Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04295, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04295
EGU General Assembly 2008

Characterization of different growing media-compost based for ornamental plants by TG-DTA and FT-IR

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The necessity to reduce the consumption of non-renewable resources like peat, as well as the need to recycle the increasing amount of cheap organic waste from municipal and agroindustrial origin led to consider the use of these organic biomasses as growing media for ornamental plants as peat partial or total substituted.

In the present study the use of different materials: peat, coconut fibre and compost as substrates in the production of plants were investigated, with a special interest on the suitability of compost as growing substrate for ornamental plants. The plant species tested were *Callistephus chinensis* and *Philodendron* "Imperial Red". The substrate mixtures (compost-based) were (v/v): i) 80% of peat and 20% of compost; ii) 40% of peat and 60% of compost; iii) 80% of coconut fibre and 20% of compost and iv) 60% of compost and 40% of coconut fibre. The compost was obtained by composting of (v/v) 60% plant trimming and 40% urban and agro-industrial sewage sludge mixture. Substrates were physically and chemically well characterized and tested at the beginning and the end of the plants grown period. Humification parameters (HR = humification rate, DH = degree of humification), humic-like fraction (HLF) content, non humic-fraction (NH), and water soluble organic carbon (WSOC) were investigated by using thermal analysis (TG-DTA) and infrared spectroscopy (DRIFT).

For both plant species tested a mixture (v/v) between peat or coconut fibre and 20% of compost gave the best agronomic performances. The chemical analyses of these mixtures at the end of plants growth showed a significant increase in humification parameters (HR $\approx$ 80 % and DH $\approx$ 50%) and a decrease in the NH content ($\approx$3 %) with respect to those of the control. DRIFT and DTA analyses of humic-like fractions supported the quantitative variations of HR and DH. In particular an increased of the relative intensity of the band at 1510 cm^{-1} due to vibrations of aromatic rings and the exothermic reaction of the second peak, assigned to thermal decomposition of aromatic substances, was observed respect to the control. Furthermore, the NH fraction showed structural modifications in the carbohydrates and carbonyl region. Similarly WSOC revealed structural changes in carbohydrates region with a significant decrease at the end of plants growth.

Both species showed a good tolerance at increasing amount of compost in the compost-based growing media up to 60%: only *Philodendron* growth in 100% of compost as growing media. Nevertheless the humification parameters changed with respect to the control in plants cultivated in growing media with 60% of compost. WSOC content also decreased and the highest variations were observed in *Philodendron*. Humic-like fraction did not show significant changes respect to that of the control.

In conclusion, the best results have been obtained with the compost-based growing media with 20% of compost and 80% of peat. Therefore a partial substitution of peat with compost seems to be possible at low doses. If we consider that the annually amount of peat worldwide used as growing media reach several million m^3 a 20% substitution is a good goal for an economical and environmental point of view.

Research funded by the Italian Ministry of the University and Scientific Research, Project PRIN n. 2005078931.39, 1493-1503.