

Does tree species richness attenuate the effect of experimental irrigation and drought on decomposition rate in young plantation forests?

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Expected changes in precipitation in Europe due to climate change are likely to affect soil organic matter (OM) transformation. In forests, increasing tree species diversity might modulate the effect of changed precipitation. We evaluated the effect of tree species richness on the decomposition and stabilization rate in combination with reduced precipitation (FORBIO, Belgium) and irrigation treatment (ORPHEE, southern France) in young (6-8 yr.) experimental plantations. The species richness were one to four in FORBIO and one to five in ORPHEE. Twenty four rainout shelters of 3 m × 3 m were built around oak and beech trees in FORBIO plantation to impose a reduced precipitation treatment, whereas four of the eight blocks (175 m × 100 m) in ORPHEE plantation was subjected to irrigation treatment. These treatments resulted in about 4% less soil moisture in FORBIO and about 7% higher soil moisture in ORPHEE compared to control. Commercially available green and rooibos tea bags were buried in the soil at 5-7 cm depth to measure two decomposition indices, known as 'tea bag index' (TBI). These TBI are (i) decomposition rate (k) and (ii) stabilization rate (S). The results showed no species richness effect on TBI indices in both reduced precipitation and irrigation treatment. In FORBIO, reduced precipitation resulted in decreased k and increased S compared to control around the beech trees only. In ORPHEE, both k and S were higher in the irrigation treatment compared to control. Overall, TBI indices were higher in FORBIO than ORPHEE and this might be explained by the sandy soils and poor nutrient content at the ORPHEE site. These results suggest that OM decomposition rate may be slower in drier condition and OM stabilization rate may be slower or faster in drier condition, depending on the site quality. The absence of tree species effects on OM transformation indicates that tree species richness would not be able to modulate the effects of changed precipitation patterns in young plantations. We conclude that in young afforestations, soil moisture has more influence on OM transformation than tree species richness.