Soils amendments production from composting of digestate of agroforestry wastes

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Introduction

Agroforestry waste valorization plays an important role in the soil nutrients cycling (Figure 1).

Anaerobic digestion can recycle these wastes into renewable energy, with the biogas recovery, and a soil amendment production (digestate).

It is important submitted this digestate to a stabilization and hygienization process such as composting.

Establishing a safe way of organic waste valorization can lead to a sustainable recovery.

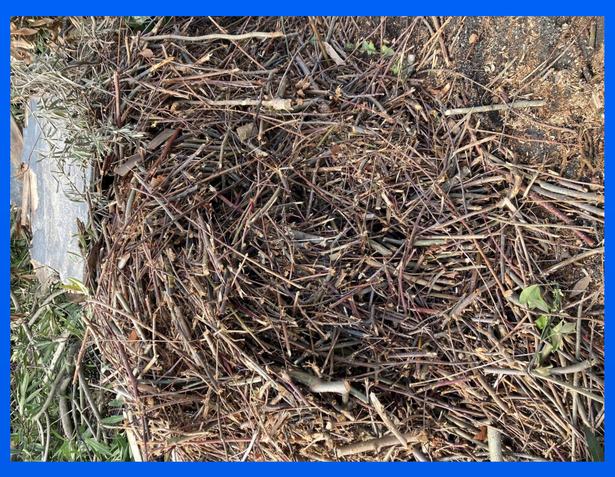

Figure 1: Agroforestry wastes

GOAL

Evaluate the potential production of soils amendments resulting from composting of an anaerobic digestate of agroforestry wastes.

Methodology

Agroforestry wastes were green biomass (EWC Code 20 02 01) and manure (EWC code 02 01 06).

Mixture: 80% of green biomass and 20% of manure.

Dry anaerobic digestion (pilot scale) of agroforestry waste was conducted for 20 days + composting process of digestate for 30 days.

European Standards/ Ordinance nº185/2022

- Physical and Chemical analysis
- Humic Substances (HS), Humic Acid, Fulvic Acid
- Maturation Degree
- Weed Seed Test

Results & Discussion

► 30 days of composting were not enough for significant changes in the parameters analyzed.
► Slight decrease in organic matter, pH and Electric Conductivity (EC) content (Table 1).
► EC value decrease can also be considered an indication of the stability of the material and its safety for future use as an organic corrective for plants.

Table 1: Physical and Chemical Characterization

Parameters	Digestate	Compost
Moisture (%)	66.9 ±0.59	66.6 ±0.75
Total Organic Matter (%)	72.2 ±0.43	70.6 ±1.80
Total Organic Carbon (%)	40.09 ±0.24	39.2 ±1.00
Total Nitrogen (%)	1.72 ±0.100	1.62 ±0.05
C/N	23.3 ±1.43	24.2 ±1.05
pH	8.55 ±0.04	7.89 ±0.05
EC (mS/cm)	1.98 ±0.11	1.58 ±0.87

► Presence of HS indicates the quality and maturation of the organic matter (Table 2).
► HS content increase 4x, which can be compared with commercial Humus Organic Corrective.
► Increase in HS content observed may explain the high Germination Index obtained after composting (data not shown), as HS have biostimulant properties.

Table 2: Humic Substances content

Parameters	Digestate	Compost	Commercial Humus Organic Corrective
Humic Substances (%)	3.32 ±0.38	13.3 ±0.25	14.8
Humic Acid (%)	1.05 ±0.350	5.77 ±0.20	8.78
Fulvic Acid (%)	2.27 ±0.730	7.51 ±0.43	6.05

70.6%, 39.2% and 7.51% for organic matter, organic carbon and humic acids

Compost still needs more time to mature so that a higher percentage of organic matter can be humified

Maturation

10 days in Dewar Flasks → T maximun of 26.4 ºC → Degree V of maturation

► Weed seed test showed a satisfactory result (Table 3).

Table 3: Weed test results

Sample	Watercress germination (%)
Control	88
Compost	0

► No viable weed seed was detected in the compost, since there was no germination during the 21 days test.
► Composting process was sufficient to inactivate the weed seeds that could be contained in the digestate.

Conclusions

Anaerobic digestion followed by composting of agroforestry wastes with manure allowed to obtain a soil amendment with a positive effect for plants, contributing to sustainable development.

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