

Composts derived from agri-food sludge and pruning wastes from Mediterranean orchards: obtaining and agronomic valorisation in organic farming production



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Objective: to validate the co-composting process of two composts made from agri-food sludge, different pruning residues from Mediterranean orchards (pruning of persimmon and pomegranate) and a mixture of cow-sheep manure, and study its effect on the yield of two crops (lettuce and melon) grown under real agronomic conditions in an organic farming system.

Phase 1: Composting experiment

Two composting piles were prepared using:

- ❖ an agri-food sludge coming from a citric juice industry (CAS)
- ❖ different pruning wastes obtained from two Mediterranean orchard crops (pomegranate pruning (PP) and khaki pruning (KP) and a mixture of cattle and sheep manure (CSM).

The mixtures were composted using **forced aeration and mechanical turning**.

Phase 2: Agronomic Validation



INGREDIENTS OF THE MIXTURE



Agri-food sludge (CAS)



Sheep manure (CSM).



Pomegranate pruning (PP)



Khaki pruning (KP)

The percentages of the initial materials used to prepare the composting piles, on a fresh weight basis

Pilas	CAS	KP	PP	CSM
C1	30	60	-	10
C2	30	60	10	-



- ❖ **Two field experiments** using different crops (**lettuce and melon**) cultivated under organic farming.
- ❖ Practices were conducted at the facilities of Experimental Station of the Fundación Cajamar placed in Paiporta (Valencia), Spain.
- ❖ The **treatments established** in both experiments were the following:
 - control soil without amendment (Control)
 - the two composts from agri-food wastes (C1 and C2).
- ❖ **Dosege:** a single dose of **30 t/ha** in plots arranged in a randomised complete block design with three replicates per treatment.

Results & Discussion

Main properties of the composts (data expressed on a dry weight basis)

Parameters	Compost C1	Compost C2
pH	7.9	7.3
EC (dS/m)	2.96	4.91
Organic matter (%)	71.4	73.6
TOC/TN	13.1	9.5
Total N (%)	2.9	3.8
P ₂ O ₅ (%)	3.4	4.9
K ₂ O (%)	1.0	1.4
Germination index (%)	99	89

Composting: An adequate evolution of this parameter

- ✓ A good development of the bio-oxidative stage of the process, which lasted **56 days** in both composting piles, which guarantees the maximum pathogen reduction.
- ✓ Losses of organic matter in both piles (48 % and 58 % for C1 and C2).
- ✓ **↓ pH, ↑ electrical conductivity**
- ✓ **↑ organic matter concentrations**
- ✓ **↑ nitrogen concentrations**

Compost: Both composts verified the criteria established by the Spanish and European legislations

- ✓ A suitable maturity degree with absence of phytotoxicity,
- ✓ A significant fertilising value, with high contents of nitrogen and phosphorous.

Field experiments developed:

- ✓ the composts C1 and C2 produced a commercial yield of lettuce statistically similar to that obtained with the Control treatment without amendment.
- ✓ the composts C1 and C2 induced higher commercial yields and a good organoleptic fruit quality in the melon crop than the Control treatment, the commercial yields between both composts being statically similar.

Conclusions: The co-composting of orchard pruning wastes with agri-food sludge has been proved as a viable alternative method to manage and valorise these organic wastes and to obtain added-value organic materials with suitable physico-chemical and chemical properties, good degree of maturity and a fertilising value, reflected in the good commercial yield obtained for lettuce and melon under organic farming management.