MICROBIOLOGICAL AND PHYSICOCHEMICAL CHARACTERISTICS MONITORING AND ANALYSIS OF THREE DIFFERENT SUBSTRATES COMPOSTS

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Introduction. Composting has become an excellent alternative for organic waste-disposal, especially in urban areas. Through this, organic wastes are turned into available nutrients for plants, obtaining great benefits from this bioprocess (1). In the present work, the aim is to compare the microbiological and physicochemical characteristics and kinetics of three different composted organic substrates. With these substrates composted at the environmental conditions of this experimental design, it was possible to compare them with home-made composting processes.

Methods. The general strategy for this work was the physicochemical and microbiological (2) assessment of composts made from different organic substrates: Horse manure (C_1), Vegetable wastes (C_2) and Kitchen wastes (C_3).
The process was carried out in similar conditions to the ones of a home-made procedure regarding environmental conditions, volume, and substrates. Samples of solid substrate and lixiviate were taken in different times up to month two of process, and microbiological quantity, diversity and viability (3) was measured. Also physicochemical variables, as temperature, pH, conductivity, moisture, carbon, nitrogen, O_2, CO_2 and trace elements were determined.

Results and discussions.
Physicochemical analysis
pH in C_2 and C_3 was initially acid while C_1 started slightly basic; the three of them ended near to neutrality. The three composts reached a pH near neutrality at day 60, with no differences between them.
At day 60, pile volumes showed a reduction of around 40% in C_2 and C_3, and less of 20% for C_1. Due to pile volume (20L), easy heat dissipation makes impossible to reach more than 50°C as reported in greater volumes.
O_2 percentage had minimal variations during all the process, assuring an aerobic condition. CO_2 started increasing for C_2 and C_3, but C_1 showed a different behavior, meanly due to the radical difference in organic source consistency.
In the elemental analysis, at day 60 Cu, Na and Ni concentrations were significantly higher in all composts compared with a black soil blank, while Fe, Mn and Zn were not statistically different.

Microbiological analysis
Optical density had a peak around day 2-3 for C_1 and C_3, and in day 3-11 for C_2. Regarding to viability, a peak around day 20 was found for C_2 and in day 30 for C_3.
It can be highlighted that microbial viability dynamics for C_1 was different from the other two, oscillating in stable values since day 3. In the first day, a similar kinetics behavior for C_2 and C_3 is noticeable, having a lag period of about 6 h for C_2 and 25 h for C_3, meanwhile C_1 start increasing immediately. After ~10 days, microbial kinetics stabilized at low values, while activity showed the highest peaks, except for C_1.
Variability in plate cultures showed that at least 3 different evident colony morphologies were found since day 3 in all treatments, and C_3 was the one with the highest variability, with around 4 to 5 different colonies since 17h up to the end of the process.

Conclusions. Compost with only vegetable wastes was found to be optimal due to microbiological growth and physicochemical variables measured.
A complete composting assessment was carried out, demonstrating differences and similarities among the three most common organic wastes used for this purpose in domestic conditions. The differences among treatments made possible to evaluate the final product quality for attain a better plant nutrition.
Finally, it is highly recommended to encourage this bioprocess' implementation around communities due to easiness and positive environmental impact.

References.

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