	N	2.12±0.002ᵃ	1.72 ± 0.05ᵇ	1.83 ± 0.021ᵇ	1.18 ± 0.06ᶜ	<0.001
	Fe	0.53 ± 0.007ᵇ	0.35 ± 0.014ᶜ	0.75 ± 0.010ᵃ	0.32 ± 0.003ᵈ	<0.001
	Zn	0.03±0.001ᵃ	0.03± 0.001ᵃ	0.03 ± 0.001ᵃ	0.024±0.001ᵇ	0.001
	Si	0.04±0.001ᵇ	0.05 ± 0.001ᵇ	0.08 ± 0.003ᵃ	0.03 ± 0.002ᶜ	<0.001
3	CP	13.40±0.14ᵃ	12.33± 0.37ᵇ	11.67±0.16ᶜ	11.24 ± 0.03ᶜ	<0.001
	EE	1.42 ± 0.04ᶜ	1.41 ± 0.04ᶜ	1.52 ± 0.06ᵇ	1.65 ± 0.08ᵃ	0.038
	Ash	5.75± 0.38ᵈ	9.77 ± 0.21ᶜ	11.14 ± 0.12ᵇ	16.27 ± 0.71ᵃ	<0.001
	NFE	46.30±0.67ᵃ	37.91 ± 0.58ᵇ	25.08 ± 1.06ᶜ	18.35 ± 1.39ᵈ	<0.001
	CF	33.13 ± 0.35ᵈ	38.34 ± 0.25ᶜ	50.70 ± 0.54ᵇ	52.62 ± 0.74ᵃ	<0.001
	ADF	39.01±0.34ᶜ	44.19 ± 0.24ᵇ	45.43± 0.38ᵇ	58.99 ± 0.24ᵃ	<0.001
	NDF	46.39±0.21ᶜ	54.02 ± 0.50ᵇ	56.39 ± 1.62ᵇ	74.85 ± 0.10ᵃ	<0.001
	ADL	5.53± 0.49ᶜ	10.62 ± 0.24ᵇ	10.75 ± 0.40ᵇ	15.85 ± 0.15ᵃ	<0.001
	Ca	3.97 ± 0.20ᵃ	2.14 ± 0.002ᶜ	2.90 ± 0.013ᵇ	1.87 ± 0.041ᵈ	0.035
	P	0.11 ± 0.004ᵇ	0.11 ± 0.001ᵇ	0.12 ± 0.001ᵃ	0.10 ± 0.001ᶜ	<0.001
	Mg	0.54±0.013ᵃ	0.52 ± 0.003ᵇ	0.53 ± 0.006ᵃ	0.24 ± 0.001ᶜ	<0.001
	Na	0.18 ± 0.002ᵃ	0.18 ± 0.001ᵃ	0.17 ± 0.001ᵇ	0.17 ± 0.002ᵇ	<0.001
	K	1.60 ± 0.14ᵇ	2.01 ± 0.01ᵃ	2.06 ± 0.03ᵃ	1.20 ± 0.029ᶜ	0.001
	N	1.36 ± 0.05ᵃ	0.72 ± 0.027ᶜ	1.19 ± 0.03ᵇ	0.54 ± 0.008ᵈ	<0.001
	Fe	0.96 ± 0.013ᵃ	0.09 ± 0.003ᶜ	0.09 ± 0.004ᶜ	0.40 ± 0.009ᵇ	<0.001
	Zn	0.03 ± 0.001	0.03 ± 0.001	0.03 ± 0.002	0.031± 0.001	0.428
	Si	0.04 ± 0.002ᵇ	0.04 ± 0.003ᵇ	0.04 ± 0.003ᵇ	0.06 ± 0.001ᵃ	<0.001

[a, b, c] There is a difference between the means shown in different letters on the same line, P<0.05

DM= dry matter, CP= crude protein, EE= ether extract, NFE= nitrogen free extract, CF= crude fiber, ADF= acide detergant fiber, NDF= nötr detergent fiber, ADL= acide detergant lignin

While CP and NFE content of plants were highest in May and June in all three rangelands, it was found to be the lowest in August and July and the differences between them were significant (P<0.05). The highest CP content was determined in rangeland 1, followed by rangeland 2 and rangeland 3.

EE content of rangeland plants was higher in rangeland 1 and 3 in August, while it was significantly higher in rangeland 2 in July and August compared to other months (P<0.05). As growing periods of plants progressed, EE content also increased.

Ash content was found to be significantly higher in all three rangelands compared to other months in August and July (P<0.05). The effect of months on the fiber material content of the plants was important. Fibrous materials indicative of digestibility; CF, ADF, NDF and ADL contents was low in May in all 3 rangelands, but increased in August and difference between months in terms of these criteria was significant (P<0.05).

Ca and N from minerals was significantly higher in May compared to other months in all 3 rangelands (P<0.05). While P was the highest in rangelans 1 and 2 in June, it was highest in rangeland 3 in July (P<0.01). Mg, Fe, Zn and Si contents of plants were highest in rangelands 1 and 2 in July (P<0.05), whereas Mg in July 3, Fe, May and Si were highest in August (P<0.05). Na was found to be the highest in rangeland 1 in August, in rangeland 2 in July, and in rangeland 3 in May-June (P<0.05). K content was high in rangeland 1in August, while rangeland 2 was high in June, and rangeland 3 was high in July and June (P<0.05). The mineral content of the plants in the rangelands varied by month.

3.3. In Vitro Feed Values of Rangelands

The change of in vitro GP, methane, DMD, OMD ME, NE_L, dNDF values of rangelands by months is given in Table 3. Rangeland X month interaction is important for all variables in Table 3 (P<0.05).

Table 3. Change of feed value in vitro by months of grasslands (100%DM)

Grassland no		May	June	July	August	Sig
1	GP	41.6 ± 0.79^a	40.14 ± 0.47^b	39.88 ± 0.04^c	36.47±0.06^d	0.001
	Methane,ml	5.37 ± 0.11^a	5.28 ±0.09^a	5.16 ± 0.13^a	4.64 ± 0.2^b	0.001
	Methane ,%	14.98±0.08^a	14.3 ± 0.12^a	14.25 ± 0.06^a	13.65 ± 0.20^b	0.001
	DMD	68.36±0.18^a	66.71 ± 0.18^b	54.97 ± 0.63^c	53.8 ± 0.26^d	0.001
	OMD	52.08±0.33^a	52.13 ± 1.36^a	50.40 ± 0.58^b	49.00 ± 0.64^b	0.005
	ME	7.88 ± 0.04	7.86 ± 0.21	7.62 ± 0.09	7.52 ± 0.09	0.149
	NE_L	4.76 ± 0.04	4.66 ± 0.19	4.27 ± 0.08	4.25 ± 0.08	0.181
	dNDF,%KM	21.37 ± 2.46^a	20.92± 1.4^a	12.94 ± 0.22^b	12.5 ± 0.78^b	0.001
2	GP	41.24±0.12^a	39.42 ± 0.31^a	39.07± 0.45^a	28.81 ± 8.43^b	0.001
	Methane,ml	5.38± 0.18^a	5.19 ± 0.07^a	5.15 ± 0.07^a	4.89 ± 0.4^b	0.004
	Methane,%	14.28±0.08^a	14.28 ± 0.09^a	14.25 ± 0.15^a	13.65 ± 0.17^b	0.063
	DMD	66.77±0.20^a	62.14 ± 0.22^b	57.23 ± 0.19^c	56.4 ± 0.42^c	0.001
	OMD	52.62 ± 0.29^a	50.26 ± 0.24^b	49.83 ± 1.21^b	46.04 ± 3.23^c	0.035
	ME	7.52 ± 0.18^a	7.38 ± 0.12^a	7.15 ± 0.04^b	6.90 ± 0.05^c	0.001
	NE_L	4.47 ± 0.07^a	4.43 ± 0.13^b	4.42 ± 0.03^b	4.12 ± 0.04^c	0.002
	dNDF %KM	22.22 ± 1.88^a	20.2 ± 1.86^a	20.4 ± 0.54^a	11.91 ± 0.45^b	0.001
3	GP	41.62 ± 0.20^a	41.28 ± 0.12^a	38.79 ± 0.02^b	37.84 ± 0.12^c	0.001
	Methane	6.24 ± 0.06^a	5.62 ± 0.03^b	5.54 ± 0.18^b	5.47 ± 0.12^b	0.001
	Methane, %	15.45 ± 0.03^a	14.85 ± 0.03^b	14.55 ± 0.03^c	14.55 ± 0.15^c	<0.001
	DMD	65.34±0.004^a	57.64 ± 0.004^b	54.28 ± 0.01^c	46.95 ± 0.50^d	<0.001
	OMD	51.42 ± 0.65^a	49.00 ± 0.64^b	47.43 ± 0.24c	45.77 ± 2.35^d	<0.001
	ME	7.94 ± 0.04^a	7.58 ± 0.04^a	7.76 ± 0.1^a	6.95 ± 0.49^b	<0.001
	NE_L	4.7 ± 0.04^a	4.64 ± 0.09^a	3.89 ± 0.32b	3.94 ± 0.39b	<0.001
	dNDF, %KM	19.28 ± 2.92a	17.42 ± 2.34b	12.5 ± 0.78^c	11.88 ± 0.14^d	0.008

[a, b, c-] There is a difference between the means shown in different letters on the same line, P<0.05

GP= gass production, DMD= dry matter digestibility, OMD= organic matter digestibility, ME= metabolisable energy, NEL= net energy Lactation, dNDF= digestible nötr detergant fiber

GP potential of rangeland plants varied by months. While GP was highest in May in rangeland 1, May-June-July in rangeland 2, May-June in rangeland 3 (P<0.05), was lowest in all rangelands in August (P<0.05). As the development period of plants progressed, GP decreased.

MP (ml) and capacity (%) of rangeland plants were significantly higher in rangeland 1 and 2 in May-June-July, and in rangeland 3 in May compared to other months (P<0.05).

In vitro DMD and OMD of rangelandswere found to be significantly higher in May compared to other months (P<0.05), These criteria tended to fall until August.

There was no statistically significant difference between months in terms of ME and NE_L values of plants in rangeland 1. ME value of plants in rangeland number 2 was significantly higher in May and June than in July and August (P<0.05). In terms of ME value of rangeland 3, no significant difference was found between May, June and July, and ME value decreased significantly in August (P<0.05). The NE_L value of rangeland number 2 was found significantly higher in May compared to other months (P<0.05) and lowest in August (P<0.05). The NE_L value of rangeland number 3 was found to be significantly higher in May and June compared to July and August (P<0.05).

In vitro dNDF values of rangeland plants changed by months. dNDF was found to be highest in May and June in rangeland 1, in May-June and July in rangeland 2, in May in June 3, and lowest in August (P<0.05).

3.4. Feed Quality of Rangelands

DMI, DMD and RFV values calculated using ADF and NDF values for determining roughage values of rangeland plants are given in Table 4. Grassland X month interaction is important for all variables in Table 4 (P<0.05).

The predicted DMI in all rangelands was determined in the highest in May and the lowest in August, and the difference between the months for DMI was significant

(P<0.05).No significant difference was found between June and July in terms of DMI on rangeland 2.

DMD was found higher in rangeland 1 in May compared to other months, and a significant difference was determined between months (P<0.05). In rangelands 2 and 3, DMD was highest in May compared to other months, while it was lowest in August (P<0.05). No significant differences were found between June and July in terms of DMD in this both rangelands.

RFV scored over 100 in May, June and July in pasture number 1, and scored below 100 in August and had the worst feed value with 5. Quality. On the rangeland 2, RFV was included in the 1st Quality Class in May, as it received less than 100 points in June and July, and in the 3rd Quality (middle) Class and in 4th (Bad) in August. Rangeland 3 was included in the 2nd Class in May, 3rd Class in June and July (middle), and 5th quality (worst) in August.

RFQI scored over 100 points in May, June and July in rangeland 1 and 2, and less than 100 points in August. The difference between months was significant (P<0.05). On the rangeland 3, there were more than 100 points in May, whereas June, July and August were below 100 points and the difference between the months was important (P<0.05).

Table.4. Change of feed value and quality by months of grasslands

Grassland no		May	June	July	August	Sig
1	DMI	2.99± 0.03a	2.63± 0.05b	2.31± 0.01c	1.78± 0.01d	0.001
	DMD	62.17±0.11a	59.49± 0.15b	56.18± 0.22c	44.75± 1.12d	0.001
	RFV	139.71±1.53a	121.07± 1.45b	100.62±1.37c	61.89± 1.24d	0.001
	RFQI	195.03±1.25a	163.89±1.44b	115.16±1.36c	92.94±1.77d	0.004
2	DMI	2.768± 0.03a	2.24± 0.04b	2.22± 0.02b	2.03± 0.01c	0.003
	DMD	60.61± 1.24a	56.19± 1.35b	54.48± 1.27b	51.13± 1.41c	0.001
	RFV	130.05±1.23a	97.481± 0.21b	93.81± 1.09c	80.34± 1.31d	0.007
	RFQI	177.80±1.39	143.45±1.79	128.99±1.57	82.45±1.82	0.005
3	DMI	2.58± 0.01a	2.22± 0.07b	2.13± 0.01c	1.60± 0.02d	0.001
	DMD	58.51± 1.32a	54.47± 0.13b	53.51± 0.23b	42.95± 1.21c	0.001
	RFV	117.33±1.26a	93.81± 0.18b	88.27± 1.21c	53.37± 1.37d	0.001
	RFQI	159.54±1.49	118.95±1.56	78.05±1.79	53.30±1.92	0.004

[a, b, c-] There is a difference between the means shown in different letters on the same line, P<0.05

DMI= dry matter intake, DMD= digestible dry matter, RFV= relative feed value, RFQI= relative forage quality index.

4. Discussion

4.1. Botanical Composition of Rangelands

While variety of plants and the proportion of legumes in rangelands that are the subject of the study are higher than the wheatgrass in rangeland 1 (Ayaş-Başbereket), the ratio of wheatgrass in the rangeland 3 (Nallıhan-Çayırhan) is higher than the legumes. The most in among wheatgrass *Agapyron Gaertn, Bromus L., Lolium L., Festuca L., Poa L., Dactylis glomerata L., Phleum pratense L., Cynodon dactylon L*. species were found. Among the legumes, *Medicago sativa L., Onobrychis viciifolia Scop., Trifolium L, Vicia L., Lathyrus sativus L., Lotus corniculatus L.* and *Astragalus* species were encountered. Fresh grassland plants are more present in the rangeland in May and June, but decreased in July and August due to the progression of vegetation, the increase in temperature and the decrease of precipitation, and they were replaced by dry grass, stalks, straw, shrubs, thorny trees and leaves. Many researchers state that plant communities change over time, and environmental variables affect the distribution and composition of plant species in the rangeland (El Bana et al., 2002; Jafari et al., 2004; He et al., 2007). However, goats have good ability to evaluate shrubs and leaves. It is stated that goats have high adaptability to nutritional conditions with different plant species even in different seasonal and geographical conditions (Goetsch et al., 2014) and It is stated that leafless, thorny bushes eat flower parts (Garcia and Gall, 1981). It is reported that plants such as *Cirsium spp* (Beskow 2001; Lamming, 2001), *Carduus nutans* (Host and Allan, 1999), *Onopordum illyricum* (Torrano et al., 1999), *Rumex* species (Hejcman et al., 2014), *Centaurea solstitialis* (Thomsen et al., 1993), *Rubus fructicosus* (Dellow et al.1988), *Artemisia tridentata* and *Juniperus sp, Euphorbia esula* and *Onopordum acanthium* (Beskow, 2001), *Cytisus scoparius* (Pierce, 1990), *Carthamus lanatus* (Lacey et al., 1992), which are also commonly found in rangelands in the present study, are consumed by goats.

4.2. Nutrient Composition of Rangelands

In the rangelands of the study, it was seen that the CP level was the highest in May, but decreased until August. CP content in rangeland 1 decreased from 16.85% in May to 12.33% in August, from 16.23% to 12.20% in rangeland 2 and from 13.40% to 11.24% in rangeland 3. CP content of rangelands decreased in parallel with the progression of vegetation and the increase of temperatures. However, CP ratios are sufficient for small ruminants in all rangelands in May-June (NRC, 2001). The most important reason for the high CP content in May and June in these two rangelands may be due to the fact that the plants of leguminous origin are higher than the rangeland 3 and fresh, young plants in May-June are higher than in July and August. Acharya et al. (2006) state that some of the geven species are perennial legume forages, this explains the high CP content especially in rangeland 1. According to McDonald et al. (1995), CP ratios of rangeland, vary depending on species diversity and families to which species belong, soil structure, fertilization and vegetation period.

In the study, EE level of rangeland plants varied according to months and rangelands. While the EE ratios of plants in rangelands are lower in May and June, EE content increased as the plant matured in July-August. Similarly, Similarly, Pallardy (2008) stated that EE content of plants varies depending on the periods. In some studies with shrubs, it was stated that the level of EE was low at the beginning of growth and there was an increase in EE content due to the progress of maturation (Wood et al., 1995, Singh and Todaria, 2012).

Ash rates of rangeland plants differ significantly between the rangelands as well as each month. Ash rates in May-August varied between 1.58-5.75% in rangeland 1, 4,12-11,42% in rangeland 2, and 5,75-16,27% in rangeland 3. Ash rate of rangeland grass is lower than it should be (9.80%) in all months in rangeland 1, May-June in rangeland 2, May in rangeland 3 compared to NRC (2001). Similarly, Kaya et al. (2001) reported that CP ratio decreased from 20.45% to 9.68% in meadow pastures (May-July) in Kars and its region, and CF increased from 24.66% to 33.58% and significant changes occurred in nutrient contents as the vegetation period progressed. Some other researchers stated that protoplasm substances with high protein content in young cells are too high, cell wall substances are low (Papachritou et al., 2005), and the protein ratio decreases in parallel with the progression of development, but an increase in cell wall materials is observed (Haddi et al., 2003). Their opinions are also compatible with the findings of the study.

Since Lignin is a fibrous compound that cannot be digested by rumen microorganisms, the increase in ADL in August reduces the feed value of plants. Wheatgrass develops faster than legumes and has more and harder stems. However, maturation is slower in legumes (Nelson and Moser, 1994).

In this study, mineral contents of rangeland plants varied according to months, but it was also found different between rangelands. Khan et al. (2004) reported that the level of microelements in forage depends on the type and plant growth cycle, season and soil structure.

4.3. In Vitro Feed Value of Rangelands

While the GU potential of pasture plants was high in May, it decreased in other months, especially in August. It is stated that there is a positive correlation between the amount of CP in feed structure and in vitro GP, and a negative relationship between the increase in cell wall components and in vitro GP (Larbi et al., 1998). This view of the researchers is compatible with the result of the current study. Because CP content of rangelands have high in May and fibrous material content is low, on the contrary, CP content in August is low and fibrous content is high. The reason of produce less gas in August of microorganisms can be explained by the fact that they provide less from feeds of the available protein that they need (Cone and Van Gelder, 1999; Blümmel et al., 2003) and richer in feeds of NDF, ADF and ADL, which they can use less. Also Blümmel and Ørskov (1993); emphasized the increase in GP and VFAs (Volatile fatty acids) due to carbohydrate metabolism in rumen and their fermentation.

MP capacities of rangeland plants varied by months (Table2). Although MP was significantly lower in the rangelands 1 and 2 in August compared to the other months, MP capacity in rangeland 3 in May was significantly higher than in the other months. It is stated that MP in ruminants is at the beginning of global climate change (Steinfeld et al., 2006). MP also increased when CP content of feeds was high. Lopez et al. (2010) reported that methane content of the total gas produced during fermentation can be used to determine the antimetanogenic potential of any feedstuffs and that the feed ingredients can be classified into three groups; low potential (methane in gas between 11-14%), medium potential (methane in gas between 6-11%) and high potential (methane in gas between 0-6%). It was seen that the antimetanogenic potential of the plants in the rangelands is in the lower class. Also, Jayanegara et al. (2009) reported a high correlation (r = 0.86) between CH_4 production and NDF content of feed material in a study with 17 different plants. In this study, NDF content was also low during the months when the methane content was high.

In our study, DMD, OMD values of rangeland plants were found to be higher in May and June, but lower in July and August. The most important factor affecting this result is the fractions of cellulose. Low levels of CF, ADF, NDF, ADL in May and June compared to July and August caused the digestibility to be higher in these months, and this increased the feed value. This situation can be attributed to the increase of the cell wall components (lignification) of herbs with the progression of vegetation. It can also be said that in July and August, feeds rich in nutrients that are difficult to dissolve in rumen, such as NDF, ADF and ADL, reduce OMD by limiting microbial fermentation.

Energy (ME and NE_L) values of plants in rangelands fell in May, when the plants were fresh and tender, and dropped until August when temperatures started to increase.

Similarly, Wilson et al (1991) reported that the main reason for the decrease in OMD, ME and NE_L levels during development was lignification.

While Frost et al. (2008) stated that as the plant stem ratio increases, there is an increase in cell wall components (NDF, ADF, ADL), this significantly decreases digestion, while some researchers have found that digestibility is related to cell wall materials (Jung and Allen, 1995; Bouazza et al., 2012). It was also emphasized that there is a positive relationship between GP and ME (Menke and Steingass, 1988) and between GP and OMD (Getachew et al., 2002). Researchers' views are consistent with the study result. In this study, the increase in the amount of gas produced for 24 hours with CP content of rangeland plants in May and June increased the level of OMD. It can also be said that in July and August, feeds rich in nutrients that are difficult to dissolve in the rumen, such as NDF, ADF and ADL, reduce OMD by limiting microbial fermentation.

4.4. Feed Quality of Rangelands

In terms of RFV (Rohweder et al. 1978) calculated with CP, ADF and NDF data; rangeland (1) in Ayaş-Başbereket scored higher than 100 in May, June and July, scored below 100 in August, and the highest score was in May. Rangelands in Ayaş-Ilıca (2) and Nallıhan-Çayırhan (3) were found to be higher than 100 in May and lower in other months. Redfearn et al (2004) reported that ADF should be 41% and NDF should be 53% for the relative feed value of the feeds to be 100, and if the RFV is greater than 100, the feed quality increases and if it falls below it. Low levels of CF, ADF, NDF, ADL in May and June compared to July and August caused the digestibility to be high in these months, which increased the feed value. This has been emphasized in many studies indicating that RFV, DMD and DMI decreased due to the increase in cell wall components of feeds (Van Soest, 1994; Kamalak et al., 2005; Kamalak and Canbolat, 2010).

According to the RFQI values calculated with TDN (Total digestible nutrients) and dNDF data, rangelands 1 and 2 were determined to exceed 100 points in May, June and July, and rangeland 3 above 100 points in May and 100 points in other months. It has been determined that rangeland forage quality is better in rangeland 1 for every month. Oba and Allen (1999) reported that there is a positive relationship between DMI and NDF digestibility (% NDF), while Undersander and Moore (2002) state that RFQI is a better index than RFV in terms of animal performance.

4. Conclusion

In this study, it was observed that rangelands had rich in botanical composition with different species in May, followed by June, in three rangeland selected based on observation, taking into account the frequency and diversity of plants in rangelands, plant diversity decreased in July and August due to the progression of vegetation and fresh tender plants were replaced by shrub, stalk, tree and shrub type plants.

Ayaş-Başbereket was found richer in terms of diversity. Rangeland plants were found to be better in May and June in terms of nutrient composition, CF, ADF, NDF, ADL, GP, DMD, OMD, RFV and RFQI values, and decreased in July and August. In terms of feed value and quality, it was determined that rangeland 1 in Ayaş-Başbereket was the best, it was followed by rangeland 2 in Ayaş-Ilıca and rangeland 3 in Nallıhan-Çayırhan was of lower quality than others. Consequently, rangelands 1 and 2 are more suitable for grazing ruminants or hay harvest, especially in May and July. In addition, thorny shrubs and tree leaves are suitable for feeding goats.

Conflict of interest

The author declare that there is no conflict of interest.

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