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Effects of repeated fire events on soil nutrients and arbuscular mycorrhizal fungi community along a fire induced forest/grassland gradient in central Taiwan.

Chun-Yu Lee (1), Chih-Hsin Cheng (2), and Tzu-Chao Lin (3)

(1) Taiwan Forestry Research institute, Fushan Research Center, Yilan, Taiwan. (myco2324@tfri.gov.tw), (2) School of Forestry and Resource Conservation, National Taiwan University, Taipei, Taiwan (chengch@ntu.edu.tw), (3) Endemic Species Research Institute, Jiji, Nantou, Taiwan.(super@tesri.gov.tw)

Repeated fires that burn in a relative short interval might substantially affect forest vegetation dynamics and soil properties. However, compared to the effects of a single fire event, our understanding about how fires affect forest ecosystem is still less depicted and discussed. In the humid tropical/subtropical forests, repeated fires commonly accompany with invasive grass which enhance a positive fire cycle in short-term. In this study, a fire-induced forest/grassland gradient from unburned forest (*Acacia confusa*), grass invaded forest, standing dead, to long-term repeatedly burnt grassland (Guinea grass) in central Taiwan was established. We aimed to examine the effects of repeated fire on soil nutrients and the symbiotic component (e.g. arbuscular mycorrhizal fungi, AMF). In addition to basic soil nutrients, AMF community, and plant analyses, a pot experiment of applying nitrogen fertilization and fungicide was further conducted to determine whether fire-induced changes in N or AMF limit invasive grass growth.

Our Results indicated that repeated fires significantly altered soil nutrients along the forest/grassland gradient. Soil available calcium, magnesium and pH increased from unburnt forest to grassland, but total carbon, total nitrogen, exchangeable inorganic nitrogen and available phosphorous decreased. Among these soil nutrients, the contents of exchangeable inorganic nitrogen dropped the most, decreasing from 34.5-82.4 mg kg^{-1} at unburnt forest to 3.07-15.9 mg kg^{-1}at grassland. AMF community and colonization were also altered along the forest/grassland gradient. The AMF community at unburnt forest was dominated by *Glomus* while changed to *Glomus* and *Acaulospora* coexistence at grassland. AMF colonization within Guinea grass ranged from 5.6% to 19.6% high at standing dead and low at grassland. We suggested that repeated fire events and invasive grass, as well the changes of soil chemical properties induced by repeated fire and invasive grass, all contribute to the change of AMF community. In the pot experiment, we found the biomass and nutrient contents of Guinea grass grown at grassland soil, was lower than those grown at other soils. Nitrogen fertilization could improve the growth Guinea grass, but had no different effects among all soils. The application of fungicide had no effects on the growth of Guinea grass, but their AMF colonization didn't drop consistently. However, the phenomena of relative low AMF colonization (less than 20%) in this study implied Guinea grass might be less mycorrhizal associated. Our study suggested that repeated fires had great impacts on soil nutrients and AMF community in Central Taiwan. The depletion in soil nutrients could be relatively more important factor to reduce the growth of invasive grass compared to the change of AMF community.