BIOCHAR: SOIL AMENDMENT FOR THE FUTURE OF TREE SURVIVAL?

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The benefits of trees in urban landscapes are well recognised, including improvements in human mental and physical health, environmental conditions and ecological value. However tree losses in the urban setting are common, partially attributed to an unbalanced root:shoot ratio from the physical loss of root material. This causes internal water deficits where the supply of water via roots is reduced. In addition nutrient requirements cannot be met due to insufficient uptake capacity. Should an urban tree survive transplant shock, the average lifespan is thought to range between 7 and 28 years depending on location, quality of environment, species of tree and after care (Moll, 1989; Nowak et al, 2004; Roman and Scatena, 2011), which is low compared to an expected lifespan of a rurally grown tree of 150 years (Moll, 1989). Biochar is the solid co-product of biomass pyrolysis, and a highly porous material, potentially allowing a greater adsorption of water and nutrients when compared to typical soil textures. This study aims to determine if biochar is a viable soil amendment to increase tolerance to both abiotic and biotic stressors, as well as transplant survival (Schaffert and Percival, 2016), on trees in mainly urban, but also rural contexts. Aims also include determining the significance of biochar feedstock and production conditions in providing these benefits, to achieve maximal reduction of tree transplant losses. Field studies thus far have looked at the effect of biochar amendment on photosynthetic efficiency, root growth, morphology and turnover using mini-rhizotron technology, soil water relations, nutrient retention, fruit yield and fruit quality. Results of these field trials to date have indicated strong reductions in disease incidence and progression associated with stress. For example, reductions of between 63 and 89% in Acute Oak Decline lesion expansion were observed compared to un-amended controls. Biochars derived from hardwood and hardwood/softwood blend have yielded optimal results in street planted trees in a London borough, with amendment at the time of planting, increasing plant vitality and photosynthetic efficiency. Most biochars also had a positive effect on root proliferation, with between 8% and 52%, and between 5 and 32% higher root weights per fixed volume compared to controls of non-diseased and diseased trees respectively. Results are preliminary and significant long terms effects are anticipated due to the nature of biochar and its persistent mode of soil improvement.

Moll, G. (1989) The state of our urban forest. *American Forests* 95, 61-64.

Nowak, D. J., Kuroda, M., Crane, D. E. (2004) Tree mortality rates and tree population projections in Baltimore, Maryland, USA. *Urban Forestry & Urban Greening*, 2(3), 139–147.

Roman, L. A., Scatena, F. N. (2011) Street tree survival rates: Meta-analysis of previous studies and application to a field survey in Philadelphia, PA, USA. *Urban Forestry and Urban Greening*, 10(4), 269–274.

Schaffert, E., Percival, G. (2016) Influence of Biochar, Slow-Release Molasses, and an Organic N:P:K Fertilizer. *Arboriculture & Urban Forestry*, 42(2): 102–110.