Impact of EM on Soil Properties

In Spain a trial (Valarini, Diaz Alvarez, Gasco, Guerrero, & Tokeshi, 2003) conducted in Madrid, evaluated the properties of a clay loam soil enriched with organic matter and microorganisms under controlled temperature and moisture conditions, over a period of three months. The following treatments were carried out: soil (control); soil + 50t/ha of animal manure (E50); soil + 50t/ha of animal manure + 30L/ha of effective microorganisms (E50EM); soil + 30t/ha of the combination of various green crop residues and weeds (RC30) and soil + 30t/ha of the combination of various green crop residues and weeds + 30L/ha of effective microorganisms (RC30EM). Soil samples were taken before and after incubation and their physical, chemical, and microbiological parameters analysed.

A significant increase was observed in the production of exopolysaccharides and basic phosphatase and esterase enzyme activities in the treatments E50EM and RC30EM, in correlation with the humification of organic matter, water retention at field capacity, and the cationic exchange capacity (CEC) of the same treatments. The conclusion was drawn that the incorporation of a mixture of effective microorganisms (EM) intensified the biological soil activity and improved physical and chemical soil properties, contributing to a quick humification of fresh organic matter. These findings were illustrated by the microbiological activities of exopolysaccharides and by alkaline phosphatase and esterase enzymes, which can be used as early and integrated soil health indicators

Table 1. Physical, chemical and microbiological parameters of a claim loam soil with kinds and amounts of organic matter incorporated, before and after incubation

Parameter	Treatment[1]				
	C	RC30	RC30EM	E50	E50EM
pH[2]	7.79 a	7.36 b	7.43 b	7.42 b	7.39 b
pH[3]	7.74 a	7.74 a	7.26 a	7.65 a	7.40 a
EC (μS cm^{-1} a 25 °C)[2]	624 a	864 ab	1529 c	1200 bc	1476 c
EC (μS cm^{-1} a 25 °C)[3]	896 a	1283 a	1429 ab	3077 c	2339 bc
%C (g kg^{-1})[2]	1.49 a	1.69 a	1.72 a	1.54 a	2.04 b
%C (g kg^{-1})[3]	1.49 a	2.71 b	3.76 c	3.67 c	4.32 d
%N (g kg^{-1})[2]	0.15 a	0.21 a	0.21 a	0.3 b	0.33 b
%N (g kg^{-1})[3]	0.20 a	0.24 a	0.29 a	0.30 a	0.33 b
C/N[2]	9.93 a	8.05 a	8.19 a	5.13 b	6.18 b
C/N[3]	7.45 a	10.29 a	12.96 b	12.53 b	12.34 b
%FC[2]	22.98 a	25.03 b	29.59 c	30.56 cd	31.33 d
%FC[3]	24.57 a	25.71 a	34.21 c	31.28 b	34.37 c
CEC(mmol dm^{-3})[2]	13.74 a	14.6 a	14.43 a	15.65 a	16.43 b
CEC (mmol dm^{-3})[3]	14.61 a	14.6 a	15.01 ab	16.42 bc	16.85 c
%CTHE[2]	0.53 a	1.03 b	1.13 b	1.02 b	1.36 c
%CTHE[3]	0.98 a	1.36 b	2.14 c	1.91 c	2.42 c
%CHA[2]	0.21 a	0.22 a	0.40 b	0.60 c	0.76 d
%CHA	0.47 a	0.47 a	0.90 b	1.14 c	1.43 d
%CFA[2]	0.32 a	0.72 b	0.74 b	0.39 c	0.58 c
%CFA[3]	0.51 a	0.88 abc	1.15 c	0.80 ab	0.99 ac
%CTHE/%CHA[2]	2.52 ab	4.16 c	2.93 b	1.64 a	1.75 a
%CTHE/%CHA[3]	2.07 a	2.87 b	2.24 a	1.64 a	1.69 a
%CTHE/%C[2]	0.35 a	0.64 b	0.68 b	0.69 b	0.66 b
%CTHE/%C[3]	0.66 b	0.52 a	0.57 a	0.51 a	0.58 a
%CHA/%CFA[2]	0.67 a	0.32 a	0.52 a	1.56 b	1.33 b
%CHA/%CFA[3]	0.93 ab	0.54 a	0.81 a	1.56 b	1.45 b
Alkaline Phosphatase (μg g^{-1} h^{-1} soil)[2]	66.54 a	125.76 b	163.40 c	114.98 b	127.08 b
Alkaline Phosphatase (μg g^{-1} h^{-1} soil)[3]	152.14 a	344.65 bc	394.11 c	320.09 b	564.17 d
Esterases (μg g^{-1} h^{-1} soil)[2]	35.10 a	60.24 c	81.45 c	47.97 b	69.37 d
Esterases (μg g^{-1} h^{-1} soil)[3]	40.39 a	49.81 ab	92.37 c	59.60 ab	75.10 bc
Exopolysaccharides (mg g^{-1} soil)[2]	0.04 a	0.06 b	0.08 b	0.12 c	0.13 c
Exopolysaccharides(mg g^{-1} soil)[3]	0.26 a	0.71 b	0.96 cd	0.89 bc	1.11 d

[1] C = soil (control); E50 = soil + 50 t ha^{-1} of animal manure; E50EM = soil + 50 t ha^{-1} of animal manure + 30 L ha^{-1} of effective microorganisms (EM); RC30 = soil + 30 t ha^{-1} of mixed fresh plant debris; EM (RC30EM) = soil + 30 t ha^{-1} of mixed of various green crop residues and weeds + 30 L ha^{-1} of EM. [2] one and [3] months after addition of organic matter in the soil. Average of three replications. Values in horizontal row followed by the same letter(s) are not significantly different according to Tuckey (P $\leq$ 0.05).