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Gene flow between crops and their wild relatives may lead to interspecific hybrids and result in the introgression in weed populations of any novel trait breeded in the crop. Transgenes are typically novel genetic constructions aimed to improve agronomic quality of crops. Consequently, introgression from genetically modified crops to their relatives might increase the fitness of receiving plants and impact the dynamics and invasiveness of related weeds. In particular, it is a concern in the case of oilseed rape, *Brassica napus*, and its wild relative *B. juncea*. Besides herbicide-resistance which directly impacts weed survival, other traits can be beneficial to weeds, such as disease and insect resistance. Two approaches are developed here to estimate how fast can increase the frequency of insect-resistant plants in a weed recipient population. For the first approach, we simulated insect-mediated damage by clipping leaves of different proportions of plants in artificial *B. juncea* populations. For the second approach, we applied insects on *B. juncea* x *B. napus* advanced backcross generations harboring a *Bt* transgene.
Simulated damage did not result in per-plant and per-plot seed production difference in pure stands, but a significant penalty was observed in mixed-plant-type plots. However, growth conditions with decreased competition intensity erased these differences. Conversely, no difference was observed in mixed plots of *Bt*-transgenic and non-transgenic BC_2 under insect attack, but the whole plot production increased with increasing proportion of resistant plants. This discrepancy was attributed to a halo effect protecting the non-transgenic plants, while this biotic interaction was not triggered by simulation. The consequences for weed infestation and competition against the crop are discussed.