MYCORRHIZAE PROMOTE FIRE ADAPTATION IN OAK-HICKORY FORESTS IN EASTERN USA

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Prescribed fire is commonly used in silvicultural programs designed to promote oak (*Quercus* spp.) and hickory (*Carya* spp.) regeneration in eastern deciduous forests (Brose and others 2008). Thick bark, hypogeal germination, large root systems, repeated-prolific sprouting, and the ability to compartmentalize scars are well-known characteristics that enable oaks and hickories to tolerate fire (Burns and Honkala 1990) unlike certain mesophytic competitors including maples (*Acer* spp.), black cherry (*Prunus serotina* Ehrh.), and yellow-poplar (*Liriodendron tulipifera* L.). Relationships between mycorrhizas and fire adaptation in eastern ecosystems, however, are poorly understood.

Mycorrhizas are symbiotic associations between soil fungi and host plants. When plant roots become colonized by mycorrhizal fungi, their ability to absorb nutrients (phosphorous and nitrogen) and water is greatly enhanced (Smith and Read 1997). Mycorrhizal colonization also lengthens the life of roots, protects against pathogens, and improves early survival and growth (Perry and others 1987). Oaks and hickories are ectomycorrhizal (ECM) while many of their competitors (e.g., maples, black cherry, and yellow-poplar) are vesicular-arbuscular mycorrhizal (VAM). Objectives of this study were to examine the impacts of prescribed burning and the influence of the pre-treatment plant community on ECM and VAM colonization of new seedlings.

Peak temperature and heating duration were measured during site-preparation prescribed burns in South Carolina's upper Piedmont. Greenhouse assays of intact soil cores (Brundrett and others 1996) collected after the burns revealed that the amount of ECM colonization of loblolly pine (*Pinus taeda* L., an ECM host) seedlings was positively correlated with both metrics of fire behavior. Conversely, VAM colonization of corn (*Zea mays* L., a VAM host) seedlings was negatively correlated with peak temperature and heating duration. In addition, best subset regression models revealed that post-burn mycorrhizal colonization was associated with the genera, life stage, and growth habits of plants in the pre-treatment vegetation assemblage.

Results of this study suggest that mycorrhizae are important factors in determining the tolerance (or sensitivity) of forest plants to fire. Moreover, the mycorrhizal colonization of new seedlings after fire depends on the composition and structure of the plant community existing prior to treatment. Finally, with the potential of mycorrhizae to influence regeneration dynamics in eastern deciduous forests, additional work is needed to determine whether traditional silvicultural practices sustain mycorrhizae in this region.

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