Stabilization of Carbon in Compost Incorporated with Nanoclay for Carbon Sequestration

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Introduction

Global warming is a significant environmental problem in the 21st century, and the carbon (C) cycle is crucial in both causing and addressing global climate change.

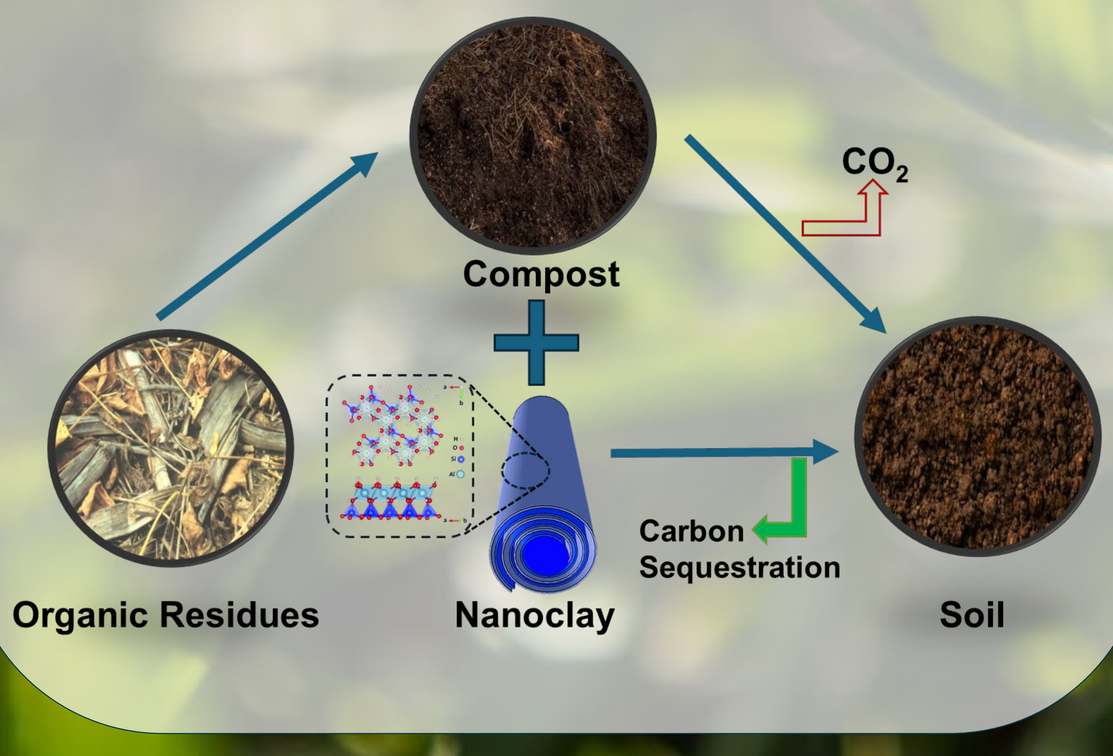
Recent increases in atmospheric carbon dioxide (CO_2) levels have generated great interest in studying the changes in soil organic carbon (SOC) and its ability to store carbon in different ecosystems.

Promoting soil C sequestration is an important strategy for decreasing the release of greenhouse gases, such as carbon dioxide, into the atmosphere.

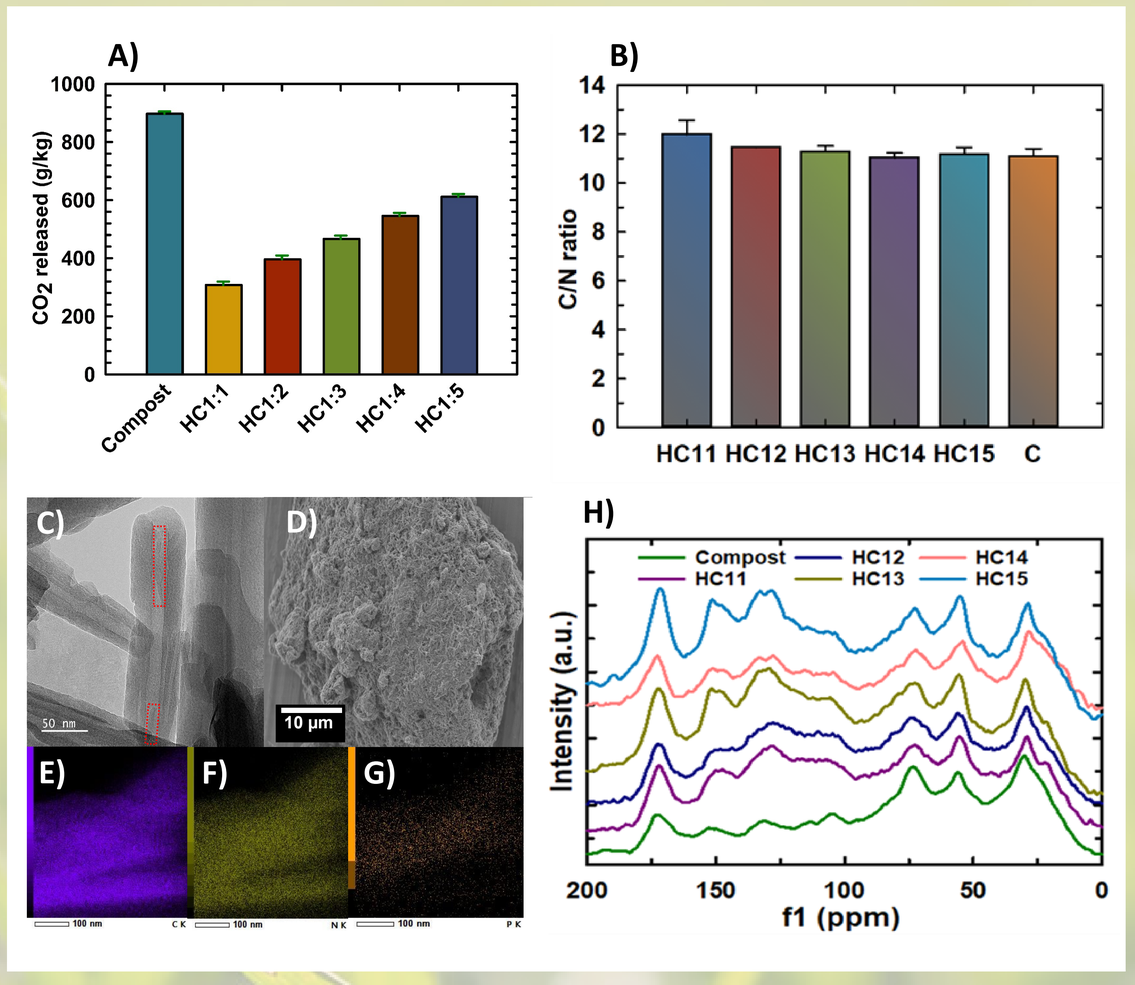
Overview

Co-composting of organic amendments with clay materials is effective in stabilizing C in soil. The application of compost to soils with high clay content is likely to achieve greater C stabilization.

Clay minerals provide both permanent and variable surface charges and high specific surface areas that are crucial to determine the OC protection in soils to promote carbon sequestration in soil.



Results



A) Microbial CO2 respiration analysis; **B)** C/N Ratio; **C & D)** TEM & SEM analysis Halloysite/Compost; **E to G)** Elemental Mapping of C, N, O and P; and **H)** 13C NMR analysis

CO_2 release is decreased after nanoclay incorporation. Al^{3+} ions from nanoclay inhibits several microbial functions including the mineralization of organic nitrogen, but it is unlikely to affect the fertilizer value of composts as N source which is confirmed in C/N ratio and the presence of N in elemental mapping.

TEM confirms the physical protection mechanisms where organic matter enters the nanopore of the clay to prevent the mineralization of OM.

The ^{13}C NMR indicates the carbon loss from the compost and shows strong carbon-based peak shift in Halloysite/Compost samples.

SOIL CRC

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