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Determination of the relationship between soil structure and botanical composition of the plain pastures in the coastal region of Samsun province

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SUMMARY – This study was conducted in 14 different plain pastures representative of the Samsun coastal Region. The relationships between soil structure and plant cover and distribution of the plants according to their families were studied in these pastures. Observations and measurements were made between 26th April and 17th May, 2005. Generally, Organic Matter (OM) contents were high in the clay soil pastures, moderate in the silty soil pastures, and moderate and low in the sandy soil pastures. pH values varied from 7.2 to 8.7. Plant cover of the pastures changed between 35.62 and 84.80%. Regarding the plant families, it was observed that silty soil pastures had more legumes and sandy soil pastures had plants belonging to the other families. However, no relationship could be determined between soil structure and sward botanical composition.

Key words: Pasture, range, vegetation, soil structure, wetland.

RESUME – *"Détermination du rapport entre structure du sol et composition botanique des pâturages de plaine dans la région littorale de la province de Samsun". Cette étude a été menée à terme dans les 14 différents pâturages marécageux qui représentent la rive de Samsun. Dans ces pâturages, on a étudié les relations entre la structure du sol, étant couverte de plantes, et la distribution des plantes selon les familles. Les observations et les mesures ont été faites entre le 26 avril et le 17 mai 2005. En général la teneur en matières organiques était haute dans les pâturages à terre argileuse, moyenne dans les pâturages "silty" et moyenne et basse dans les pâturages à terre sableuse. Le pH a varié de 7,2 à 8,7. La région qui est couverte de plantes dans les pâturages a présenté une variabilité entre 35,62 et 84,80%. Quand nous avons pris en considération les familles des plantes, nous avons observé que les légumineuses se trouvaient dans les pâturages à terre argileuse, mais les plantes appartenant aux autres familles existaient davantage dans les pâturages à terre sableuse. Cependant, nous n'avons pas pu déterminer une relation entre la structure de la terre et la composition botanique des prairies.*

Mots-clés : *Pâturage, végétation, structure de la terre, espace mouillé.*

Introduction

As pasture stockbreeding consists of the 70%. Turkey's stockbreeding system, naturally this function is priority. Overgrazing for years and inconsiderable utilization of native pastures have caused extinction of high quality plant species in the pastures and continual decrease of the biodiversity.

Regarding plant cover of meadow and pastures in Samsun province, vegetation was adequate in some pastures, whereas, low vegetation density was observed in some parts of pastures. However, meadow and pasture quality is low as they were a lot of non-nutritious plant species having low yield. Most of the flat pastures flood or water level are too close to surface between December and May as water level is high in this period. Determination of the soil characters of a pasture, plant cover rate and contribution of the species to the botanical composition is main application to find out the damage degree and precautions. There is a significant correlation among the plant - soil and water (Altın *et al*., 2005). Plant covered area gives reliable data on general situation of pasture vegetation (Genckan, 1966; Bakır, 1970). Kroel-Dulay *et al*. (2004) determined the species ratio of botanical composition in meadows, soil type differences and special characters of the dominant species in a research conducted in New Mexico.

This study was conducted in 14 different flat pastures representing Samsun Coastal Region. Considering each pasture zone, soil samples were analyzed to determine the general soil characters. Plant covered area; botanical composition and distribution of the plants according to their families were inspected in these pastures.

Material and method

This study was conducted in 14 different flat pastures (Terme Town - Sakarlı settlement, Miliç village and Ahmetbey village, Çarşamba Town - Akçatarla village, Kumtepe village, 19 Mayıs Town - Engiz village and Yörükler village and Bafra Town - Doğanca settlement, Fener village, Koruluk village, Sarıköy, Üçpınar village) representing Samsun Coastal Region.

Average altitudes of these pastures were about 4 meters. Observations and measurements were done between 26th April and 17th May 2005. Transect method, recommended by many researchers was used for measurements (Tosun, 1968; Koç and Gökkuş, 1996; Kendir, 1999). Considering each pasture zone, plant covered area was determined using at least 10 transect measurements.

Samsun province has generally moderate climate. But, climate shows difference towards transit zones. Moderate climate in coastal region (hot weather in summers, warm and rainy in winters), and terrestrial climate is observed (cold and rainy in winters; cool in summers) in transit zones effected by Akdag (2000 m altitude), Canik (1500 m altitude), Nebyan (1399 m altitude) mountains. Annual mean temperature was 14.2°C. The hottest months according to long-term mean temperatures were July (23.1°C), and August (23.2°C). The coldest months were January (6.9°C) and February (6.6°C). Long term mean precipitation of Samsun province was 666.4 mm. Precipitation percentage was 24% in spring, 17% in summer, 32% in autumn and 27% in winter months.

Considering each pasture zone, soil samples were analysed to determine the general soil characters. Organic matter content (Walkley – Black method), Phosphorous content, (Olsen), lime content (Calcimetric method) were determined in soil (Kacar, 1994). Texture analysis was done according to "Bouyoucos Hidrometre" method (Demiralay, 1993). PH values of soil samples were measured with 1:1 soil-water rated pH meter having glass electrode (Bayraklı, 1987). Electrical conductivity values of the soils were found out with 1:1 soil-water rated electrical conductor (Richards, 1954). Total Nitrogen was calculated according to Kjeldahl method (Bremner 1965).

Results and discussion

Some soil characters, plant covered areas, plant species belonging to legumes, grasses and other families of flat pastures in coastal region of Samsun province is presented on Tables 1, 2, 3. Different soil textures such as sandy, silty, clay and different mixture types, and different values and ratios were determined concerning organic matter, lime and pH. Different ratios of plant species belonging to legume, grass and other families were obtained as well. Considering the organic matter contents of soil samples, generally clay soils had high organic matter contents, silty soils had moderate and sufficient organic matter contents, whereas, sandy soils had moderate and insufficient organic matter content. Only does the soil sample obtained from Ahmetbey have sufficient phosphor content. Other soil samples had moderate and low phosphor content.

Table 1. Soil characters and plant designs of flat pastures with sandy textures in Coastal regions of Samsun province

Character	Locations				
	Sakarlı	Doganca	Milic	Kumtepe	Engiz
Texture	Sandy	Sandy	Sandy-Loamy	Sandy-Clay-Loamy	Sandy-Clay-Loamy
Organic matter (%)	1.90	0.38	5.54	1.30	2.98
pH	8.7	8.7	7.3	8.5	8.0
Phosphor (ppm)	2.308	7.847	2.769	6.001	5.077
Lime (%)	3.92	6.15	0.99	7.97	2.88
Legume rate (%)	41.00	22.98	23.33	28.16	28.16
Grass rate (%)	24.49	43.25	39.10	33.86	33.88
Other fam. rate (%)	34.51	33.77	37.56	38.98	38.96
Plant covered area (%)	49.27	35.62	58.30	70.20	69.90

Table 2. Soil characters and plant designs of flat pastures with clay textures in Coastal regions of Samsun province

Character	Locations			
	Akcatarla	Engiz	Fener	Ucpınar
Texture	Clay	Clay	Clay	Clay
Organic matter (%)	8.01	5.16	5.09	4.99
pH	7.2	7.8	8.4	8.5
Phosphor (ppm)	3.231	1.846	1.846	11.540
Lime (%)	0.20	1.19	3.48	2.09
Legume rate (%)	37.50	37.81	15.61	26.79
Grass rate (%)	26.63	33.59	66.11	50.19
Other fam. rate (%)	35.89	28.42	18.27	23.02
Plant cov. area (%)	84.80	78.20	60.20	53.00

Table 3. Soil characters and plant designs of flat pastures with silty textures in Coastal regions of Samsun province

Character	Locations				
	Yorukler	Sarıkoy	Doganca	Koruluk	Ahmetbey
Texture	Silty-Clay	Silty-Clay	Silty-Clay-Loamy	Silty-Clay-Loamy	Loamy
Organic matter (%)	2.86	4.48	1.52	4.39	6.67
pH	8.4	8.2	9.0	8.3	7.9
Phosphor (ppm)	3.231	11.079	4.616	6.466	23.080
Lime (%)	1.34	2.95	12.82	5.98	2.73
Legume rate (%)	42.43	46.01	28.37	30.42	32.12
Grass rate (%)	48.22	38.18	41.13	38.12	50.65
Other fam. rate (%)	9.35	15.81	31.13	31.46	18.69
Plant cov. area (%)	67.40	62.60	59.90	76.60	61.00

Lime contents of the soil samples changed between 0.20 and 12.82. Soil samples, neutral pH characters, obtained from Milic and Akcatarla pastures had low lime content.

Plant covered areas of the pastures were determined between 35.62 and 84.80%. The highest value concerning plant covered area was found in Akcatarla pasture with clay soil character (84.80%), while the lowest value found in Doganca pasture with sandy soil (35.62%). Generally, the pastures with clay soil had higher plant covered area ratio.

Conclusion

The relationships among the soil characters and plant species-families were not clear in the study areas. This situation shows that climate factors and pasture grazing factors are also effective on plant species design. Most of the pastures flood or water level gets close to surface between December and January. Determination of pasture grazing time is very important in these kind of pastures. Soil gets tight when it is wet because of the overgrazing, sufficient aeration can not be supplied for plant root region. Therefore, roots can not strongly grow and vegetation remains short and weak. During the year, animals are grazing on the pastures. Sheep, cattle in winter, and sheep and cattle in some pastures are grazing together. This situation accelerates the pasture degeneration. Especially in the sandy soil and wet pastures, grass species are pulled up by sheep. Improvement of the flat pastures and sustainability can be supplied evaluating soil – plant and grazing relations.

References

Altın, M., Gokkus, A. and Koc, A. (2005). *Pasture – Rangeland Improvement.* Ankara, Turkey.

Bakır, O. (1970). *Comparison of Some Significant Methods Used for Measurement of Vegetation Characters*. Ankara, Turkey.

Bayraklı, F. (1987). *Analysis of Soil and Plant*. Samsun, Turkey.

Bremner, J.M. (1965). *Methods of soil analysis* part 2, *Chemical and microchemical properties*. Ed. C. A. Black., A. M. Soc. Of Agr. Inc. Madison, Wisconsin, USA.

Demiralay, İ. (1993). *Physical Analysis of Soil*. Erzurum, Turkey.

Genckan, M.S. (1966). Quantitative Characters of Pasture–Rangeland Vegetation. *Ege U., Journal of Agriculture Faculty,* 4(1):53-74.

Kacar, B. (1994). *Chemical Analysis of Soil and Plant*. III. *Soil Analysis*. Ankara, Turkey.

Kendir, H. (1999). Vegetation, hay yield and condition of a natural rangeland in Ayaş (Ankara). *Journal of Agricultural Science,* 5(1):104-110.

Koç, A. and Gokkuş A. (1996). Comparison of some canopy characters of the rangelands under grazing with partly protected and used as skıing ground in Palandöken Mountains. *3th Pasture – Rangeland and Forage Crops Congress of Türkiye,* June 17-19, page: 162-170, Erzurum, Turkey

Kroel-Dulay, G., Odor, P., Peters, D.C. and Hochstrasser, T. (2004). Distribution of plant species at a biome tarnsition zone in New Mexico. *J. of Veg. Sci.*, 15(4): 531-538.

Richard, L.A. (1954). *Diagnosis and improvement of saline and alkali soils*. U. S. Dept. Agr. Handbook, 60:105-106.

Tosun, F. (1968). *The Research on Determination of Optimum Sample Intensity in Rangeland Vegetation Study Using with Transekt Method*. Erzurum, Turkey.