The effect of organic wastes applied to eroded soils in different levels on structural stability index

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Introduction

Erosion which affects deadly the formation and maturing of the soil that is a living creature, disrupts the balance of the soil and consequently of the nature. Accelerated erosion is a serious problem for Turkey, as in whole world (Ozden and Ozden, 1998). Erodibility is closely related to the dynamic soil properties (Bajracharya and Lal, 1992). Soil organic matter content is one of the most important these properties. Application of organic conditioners into the eroded soils is increased organic matter content. Added organic residue to soil is a way efficiently for conflict against soil erosion.

This investigation was carried out to find the effect of adding various organic wastes such as bio-solid (BS) and tea waste (TW) into soil on structural stability index of eroded soils in different levels.

Methodology

Soil samples (0-20 cm depth) which used in this study were taken from slightly, moderately and severely eroded area in Samsun-Turkey. The bio-solid (BS) and tea waste (TW) were obtained from different institutions. Soils which used in this research were found different in terms of erosion index that SSI (Table 1). These soil samples were dried in shadow, were handled with wood handle and were sieved from 4mm. The used BS and TW were sieved from 0.5 mm. The soil samples were treated with the organic residue at four different levels (0, 2, 4, and 6, % basis w/w) and each treatment was replicated three times in a split block design [(3x2x4)x3]. All mixtures that put into the pots (height: 10 cm, diameter: 9 cm) were incubated for eighteen weeks under greenhouse condition. After incubation period, treated soil samples were rubbed by hand and sieved from a sieve with 2 mm openings.

Some properties of soils and organic wastes were determined by standard methods. Statistical assessment was done using SPSS (1998) software package program.

Results

Some properties of surface soil samples (0-20cm) were found as Table 1.

Table 1. Some properties belong to experiment soils.

Soil samples in different erosion levels		Slightly	Moderately	Severely
Particle size distribution, gkg^{-1}	S	146	131	152
	Si	260	308	317
	C	594	561	531
Textural class		C	C	C
pH		8.0	8.1	8.1
Organic matter content (OM), %		0.99	0.84	0.83
Cation exchange capacity (CEC), $meq100g^{-1}$		37.4	23.9	21.4
Lime content, %		16.6	19.4	21.9
SSI		68.7	77.8	78.3

After experiment period for eighteen weeks, changes in SSI values of eroded soils were determined. Significant difference in this property was observed depending on soil erosion levels, kind of organic residues, and application doses. Variance analysis result of this property is presented Table 2. As shown Table 2; SSI values were significantly influenced from the organic conditioners depending on erosion level ($P<0.001$), kind of residues ($P<0.01$), and application doses ($P<0.001$).

Table 2. Variance analysis of the SSI data.

Sources	DF	SS	SM	SM
Replicate	2	0.159	0.079	0.385ns
Erosion levels (A)	2	569.714	284.857	1380.433***
Error 1	4	0.825	0.206	
Organic wastes (B)	1	14.589	14.589	656.875**
Error 2	2	0.044	0.022	
A*B	2	60.109	30.054	1680.257***
Error 3	4	0.072	0.018	
Doses (C)	3	390.588	130.196	1210.338***
A*C	6	109.535	18.256	169.711***
B*C	3	17.735	5.912	54.956***
A*B*C	6	33.152	5.525	51.366***
Error	36	3.873	0.108	
General	71	1200.394	16.907	

ns: not significant, *: p<0.05, **: p<0.01, ***: p<0.001

Changes in SSI values of eroded soils compared with control treatments are shown in Figure 1. According to this figure, effectiveness of organic wastes is more evident on severely erosion level than other erosion levels. The highest increase in SSI value (%18.1) was obtained from 6 % doses of BS application in severely eroded soil compared to control (Figure 1). It is clear that organic waste application increase structural stability of soils. Similar results are supported by different many researchers (Saltali et al., 2000; Oguike et al., 2006) used organic residues.

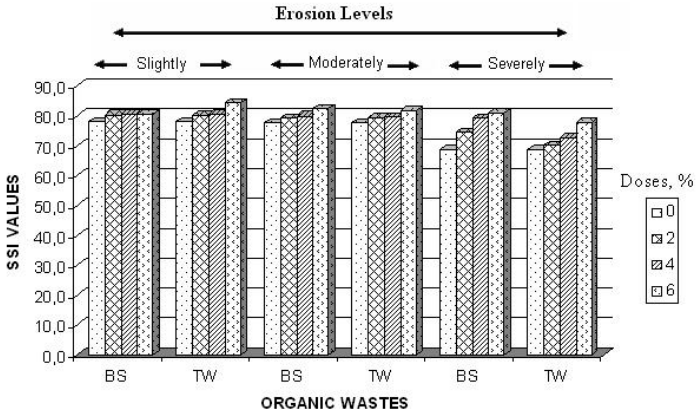

Figure 1. Changes in SSI values of the soils dep
severely), type of organic wastes (BS and T

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