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# Phenotypic plasticity of *Populus nigra* to hydrogeomorphological constraints: A trait-based approach

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## Résumé

Black poplar (*Populus nigra* L.) pioneer trees are riparian ecosystem engineers which modify their fluvial habitat, e.g. by enhancing sediment accumulation. The engineer effect implies that young individuals are successful in establishment. However, the specific above- and below-ground responses of young poplars to hydrogeomorphological constraints that lead to establishment remain poorly understood. Based on the hypothesis of an eco-evolutionary feedback between woody riparian species and fluvial geomorphology, we performed a semi-controlled *ex situ* experiment to exhaustively quantify response traits of poplar cuttings to simulated hydrogeomorphological constraints. A completely randomized experimental design was employed with cuttings (n=128) and treatments (i.e., the simulated constraints: sediment burial, drag force exerted by floods, their combination, and control). Two partial harvests were performed to evaluate the development of the plants (especially, below ground). At the end of the first growing season, a final harvest was performed in which plants were divided into two groups of equal number (n=48 each). A whole-plant extraction was carried out for the first half of plants; an uprooting test was performed with the second half of plants. Above- and below-ground morphological traits were measured manually and from image analysis for both groups. Biomechanical and anatomical traits were also recorded to characterize the plasticity of this species and to dissociate the specific and more relevant responses to each type of constraint. The results from this research will improve our understanding of riparian ecosystem functioning and specifically of the role of this foundation woody pioneer species within active floodplain rivers.

**Mots-Clés:** Black poplar, plant trait, hydrogeomorphology

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