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Nutritive Value of Botanical Composition Under Management Practices in Pirincci Pasture

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A compatible topography had been built in the end of the land consolidation, land filling, terracing and staging processes and then the planting procedure started. In the matter of filling it is necessary to build a structure friendly to the environment, convenient for plant breeding and maintaining the vegetation in the future periods. To achieve these, first cleaning the greenstuffs on the ground to hinder landslide during and/or after land filling are taken. Then excavated land is dumped after the ground is firmed by stones and pieces of concrete. It is noted that, there is no water and environment contaminating components (aspest, chemical and medical waste *etc.*) in the land. This study shows that improved and native pasture nutritive value differ according to differences land filling, terracing and staging processes, fertilization or planting seed. Improved management practices, such as fertilizing, forage seeding, cutting, may have a crucial role in hay production and quality crude protein, ash, crude fibre and calcium ratio increased by fertilization in the improved pasture. In the experiment, the fertilization increased the contents of proteins, ash, calcium. Phosphorus content in improved pasture was less than or equal to that of the native pasture while crude fibre content in improved pasture was more than or equal to that of the native pasture.

Key Words: Land filling, Fertilization, Seeding, Pasture, Nutritive value.

INTRODUCTION

Because they are not evaluated according to management regulations, the grasslands today are problem filled and infertile. These lands need to be protected and made fertile. This can be done through the proper management of animal, plant, land and economic resources. In a metropolitan city like Istanbul, Turkey protecting what little plantation that exists and making use of it in the most optimum way is becoming more and more important.

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The plantation of Pirincci village, which is a district of Eyup, Turkey is adjacent to a squatter settlement. Part of the land of the plantation has been used for other purposes, in some parts the upper soil layer and main rock have been destroyed as filling and display material and cliffs posing a danger to people and animals have formed. In some areas pollution has occurred with the spilling of waste. This formation spoils the scene of the environment. These inconveniences can only be eliminated with the conservation of the grasslands. The purpose in protecting these is eliminating environmental protection, then by creating a good vegetation layer forming a clean environment, healthy and clean water storage and subsequently producing more nutritive. The plantation of Pirincci village was chosen by the Ministry of Agriculture and Village Affairs for this reason. The processes done on the plantation (filling and vegetating) have became exemplary for other plantations in the country. Improved management practices, such as fertilization and timely cutting, may have a crucial role in hay production and quality. Accurate information on plant N status of pastures and nutritive value of herbage is extremely useful in livestock and forage management. Better understanding of factors, such as genotypes and environmental conditions, which influence seasonal patterns of herbage mass and nutritive value and timely prediction of these variables, can help improve decision-making by grazing land managers on, for example, the adjustment of stocking rates[1].

For any given grazing system, pasture species, application of fertilizers, growing conditions, stage of maturity and stocking rate all affect nutritive value of herbage[2-4]. Forage nutrition can be measured by the relative performance of animals when forage is fed to livestock. Animal performance is highly influenced by nutrient concentration, intake and digestibility[5]. Adequate nutritive value of herbage is essential for a high rate of live weight gain and overall livestock performance[6]. Pasture productivity and nutritive value are major factors that determine patterns of grazing distribution of wildlife and livestock[7].

The aim of this study was to determine the chemical and nutritional characteristics of some of the most widespread and abundant forage species of 2 pastures. Furthermore, in the pollution and destroyed pastures soil is eliminating environmental protection, then by creating a good vegetation layer forming a clean environment, healthy and clean water storage and subsequently producing more quality and quantity nutritive.

EXPERIMENTAL

Pirincci village pasture improved had been started according to the 14th determination in September, 1999 of Central Grassland Found Management Council and the ministry conformation in 1999. 72 Decameters of the 2325-decameter-pasture of the village had been given to Basaran Insaat Hafriyat Taahhut and Turizm San. Tic. Ltd. Company for improved which should be started by building a compatible topography by landfill according to the program prepared by Istanbul local

agriculture authority. A compatible topography had been built in the end of the land consolidation, land filling, terracing and staging processes and then the planting procedure had begun.

In the matter of filling it is necessary to build a structure harmless to the environment, convenient for plant breeding and maintaining the vegetation in the future periods at least. To achieve these, first cleaning the greenstuffs on the ground to hinder landslide during and/or after land filling are taken. Then excavated land is dumped after the ground is firmed by stones and pieces of concrete. It is noted that, there is no water and environment contaminating components (aspest, chemical and medical waste *etc*.) in the land. After filling of about 1-2 meters, the land is pressed. The heavy part of the excavated land is used for filling the cavities on the ground. In this study, filling and staging processes had lasted until the spring time of 2003, the slope of the topography had been held between 12-20 % and the upper level soil of 35-40 cm had equipped for plant breeding. This filled land had been sown of sorts clover, white clover, sheep fescue and barley for plant breeding purposes. The expert committee that had been formed in May 2003 decided the applied plant breeding had been insufficient and determined new rules to be applied on the land. After May 2003, a better seed reservoir arrangement had been introduced. In the summer season some parts of the land had been manured by sprinkle method. Then in the autumn season the land had been disk harrowed for several times and with the seedbed preparation the manure had been mixed. By the end of the November, Annual ryegrass and Hungarian vetch seed mixture had been sown for a year by sprinkle method. Before and after sowing a flock of sheep had crossed the land for several times. The land had been manured 20 kg/da by composed fertilizer in February 2004 and 30 kg/da ammonium nitrate fertilizer in April 2004. Botanical composition according to weight: areas with the width of $0.5 \times 0.5 = 0.25$ m^2 are mowed, the plants are separated into their family groups and are weighed while and fresh and after they are dried to determine their value. A dominant species for nutrition analyses from the pastures were selected.

This fact sheet will discuss the potential nutritional value of 2 types of pasture grown in this area of Istanbul, Turkey. In the native pasture wasn't application land filling, terracing and staging processes, fertilization or planting seed.

In this region, there aren't any meteorology station. However, average long term fall rates of the two meteorology stations close to the region are 641.8-1198.3 kg/m^2, 724.8-1303.5 kg/m^2 for the year 2004 and a total of 510.0-605.7 kg/m^2 till the end of may for the year 2005.

Chemical analyses: The dry matter (DM) percentage is the proportion of the material left after removing the moisture of the sample by volatilization caused by a forced-draft oven drying the sample (5 g) at 105 ºC overnight. The percentage of dry matter content was calculated using the formula developed by the association of Analytical Chemist[8]. The ash is the inorganic mineral material left when the DM sample (3 g) is ignited and volatilized in a muffle furnace at 550 ºC overnight to

burn off the organic material. The difference between the sample DM and ash gives the organic matter. The percentage ash and organic matter contents were calculated using standard formulae[8]. Total N was determined using the Kjeldahl method. The percentage crude protein was calculated from the percentage N value by multiplying it with the factor 6.25[8]. The pH was measured immediately after sampling using a glass electrode (digital pH measurement device, pH 525, WTW, Weilheim, Germany).

TABLE-1
SOIL CHARACTERISTICS OF TWO PASTURE

	Total salt %	$CaCO_3$ %	Soil organic matter %	P_2O_5 kg/da
Imroved pasture	0.057	1.50	3.49	13.96
Native pasture	0.072	1.13	0.74	4.57

TABLE-2
DOMINANT SPECIES OF TWO PASTURES

Improved Pasture	Native Pasture
Legumes	Legumes
Vicia pannonica Crantz	*Trifolium subterraneum L.*
Trifolium pratense L.	*Trifolium campestre Schreb.*
Trifolium campestre Schreb.	*Medicago arabica L.*
Trifolium repens L.	
Medicago sativa L.	
Medicago arabica L.	
Grasses	Grasses
Festuca arundinacea Schreb.	*Festuca arundinacea Schreb.*
Lolium perenne L.	*Lolium perenne L.*
Lolium multiflorum Lam.	*Poa pratensis L.*
Poa pratensis L.	
Hordeum vulgare L.	
Forbs	Forbs
Veronica hederifolia L	*Veronica hederifolia L.*
Lamium purpereum L.	*Lamium purpereumL.*
Capsella bursa–pastoris L.	*Capsella bursa pastoris L.*
Achillea millefolium L.	*Achillea millefolium L.*
Anthemis arvensis L.	*Plantago lanceolata L.*
Erodium ciconium L.	*Anthemis arvensis L.*

Statistical analysis: Differences between means were tested for significance by ANOVA using SPSS 10.0. Standard deviation of means are presented.

RESULTS AND DISCUSSION

The nutritional composition of the legumes, grasses and forbs obtained from the 2 pastures are reported in Table-3. The quality of the forages was different between families in the pastures.

TABLE-3
NUTRITION CONTENTS OF BOTANICAL COMPOSITION OF IMPROVED AND NATIVE PASTURE (%)

	Improved pasture			Native pasture		
	Legumes	Grasses	Forbs	Legumes	Grasses	Forbs
CP	20.07±6.58	15.70±2.11	17.82±3.33	11.24±1.37	8.91±1.54	9.55±1.19
Average	17.72-17.86			9.90±1.61		
F ratio	32.06**					
DM	92.55±0.84	93.11±0.48	91.73±0.51	93.26±0.34	93.41±0.01	93.77±0.23
Average	92.46±0.82			92.48±0.31		
F ratio	15.86**					
Ash	12.62±0.89	11.96±1.33	11.61±0.53	7.37±0.07	6.38±0.73	7.22±0.27
Average	12.06±0.98			6.99±0.61		
F ratio	228.71**					
CF	26.00±2.26	28.51±4.91	25.05±1.51	26.85±2.27	28.97±5.08	23.65±3.33
Average	26.51±3.31			26.49±4.09		
F ratio	0.02					
Ca	1.34±0.14	0.32±0.05	0.39±0.08	0.30±0.01	0.29±0.02	0.31±0.02
Average	0.68±0.49			0.29-0.30		
F ratio	7.32*					
P	0.32±0.02	0.34±0.00	0.35±0.02	0.40±0.00	0.26±0.01	0.35±0.04
Average	0.33±0.02			0.34±0.04		
F ratio	0.05					

*,**Indicate significant F values at the $p < 0.05$ and 0.01 levels, respectively.
CP = Crude protein; CF = Crude fibre; Ca = Calcium, P = phosphorus
±SD = Standard deviation.

Improved management practices, such as fertilizing, forage seeding, cutting, may have a crucial role in hay production and quality. Accurate information on plant N and P status of pastures and nutritive value of herbage is extremely useful in livestock and forage management. Nitrogen fertilization lowered per cent nitrogen free extract and increased the per cent crude fibre lignin and ash. This would indicate a decrease in energy value due to nitrogen application[9]. Delagarde *et al.*[3] reported a depressed herbage organic matter intake in unfertilized swards. In the experiment, the fertilization increased the contents of proteins, ash, Ca and P content in improved pasture was less than or equal to that of the native pasture while crude fibre content in improved pasture was more than or equal to that of the native pasture. Furthermore, increased N rates increasing the contents of protein, ash and reduced the contents of cellulose, P and Ca failed to affect the chemical and mineral composition of dry matter[10]. In chemical analysis, grasses had the highest crude cellulose content, while legumes had the highest crude protein content and legumes and forbs had the highest mineral element content[11].

Crude protein (CP): The chemical composition of legumes, grasses and forbs as hay showed a high crude protein content of 20.07, 15.70 and 17.82 %, in improved pasture respectively. The chemical composition of legumes, grasses and forbs as

hay showed a crude protein content of 11.24, 8.91 and 9.55 %, in native pasture, respectively (Table-3). Similar results were reported by Suyamaa *et al.*[12]. Between the pastures were significant differences ($p < 0.01$). This study showed that improved and native pasture nutritive value differ according to differences land filling, terracing and staging processes, fertilization or planting seed. Crude protein ratio may increase by fertilization in the improved pasture. Besides, grasses generally produce lower quality forage than legumes. This is because grasses usually have less crude protein than legumes. In native rangeland, study showed that the effect was to reduce the abundance of ground cover species especially forbs. The proportion of legumes also had an influence on herbage nutritive value. Manure applications and seeding also alter plant species composition in the improved pasture. Generally, legumes have higher protein content than grasses. The results were in accordance with findings of Ebelhar *et al.*[13]. Crowder[14], Hoehne *et al.*[15]. They stated that, fertilization with N and P affects crude protein production and botanical composition in pasture. The fertilization of multiyear or perennial grass associations affects the fodder chemical composition indirectly by differences in the species composition of the stand or directly by the change of the species nutrition[16]. Protein content in hay from an agri-environmental grassland was lower than in conventional grass hay with a similar or a higher crude fibre content[17]. Besides, applying additional phosphorus could compensate negative effect of the nitrogen fertilization on the forage quality in terms of protein concentration in the forage dry matter[18]. 7.5 % crude protein was accepted as an adequate forage quality threshold by Ganskopp and Bohnert[19]. El-Shatnawi and Mohawesh[20] suggested that ewes require 7-9 % crude protein for maintenance and 10-12 % for lactation. Hoehne *et al.*[15] found that forbs on Nebraska sandhills range during rapid growth sometimes contained higher nutrient levels than grasses and forbs are generally not as reliable as grasses for herbage production. Buxton *et al.*[5] reported that crude protein concentration in forage is strongly influenced by available soil. Collins[21] found that crude protein levels in tall fescue and perennial ryegrass were increased with increasing soil N levels. According to Wilman and Riley[22], differences in the chemical composition of leaves and stems and their ratio, often affect the nutritive value of forages. At the same harvest maturity, legumes contain higher crude protein compared to grasses. Digestibility of hay increases with the increase in crude protein concentration[23].

Dry matter (DM): Grasses showed higher DM than legumes. Improved pasture, DM percentage of grasses, legumes and forbs averages were determined 92.55, 93.11 and 91.73 %, respectively. Grasses, legumes and forbs DM percentage for the native pasture averages were determined 93.26, 93.41 and 93.77 %, respectively (Table-3). Similar results were reported by several researchers[24-27]. Many factors, such as botanical composition, growing conditions of the forage, N and P fertilization and stage of maturity at harvest time have effects on crude protein and DM contents. Dry matter ratio of fertilized meadow higher than not fertilized meadow[28]. Herbage availability and digestibility, the main factors affecting nutrient supply in grazing

animals, is dependent on stocking rate, forage species, the supply of available nitrogen and other sward growth factors[2,29]. The low DM content of forage may induce behavioural changes such as reductions in bite size[2].

Ash: Ash concentrations was higher in grasses and forbs. The chemical composition of legumes, grasses and forbs as hay showed ash content of 12.62, 11.96 and 11.61 %, in improved pasture, respectively. The chemical composition of legumes, grasses and forbs as hay showed ash content of 7.37, 6.38 and 7.22 %, in native pasture respectively (Table-3). Ash content was higher in improved pasture than in native pasture. The differences in 2 pastures could be botanical composition and soil type. The significant correlation coefficients between the ash contents of grasses, legumes and forbs in the improved and native pastures. The nutrition value of range forage is depend on sward floristic composition[30]. Additionally, forbs species were assumed to have low nutritive value and to be unpalatable to livestock. Nitrogen fertilization lowered per cent nitrogen free extract and increased the per cent crude fibre lignin and ash[9]. The ash content in grass fodder is highly variable (4-14 %) in extreme conditions, but usually ranges between 7-10 %[31]. Per cent ash ranged from 6.4 to 10.2[9]. Pasture nutritional quality is affected by abiotic and biotic environmental factors including soil type, climatic regime, botanical composition and range improved practices[32-34].

Crude fibre (CF): The larger amounts of CF found in grasses (28.51 %). The lowest CF content occurred forbs (25.05 %) in the improved pasture. In the native pasture, per cent CF ranged from 23.65 to 28.97 %. The larger amounts of CF found in grasses (28.97 %). The lowest CF content occurred forbs (23.65 %) (Table-3). From the point of view of cattle nourishment and a high utility, the fibre content in the fodder dry mass is very desirable until 23 %[31]. Per cent cellulose ranged from 32.3 in June to 36.3 in November[9]. Fibre content is influenced by the harvest time, species maturity, botanical composition and fertilization[16]. Crude fibre contents for grasses as straw 40.6-46.7 % compared to 36.7-39.3 % as hay[35].

Calcium (Ca): Calcium plays an important role in bone development, particularly for young and breeding animals. In this study, mean Ca concentration was found to be between 0.29-1.34 % in the two pasture. The larger amounts of Ca found in legumes (1.34 %) in the improved pasture. Whilst, the lowest CF content occurred grasses (0.32 %) in the improved pasture. In the native pasture, the Ca content levels were 0.30 % in legumes while grasses were 0.29 %. The larger amounts of Ca found in forbs (0.31 %) (Table-3). The finding was in accordance with the results of NRC[36,37]. High Ca ratio could probably be explained by leafy proportion of legume or forbs species. Forbs retain most of their leafy portions even during dry seasons, which are richer in minerals, including Ca[38] than stem fractions[39]. Besides, especially forbs contain more minerals than would be in grass species. Differences in the content of Ca could be explained by land filling, terracing and staging processes, fertilization or planting seed. Additionally, the application of fertilization on species composition influence quality of the pasture. In the dry

mass of grasses there is 0.54 % Ca, in clover crops 1.79 % and the other herbs 1.85 % Ca[16]. Nashiki, *et al.*[40] stated that the Ca content in weed species was less than or equal to that of the *Lolium* cultivars. Furthermore, Wilman and Derrick[41], *Plantago lanceolata* had 4 times higher levels of Ca than *Lolium perenne*. In the experiment also consist of *Lolium perenne* and *Plantago lanceolata* species.

Phosphorus (P): Minerals are vital for normal growth, reproduction, health and proper functioning of the animal's body[42]. Phosphorous is one of the most important minerals for many metabolic processes in animals[43] and its deficiency can retards growth and reproductive performance[44]. Phosphorus plays also an important role in bone development, for young and breeding animals. In this study, per cent P ranged from 0.32 to 0.35 %. The larger amounts of P found in forbs (0.35 %) in the improved pasture. The P content levels were the same as forbs in the two pastures. The lowest P content occurred legumes (0.32 %) in the improved pasture. In the native pasture, per cent P ranged from 0.26 to 0.40 %. The larger amounts of P found in legume species (0.40 %). The lowest P content occurred grasses (0.26 %) (Table-3). Phosphorus content in forage changes from 0.26 % grasses less than 0.40 % legumes in nature pasture (Table-3). Differences in the ratio of P could be partly clarified by botanical species composition and variations in soil characteristics due to location of the different pasture lands. Minson[38], reported that, the variation P ratio in forage could be also due to variability in the available soil P and pH, forages' growth stage and proportions of leaf and stem fractions harvested for mineral analyses and sampling season. Contents of minerals in forages including P decrease with plant maturity[45]. Variable contents of P could be due to differences between varieties and cultivars in the factors that control accumulation of P in forages[46]. Sheep require 5 g potassium/kg dry matter[47].

Conclusion

This study aim, in the pollution and destroyed pastures soil is eliminating environmental protection, then by creating a good vegetation layer forming a clean environment, healthy and clean water storage and subsequently producing more quality and quantity nutritive. The plantation of Pirincci village was chosen by the Ministry of Agriculture and Village Affairs for this reason. The processes done on the plantation (filling and vegetating) have became exemplary for other plantations in the country. Improved management practices, such as fertilization and timely cutting, may have a crucial role in hay production and quality. Besides, in this study indicated that improved and native pastures's differ nutritive quality. According to the author, research based on these types of studies is not performed yet; meanwhile, research conducted in the world must be estimated in terms of local conditions. Improvements in grass and legumes species, fertilizer and an increased understanding of the importance of pastures in nutrition have contributed to the development of intensive management practices. Thus, forage quality and quantity can be utilized to their highest potentials. This study showed that the improved and native pasture nutritive value differ according to differences land filling, terracing and staging

processes, fertilization or planting seed. The use of, white clover, sheep fescue and barley, annual ryegrass and Hungarian vetch species in pasture plant associations could be strategically employed to develop pasture system that would supply forage.

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