Determination of Nutrient Materials Content and Some Mineral Substance Levels of Forage Resources of Some Provinces in the GAP Region of TURKEY

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ABSTRACT
It is known that the forage crops are changed based on climate, soil and region, and researches about the nutrient content of forage crops grown or silage are limited in the GAP region . For this purpose, nutrients and some mineral substances (Calcium (Ca), Phosphorus (P), Magnesium (Mg), Zinc (Zn), Iron (Fe), Copper (Cu)) contents of feed plants and silages which have been planted and harvested in the region have been determined In the maize silage, dry matter (DM) content was 22.81%, crude protein (CP), crude cellulose (CC), nötr detergent fiber (NDF), acid detergent fiber ADF, crude fat (CF) and crude ash (CA) (dry matter basis) respectively; the mean total area was 7.38%, 24.12, 53.20, 32.84, 2.68 and 5.13 respectively. In wheat straw and lentil straw, these values were; 2.59, 41.50, 70.90, 47.92, 1.47, 7.70 and 6.72%, 33.30, 57.97, 40.86, 1.38, 8.81. In the maize silage, Fe, Cu, Zn, P, Mg and Ca levels (on dry matter basis) the mean values of all regions were determined as 76.73 mg / kg, 4.35 mg / kg, 30.83 mg / kg, 1.31 g / kg, 23.61 g / kg and 1.87 g / kg. whereas .in wheat straw and lentil straw, these values were; Kg, 0.49 g / kg, 0.59 g / kg, 4.49 g / kg and 82.03 mg / kg, 8.61 mg / kg, 14.96 mg / kg, 1.46 g / 2.74 g / kg, 20.74 g / kg respectively.

Key words: Roughage, nutrients, minerals, GAP Region

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1. INTRODUCTION

The soil asset of the GAP Region is around 7.5 million ha, and 3.1 million of which is decent for agricultural activities. The amount of fields decent for processed agriculture constitutes 33.2% of the total fields. 12% of the soil in the GAP region is basaltic structures. The basaltic soil is mostly seen in Şanlıurfa (423 359 ha) and Diyarbakır (295 060 ha) (Anonim, 2009a). Moreover, 26% of the basaltic soil is decent for processed agriculture, while the rest of 74% is mostly used as pastures (Anonim, 2009b).

The fodder plants described as forages are the cheapest nutrition, including necessary nutrition materials for the tummy micro flora of the animals. Also, they influence the efficiency and reproduction performances of the animals due to being mineral and vitamin sources. Furthermore, they have an indispensable importance in feeding of ruminant animals like cattle and sheep.

Being economic fodder resources in addition to having major features in terms of digestion physiology give these nutrition substances a vital attribution. Since the fodder expenses in ruminants constitute 70% of the total expenses, quality forages become more important. Mentioning quality forages, it is the meadows and pastures, fodder plants and silage which is focused firstly (Budak, F., et al., 2014).

Forage requirements of the animals are met from resources such as natural pastures and meadows, fodder plants (clover, trefoil, vetch, pea, sorghum, sudan grass, and whole corn), harvest remnants (wheat and legume straws, husks), and green and watery plants (pulp and marc). The forage produced in Turkey does not meet the requirements of the animals sufficiently. The reasons for this include the insufficiency of natural pasture-meadow areas, short vegetation period, low amount of grass in unit area and limited areas for planting fodder plants (Ergun, et al., 2002).

Forages include necessary fodder substances for rumen microorganisms in addition to feeding of the ruminant animals. Besides, they have an indispensable importance in the feeding of ruminant animals due to being a source of mineral and vitamins as well as basic nutrition substances. Being economic fodder resources as well as having major features for rumen metabolism they give forages a vital attribution. Forage requirements of the animals are met from resources such as natural pastures and meadows, fodder plants (clover, trefoil, vetch, pea, sorghum, sudan grass, and whole corn), and harvest remnants (wheat and legume straws, husks) (Ergun, et al., 2002).

In a research they conducted to determine the raw nutrition substance amounts and metabolized energy (ME) levels in forages produced in Kırıkkale region and used widely in ruminant feeding, Güngör et al. (2008) have identified DM, CP, CA, CF, CC, ADF and ADL contents in some forage samples (clover dry grass, Hungarian vetch dry grass, corn silage, dry corn silage, wheat straw, chickpea straw and grape marc) produced in Kırıkkale. The DM levels of forages was identified as 90.12-95.31%, average CP and CS amounts in good quality and bad quality clover dry grass, corn silage, wheat straw and grape marc was identified respectively as 20.26, 12.11, 5.61, 3.63, 12.15 and 24.71, 30.62, 33.30, 45.53, 33.52%.

The study has been conducted to determine the nutrition substance and energy contents, and differences between periods for fodder plants trefoil (*Onobrychis sativa L.*) and vetch (*Vicia sativa L.*) planted in Kars province. Samples have been taken from trefoil and vetch plants from 5 different planting areas in June and July. Major differences have been identified in organic matter (OM), CP, CC, CA, NDF, ADF and ME levels of trefoil, and CP, CF and ME levels of vetch between June and July ($P<0.05$). It has also been determined that OM, CC, NDF and ADF levels of trefoil have

increased significantly ($P<0.05$), while CP and ME contents of trefoil and vetch has decreased ($P<0.05$).

The absence of standard diagrams showing nutrition substance and energy contents of the fodder raw materials per regions Turkey prevent from obtaining healthy information about the nutrition substance and energy contents obtained from different regions. In this research the objective is to determine the raw nutrition substance amounts and metabolized energy levels in forages produced or grown in Diyarbakır, Adıyaman, Mardin ve Şanlıurfa province.

2. MATERIAL AND METHOD

In this study, in the corn silage (CS), wheat straw (WS) and lentil straw (LS) samples collected from Diyarbakır, Adıyaman, Mardin and Şanlıurfa regions, DM, CP, CF, CC and CA analysis were identified as specified by A.O.A.C (1990), ADF and NDF analysis were determined as specified by Van Soest (1963), Van Soest et al. (1991), and organic matter (OM), nitrogen-free essence substances (NES), cellulose and hemicellulose values were definied through calculation method.

In forage samples micro elements (Fe, Cu, Zn) were analyzed using DTPA+TEA extraction solvent (Lindsay and Norwell, 1978), and phosphor were described with EC Extraction solvent (Horneck et al., 1989). Forage was dried for 48 hours in an oven adjusted to 65 °C and the dried samples were then grinded in agate mill. 1 g is taken from grinded plant samples were placed inside crucibles, and turned into ashes after burning 5 hours at 550 °C. In samples extracted with 3.3% HCl solution, Fe, Zn and Cu were read in AAS through Magnesium (Voth 1981, Walinga et al., 1989, Hanlon 1998) method (Çakmak et al., 1996). For statistical analysis, SPSS 9.0 was used.

3. RESULTS AND DISCUSSION

For corn silage (CS), wheat straw (WS) and lentil straw (LS) samples collected from Diyarbakır, Adıyaman, Mardin and Şanlıurfa regions, DM, CP, CC, NDF, and ADF, CF and CA values are given in Table 1.

Table 1. Results of chemical analysis of fodders (DM %)

Fodder	Region	DM	CP	CC	NDF	ADF	CF	CA
CS	Diyarbakır	21.28 ± 0.52[a]	8.08±1.06	25.57±0.78	53.52±4.67	33.18±3.45	2.71±0.75	4.89±0,92
	Adıyaman	23.56 ± 0.47[ab]	7.10±1.6	23.09±2.60	48.37±0.87	33.29±1.23	2.44±0,80	4.41±0.62
	Mardin	22.95 ± 0.47[ab]	6.69±0.84	23.40±1.81	52.82±3.11	32.68±2.42	3.18±0.75	5.96±0.97
	Şanlıurfa	23.44±0.64[b]	7.66±0.97	24.43±1.47	58.09±3.58	32.21±3.60	2.40±0.68	5.24±0.46
	Av.	22.81±0.36	7.38±0.45	24.12±0.82	53.20±1.77	32.84±1.22	2.68±0.33	5.13±0.37
		*	ns	ns	ns	ns	ns	ns
WS	Diyarbakır	89.02±0.74	2.62±0,27	42.22±1.62	70.14±0.79	49.81±2.10	1.37±0.30	7.18±0.59
	Adıyaman	91.11±1.66	2.63±0,20	40.40±2.20	70.93±3.03	43.29±0.47	1.55±0.18	7.44±1.07
	Mardin	88.22±0.84	2.67±0.28	42.56±1.27	71.39±3.19	50.51±2.93	1.62±0.15	9.09±0.29
	Şanlıurfa	89.09±1.11	2.45±0.29	40.83±1.99	71.13±0.73	48.06±2.49	1.35±0.18	7.09±0.51
	Av.	89.36±0.58	2.59±0.11	41.50±0.82	70.90±0.98	47.92±1.27	1.47±0.10	7.70±0.38
		ns	ns	ns	ns	ns	ns	ns
LS	Diyarbakır	92.03±0,69[ab]	6,98±0.22	32.73±1.33	57.38±5.62[ab]	44.28±4.21	1.44±0.11	9.16±0.78
	Adıyaman	93.47±0.44[b]	6.44±0.36	36.21±3.08	50.80±1.88[a]	41.95±5.23	1.37±0.19	8.25±0.58
	Mardin	90.50±0.18[a]	6.49±0.31	32.39±0.75	60.36±2.43[ab]	39.54±5.31	1.19±0.15	9.55±1.10
	Şanlıurfa	93.05±0.49[b]	6.95±0.22	31.85±0.90	63.34±1.77[b]	37.65±3.19	1.53±0.10	8.28±0.56
	Av.	92.26±0.40	6,72±0.14	33.30±0.92	57.97±1.99	40.86±2.09	1.38±0.07	8.81±0.38
		*	ns	ns	*	ns	ns	ns

In corn silage, DM content is identified as 22.81%; CP, CC, NDF, ADF, CF and CA contents (based on dry material) were identified respectively as 7.38, 24.12, 53.20, 32.84, 2.68 and 5.13% as all regions average. These values were respectively as such for wheat straw and lentil straw; 2.59, 41.50, 70.90, 47.92, 1.47, 7.70% and 6.72, 33.30, 57.97, 40.86, 1.38, 8.81%.

Taking into account Table 1, major difference was identified between regions in terms of corn silage and lentil straw DM % ($P<0.05$). The lowest substance content in corn silage was determined in Diyarbakır region while the highest was observed in samples collected from Şanlıurfa region. In addition, the lowest amount of dry substance in lentil straw was detected in Mardin while the highest was figured out in samples collected in Şanlıurfa and Adıyaman regions. On the other hand, major statistical differences were not identified between samples in terms of CP, CC, ADF, CF and CA values. Major difference was observed between regions in lentil straw samples in terms of NDF content ($P<0.05$).

In corn silage, wheat straw and lentil straw samples collected from Diyarbakır, Adıyaman, Mardin and Şanlıurfa regions; Fe, Cu, Zn, P, Mg and Ca values are given in Table 2.

Table 2. Results of mineral substance analysis (dry material)

Fodder	Provinces	Fe mg/kg	Cu mg/kg	Zn mg/kg	P g/kg	Mg g/kg	Ca g/kg
CS	Diyarbakır	77.78±3.36	4.61±0.18	36.18±7.41	1.17±0.21	16.59±0.22	2.11±0.14
	Adıyaman	74.84±9.90	4.52±0.93	21.00±1.67	1.47±0.13	24.64±1.99	2.04±0.20
	Mardin	71.96±9.27	3.80±0.81	37.17±5.79	1.42±0.12	25.83±3.62	1.51±0.06
	Şanlıurfa	82.32±8.61	4.45±0.47	28.97±8.15	1.17±0.19	27.37±5.75	1.82±0.24
	Av.	76.73±3.69	4.35±0.30	30.83±3.32	1.31±0.08	23.61±1.96	1.87±0.10
		ns	ns	ns	ns	ns	ns
WS	Diyarbakır	135.83±12.91	3.35±0.60	17.46±2.58^{ab}	0.74±0.01	0.51±0.15	4.61±0.88
	Adıyaman	105.78±33.91	4.26±0.48	13.73±1.69^{a}	0.68±0.07	0.64±0.14	5.00±0.95
	Mardin	112.83±22.24	3.48±0.64	20.62±0.78^{b}	0.73±0.09	0.63±0.16	4.28±0.77
	Şanlıurfa	191.13±28.72	2.59±0.23	13.98±1.51^{a}	0.66±0.07	0.58±0.09	4.06±0.13
	Av.	136.39±14.89	3.42±0.28	16.45±1.13	0.70±0.03	0.59±0.06	4.49±0.34
		ns	ns	*	ns	ns	ns
LS	Diyarbakır	78.80±6.06	6.02±0.68^{a}	13.59±0.66	1.45±0.25	2.74±0.03^{ab}	22.83±3.39^{ab}
	Adıyaman	91.99±0.66	5.94±0.37^{a}	14.98±2.49	1.36±0.10	2.92±0.02^{b}	28.03±0.49^{b}
	Mardin	78.24±13.81	10.84±2.26^{b}	15.61±1.22	1.24±0.13	2.70±0,10^{a}	17.70±0.75^{a}
	Şanlıurfa	79.09±8.60	11.63±1.22^{b}	15.65±2.01	1.78±0.13	2.60±0.05^{a}	27.53±2.07^{b}
	Av.	82.03±4.09	8.61±0.98	14.96±0.79	1.46±0.09	2.74±0.04	24.03±1.53
		ns	*	ns	ns	*	*

In corn silage, Fe, Cu, Zn, P, Mg and Ca levels (based on dry material) respectively were identified as 76.73 mg/kg, 4.35 mg/kg, 30.83 mg/kg, 1.31 g/kg, 23.61 g/kg and 1.87 g/kg as average for all regions. These values in wheat straw and lentil straw were found respectively as; 136.39 mg/kg, 3.42 mg/kg, 16.45 mg/kg, 0.70 g/kg, 0.59 g/kg, 4.49 g/kg and 82.03 mg/kg, 8.61 mg/kg, 14.96 mg/kg, 1.46 g/kg, 2.74 g/kg, 20.74 g/kg.

Considering Table 2, major differences were not observed in terms of mineral contents in corn silage samples ($P>0.05$). In addition, Zn content in wheat straw was the lowest in samples collected from Adıyaman and Şanlıurfa regions while the highest was in Mardin region, and major differences were determined between regions ($P<0.05$). On the other hand, while the difference between regions was major in terms of Cu, Mg, Ca levels for lentil straw ($P<0.05$), major statistical differences were not found between regions in terms of Fe, Zn and P values. Cu content in lentil straw was seen in samples collected from Diyarbakır and Adıyaman while the highest was found in Mardin and Şanlıurfa regions.

It is known that nutrition substance contents of plants vary due to factors like the region they grow, soil type, climatic condition of the region as well as fertilization, vegetation period and harvest period. Therefore, each of the mineral substance levels identified in fodders grown in the GAP region have not been compared one by one to the values on the international tables showing the mineral substance level of fodders. Comparisons made with the results of the research conducted by Akyıldız,

R.,1983 in the Eastern and Southeastern Anatolia and Black Sea Regions of Turkey, have displayed that different mineral substance levels of various fodder plants and fodder raw materials in the Eastern and Southeastern Anatolia and Black Sea Regions differ widely even within the same region.

4. CONCLUSION

In the present study, DM, CP, CF, CA, CC, NDF and ADF values have been determined in order to identify the mineral substance levels in some forages produced in the GAP region and used in feeding the animals. Ca, P, Mg, Fe, Cu and Zn levels have been determined in the fodder samples collected. Based on the gathered information, it might be possible to prevent low fertility related to minerals in animal feeding in the region.

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