Poster #112

Inducing Senescence of Fine Root Branches Under Root Windows by Steam Girding

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The fine roots of plants are a substantial, though often underappreciated, component of ecosystem nutrient cycling. With turnover rates similar to those of leaves, and comprising an estimated 10-40% of forest net primary productivity, fine root turnover and associated nutrient cycling is a necessary component in understanding both the impact of these structures on the immediate rhizosphere, as well as ecosystem nutrient cycling at large. The pervasive and intimate relationship of plants to mycorrhizal fungi adds an additional consideration in the effort to understand the importance of fine roots in nutrient cycling.

Of particular interest is the process of root senescence. Resorption of nutrients during senescence of leaves is known to have a substantial influence on available nutrient pools. However, studies of root senescence are comparatively lacking. In leaves, the role of senescence associated genes (SAGs) in coordinating the senescence process (including resorption of as much as 70% of leaf N) is well studied. Similar genetic determination may be found in the process of nutrient resorption in roots, which carry the additional complexity of mycorrhizal associations. Loblolly pine roots have shown N levels similar to those found in needles, and the presence of ectomycorrhizal (ECM) colonization on root tips has been shown to influence the rate of decomposition. However, the fate of the mobile C and N during senescence is not known. Given the nature of the mycorrhizal relationship, it is plausible that fungi absorb mobile nutrients during root senescence.

The influences of plant genetic control and mycorrhizal association on fine root senescence are essential and tractable avenues to pursue in the effort to understand the role of fine roots in nutrient cycling. The work presented lays the groundwork for further studies that explore the fate of mobile C and N during root senescence in loblolly pine, and the influence of ECM colonization and genetic control on that outcome. This poster outlines preliminary work in this system that has demonstrated the efficiency of steam-girdling of fine roots as a non-destructive method to induce root senescence while maintaining conduits for nutrient resorption. Additionally, appropriate sampling times post-treatment implementation have been identified to maximize detection of C and N movement.