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Construction of purpose-designed Technosols from construction waste as substrates in the production of ornamental plants

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Abstract

The overexploitation of the litter layer of the soil profile in the production of ornamental plants causes the disintegration of the landscape and the loss of soil productivity in preserved areas. Thus, this study evaluated Technosols constructed with construction and excavation debris for greenhouse production of ornamental plants.

The evaluated treatments were: (CCW) 40% concrete waste, 30% compost, 30% wood chips; (ECW) 40% excavation waste, 30% compost, 30% wood chips; and (AOW) 40% compost, 60% wood chips. A control treatment (CTL) was composed of 50% compost and 50% natural exported soil. The plant species used were *Heliotropium arborescens*, *Lobularia maritima*, and *Lavandula angustifolia*, which were grown for one cycle in an 8-week greenhouse experiment. The pH, electrical conductivity (EC), carbon and nutrient (N, P, and exchangeable cations) contents, and water availability of the Technosols and control treatment, as well as the survival rate, presence of flowers, number of flowers per plant and shoot diameter of the ornamental plants were evaluated.

All treatments had alkaline pH, yet their EC decreased to the levels recommended for growing media considering the evaluated species. The AOW presented the highest initial contents of total C, total N, and available P, and the highest concentration of DOC at the end of the experiment, followed by the CCW Technosol. There were no differences within treatments regarding their initial and final available P contents, and the final available P and mineral N contents in Technosols and control did not differ, thus showing their ability to supply both N and P to plants. A high plant survival rate was observed, and the frequency of blooming plants increased for all species regardless of the treatment.

The Technosols produced from construction and excavation waste had been shown to provide favorable chemical, physical, and physicochemical conditions for the vegetative development and blooming of ornamental plants with different fertilization requirements and, thus, could be used as alternative to reduce the exploitation of natural soils. The plants used in the study had different nutritional requirements, yet they all grew adequately. The Technosol made from concrete waste had the most promising outcome in terms of C and available nutrients (N, P and exchangeable cations) as well as water retention and availability to plants compared to the excavation-based Technosol, besides having comparable results with the control treatment that is commonly used by the producers to grow ornamental and flower plants.