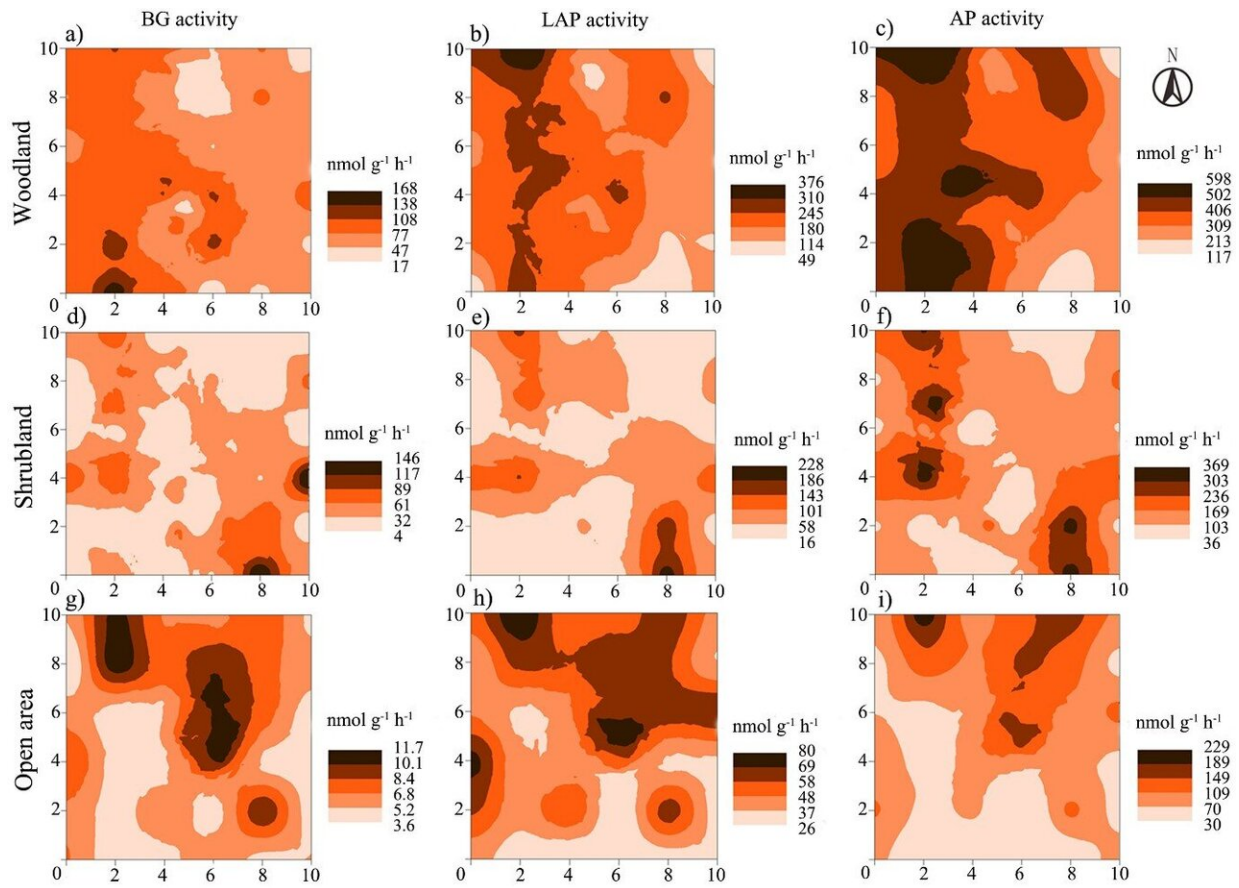
How do biotic and abiotic factors regulate soil enzyme activities at plot and microplot scales under afforestation?

April 6 2020, by Zhang Nannan



Spatial patterns of activities of BG, LAP and AP at the plot scale in each site. Credit: LI Qianxi

Soil carbon (C)-, nitrogen (N) and phosphorus (P)-acquiring enzymes secreted by microorganisms can catalyze key steps in C, N and P cycling by degrading soil organic matter (SOM) and detritus into low-molecular-mass compounds for microbial assimilation, and are distributed heterogeneously even within ecosystems. However, the relationships between soil enzyme activities (EA) and environments within ecosystems remain unresolved.

Supervised by Prof. CHENG Xiaoli, LI Qianxi, a postdoctor of Wuhan Botanical Garden, investigated the spatial variations in EA in woodland, shrubland and adjacent open areas (i.e., control) in the Danjiangkou Reservoir of central China, and explored the underlying mechanisms of whether or not and how environmental drivers, including biotic factors and abiotic factors regulated the spatial variations in EA at the plot (100 m^2) and microplot (1 m^2) scales.

Shifts in drivers of soil EA were observed following afforestation from open area to shrubland to woodland. At the plot scale, the spatial variations in soil EA were primarily controlled by litter and root biomass in the coniferous forest, while they were controlled by soil pH, microbial biomass and community composition in the leguminous shrubland.

At the microplot scale, the controlling factors of soil EA were different between the tree patch microplot and the inter-patch microplot in afforested sites. Moreover, shifts in these drivers were also closely coupled with tree individual distribution, but the scale at which tree distribution operate was different between the woodland and shrubland.

Results provide new sight in SOM dynamics and nutrient cycles via C-, N- , and P-acquiring enzymes, which can have significant implications for the long-term afforestation and sustainable development of forests.

Results have been published in *Ecosystems*, titled "How do biotic and

abiotic factors regulate soil enzyme activities at plot and microplot scales under afforestation?"

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