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Kin recognition in plants: a plea to consider competitive ability

Lucas Mazal¹, Dov Corenblit¹, Philippe Malagoli², Irène Till-Bottraud¹, Boris Fumanal²

¹Université Clermont Auvergne, CNRS, GEOLAB, F-63000 Clermont-Ferrand, France

²Université Clermont Auvergne, INRA, UMR 547 PIAF, F-63000 Clermont-Ferrand, France.

Context and problematic

Black poplar (*Populus nigra* L.) is a pioneer tree species in European rivers that colonises alluvial banks in very high densities. Indirect positive interactions (*i.e.* facilitation) between young black poplars are already documented. However, the nature of direct interactions between young individuals remains unknown. The conceptual framework of kin recognition allows for direct positive interactions such as cooperation between individuals. Many studies have interpreted the reduction of biomass between plants growing with kin (related individuals) compared to growing with strangers (unrelated individuals) as an indication of kin recognition (*i.e.* ability for individuals to distinguish relatives). We address the following questions: do black poplars reduce their growth in the presence of kin's? and does drought stress enhance or change the outcome of competition between individuals? We tested the following hypotheses; when grown with relatives, individuals exhibit lower biomass (H1 Kin recognition), while when growing with strangers, individuals exhibit higher biomass (H2 Kin competition). Alternatively, drought stress can change the outcomes of competition between relatives and strangers (H3 Drought).

Material & Methods

We set up an experiment where black poplar seedlings from 4 families (seeds from the same mother tree collected along the Allier's river in France and named A1, A2, A3, A4) were grown in pots with related individuals (Kin treatment), or unrelated individuals (Strangers treatment), or alone as a control (Fig.1). Half of the pots were well-watered and half of the pots were not (drought conditions). Growth plant traits, such as dry biomass (presented here) were measured in 6 replicates for the tested conditions.

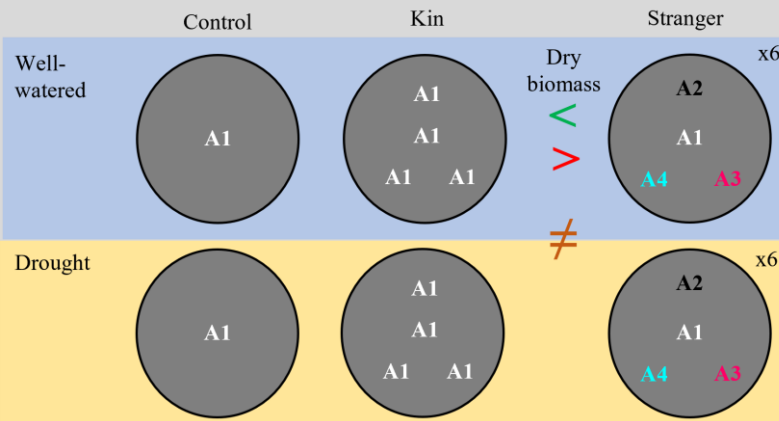


Fig.1. Experimental setup used. Each traitement (water condition and kinship treatment) was replicated six times per family. Mathematical signs refer to tested hypotheses (H1, H2, H3).

Key results and discussion

- ✓ For the A1 and A2 families, individuals grown in the Kin treatment exhibit respectively higher and lower biomass than those grown in the Stranger treatment (Fig.2).
- ✓ Individuals from the A2 family were considered good competitors whereas individuals from the A1 family were considered poor competitor (Fig.2). Thus, in the Kin treatment, competition between relatives was greater in the A2 family and reduced in the A1 family (Fig.2).
- ✓ Therefore, differences in competitive ability between families was the most parsimonious interpretation, thus eliminating kin recognition as an explanation.
- ✓ Drought did not change the outcomes of competition.

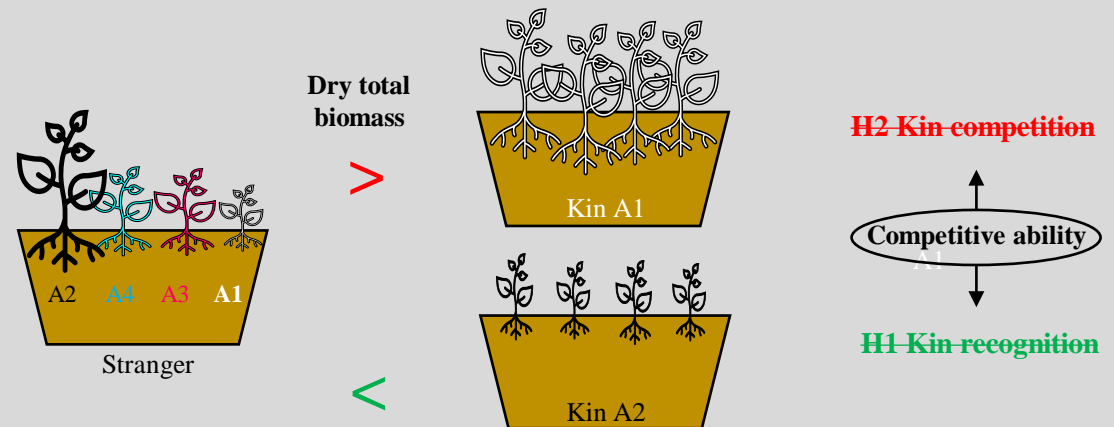


Fig.2. Comparison of dry biomass for individuals grown in the Kin and the Stranger treatment. Significant differences were found for the A1 and the A2 families (p.value < 0.05).

Conclusion

Results obtained in kin studies must be carefully analyzed and alternative interpretations, such as differences in competitive ability, must be tested before concluding to kin recognition.