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An Investigation on Nutrient and Selenium Content of Grass from Different Areas

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Abstract: In this study, total nutrient and Selenium (Se) content of 84 pasture grass samples taken from 15 locations around Van Lake and were analyzed. The samples were collected every 15 days between May 15th 1996 and August 15th 1996 for seven different periods. Sampling was performed in 1 location for 3 periods, in 5 locations for 5 periods, in 7 locations for 6 periods and in 2 locations for 7 periods. The differences between periods were not significant in Crude Ash (CA%) ($p>0.05$) but were significant in Dry Matter (DM%), Crude Protein (CP%), Ether Extract (EE%), Crude Fiber (CF%) and Nitrogen Free Extract (NFE%) ($p<0.05$). There were significant differences between locations in DM, CP, EE, CA, CF and NFE% ($p<0.05$). Regression analysis results showed no relationship between DM, CP, EE, CA, CF and NFE% and Se (mg kg^{-1}) content.

Key words: Meadow, total nutrient, selenium, pasture grass, crude ash

INTRODUCTION

The importance of animal food stuffs in human consumption has become the main reason in the interest of human to animals.

In animal feeding, meadows and pastures have an important part in animal husbandry; therefore, studies on them are very effective on animal production.

Due to the fact that Eastern Anatolia is an important region for animal production, determining both nutrient content and Se content, said problematic in the region of the meadows and pasture of Lake Van Basin will fill the gap in the region.

Although, Se has been known as a toxic element since 1817, it was determined as an essential nutrient in 1957. It has been reported that the deficiency or excess of Se in meadows and pastures cause several diseases and negative nesses in animals (Beale *et al*., 1990).

Selenium is an essential micro element. As reported in Pehrson *et al*. (1993) Schawanz and Folltz revealed that Se prevented the lung degeneration in rats fed whit inadequate vitamin E; therefore, showed that it is an essential nutrient. Moreover, when Se is taken up over the requirement, it becomes toxic. It has been known as a toxic element far many years. On the other hand, inadequate Se causes many diseases and negative nesses in many animal species Sevgican (1977) and Spallholz (1994) retorted the deficiencies caused by inadequate Se as fatigue, weakness, decrease in wool and offspring production, weak teeth, white muscle disease in sheep and fatigue, weakness and problem in placenta removal (throw) in cattle. Se has important roles in cell respiration. In an organism, Se content is the most abundant in liver and kidneys, but the least abundant in blood, pancreas, spleen, hair and horns. Se accumulation increases in some period based on the consumed amount and then a balance is established between the up taken and removed Se (Spallholz, 1994). Rotruck and Fhale independently determined that Se is an indents able building material of GSH Px in 1973 and is was the most important biochemical role of Se. With this property, Se protect from oxidative pressure (Zachara *et al*., 1992).

Due to the complexity of deface mechanisms related whit the oxygen poisoning and lipid oxidation in cell level, three functions of Se-GSH-Px have been demonstrated only experimentally up until now. These functions are, Se-GSH-Px prevents oxidation by destroying H_2O_2 and hydrocyperoxide in erythrocytes, Se-GSH-Px regulates the H_2O_2 concentration in cells when katalaz activity is low or absent and Se-GSH-Px blocks lipid peroxsidation in liver and destroys H_2O_2.

In the study, no certain criteria has been determined in order to find out the suitable levels of Se compounds. In contrast to white muscle disease and problems in plesenta throw, it is difficult to find adequate experimental results for total Se concentration in serum, tissue and blood. Another negative situation is that different diagnostic methods have been applied in Se measurements such as the determination of Se levels in serum or plasma, the determination of peroxides activity in plasma or blood (Galgan and Frank, 1993).

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Food and Drug Administration in the USA stated that 0.1 ppm of Se level in pigs and chickens and 0.2 ppm of Se level in turkey's feed provided safety in 1974. On the other hand, in 1987, it was concluded that the minimum 0.3 ppm Se for each kg of dry matter of feed should have given to chickens, turkeys, pigs, sheep and cattle in order to prevent health problems and other negative consequences (Ullrey, 1992).

The results on the Se uptake in ruminants were all different. These differences were caused by the various criteria taken into consideration such as the form of Se, the Se reserve of the animal, various factors in feed (proteins and the structure and concentrations of heavy metals) and the structure of mixed feed. According to the World Health Organization reports 0.2 ppm Se concentration for each kg dry matter of ruminants' feed was enough to prevent Se inadequacy. On the other hand, Conrad and Smith recommended the use of 0.03 mg Se addition per kg dry matter of feed. However, nowadays it is agreed that 0.01 ppm Se addition is adequate (Zachara *et al*., 1992).

The 68.7% of protein and 62.2% of starch in crude feed is supplied from meadows and pastures in plateaus. The starch, crude protein and crude fiber levels of the dry matter contents of plant species in Turkey's meadows and pastures were 45.1, 9.4 and 35.6%, respectively in gramineae species, 40.9, 19.9 and 25.1%, respectively leguminosea species and 49.6, 33.0 and 22.1%, respectively other species (Genckan, 1985).

MATERIALS AND METHODS

Total 84 meadow plant samples from 12 towns of Van province (Erek-Central, Fidanlik-Central, Edremit, Gevas, Catak Gurpinar, Baskale, Ozalp, Saray, Muradiye, Caldiran, Ercis) and 3 towns of Bitlis province (Adilcevaz, Ahlat, Tavan) were evaluated from 15th May to the end of vegetation period in fifteen day intervals.

Se analysis of samples were carried out at the beginning middle and end of the vegetation period, but when there was inadequate samples in that periods, samples from the close dates were used. In some regions, samples couldn't collect in some periods due to various reasons.

The exact places of meadows were determined after fixing the subject of this study. The Staff of Province Agricultural Managements and 9th village Support Management was interviewed on April 20th and 21st 1996. By taking into consideration the soil structure and meadows' characteristics of the regions, representative meadows were chosen on the maps and these regions were visited on the first three days of May 1996 and samples were taken in 15 days intervals from May 15th to end of the vegetation period in the selected meadow parcels.

Samples were put into the plastic bags and carried to the laboratory were some parts of the samples were dried immediately at 105°C and analyzed. The rest of the samples were naturally dried in laboratory condition. Dried samples were sieved in a 1 mm-mesh size grinder and saved in plastic bags. All nutrient matters except crude starch were analyzed by the method of Weende (Akyildiz, 1984). Crude cellulose was analyzed by the method published in Official News Paper in 21 January 1992 (Anonymous, 1992).

The hydrur formation method was used in the Se analysis. The Se amount was determined by atomic absorption spectrophotometer in heated quartz tubes after Se (IV) was transformation into SeH_2. External calibration technique and standard addition method was used in this analysis (Anonymous, 1997).

All data were subjected to analysis of variance using General Linear Model procedure of SAS (1982). Mean treatment differences were determined by Duncan's multiple range tests with a level of statistical differences of 5% (Duzgunes *et al*., 1978).

RESULTS AND DISCUSSION

The main objective of this study was to determine the Se and nutrient content of meadows located in 15 regions of Lake Van Basin and collected in 15 days intervals (Table 1). The sample sizes were different in these regions. Table 2-10 demonstrate the nutrient contents of meadows.

Crude nutrient content results were determined for each period (from 1-7) in the Table 2-10.

Based on the analysis it was seen that the meadows of Lake Van Basin had general crude nutrient content characteristics of meadows even some had better crude nutrient content (9). Crude nutrients were presented as percentage in dry matter content. While, the highest CP level (20.06%) was obtained from the first period in Adilcevaz region, the lowest one (4.63%) was obtained from the 6th period in Muradiye region. The highest CL (3.76%) was obtained from the 6th period in Gurpinar, while the lowest one (1.08%) was obtained from 2nd period in Edremit. The highest CA (17.01%) was obtained from the 3rd period of Ercis, while the lowest one (4.92%) was obtained from the 4th period in Baskale. While, the highest CC value (42.40%) was obtained from the 4th period in Saray, the lowest one (22.18%) was obtained from the 1st period in Ercis. The highest NFE (62.17%) was obtained from the 6th period Fidanlik-Central, the lowest one was obtained from the 4th period in Ercis.

Table 1: The regions, the numbers and dates of samples

Location	Samples	Start of samples	End of samples	Period of samples	Period of Se samples
Erek*	5	01.06.1996	01.08.1996	2 3 4 5 6	2 4 6
Fidanlik*	5	01.06.1996	01.08.1996	2 3 4 5 6	2 4 6
Edremit*	5	01.06.1996	01.08.1996	2 3 4 5 6	2 4 6
Gevas	7	16.05.1996	16.08.1996	1 2 3 4 5 6 7	2 4 6
Catak	6	16.05.1996	02.08.1996	1 2 3 4 5 6	2 4 6
Gurpinar	6	16.05.1996	02.08.1996	1 2 3 4 5 6	2 4 6
Baskale**	5	02.06.1996	15.08.1996	2 4 5 6 7	2 4 6
Özalp	6	15.05.1996	15.08.1996	1 2 3 4 5 6	2 4 6
Saray	5	15.05.1996	03.08.1996	1 2 3 4 5	2 4 5
Muradiye	6	17.05.1996	17.06.1996	1 2 3 4 5 6	2 4 6
Caldiran***	3	17.05.1996	17.08.1996	1 2 3	1 2 3
Ercis	7	17.05.1996	08.08.1996	1 2 3 4 5 6 7	2 4 6
Adilcevaz	6	17.05.1996	03.08.1996	1 2 3 4 5 6 7	2 4 6
Ahlat	6	17.05.1996	03.08.1996	1 2 3 4 5 6	2 4 6
Tatvan	6	17.05.1996	03.08.1996	1 2 3 4 5 6 7	2 4 6

*Taking the samples began on 01.06.1996; **Taking the samples didn't made in Baskale because of security reasons on 16.05.1996 and 16.06.1996; ***Taking the samples didn't made the last 4 period becous of kuraklik

Table 2: Parameter estimates for 1st period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Erek	**	-	-	-	-	-	-
Fidanlik	**	-	-	-	-	-	-
Edremit	**	-	-	-	-	-	-
Gevas	18.960	91.419	10.311	2.899	7.806	22.484	56.500
Catak	21.550	91.625	14.080	1.708	12.534	24.711	46.968
Gurpinar	26.590	91.996	10.991	2.228	8.794	27.677	50.310
Baskale	**	-	-	-	-	-	-
Özalp	19.130	90.891	11.471	2.324	10.297	26.872	49.036
Saray	21.440	91.523	13.595	1.548	13.850	28.139	42.867
Muradiye	16.020	91.441	12.003	1.102	14.148	31.322	41.425
Caldiran	19.720	91.984	12.585	2.128	9.209	28.500	47.579
Ercis	16.480	92.186	14.585	1.724	10.862	22.185	50.645
Adilcevaz	16.630	90.400	20.059	1.371	12.857	25.631	40.083
Ahlat	16.530	92.669	13.069	1.693	10.461	38.647	36.130
Tatvan	19.040	92.481	14.082	2.406	10.271	24.668	48.573

*Dray matter in fresh matter; **Because the vegetation wasn't starting, samples weren't taken in this period

Table 3: Parameter estimates for 2nd period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Erek	26.070	91.376	10.567	1.700	10.993	38.866	37.877
Fidanlik	34.030	90.539	9.165	2.293	8.880	29.888	49.774
Edremit	32.130	92.729	10.806	1.077	8.244	27.537	52.335
Gevas	27.820	92.678	9.478	1.151	8.206	26.244	54.920
Catak	23.450	91.103	10.552	1.891	8.147	30.574	48.836
Gurpinar	30.700	91.139	10.864	2.466	9.634	30.448	46.588
Baskale	21.290	91.185	10.831	1.223	12.560	23.178	52.209
Ozalp	22.340	92.699	9.973	1.873	10.106	34.316	43.702
Saray	24.980	92.812	10.643	1.775	9.943	34.639	43.001
Muradiye	19.080	91.112	10.997	1.437	12.309	28.331	46.693
Caldiran	23.370	91.995	12.144	3.149	9.078	24.959	51.133
Ercis	17.860	93.668	13.746	2.248	13.281	30.355	40.369
Adilcevaz	19.810	91.831	16.918	1.742	11.066	31.718	38.556
Ahlat	18.390	92.264	10.887	2.462	11.069	36.528	39.053
Tatvan	21.440	91.779	13.887	2.103	11.662	31.456	40.893

*Dray matter in fresh matter

There was significant ($p<0.05$) differences for DM, CP, CL, CC and NOM in the regions and periods. The regions, but not periods were significantly ($p<0.05$) different for CA. Se content was insignificant in the regions and periods. The highest Se content (0.0301 ppm) was obtained from the second period and lowest one (0.226 ppm) was obtained from the 6th period. Average essential Se content for ruminants is between 0.02-0.30 ppm. However, in this study the Se content never reached to the upper limit (0.3 ppm). However, in some places and periods (2nd periods of Erek, Edremit, Fidanlik, Ahlat, Muradiye, Caldiran 4th periods of Ercis and Ahlat) it dropped below the lower limit (0.02 ppm).

Based others results, it was shown that there was no constant inadequacy for the some region, but there were some inadequacy in some periods of some regions. The

Table 4: Parameter estimates for 3rd period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Erek	29.850	91.376	9.684	1.973	10.383	30.630	47.329
Fidanlik	34.700	96.558	9.658	1.164	9.719	31.872	47.587
Edremit	35.990	90.005	8.362	2.307	9.166	34.915	45.251
Gevas	25.520	92.458	8.736	1.808	7.221	28.508	53.710
Catak	26.190	91.868	8.339	2.111	8.486	39.440	41.444
Gurpinar	36.070	90.736	10.300	1.450	8.944	37.661	41.645
Baskale	**	-	-	-	-	-	-
Özalp	27.860	90.740	8.673	2.125	10.455	35.378	43.369
Saray	23.490	92.223	10.116	2.155	10.196	39.623	37.911
Muradiye	23.940	90.480	10.584	2.202	10.644	37.267	37.553
Caldiran	63.580	88.135	9.345	2.867	11.157	34.636	41.996
Ercis	21.630	89.824	11.407	2.024	17.097	41.342	28.131
Adilcevaz	22.790	86.547	10.465	2.027	9.894	37.691	39.927
Ahlat	28.440	90.816	10.191	1.783	16.317	39.120	32.590
Tatvan	24.400	91.463	11.760	1.249	12.901	37.873	36.217

*Dray matter in fresh matter; **Taking the samples didn't made in Baskale because of security reasons

Table 5: Parameter estimates for 4th period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Erek	31.220	94.961	9.180	2.898	9.767	32.232	45.933
Fidanlik	35.150	93.033	6.713	1.416	8.454	30.008	53.335
Edremit	37.220	91.388	7.920	1.822	8.754	33.483	48.022
Gevas	32.740	93.999	8.432	1.239	8.077	31.557	50.695
Catak	29.320	93.995	6.812	1.334	7.083	32.059	52.711
Gurpinar	41.950	94.067	8.792	2.833	8.287	38.250	41.838
Baskale	23.340	93.881	8.814	2.025	4.917	28.390	55.950
Özalp	33.060	93.878	7.797	1.728	9.222	37.226	44.027
Saray	49.560	92.887	8.004	1.363	9.882	42.464	38.286
Muradiye	25.710	92.469	8.254	2.230	12.298	42.186	35.032
Caldiran	**	-	-	-	-	-	-
Ercis	23.400	92.060	10.402	2.080	16.700	42.238	28.580
Adilcevaz	29.820	93.203	9.275	1.908	12.415	37.001	39.401
Ahlat	34.040	93.085	10.317	2.459	15.309	38.371	33.544
Tatvan	27.760	93.228	8.874	2.018	12.141	32.983	43.985

Table 6: Parameter estimates for 5th period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Erek	33.000	95.893	8.180	2.539	11.017	30.632	47.631
Fidanlik	35.650	95.805	5.603	1.781	8.350	28.914	55.351
Edremit	39.950	95.970	7.312	2.074	9.735	31.936	48.943
Gevas	33.070	91.912	8.623	2.874	10.742	36.792	41.941
Catak	30.740	91.642	5.855	2.565	8.225	35.653	47.700
Gurpinar	55.520	91.268	8.340	3.584	9.805	37.045	41.226
Baskale	26.410	89.608	8.093	2.698	9.634	32.278	47.296
Özalp	35.330	92.185	6.984	2.696	11.728	33.180	45.413
Saray	62.230	91.628	6.052	1.946	12.838	42.389	36.776
Muradiye	34.630	91.659	6.616	2.367	9.242	39.789	41.986
Caldiran	**	-	-	-	-	-	-
Ercis	24.340	93.376	8.003	2.131	13.192	36.116	40.558
Adilcevaz	41.320	94.159	6.648	2.104	10.053	40.434	40.761
Ahlat	35.910	93.769	9.369	2.316	11.326	34.397	42.592
Tatvan	59.420	93.144	8.487	1.698	14.640	35.162	40.011

Table 7: Parameter estimates for 6th period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Erek	36.400	91.987	5.509	2.426	15.055	35.608	41.401
Fidanlik	38.380	95.081	5.110	1.928	7.558	23.324	62.170
Edremit	46.100	96.784	6.029	1.681	12.104	32.500	47.686
Gevas	40.480	93.419	6.570	2.482	10.777	37.868	42.302
Catak	36.470	93.754	4.803	2.096	9.598	38.669	44.833
Gurpinar	61.180	94.439	6.457	3.755	9.461	36.707	43.620
Baskale	33.720	94.704	7.111	1.837	6.756	31.064	53.232
Ozalp	59.670	94.767	5.910	1.966	10.011	37.489	44.624
Saray	**	-	-	-	-	-	-
Muradiye	47.910	93.994	4.634	2.480	11.218	37.616	44.050
Caldiran	**	-	-	-	-	-	-
Ercis	32.450	93.937	7.175	1.393	16.359	26.901	48.172
Adilcevaz	57.400	93.325	6.236	2.364	14.718	36.085	40.597
Ahlat	36.470	93.754	7.714	2.096	9.598	32.412	48.179
Tatvan	61.020	92.517	7.820	2.102	11.802	38.668	36.907

*Dray matter in fresh matter; **Because the vegetation finished, samples weren't taken in this period

Table 8: Parameter estimates for 7th period

Locations	DM*%	DM%	CP%	EE%	CA%	CF%	NFE%
Gevas	45.350	94.375	6.182	2.582	12.733	34.622	43.900
Baskale	54.217	94.624	6.318	1.402	8.671	32.033	51.576
Ercis	43.750	94.512	5.599	2.503	12.138	27.858	51.901

*Dray matter in fresh matter; **Because the vegetation finished, samples weren't taken in other location

Table 9: Parameters (%) of the all periods and standard error

Periods	n	DM	CP	EE	CA	CF	NFE
1	11	19.30±2.34f	13.33±0.40a	2.03±0.16	11.01±0.60	27.35±1.09c	46.29±1.38a
2	15	24.19±1.95ef	11.42±0.33b	1.91±0.13	10.38±0.50	30.59±0.91bc	45.70±1.15a
3	14	30.53±2.03de	9.82±0.35c	1.95±0.14	10.99±0.52	36.93±0.95a	40.31±1.20b
4	14	32.45±2.04cd	8.54±0.35d	1.96±0.14	10.31±0.52	35.53±0.96a	43.67±1.21ab
5	14	39.11±2.04bc	7.45±0.38d	2.45±0.14	10.74±0.52	35.17±0.95a	44.20±1.21ab
6	13	45.23±2.13ab	6.22±0.36e	2.18±0.14	11.15±0.55	35.11±1.00a	45.34±1.29a
7	3	50.09±4.69a	6.03±0.80e	2.16±0.32	11.14±1.21	31.49±2.19b	49.18±2.77a

a-f: Values with different letters in the same line differ significantly ($p<0.05$)

Table 10: Parameters of Se (mg kg^{-1})

Locations	2nd period	4th period	6th period
Erek	0.0199	0.0310	0.0174
Fidanlik	0.0264	0.0297	0.0150
Edremit	0.0199	0.0321	0.0240
Gevas	0.0285	0.0325	0.0240
Catak	0.0256	0.0310	0.0247
Gurpinar	0.0369	0.0224	0.0241
Baskale	0.0321	0.0222	0.0240
Özalp	0.0289	0.0280	0.0256
Saray*	0.0299	0.0421	0.0310
Muradiye	0.0634	0.0199	0.0221
Caldiran**	0.0367	0.0160	0.0179
Ercis	0.0325	0.0170	0.0199
Adilcevaz	0.0334	0.0220	0.0219
Ahlat	0.0166	0.0200	0.0149
Tatvan	0.0215	0.0185	0.0316

*Because vegetation in Saray town was short, samples were collected in only 5 periods; **There was drought in Caldiran town and after the first three periods, there were no samples

Table 11: Correlations among DM, CP, EE, CA, CF, NFE and Se

Factors	DM	CP	EE	CA	CF	NOM	Se
DM	1.00000						
CP	0.68087**	1.00000					
EE	0.26182	-0.04855	1.00000				
CA	-0.00736	0.09702	0.10673	1.00000			
CF	0.41704**	-0.33396*	0.28902	0.26095	1.00000		
NOM	-0.01210	-0.16390	-0.23690	-0.70682**	-0.74000**	1.00000	
Se	-0.13144	0.29776a	-0.19745	-0.14057a	-0.30380a	0.19690	1.00000

*Significant at $p<0.05$; **Significant at $p<0.01$; a: Insignificant relationship with Se (+/-) b: Percentage value

highest two Se contents (0.0634 ppm and 0.0421 ppm) was obtained from the 2nd period in Muradiye and the 4th period in Saray, respectively. The lowest two Se contents (0.0149 ppm and 0.0150 ppm) were obtained from the 6th period in Ahlat and the 6th period in Fidanlik-Central-Van.

When evaluating the correlations among DM, CP, CL, CA, CC, NFE and Se there were insignificant correlations among these combinations; DM-CL, DM-CA, DM-Se, DM-NFE, CP-CL, CP-CA, CP-NFE, CL-CA, CL-Se, CP-Se, CA-Se and NFE-Se. There were very significant ($p<0.01$) positive correlations between DM and CC and between CA and NFE.

There were also significant ($p<0.05$) and negative correlations between CC and Se and between CP and Se. There were also significant ($p<0.05$) and positive correlation between CA and CC and between CL and CC (Table 11).

CONCLUSION

Obtained from the region of the basic nutrient content of pasture grasses in general reflected the topical characteristics. However, some differences were observed in the basic nutrient content between the periods and the region due to soil structure and climate in the study area. Expected the maximum and minimum levels of selenium in ruminant feed rations are 0.30-0.02 mg kg^{-1}. In this stud, selenium values were found near the lower limits. There were found same negative and positive correlations between selenium and other nutrients but those are statistically insignificant.

In this study, it was concluded that good for ruminant animal production activities selenium should be added to the ruminant rations in the region.

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