Nitrogen dynamics in soils amended with composts from decentralised urban composting models

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RHODES2024
19-22 JUNE
rhodes2024.uest.gr

Introduction

In recent years, the European Union has been a driving force for the **change** in **waste management models** through the development of legislation in line with the principles of the **circular economy**. In this context, **community composting** and **decentralised urban composting** are new composting scenarios for a **sustainable** organic waste **management**. Thus, the organic fraction of municipal waste selectively collected and the pruning from parks and gardens are managed to obtain a compost with properties that can be **compatible** with their **use** in **agriculture** and for soil improvement. However, it is important to be aware of the **characteristics** of these new **composts** in order to avoid potential risks to **human health** and to the **environment**.

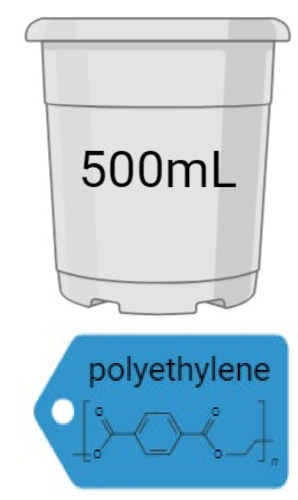
The aim of the study was to **evaluate** the **N mineralization** processes in **soils amended** with these **composts** to analyze their potential **use** in **agriculture** as substitutes for conventional **fertilisers**.

Material & methods

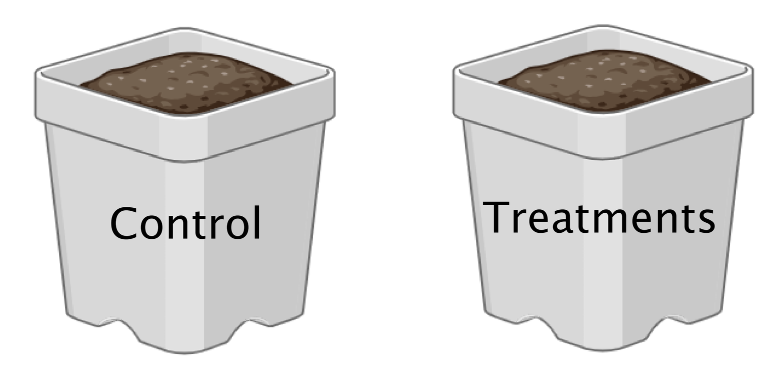
- Community composting: CC1, CC2
- Decentralized urban composting: DC1, DC2

Parameters	CC1	CC2	DC1	DC2
pH	8.2	8.7	7.7	8.1
EC (dS m^{-1})	3.2	6.1	1.1	5.2
OM (%)	38.4	38.1	41.0	56.6
TOC (%)	23.6	25.5	24.8	31.7
TN (%)	1.8	2.1	1.9	2.9
TOC/TN	13.3	12.0	13.0	11.1
K (g kg^{-1})	8.9	20.9	7.2	11.2
P (g kg^{-1})	9.2	7.5	6.3	9.6
Na (g kg^{-1})	3.3	7.0	1.3	5.5
Cu (mg kg^{-1})	20.8	56.9	32.0	39.1
Zn (mg kg^{-1})	66.1	83.7	104	102
Cr (mg kg^{-1})	22.0	54.2	70.7	52.8
Cd (mg kg^{-1})	0.4	0.3	0.3	0.5
Pb (mg kg^{-1})	9.1	20.6	15.1	15.9
Ni (mg kg^{-1})	7.3	18.2	19.4	18.6

Experimental design:

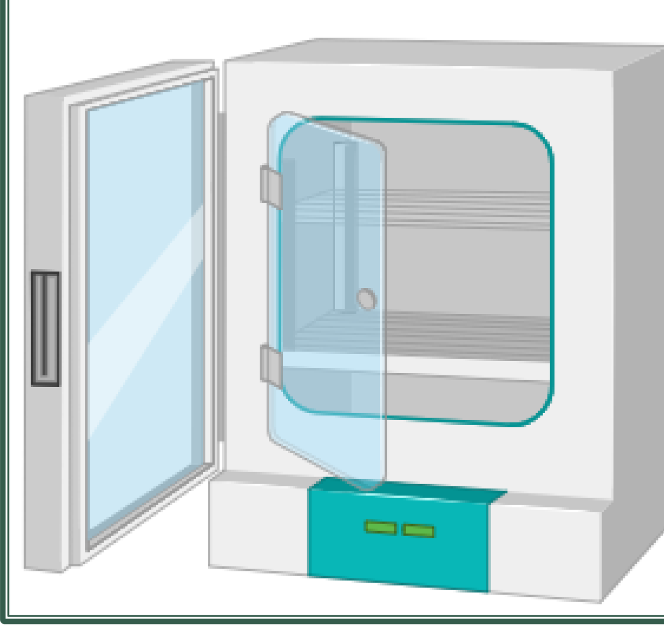


- 200g of sandy loam soil
  - Air drying
  - Sieving 2mm
- 4.5g each compost (50t ha^{-1})



All treatments in triplicate

Incubation conditions:



- 25 °C
- 50% WRC
- Aerobic
- Watering once a week
- Non-leaching
- 120 days

Parameters studied:

Diferents form of nitrogen:
- Kjeldahl total nitrogen
- Organic nitrogen
- Nitrate nitrogen
- Ammonium

Destructive simples at 0, 2, 8, 10, 15, 37, 63 and 120 incubation days

Results & Discussion

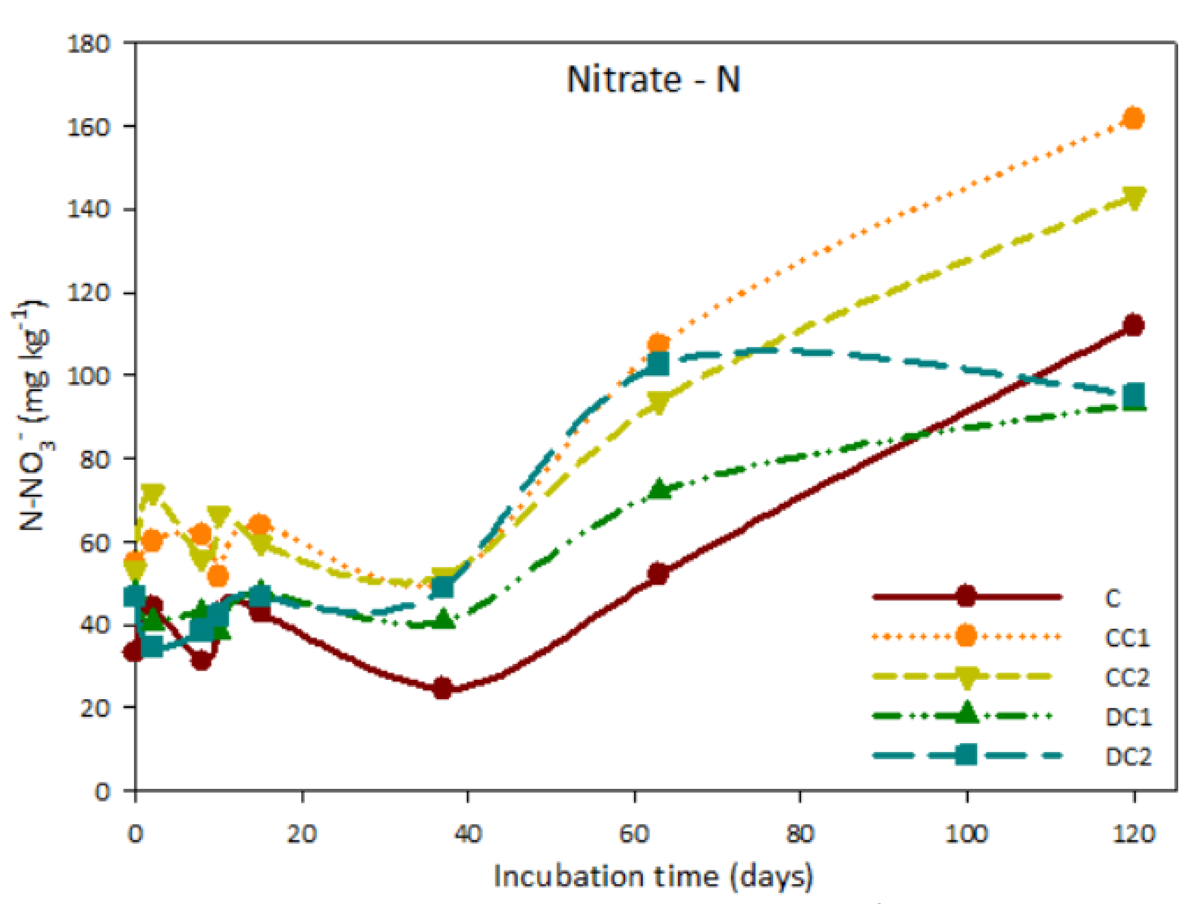


Figure 1 - Evolution of N-NO$_3^-$ (mg kg^{-1} dry basis)

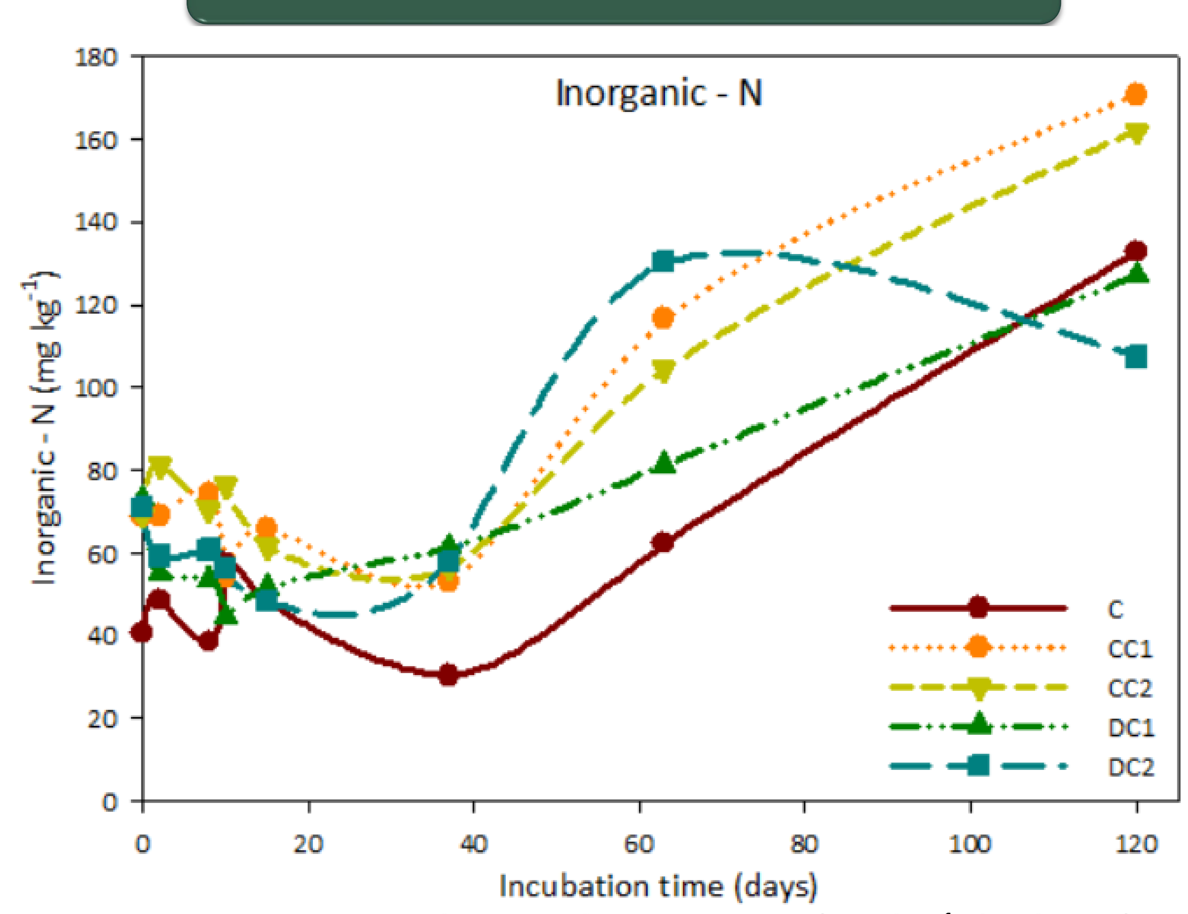


Figure 2 - Evolution of Inorganic-N (mg kg^{-1} dry basis)

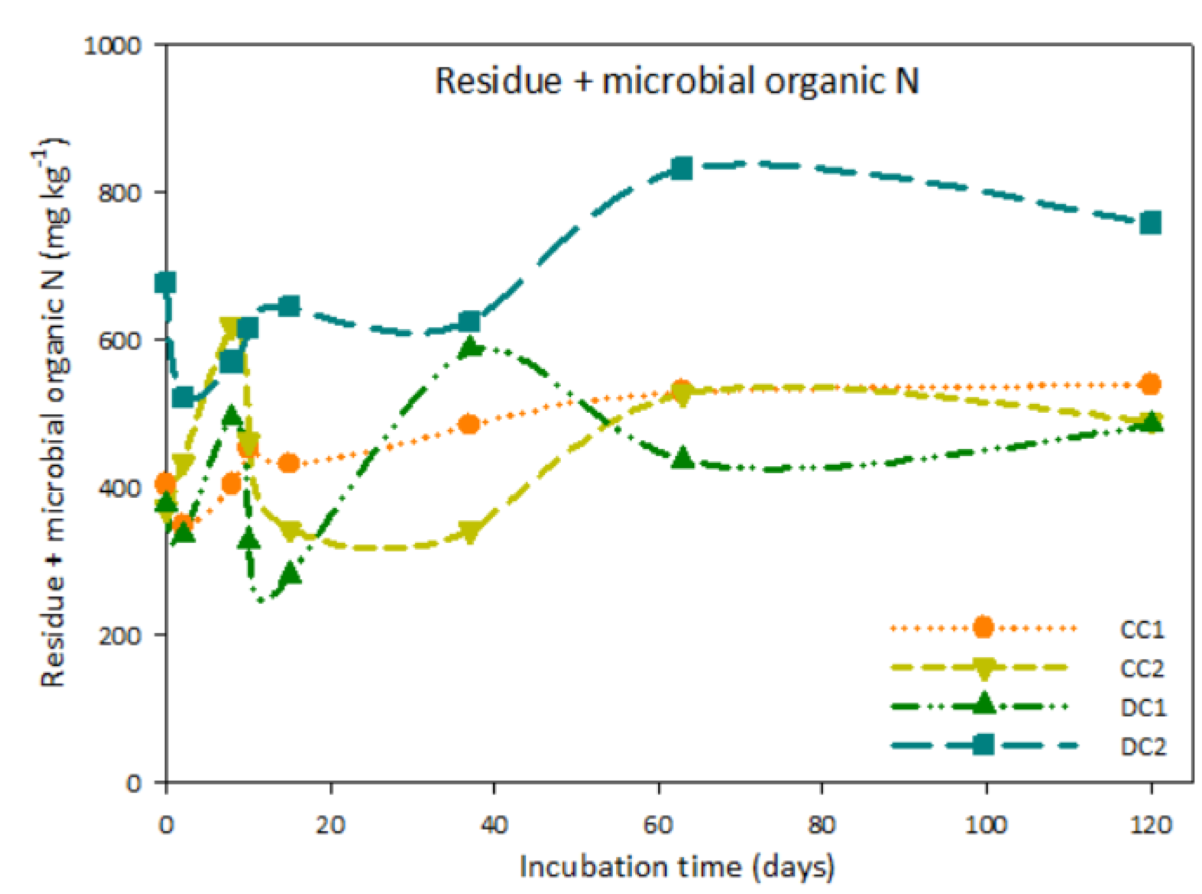


Figure 3 - Evolution of residual and microbial organic N (mg kg^{-1} dry basis)

- Initial values in all treatments > Control
- Significant increase from day 40, with different evolution between composting models:
  - CC1 and CC2 ↑
  - DC1 and DC2 = from day 60 onwards
- Only final values CC1 and CC2 > Control

- Significant increase during incubation period in all amended soils
- From day 60 onwards to the end of experiment:
  - CC1 and CC2 ↑ Final values > Control
  - DC1 ↑ but final value < Control
  - DC2 ↓ and final value < Control

- Increase in initial days in all treatments, indicating immobilization against volatilization or denitrification losses
- Higher values from the beginning in DC2, associated with active microbiota, which are maintained until the end of the incubation

Conclusions & Acknowledgements

The **N dynamics** in the **soils amended** with the **composts** obtained from the different decentralized models has shown the feasibility of these **stabilized organic materials** as a more sustainable option than the use of mineral fertilisers due to their **progressive liberation** of this **nutrient**, avoiding its losses in the soil-plant system. Furthermore, these materials constitute not only a **source** of **nutrients** but also of **organic matter**, which improves soil properties, increasing the **circularity** and **sustainability** of the **agricultural** sector.

This research has been financed in the framework of the research project NEOCOMP (ref. PID2020-113228RB-I00) funded by MCIN/ AEI /10.13039/501100011033 and, also it was supported by the Spanish Ministry of Science and Innovation with a PhD scholarship to the first author (FPU21/01207).