

## Characterization of a soil amendment derived from co-composting of agricultural wastes and biochar

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The aim of this study was to characterize a compost blend prepared from sheep manure and oat straw in a co-composting process enriched with oat husk biochar (BC). For this, a co-composting trial was carried out in rotator bins of 200 L capacity. Three mixtures (piles) were assayed: BC0: sheep manure (SM) 65% w/w with 35% w/w oat straw (OS) and no biochar; BC5: SM 62.5% w/w, 32.5% of OS and 5% of BC and BC10: SM 60% w/w, 30% of OS and 10% of BC. The piles were turned 3 times per week in the first week, and then once a week until the end of the composting process (140 days). The temperature and humidity of the piles were monitored continually and the humidity was maintained in a range from 55% to 65%. The maturity of final compost was evaluated by FTIR and Solvita Test analysis. At the same time a chemical characterization including macro and micro nutrient for each compost was performed and the compost phytotoxic effect was evaluated by a germination test using aqueous extract over lettuce, radish and wheat seeds. FTIR analysis showed bands attributed to aromatic C=C, C=O stretching of amide groups, quinone C=O and/or C=O of H-bonded conjugated ketones ( $1640\text{ cm}^{-1}$ ) which are typical in biological stabilized composts and compost with high concentration of highly aromatic materials such as biochar, which seems to become relatively more intense specially in BC10 treatment. Both composts were characterized by a Solvita maturity index of 7, reflecting an adequate degree of maturation. The  $\text{CO}_2$  emission was lower in the piles enriched with BC compared to control treatment without BC. In the same way,  $\text{NH}_3$  index was 5 for all the treatments indicating a null  $\text{NH}_3$  emission. In this respect, a decrease in the N- $\text{NH}_4$  content was related with the use of BC which indicate that BC could reduce N-losses during composting favoring nitrification process. Chemical characterization showed pH values higher than 8 for all piles and EC ranged from 8.6 to  $14.7\text{ dS cm}^{-1}$ . The Total N and P contents increased in BC10 treatment, while the K contents were similar in all treatments as well as C/N ratio (around 15). The organic matter content was  $\text{BC10} > \text{BC5} > \text{BC0}$  and the dissolved organic C content was lower than  $8.3\text{ g kg}^{-1}$  for all piles confirming the maturity of compost. The germination test showed a non-toxic effect of all amendments in the species assayed obtaining a germination index between 55% and 80.7% indicating maturity of the amendments evaluated. Our results indicated that the combined use of agricultural wastes and biochar by mean of a co-composting process is a suitable option for generating good quality amendments for improving soil condition and optimizing nutrient cycling at farm scale.

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