Biowaste recovery by co-composting. Limiting factors of the process and agronomic final product quality

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PROYECTO DE INVESTIGACIÓN Y EXPERIMENTACIÓN EN COMPOSTAJE

AgroCompost

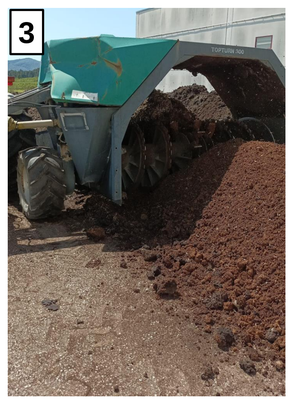
UNIVERSITAS Miguel Hernández

Introduction

In Spain, Castellón province **produce 542 ton year^{-1} of municipal solid waste (MSW),** which represents 15% of the entire of Valencian Community (PIRCV, 2020).
The bioestabilized it can **be used in agriculture soils for a circular economy** (BOE, 2022), resulting an **important source of organic matter** due to the almost generalized deficiency in Spain´s soils (Gil et al., 2008)

The quality of the biostabilized have led to its rejection by farmers, which **currently** means a **non-optimized organic waste flow that is transferred to landfills**

The valorization of this biostabilized can be carried out through local co-composting processes with other agrifood waste flows, obtaining stabilized compost oriented for agricultural use.



Figures 1, 2, 3: preparing start up mix, irrigation system, and turning:

Figure 4, 5: final compost:

The aim of this work is **to evaluate the co-composting process of bioestabilized organic fraction** to obtain high **value composts oriented to agricultural systems.**

Results & Discussion

Six windrow composting piles (7,800 kg f.m) (Composition in figure 3)

Ingredients

Source of C

- **olive mill waste (OMW)** kept constant in all mixtures, 65% f.m.
- **olive leaves waste (OLW)**
- **urban pruning residues (UPR)**
- **OLW+UPR (1:1, w/w)**

Source of N

Biostabilized material of urban waste management plants from (15% constant in all mixtures)

- **Valencia (MBT1)**
- **Castellón (MBT2)**

150 days of bioxidative process + 30 days of maturation

Pile	MBT1	MBT2	OLW	UPR	OLW	OLW+UPR
1	15%	-	65%	20%	-	-
2	15%	-	65%	-	20%	-
3	15%	-	65%	-	-	20%
4	-	15%	65%	20%	-	-
5	-	15%	65%	-	20%	-
6	-	15%	65%	-	-	20%

Figure 6. Piles composition (% f.m)

	OMW	UPR	OLW	MBT1	MBT2
Moisture (%)	58.9	29.4	28.5	26.4	30.1
BD (g cm^3)	0.866	0.183	0.097	0.319	0.373
pH	6.7	7.5	6.1	6.9	7.6
EC (dS m^{-1})	3.05	2.71	1.34	6.50	5.07
TOC (%)	50.6	37.1	45.5	33.8	31.35
TN (%)	0.81	1.22	1.21	1.65	1.73
TOC/TN	62.51	30.31	37.67	20.46	18.12
PPH (mg kg^{-1})	5757	2492	6295	1458	2680

Figure 7. Physico-chemical properties of raw material.

Temperatures of **MBT1 treatments rapidly increased and reached the thermophilic phase (>50 °C)** on the first week of composting remaining above this level during 145, 147 and 129 days in piles 1, 2 and 3, respectively**.**

Figures 8 and 9. Evolution of the temperature and of the cumulative quadratic exothermic index (EXI2)

A) MBT1 (Piles 1, 2 and 3)

B) MBT2 (piles 4, 5 and 6).

	Pile	T med(ºC)	Cumulative EXI² index (C°²)	EXI² index Bioxidative days $^{-1}$
MBT 1	1	59.7 D	150.856 C	1006 C
	2	**60.7 D**	**153.361 C**	**1022 C**
	3	55.9 C	138.761 C	925 C
MBT2	4	56.0 C	121.062 B	807 B
	5	54.0 B	105.899 B	706 B
	6	50.5 A	83.151 A	554 A
	F anova	31.37 ***	21.53 ***	21.53 ***

*Different letters within the same column represent significant differences at p < 0.05. *** significant at p-value 0.001..*

Conclusions

The results obtained during the composting process allow us to conclude that the presence of bioestabilized did not have a limiting effect on the process: all the piles reached high temperatures and composting was carried out satisfactorily. More tests should be carried out to define the difference in thermal parameters between the different bioestabilized piles.