



Mechanisms leading to tree species diversity effects: a test on water and light acquisition in mixed-forests

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Abstract (400 words max):

In the context of ecology studies on biodiversity and ecosystem functioning relationships, mixed-species forests have been highly studied over the past decade. Forests with a high diversity of tree species are usually found to be more productive than monospecific ones (Toïgo et al. 2015). However, the aboveground and belowground mechanisms leading to these patterns are still not well understood (Forrester 2014). Furthermore, in the context of climate change, it is interesting to analyze whether these mechanisms can help mediate the effects of harsher climatic conditions such as drought (Grossiord et al. 2014).

The objective of this study was to characterize the influence of tree species interactions on functional traits related to carbon and water acquisition of trees under various environmental conditions in mixed forests, in order to discuss the mechanisms leading to diversity effects.

We measured tree-level water use efficiency using carbon isotope composition of the wood in tree rings, leaf functional traits related to carbon and water acquisition and use, light availability for the dominant trees, and soil water acquisition. A triplet approach (3 different forest stands) was used to compare these functional traits in pure and two-species stands. Measurements were conducted along a latitudinal gradient in natural forests (5 sites in the South-East of France) in beech-silver fir or beech-pubescent oak forests.

All data are available right now and statistical analyses are currently being processed. We expect trees in mixed-stands to have enhanced access to water resources and thus display different functional traits. Moreover, we hypothesize that aboveground interactions between species result in higher light interception in mixed-stands. Finally, we expect that these effects should be stronger in the sites that are the most exposed to water stress.

Toïgo, M., Vallet, P., Perot, T., Bontemps, J.-D., Piedallu, C. & Courbaud, B. (2015). Overyielding in mixed forests decreases with site productivity. *J. Ecol.* doi: 10.1111/1365-2745.12353

Forrester, D.I. (2014). The spatial and temporal dynamics of species interactions in mixed-species forests: From pattern to process. *For. Ecol. Manage.* doi: 10.1016/j.foreco.2013.10.003

Grossiord, C., Granier, A., Ratcliffe, S., Bouriaud, O., Bruehlheide, H., Checko, E., et al. (2014). Tree diversity does not always improve resistance of forest ecosystems to drought. *Proc. Natl. Acad. Sci.* doi: 10.1073/pnas.1411970111