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Investigation on some Soil Parameters for three Different Habitats of Mediterranean Region, Turkey

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Some soil parameters (humidity, pH, conductivity, organic matters, total nitrogen, saturation percentage, field capacity, cation exchange capacity, exchangeable cations, available phosphorus and soil texture) in three different types of habitats and three different parts in the Mediterranean region in Turkey were investigated. Overall results revealed that the differences among measurements of the some soil parameters for the three types of habitats of the high plateaus were negligible. The results of soil parameters analysis indicate that the eroded habitats may be subject to rehabilitation.

Key Words: Soil parameters, Mediterranean region, Erosion, Forest, Maquis, Turkey.

INTRODUCTION

Soil variability is partition able into systematic components associated with predictable factors of soil formation and random components. Many detailed studies in different part of the world have been confirmed that partitioning landscape on the basis of their contrasting segments has potential for efficient soil resource characterization and soil attribute prediction[1]. Quantitative information on soil variability has successfully been used to further understanding of causal factors of soil distribution and relationship among variables.

Soil is a complex system composed of organic and inorganic matters and where plants are growing and micro-macro organisms are living. Some soil parameters *e.g.* organic carbon has the potential for significant changes that depend on climatic fluctuations and land use by human beings. Organic matter in the soil contains dead biological matters and 10-15 % vegetable and animal microorganisms. It also includes some plant nutritional elements such as nitrogen, phosphorus and potassium. The turnover of organic matter is controlled by the kinetics of mineralization of organic matter. Mineralization kinetics is correlated with the quality of organic

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matter, such as the level of nitrogen, phosphorus and sulfur[2,3]. In addition, it is used as biological manure and improves the properties of soil. Transformation of soil organic matter is associated with the activity of microorganisms and enzymes in soil. Microbial and enzyme activity in soil are controlled by physical and chemical conditions, which include oxygen supply, pH and ionic activity.

The investigated area includes several natural areas in the Mediterranean region (C4, C5, C6 in the grid system) such as Amanos mountains in Hatay; Seyhan and Ceyhan river basins in Adana; Taurus mountains and Göksu, Lamas and Delicay river basins in Mersin, Turkey (Fig. 1). Tectonic pressure has given rise to rich karstic formations such as the deep caves and canyons and various kinds of marine fossils and some freshwater forms can be found on all of the high plateaus of the area[4]. In addition Mediterranean, Irano-Turanian and Euro-Siberian elements are known to exist in the investigated area and among them, asteraceae, fabaceae, poaceae, lamiaceae, rosaceae families are predominantly found[5]. Climate of the investigated area is generally Mediterranean, with hot summers and mild winters (mean annual rainfall is 611.4 - 1032.3 mm and mean annual temperature is 10.4 - 18.8°C)[6]. The selected area for the investigation plays an important role for the ecological stability in the southern part of Turkey. This area also has three different habitats such as Erosion, Maquis (*Quercus coccifera*) and Forest (*Pinus brutia*).

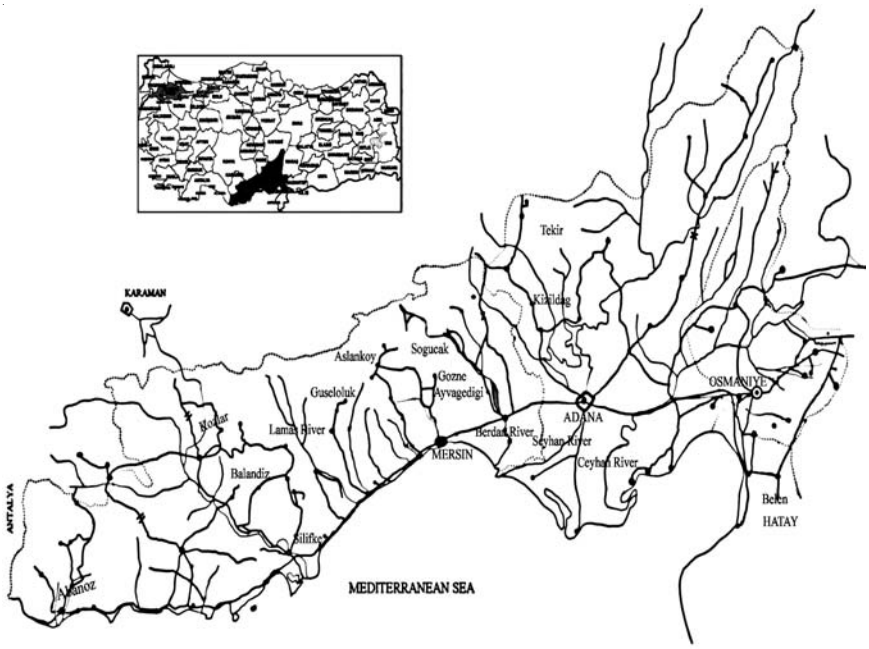

Fig. 1. Research area of Mersin, Adana and Hatay high plataeus

On the ground of literature survey, no report is available on soil components of the research areas which the selected high plateaus in the east part were Belen (Hatay), Kizildag and Tekir (Adana), in the middle part were Sogucak, Gozne, Ayvagedigi, Aslankoy (Mersin) and in the west part were Güzeoluk, Kozlar, Balandiz and Abanoz (Mersin). In this paper, some soil parameters in three different types of habits in the Mediterranean region is reported.

EXPERIMENTAL

Analytical reagent-grade chemicals were employed for the preparation of all solutions. Eleven locations were chosen in the Mediterranean region of Turkey from which a number of soil samples were collected over a period of January to March 2004. Soil samples were collected from 0-20 cm depth (8 cm diameter) and same altitude (*ca.* 950 m). Soil samples were air-dried and sieved with a 2 mm screen before analysis.

Soil samples were analyzed for humidity by the gravimetric method. Electrical conductivity and pH were determined according to Mc Lean method[7], organic carbon following Walkley and Black method[8], Organic matter was obtained by multiplying C values with 1.72 and total N by Bremner and Mulvaney method[9]. Cation exchange capacity was determined according to Rhodes[10] and exchangeable cations according to Thomas method[11]. Available P was analyzed using the method of Olsen and Sommers[12]. Saturation percentage was determined according to Robbins and Wiegand method[13]. Field capacity was calculated with a formula proposed by Flint and Child[14]. Sand, silt and clay percentages were determined by the pipette method[15] and texture classification was obtained using USDA texture categories[16].

RESULTS AND DISCUSSION

In present investigation, soils samples were collected from eleven high plateaus in the east, middle and west part of the research area. The selected high plateaus in the east part were Belen, Kizildag and Tekir; in the middle part were Sogucak, Gozne, Ayvagedigi, Aslankoy and in the western part were Güzeoluk, Kozlar, Balandiz and Abanoz. The soil samples were collected from the same depth and same altitude during the period of January to March 2004. Some soil parameters which are humidity, pH, conductivity, organic matters, total nitrogen, saturation percentage, field capacity, cation exchange capacity, exchangeable cations, available phosphorus and soil texture in three different types of habits and three different parts in the Mediterranean region in Turkey were investigated. The parameters in the soil samples at the respective stations are given in Tables 1-3 with different habitats.

TABLE-1
PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE SOILS OF EAST PART

Parameters		Belen			Kizildag			Tekir		
		Erosion	Maquis	Forest	Erosion	Maquis	Forest	Erosion	Maquis	Forest
Texture	Sand (%)	71.18	67.90	64.06	71.73	82.10	63.08	51.75	71.40	63.12
	Silt (%)	22.42	26.03	28.94	22.26	10.89	29.61	40.24	21.55	29.45
	Clay (%)	6.40	6.07	8.00	6.01	7.01	7.31	8.01	7.05	7.43
Humidity (%)		9.48	12.55	21.22	19.31	11.76	22.78	19.68	18.86	21.57
pH		7.77	7.85	7.70	7.96	7.84	7.54	7.60	7.04	7.25
Conductivity (dS/m)		0.87	0.51	0.87	1.12	0.46	0.89	0.91	0.59	0.69
Organic Matters (%)		4.35	4.13	5.66	5.28	4.27	5.50	3.48	3.71	5.54
Total Nitrogen (%)		0.22	0.31	0.23	0.24	0.31	0.39	0.22	0.17	0.20
C/N ration		11.5	7.75	14.3	12.8	8.0	8.2	9.2	12.7	16.1
Saturation (%)		23.45	24.44	24.69	22.14	21.23	24.73	26.19	23.57	24.69
Field Capacity (%)		10.78	12.46	11.85	10.41	10.40	12.61	12.57	11.79	11.61
CEC (cmol/kg)		12.61	11.43	7.68	16.91	14.75	15.10	16.61	18.53	14.91
Ca (cmol/kg)		2.94	2.79	1.92	3.27	2.32	2.90	2.48	2.69	2.30
K (cmol/kg)		1.96	1.88	1.30	2.51	1.77	2.16	1.18	1.07	1.11
Available P (mg/kg)		13.62	17.81	21.31	25.14	20.61	18.41	12.23	15.72	11.53
Soil Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam

Sand, clay and silt were found in the texture of soil samples taken. Sand content varied between 47.49 and 82.10 %, whereas clay content was between 6.01 and 9.41 % and silt content varied between 10.89 and 45.11%. According to texture analyses, all the soil samples exhibited sandy loam texture with *ca.* 67 % of the soil in the sand fraction except for maquis-Abanoz (Loamy sand). Clay content generally increased from the ground surface to the subsoil, probably as a result of argillation. This may also be due to severity of erosion on these stations.

The pH of a soil is dependent on the parent material, the climate, the native vegetation, the cropping history (for agricultural soils) and the fertilizer or liming practices. The pH range for soil samples is from 6.84 to 8.02 and mean is 7.49. This is also the range for most soils found in Mediterranean region. The pH values indicate that the most of the research areas have mostly alkaline soils while the Sogucak and Ayvagedigi have acid soils. The basic cations will come from the weathering of rocks and minerals, from dust blown on soils, from irrigation water or runoff water. When basic cations dissociate in the soil solution, they produce OH^-, which raise the pH of the soil.

Organic matter contents varied between 2.97 and 9.73 %. Organic matter encompasses all organic components of a soil *e.g.*, fresh residues, decomposing organic matter, stable organic matter, living organisms and fresh

TABLE-2
PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE SOILS OF WEST PART

Parameters		Kozlar			Abanoz			Balandiz			Guzeloluk		
		Erosion	Maquis	Forest	Erosion	Maquis	Forest	Erosion	Maquis	Forest	Erosion	Maquis	Forest
Texture	Sand (%)	74.41	78.59	77.78	69.92	70.92	78.98	73.61	73.19	69.09	47.49	70.16	50.49
	Silt (%)	17.63	15.03	15.15	24.07	22.07	14.78	19.34	20.21	22.92	45.11	23.14	43.11
	Clay (%)	7.96	6.38	7.07	6.01	7.01	6.24	7.05	6.60	7.99	7.40	7.70	6.40
Humidity (%)		7.08	7.11	9.90	12.65	14.58	16.04	12.05	19.13	14.76	19.68	16.86	17.57
pH		7.56	7.15	7.28	7.26	7.08	7.65	8.02	7.96	7.14	7.57	7.33	7.19
Conductivity (dS/m)		0.89	0.52	0.72	0.31	0.25	0.26	0.56	0.55	0.65	0.90	0.75	0.71
Organic Matter (%)		5.87	6.23	9.73	2.97	9.13	7.62	6.62	8.53	5.83	3.83	9.08	5.01
Total Nitrogen (%)		0.22	0.24	0.37	0.13	0.32	0.27	0.25	0.41	0.28	0.21	0.29	0.26
C/N ratio		15.5	15.1	15.3	13.3	16.6	16.4	15.4	12.1	12.1	10.6	18.2	11.2
Saturation (%)		22.80	22.73	22.61	24.16	19.59	22.72	23.24	23.46	23.59	27.04	23.88	26.94
Field Capacity (%)		10.26	11.14	10.85	11.60	9.99	10.68	10.69	11.49	11.80	12.98	11.46	13.75
CEC (cmol/kg)		12.48	14.04	14.99	13.81	15.17	10.85	20.26	18.83	18.22	16.59	16.74	19.46
Ca (cmol/kg)		2.40	2.67	2.64	1.66	1.85	1.32	2.98	2.81	2.64	3.13	3.10	3.63
K (cmol/kg)		0.75	0.89	0.81	0.47	0.51	0.39	1.10	1.01	0.98	1.02	0.97	1.17
Available P (mg/kg)		12.22	12.28	9.78	20.95	24.80	19.91	16.41	19.92	13.27	11.53	15.02	12.22
Soil Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam	Loamy sand	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam

TABLE-3
PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE SOILS OF MIDDLE PART

Parameters		Aslankoy			Sogucak			Ayvagedigi			Gozne		
		Erosion	Maquis	Forest	Erosion	Maquis	Forest	Erosion	Maquis	Forest	Erosion	Maquis	Forest
Texture	Sand (%)	70.06	65.01	68.27	61.21	72.64	70.19	63.27	57.41	71.98	51.62	70.52	49.58
	Silt (%)	22.93	26.82	23.52	29.38	21.13	21.46	29.32	36.02	19.39	40.67	21.47	42.31
	Clay (%)	7.01	8.17	8.21	9.41	6.23	8.32	7.41	6.57	8.63	7.71	8.01	8.11
Humidity (%)		17.97	8.33	11.71	21.08	12.20	13.03	13.58	14.05	16.61	20.62	17.69	13.19
pH		7.79	7.61	7.23	7.80	7.51	6.84	7.20	7.63	6.91	7.62	7.72	7.59
Conductivity (dS/m)		0.74	0.69	0.79	0.74	0.61	0.58	0.88	0.54	0.65	0.76	0.74	0.58
Organic Matter (%)		3.69	5.27	8.90	6.13	8.62	3.59	3.15	5.73	7.08	5.04	8.23	8.73
Total Nitrogen (%)		0.15	0.21	0.26	0.26	0.28	0.14	0.15	0.28	0.23	0.29	0.33	0.36
C/N ratio		14.3	14.6	19.9	13.7	17.9	14.9	12.2	11.9	17.9	10.1	14.5	14.1
Saturation (%)		23.79	24.14	23.64	24.28	23.67	23.31	24.67	25.84	22.93	26.31	23.37	26.48
Field Capacity (%)		11.18	11.59	11.46	11.53	11.84	11.42	11.84	11.56	11.47	11.84	12.85	14.83
CEC (cmol/kg)		13.74	11.31	12.30	6.92	5.14	5.55	6.88	6.09	5.85	10.52	6.64	7.62
Ca (cmol/kg)		3.22	2.21	2.10	1.26	0.90	0.79	0.97	0.87	0.86	1.67	1.05	1.27
K (cmol/kg)		1.04	0.70	0.71	0.39	0.27	0.26	0.36	0.33	0.31	0.48	0.29	0.35
Available P (mg/kg)		12.57	16.41	11.18	8.38	6.98	9.08	15.72	18.41	18.51	9.43	14.32	17.81
Soil Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy Loam	Sandy loam

residues. According to organic matter per cent; forest samples have generally higher percentage of organic matter. We can draw a conclusion from this result that the forest soil would resist erosion and compaction.

Each organic amendment has a characteristic amount of carbon in proportion to nitrogen. A low C:N ratio means that the material is high in nitrogen. Materials with a high C:N ratio (low nitrogen) decompose slowly and may trigger nitrogen deficiency in plants as they decompose. Mean C:N ratio was found 13.58 in this investigation. The C:N ration equal to or lower than 10 indicated a good to discrete equilibrium in soil between organic matter mineralization and production processes.

Cation exchange capacity is the ability of the soil to hold onto nutrients and prevent them from leaching beyond the roots. The more cation exchange capacity of the soil should have a higher fertility level. When combined with other measures of soil fertility, cation exchange capacity is a good indicator of soil quality and productivity. Mean value for cation exchange capacity is 12.68 cmol/kg. The high value of cation exchange capacity indicated a good nutrient availability. In addition, soil texture analysis and cation exchange capacity analysis results are in good agreement with each other.

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