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Determination of Some Characters of Natural Orchardgrass Plants Collected from Different Places of Ondokuz Mayis University Campus Area II: Content of Some Nutritional Components†

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This study was conducted to determine some nutritional elements of natural orchardgrass plant (*Dactylis glomerata* ssp. glomerata) which were collected from different places of Ondokuz Mayis University Kurupelit Campus in 2002-2003 years. Average crude protein content was found as 6.38 % in 2002, whilst it was determined as 7.34 % in 2003. Average crude ash content studied in orchardgrass plants were 10.11 and 10.15 % in both 2 years, respectively. Ca, Mg, K contents in orchardgrass plants which were grown naturally were determined between 0.27-0.50 %, 0.10-0.14 %, 1.46-2.01 %, respectively. It was determined that Fe, Zn, Cu and Mn contents of collected samples were exceeded average values and adequate.

Key Words: *Dactylis glomerata*, Crude protein and Ash content, Mineral nutrition contents.

INTRODUCTION

Turkey is located at a significant position in the world from the viewpoint of plant genetic resources and genetic diversity. It is scientifically agreed that two of the centers of divercity and centers of origin are the nearly Eastern and Mediterranean overlap of Turkey[1]. Due to its great variety in geomorphology, topography and climate, Turkey has large diversity of habitats so it is very rich in plant species and subspecies[2-4]. In addition Turkey has many sub-centers. For instance Samsun, Amasya, Tokat are sub-centers of diversity for many plant species, especially forages[1,5,6]. Maintenance of the genetic diversity is extremely important as many species have faced to genetic erosion because of various reasons. 19 Mayis University Kurupelit Campus area (1300 ha) has been protected since early 1970's is a significant gene source with different topographic structures such as about 500 m altitude, sandy-clay, forest, meadow, rangeland, bushy plant vegetation, various soil types, valleys, hill and hillsides[4,7].

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Nutritional quality of plants grown in natural areas directly affects the performance of the grazing livestock. Poor animal growth and reproductive problems are common even when forage supply is adequate and can directly related to mineral deficiencies caused by the low mineral concentrations in soil and associated forages[8]. It has been reported that mineral concentrations in both soils and plants affect mineral status of grazing animals[9].

Mineral composition of forage is affected by soil-plant factors, growth stage, plant part, climate, fertilizing, including pH, drainage, irrigation, soil structure and interaction among minerals[10-12].

Crude protein (CP), crude fiber (CF), Ca, K, Mg and P contents in orchardgrass samples collected from range and pastures in Erzurum district were found as 11.8, 32.06, 0.43, 4.06 %, 1906 and 2345 ppm, respectively[13]. Crude protein, Ca and P contents in orchardgrass fodder at full flowering were found as 8.4, 0.26 and 0.30 %, respectively.

This study was aimed at determining some nutritional elements in orchardgrass (*Dactylis glomerata* ssp. glomerata L.) naturally grown in 19 Mayis University campus area.

EXPERIMENTAL

Salt content is extremely low and pH is moderate acid or neutral in soils according to the physical and chemical analyses conducted in soil samples taken from 0-20 cm soil depth (Table-1).

TABLE-1
SOME CHARACTERS OF SOIL IN LOCATIONS FROM WHICH ORCHARDGRASS SAMPLES WERE COLLECTED IN THIS STUDY

Characters	Locations						
	1	2	3	4	5	6	7
Soil texture	Clay	Clay-loam	Clay	Clay-loam	Clay-loam	Clay-loam	Clay
Total salt (%)	0.11	0.08	0.06	0.06	0.08	0.05	0.08
pH	7.25	7.30	6.80	6.05	7.00	7.25	6.35
P_2O_5 (kg/da)	8.47	6.41	3.89	2.74	3.89	4.58	9.16
K_2O (kg/da)	127.85	234.60	57.47	48.09	120.82	234.60	85.62
Organic matter	2.45	2.00	3.28	3.28	1.17	3.45	4.95
Ca (%)	0.75	0.58	0.39	0.40	0.60	0.52	0.47
Mg (%)	0.06	0.05	0.12	0.09	0.09	0.03	0.10
Fe (ppm)	12.50	8.20	50.42	38.17	9.62	11.69	42.77
Zn (ppm)	1.09	1.08	1.87	1.46	1.27	2.46	1.81
Cu (ppm)	2.55	1.51	2.74	2.65	1.65	1.44	3.13
Mn (ppm)	16.65	19.71	66.98	48.57	31.53	25.49	50.11

While long-term total precipitation during growth period (January-June) of orchardgrass in Samsun was 317.9 mm, it was 301.3 mm in 2002 and 242.4 mm in 2003. Long-term mean temperature was 11.39 ºC during January-June. Long-term mean temperature (11.39 ºC) was lower than that in 2002 (11.64 ºC) and higher than in 2003 (10.8 ºC).

The orchardgrass (*Dactylis glomerata* ssp. glomerata L.) samples grown naturally at 19 Mayis University campus area were used in this study.

Orchardgrass samples were collected from the 7 different locations, in which orchardgrass plants were found intensively, during March and June in 2002 and 2003. General information regarding the locations from which samples were taken was given in Table-2. Orchardgrass samples were monitored at regular intervals between March and June.

The results of the study were evaluated according to the Randomized Parcels Experimental Design[14]. The means were compared using Duncan multiple comparison test. Variance analysis and comparison tests were made using MSTAT-C pocket programme. Furthermore, measurements done[15] for orchardgrass were compared by computing standart error, coefficient of variation (CV) and probability confidence values at 0.05 levels.

RESULTS AND DISCUSSION

The CVs related to crude protein content were 24 % in 2002 and 18 % in 2003 (Table-3). These relatively high CVs can be attributed to the differences in altitude, north or south facing pastures, soil structure among the locations. The differences in crude protein content among the locations were found very significant in both years. The lowest crude protein content (4.55 %) was found for 4th location in 2002 with no differences among the other locations. The highest crude protein content were found for 1st location, 2nd location and 6th location (8.78, 8.26 and 8.07 %, respectively). The average crude protein content were 6.38 % in 2002 and 7.34 % in 2003 (Table-4). Crude protein content found in present study were slightly lower than those reported by Tükel and Hatipoglu[16] and Hannaway *et al.*[17] in both years. The relatively lower crude protein contents in present study can be attributed to differences in growing conditions and cutting time. In fact, feed value varies with growing conditions and growing period and declines rapidly from the beginning of flowering[18,19].

The CVs found in terms of crude ash content was 15 % in 2002 and 13 % in 2003 (Table-3). Among the locations differences of crude ash content are very significant in 2002 and insignificant in 2003 (Table-4). Average crude ash contents were found in both 2002 and 2003 (10.11 and 10.25 %, respectively). Crude ash contents in both years were in consistence with findings reported by Duke[20] and slightly lower than those reported by Tosun[21].

TABLE-2
GENERAL DESCRIPTION OF LOCATIONS FROM WHICH ORCHARDGRASS SAMPLES WERE COLLECTED IN THIS STUDY

Locations	Position	Soil depth (cm)	Altitude (m)	General description of land
1	Entrance of University	90-120	24	The samples were collected from a land with a 10% slope positioned in northwest direction. The land was covered with fruit shoots.
2	Between Theological Faculty and Waste Water Cleaning Unit.	0-30	147	The samples were collected from a slightly gravelled land with a low soil depth. The slope was 20-25%. The land was positioned in northwest direction and was covered with short bush vegetation.
3	Egitim Fakültesi arkas?nda kalan orman içi mera The range behind the Educational Faculty.	0-30	180	The samples were collected from within-forest ranges found among oat trees in west direction.
4	Between TEK building and main road	30-60	188	The samples were collected from rarely afforested lands (5% slope) positioned in the direction of north-east. The samples were also collected from way sides.
5	The range which was found behind TEK building.	0-30	190	The samples were collected from the range which abandoned 26 years ago after plowing. The land was positioned in west region.
6	The secondary way between Agricultural Faculty and Educational Faculty.	30-60	191	The samples were collected from the land with low soil depth, slightly gravelled and positioned in southwest region.
7	Between Educational Faculty and dormitory	30-60	192	The samples were collected from open areas found among oat trees in direction of northwest.

TABLE-3
VARIATION LIMITS, CONFIDENCE LIMITS AND COEFFICIENTS OF VARIATION RELATED TO AGRONOMIC TRAITS OF ORCHARDGRASS PLANTS RAISED IN DIFFERENT SPOTS OF KURUPELIT CAMPUS

Traits	N	Year	Variation limits	Confidence limits	CV (%)
Crude protein ratio (%)	70	2002	4.04-12.86	6.37 ± 0.37	24
	70	2003	4.63-10.41	7.38 ± 0.33	18
Crude ash ratio (%)	70	2002	7.50-14.53	10.11 ± 0.37	15
	70	2003	8.17-14.20	10.26 ± 0.33	13

TABLE-4
AVERAGES RELATED TO AGRONOMIC TRAITS OF ORCHARDGRASS PLANTS RAISED IN DIFFERENT SPOTS OF KURUPELIT CAMPUS

Locations	Traits			
	Crude protein content (%)**		Crude ash content (%)	
	2002	2003	2002*	2003**
1	6.03 ab	8.78 a	8.52 c	9.49
2	6.85 a	8.26 a	10.34 ab	10.19
3	7.14 a	6.77 c	10.10 b	9.59
4	4.55 b	6.93 bc	8.70 c	10.38
5	6.03 ab	6.48 c	10.59 ab	10.64
6	6.49 a	8.07 ab	10.73 ab	10.52
7	7.54 a	6.07 c	11.76 a	10.94
Average	6.38	7.34	10.11	10.25
CV (%)	20.92	13.63	11.36	13.15

There were no differences at 0.05 and 0.01 probability levels between averages with same superscripts.

Average Ca, Mg, K, Fe, Zn, Cu, Mn contents and K/(Ca + Mg) ratios found in orchardgrass samples collected from various locations of Ondokuz Mayis University, Kurupelit Campus were given in Table-5.

Calcium contents in orchardgrass samples collected various locations of campus were between 0.27 and 0.50 %. Tajeta *et al.*[22] and Kidambi *et al.*[23] recommended that the Ca content should be at least 0.3 % in ruminant feeds. It can be seen that Ca contents of orchard grass samples collected from 7th, 1st and 5th locations are lower than those reported by these researchers (Table-5). Wanatebe *et al.*[24] reported that calcium content of orchardgrass is generally low.

TABLE-5
AVERAGE CRUDE ASH, Ca, Mg, Fe, Zn, Cu, Mn CONTENTS AND K/(Ca + Mg) RATIOS IN ORCHARDGRASS PLANTS RAISED IN DIFFERENT SPOTS OF KURUPELIT CAMPUS

Locations	Crude ash (%)	Ca (%)	Mg (%)	K (%)	K/Ca + Mg)	Fe (ppm)	Zn (ppm)	Cu (ppm)	Mn (ppm)
1	9.49	0.28	0.11	1.65	4.23	680.32	45.98	13.20	153.82
2	10.19	0.50	0.14	1.52	2.38	395.53	39.52	10.36	140.26
3	9.59	0.35	0.13	1.64	3.41	713.43	46.26	14.08	195.97
4	10.38	0.32	0.10	1.46	3.47	458.48	37.60	12.38	111.99
5	10.64	0.29	0.14	1.74	4.05	479.66	48.47	12.38	111.99
6	10.52	0.43	0.12	1.90	3.45	511.75	36.47	9.40	133.58
7	10.94	0.27	0.13	2.01	5.03	326.53	49.73	13.52	112.60

Tajeta *et al.*[22] reported that the Mg content of forages used in ruminant nutrition should be at least 0.2 %, whereas Kidambi *et al.*[23] recommended a value of 0.1 % for Mg content of forages. Loreda *et al.*[25] reported that the Mg contents of 0.18-0.20 % were inadequate in case high P contents (1.36-1.69 %) existed in forages.

K contents were high in orchardgrass samples collected in this study (1.46-2.01 %). These ratios are above the least values which were recommended by Tajeta *et al.*[22] (0.85 %) and NRC[26] (6.5 g/kg) for forages used in ruminant nutrition. But, K contents can cause deficiency in Mg supply to ruminants[25].

K/(Ca + Mg) ratios below 2.2 are recommended for ruminant feeds[23,27]. K/(Ca + Mg) ratios above 2.2 can enhance the risk of tetany[28]. The K/(Ca + Mg) ratios in samples collected in this study are above 2.2. Lower Ca and Mg contents in samples might have led to increase in K/(Ca + Mg) ratio[24,29].

It is generally recommended that Fe contents should be at least 50 ppm in ruminant feeds. The Fe contents of samples collected in this study are above this recommended level. Fe contents found in samples collected in a study which conducted in Samsun district were similar those found in samples collected in our study. High N, P, K fertilizer levels cause increases in plant yield, which leads to rapid removal of microelements from the soil. This leads to decrease in microelement content (especially Fe) of forages[30,31]. The Fe contents of samples collected in present study were found higher due to the fact that the samples were collected from natural flora with no N application and the Fe contents of soils are adequate (Tables 1 and 5).

The Zn contents varied from 36.47 to 49.73 ppm in collected samples. Zn contents which should be in ruminant ratios were reported as 10 ppm by Danbara *et al.*[32] and Aydin[33] and as 50 ppm by Periguad[34] and Lamand[35]. Zn deficiency may result in infertility, anemia and a weakened immune system[36].

Cu contents of samples ranged between 9.40 and 14.08 ppm. The critical least Cu levels proposed by some researchers[30,33-36] were 10, 8 and 5 ppm. The Cu contents of samples collected in this study were above these values. Some symptoms such as anemia, bone deformation, infertility and weakened immune system might be observed[33,37] in animals given feeds deficient in Cu. Mn level should be around 50 ppm in forages[34,35] as over-consumption of this element causes a decrease in appetite[32]. The Mn contents in samples collected in this study were quite above 50 ppm.

Conclusion

There is a wide range of variation among the orchardgrass plants grown in different regions of Kurupelit campus in terms of examined traits in this study. This case is seemed important gene sources for following studies regarding to the examined characters. Genotypic features of plants should be determined by eliminating the effects of environmental factors, which might be succeeded by raising plants in similar environmental regions.

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