Selfing Results in Inbreeding Depression of Growth but not of Gas Exchange

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In most tree species, inbreeding greatly reduces seed production, seed viability, survival, and growth. In a previous large-scale quantitative analysis of a black spruce (*Picea mariana* (Mill.) B.S.P.) diallel experiment, selfing had large deleterious effects on growth but no impact on stable carbon (*C*) isotope discrimination (an indirect measure of the ratio of net photosynthesis (*A*) to stomatal conductance (g_{wv})). It was hypothesized that selfing did not impact carbon gain via leaf level gas exchange but it did impair subsequent utilization of *C*. Alternatively, both *A* and g_{wv} may each have been impacted by selfing to the same extent. However, no gas exchange data was ever collected to further test these hypotheses. Here we present photosynthetic gas exchange data collected from three selfed families and three outcrossed families (all the result of controlled pollination) from the same diallel experiment. Photosynthetic responses to intercellular CO_2 concentration (A/C_i curves) were generated on four replicates per family, one block per day, over a four-day period in July. Results indicate no differences between selfed and outcrossed families in maximum carboxylation rate, maximum electron transport, (*A*) and g_{wv} (both estimated at 370 ppm CO_2 concentration), or the ratio A:g_{wv}. Selfed trees had higher mortality during the experiment thus it is possible that there were potential negative impacts on gas exchange of previously living selfed progeny. However, we clearly show that inbreeding can result in trees that have low productivity despite retaining high levels of leaf level A. Results are consistent with the hypothesis that gas exchange was similar between selfed and outcrossed progeny trees, thus subsequent utilization of *C* in selfed progeny must have been modified.

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