Can riparian key plant species alleviate the effects of plantations on leaf litter decomposition in headwater streams?

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INTRODUCTION

In the Mediterranean basin, cropland abandonment has been a common event with noticeable effects on biological communities. The restoration of these agricultural landscapes has been carried out, in most cases, via tree plantations due to its potential to produce forestland in a short timescale. In the western Mediterranean, this practice has been done through pine and poplar reforestations, involving the creation of a vegetation structure that is different from that of natural Mediterranean woodlands. Such changes has the potential to alter the functioning of headwater streams, which are highly dependent of the inputs of leaf litter coming from the surrounding vegetation.

Aims

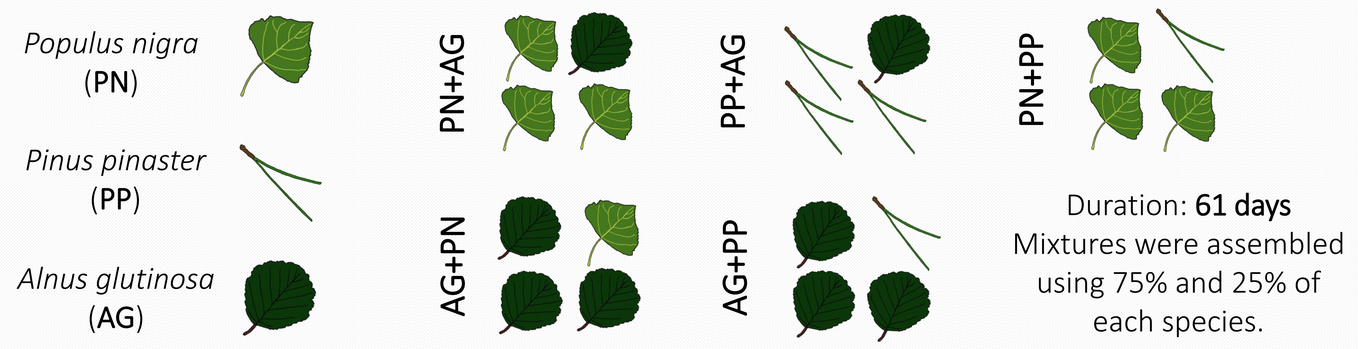
To test how *Pinus pinaster* and *Populus nigra* reforestations may alter the rates of leaf litter decomposition, and whether the presence/absence of a key species *Alnus glutinosa* could reduce plantation litter effects over the decomposition process.

Hypotheses

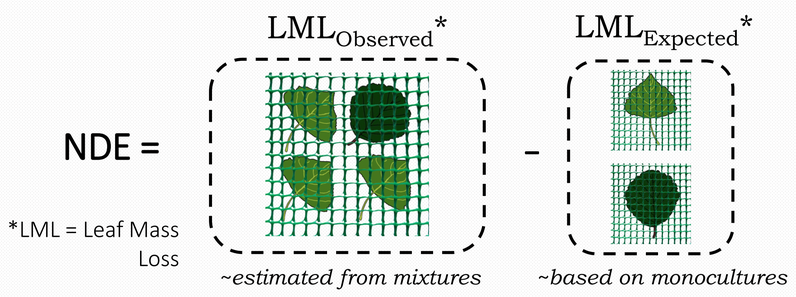
i. Microbially- and detritivore-mediated decomposition rates would be higher in streams with well-naturalized riverbanks independently of the litter combination.
ii. The presence of a key plant species within a mixture would increase the decomposition rate of that mixture.

METHODS

Field experiment: 384 bags [(5 coarse + 3 fine mesh) x 6 streams x 5 rep x treatment (3 monocultures and 5 mixes)].



Net Diversity Effect (NDE):



Partitioning the NDE[1]:

NDE = Complementary effect + Selection effect
~ what mean values explain *~ what variability explains*

Fig. 1 Litterbags immersed in a stream during the experiment

RESULTS

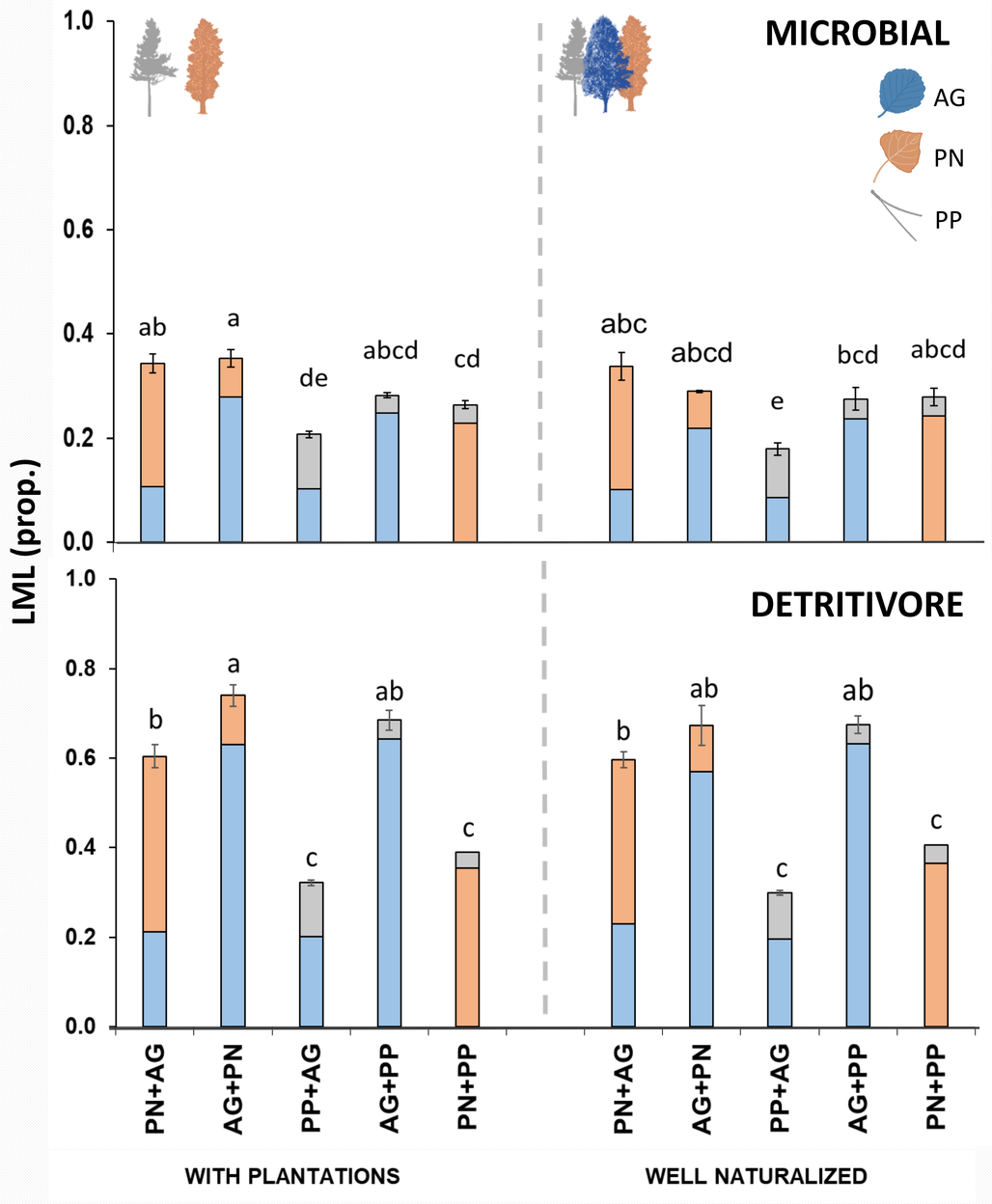


Fig. 2.. Mean (±SEM) litter mass loss (LML; prop.) of mixtures in fine and coarse mesh bags among riverbanks types. Different letters indicate significant differences ($p < 0.05$) across 2-spps litter mixtures, on the basis of linear models followed by pairwise multiple comparisons.

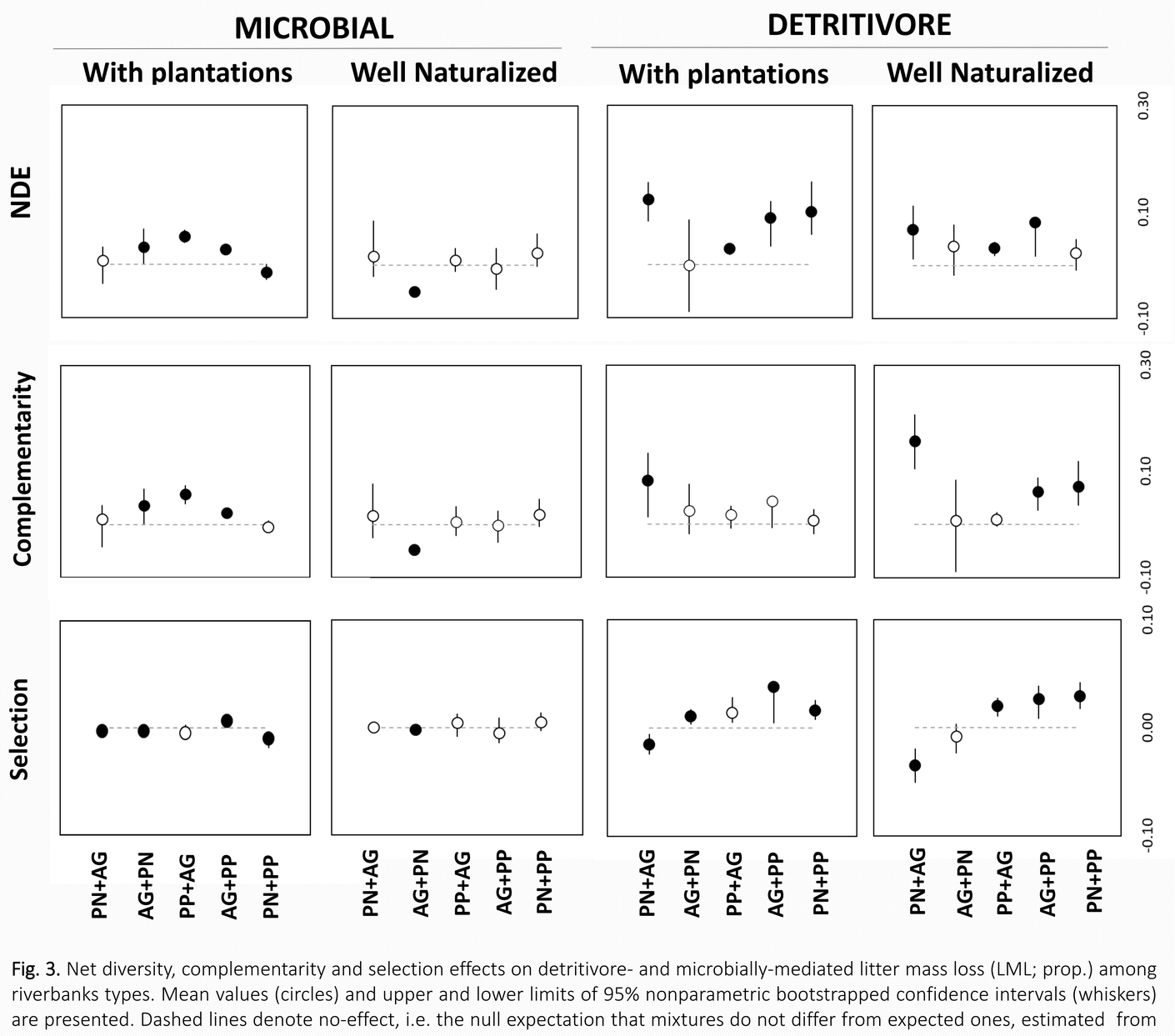


Fig. 3. Net diversity, complementarity and selection effects on detritivore- and microbially-mediated litter mass loss (LML; prop.) among riverbanks types. Mean values (circles) and upper and lower limits of 95% nonparametric bootstrapped confidence intervals (whiskers) are presented. Dashed lines denote no-effect, i.e. the null expectation that mixtures do not differ from expected ones, estimated from monocultures. Closed circles represent intervals that reject the null hypothesis (i.e., confidence interval do not contain the 0-value) and open circles represent intervals that accept the null hypothesis.

CONCLUSION

Our first hypothesis was rejected since no differences were found in the decomposition of any mixture among well naturalized and reforested riverbanks. However, our second hypothesis was partially supported, and the presence *A. glutinosa* tended to increase decomposition rates of the mixtures in which it was present, especially in those riverbanks with plantations. Thus, exhibiting the importance of key plant species, and the need for managers to pay special attention to these species.

References

1. Loreau, M., & Hector, A. (2001). Partitioning selection and complementarity in biodiversity experiments. *Nature*, *412*(6842), 72.

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