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CREASE LINKED TO BIOLOGICAL ACTIVITY IN AMENDED SOILS

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INTRODUCTION

Global warming is a very palpable reality. This phenomenon, which is mainly caused by gas emission into the atmosphere, can also be attributed to other phenomena such as deforestation, soil mismanagement, as well as to uncontrolled debris increase. **Almond tree cultivation** in Mediterranean countries, specially in areas such as Majorca, poses a high risk of soil erosion mainly due to two factors: soil fertilization and its consequent increase of soil nutrient and organic matter levels. The other one is low productivity which stems from the age of the plantations. Both these factors with an absence of crop rotation may trigger **soil loss and degradative processes. Large amounts of organic debris** such as sewage sludge pose a problem to urban areas, specially to those where transport can be limited by geographic constraints such as islands.

Sewage sludge compost application to almond tree plantations presents a potential management alternative to combat soil mismanagement in Mediterranean areas where almonds are grown. This practice could also be used to restore vegetable biomass to soils which are not fertile enough to support other crops, as well as to fight climatic change.

OBJECTIVE

TO ESTIMATE **AERIAL VEGETABLE BIOMASS INCREASE** FROM **ORGANIC MATTER FLUCTUATIONS** AND **NUTRIENT DYNAMICS** ASSOCIATED WITH **SOIL MICROBIAL ACTIVITY**

How?

Studying the relationship between chemical-biological changes in **compost-amended soils** and vegetable biomass production in a **long-term study** (2 years)

MATERIALS

Almond trees planted in composted soil contained in dustbins.

Four types of Majorca-sewage-sludge compost were compared (P, PA, PJ, L) at two different doses (L, H). The control treatment contained unamended soil (C).

METHODOLOGY

Soil and tree sampling took place two years into the growth process. For the latter, the trunks, branches and leaves of those almond trees which grew in amended soils.

The soil characterization was carried out according to the Spanish soil methodology (M.A.P.A.)

The biological parameters were determined according to García et al. (2000).

Tha data were examined by analysis of variance (ANOVA) using STATGRAPHICS plus 4.1.

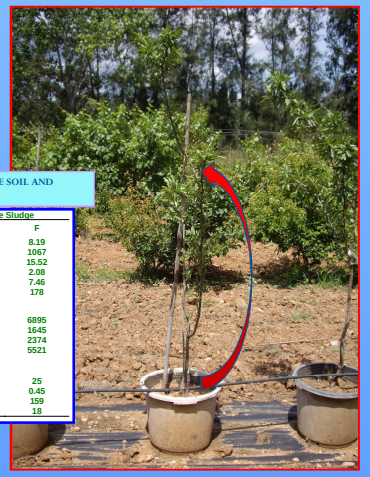


Table 1. CHEMICAL CHARACTERISTICS OF THE SOIL AND AMENDMENTS, AND HEAVY METAL CONTENT

	Soil	Composted Sewage Sludge			
	C	P	PA	PJ	F
pH	8.45	7.12	8.21	8.41	8.19
E.C. $\mu S.cm^{-1}$	228	2950	1030	840	1067
C %	1.85	14.7	10.05	16.52	15.52
N %	0.24	2.61	1.52	1.64	2.08
C/N	7.73	5.63	6.61	10.07	7.46
P $mg.Kg^{-1}$	9	130	151	186	178
Exchangeable Cations $mg.Kg^{-1}$					
Ca	5976	16044	6862	5544	6895
Mg	390	1707	1207	1010	1645
Na	76	1511	1773	1353	2374
K	191	3795	3304	1761	5521
Heavy Metals $mg.Kg^{-1}$					
Pb	157	48	27	35	25
Cd	0.95	0.90	0.90	0.80	0.45
Cu	39	232	123	162	159
Ni	15	20	20	21	18

RESULTS

Soil Chemical Characteristics (Table 2)

- N and P levels increased significantly in amended soils with respect to C.

Soil Biological Characteristics (Figure 1)

- Microbial biomass carbon in amended soils was not statistically different at any dose.
- The soil treated with the most mature compost showed the highest levels of enzyme activity.
- The levels of alkaline phosphatase were the highest in all the soils treated with compost. When the same enzyme was analyzed per gram of microbial biomass carbon, both phosphatase and protease activity were significantly higher in amended soils.

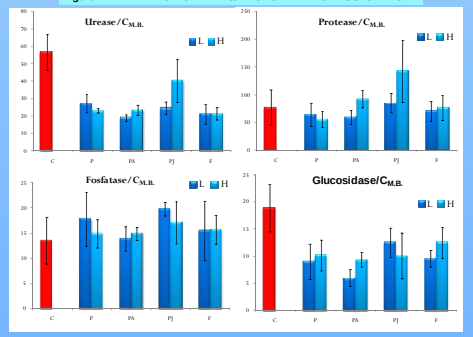
Vegetal Biomass (Figure 2)

- Branch biomass weight doubled its initial weight in soils treated with high doses of urban sewage sludge as compared to C.
- Significantly highest biomass weight increase with respect to organic carbon content in the soil, originated from microbial biomass carbon was found in soils treated with the most stable or mature compost, with the highest C/N ratio

Table 2. CHEMICAL CHARACTERISTICS IN THE SOILS AMENDED WITH COMPOST AFTER TWO YEARS.

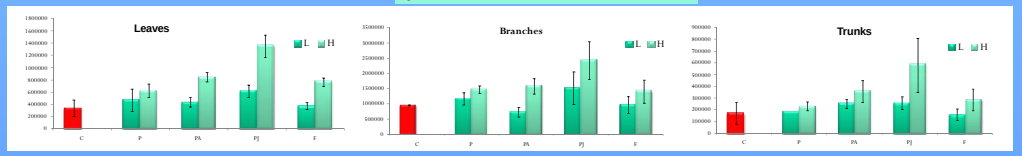
		pH	E. C. $dS.m^{-1}$	C %	N %	C/N	P $mg.Kg^{-1}$
C		8.61	0.24	1.80	0.21	8.56	18
P	L	8.44	0.22	3.49	0.41	8.58	110
	H	8.24	0.28	4.70	0.57	8.25	135
PA	L	8.20	0.16	4.28	0.50	8.48	217
	H	7.97	0.21	8.38	0.98	8.57	286
PJ	L	8.13	0.17	4.79	0.51	9.44	212
	H	8.03	0.28	8.89	1.03	9.11	271
F	L	8.29	0.20	3.16	0.39	8.06	133
	H	8.04	0.24	6.28	0.82	7.67	255

Figure 1. ENZIMATIC ACTIVITIES/ MICROBIAL BIOMASS CARBON



C: Control, P: Palma, PA: Sa Pobla Agriculture PJ: Sa Pobla Gardening, F: Felanitx
L: Low, H: High

Figure 2. VEGETAL BIOMASS INCREASE/ $C_{B.M.}/C_{ORGANIC}$



CONCLUSIONS

Enzyme activity analyses (urease, protease, phosphatase and glucosidase) per gram of microbial biomass carbon would seem to indicate that only protease and alkaline phosphatase have resulted from changes in compost microbial biomass. These two enzymes could, in turn, be responsible for the changes in plant biomass.

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