

ABSTRACT

Large-scale production of soil amendments/fertilizers/biostimulants by processing plant and marine residues, which are currently underutilized, using composting, compost fermentation, and pyrolysis could have important agricultural and environmental benefits.

Two types of fermented compost extract (tea) (CT) were prepared by fermentation of 2 types of compost (one based on *Ascophyllum nodosum* macroalgae residues, the other derived from macroalgae and fish residues), were characterized, and tested as fertilizers/biostimulants. Diluted CT (75% water) obtained from compost based on macroalgae and fish residues improved the growth of lettuce (cv. 'Lollo Rosso') seedlings and determined high values of germination percentage (97.0%) and seedling viability index (96.5%). CT derived from macroalgae residue compost had negative effects on lettuce seed germination and seedling growth, *i.e.*, seeds treated with undiluted CT did not germinate, and all seedlings obtained with diluted CT treatments (50% and 75% water, respectively) were non-viable.

Strongly alkaline biochar (BC) ($\text{pH} = 9.89 \pm 0.01$) was obtained by slow pyrolysis of vine pruning residue (mean temperature of residue fixed bed: 517 ± 16 °C; pressure: 1 atm; process duration: 60 min), characterized, and tested as a soil amendment/fertilizer (20 L BC/80 L soil). BC had a significant positive effect on the growth of bell pepper (*Capsicum annuum* L.) plants grown in a strongly acidic soil ($\text{pH} = 5.40 \pm 0.01$), but did not have a favorable effect on the growth parameters of plants grown in weakly alkaline soil ($\text{pH} = 8.03 \pm 0.03$), respectively weakly acidic soil ($\text{pH} = 6.62 \pm 0.04$). Combining BC with other organic amendments (*e.g.*, compost, digestate, manure) or lowering the pyrolysis temperature and/or the dose of BC could be suitable options for improving crop growth performance in weakly alkaline/acidic soils.