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Evaluation of Technosols constructed with construction waste as alternative substrates to peat moss in container nurseries of forest plants

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Abstract

Peat moss is gradually being replaced by other materials as a growing medium in forest nurseries due to economic and ecological constraints. Thus, this study evaluated the potential of Technosols constructed with construction and excavation debris amended with urban organic residues for containerized production of forest plants.

The following treatments were evaluated: (CCPC) 30% coarse concrete waste, 30% pruning waste, 40% compost; (CCWC) 30% coarse concrete waste, 30% wood chips, 40% compost; (FCPC) 30% fine concrete waste; 30% pruning waste, 40% compost; and (FCWC) 30% fine concrete waste, 30% wood chips, 40% compost. A control treatment was 100 % peat moss. The plant species used were *Dodonaea viscosa*, *Pinus hartwegii*, *Prunus serotina*, *Fraxinus udheí* and *Salix bonplandiana*, which were grown for one cycle in an 1-year experiment. The constructed Technosols were analyzed for bulk and particle densities, porosity, pH, electrical conductivity, and carbon and nutrient (N, P, and exchangeable cations) contents. The plants were evaluated regarding their height and stem diameter.

The peat moss presented the lowest bulk and particle densities, and the highest porosity among treatments. However, less differences were observed between the Technosols regarding their bulk density at the end of the experiment. The FCWC Technosol showed the lowest porosity among treatments. All treatments had alkaline pH, except for the peat moss, which presented acid pH value. Yet, their EC decreased throughout the experimental period, showing less differences between Technosols and control. The peat moss presented higher initial contents of organic C, total N and available P compared to Technosols. However, higher contents of exchangeable cations were observed for Technosols compared to peat moss. Moreover, the Technosols presented inorganic N concentrations that did not differ from the peat moss. A greater plant height and stem diameter were observed for the plants

cultivated in peat moss. However, *F. udheí* and *S. bonplandiana* cultivated in Technosols presented plant height and stem diameter comparable to those cultivated in peat moss.

The Technosols produced from construction waste amended with urban organic residues evaluated in this study could be used as an alternative to peat moss for the growth of *F. udheí* and *S. bonplandiana, which* were less sensible to the type of substrate compared to the other species. Comparing among Technosols, the CCPC and FCPC have shown a better performance in plant development than the CCWC and FCWC Technosols, which led to lower plant height and diameter of most of the forest species evaluated.