

Decentralized composting models for organic waste management I: two examples of community composting in the Valencian Community (Spain)

C. Álvarez-Alonso¹, M.D. Pérez-Murcia¹, C. Gómez¹, A. García-Rández¹, E. Agulló¹, E. Martínez-Sabater¹, I. Irigoyen², M. López³, J. Andreu-Rodríguez¹, C. Paredes¹, A. Pérez-Espinosa¹, R. Moral¹, M.A. Bustamante¹

¹ Centro de Investigación e Innovación Agroalimentaria y Agroambiental (CIAGRO-UMH), Universidad Miguel Hernández, EPS-Orihuela, Ctra. Beniel Km 3.2, Orihuela, Alicante.

² Department of Agricultural Production, Public University of Navarre (UPNA-NUP), Pamplona, Spain

³ Universitat Politècnica de Catalunya (UPC), Campus del Baix Llobregat, Edifici D4, C. Esteve Terradas, 8, Castelldefels, Spain



UNIVERSITAT
Miguel Hernández



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Introduction



Figure 1: Decentralized composting model

The progressive implementation of the circular economy in the productive cycle is producing a conceptual change on the models for organic waste management, where waste is now becoming to be considered as a resource. Thus, new scenarios have emerged in which the management by composting of different organic waste fractions (bio-waste) is conducted in a more local manner using decentralized models, such as community composting.



Figure 2: Turning and control of the composting process

The control of the process and of the final product is not standardized yet in these new composting models, which is essential to guarantee the agronomic value, quality and especially the hygienic conditions of the compost obtained. When the composting process is not properly managed can induce the proliferation and dispersion of potentially pathogenic microorganisms, such as *Salmonella* and/or *Listeria*.

The main aim of this work was to study and monitor two examples of community composting of the selectively collected organic fraction of the municipal solid waste (OFMW) and pruning waste (PW) generated in two concrete small municipalities located in the Valencian Community (Spain), to guarantee the effectiveness of the composting process to obtain a sanitized compost.

Results & Discussion



Table 1: Characteristics of the initial materials expressed on a dry weight basis.

	OFMW1	OFMW2	PW1	PW2
Dry weight (%)	31.6	27.9	78.2	80.6
pH	6.5	7.7	8.9	6.4
Electrical conductivity (dS/m)	5.52	3.34	3.25	6.54
Organic matter (%)	68.7	62.2	77.7	73.9
Total organic carbon (%)	38.9	35.0	41.1	41.5
Total nitrogen (%)	2.39	1.35	1.00	2.47
TOC/TN	16.3	25.9	41.0	16.8
P (g/kg)	0.62	0.63	0.16	0.38
Fe (mg/kg)	357	1828	1307	736
Cu (mg/kg)	11.3	24.9	7.58	14.1
Mn (mg/kg)	32.6	127	53.5	49.0
Zn (mg/kg)	39.7	39.1	24.9	35.4
Cd (mg/kg)	0.63	0.11	0.07	0.08
Cr (mg/kg)	11.1	30.6	24.1	36.4

The pH and the electrical conductivity values increased in both mixtures, whereas organic matter levels decreased, principally during the thermophilic phase, when the highest temperature values were reached and the total nitrogen concentrations increased in both composting mixtures during the process, showing pile 2 the highest contents of total nitrogen at the end of the composting process.

Both composts showed a suitable maturity degree with absence of phytotoxicity, as well as verified the criteria concerning the limit values for pathogenic microorganisms established by the European legislations.

Conclusions

The decentralized composting of the OFMW with urban pruning waste, conducted in the Valencian Community, allowed to obtain a high-quality product, with suitable characteristics, such as adequate maturity degree and nutrient content, absence of phytotoxicity and a good sanitary quality, with levels of human pathogens in the composts below the maximum limit for the use of composts as fertilisers. In addition, this waste management model provides environmental benefits in the circular economy framework, increasing the environmental awareness of citizens and reducing the impacts derived from the landfill and/or incineration of these organic wastes.

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