

Are *Arabidopsis* plants grown in climate chambers like those grown in the field?

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Plants are plastic and respond to differences in environmental conditions by acclimation. We have, to the best of our knowledge for the first time, made a systematic comparison of leaves of *Arabidopsis thaliana* plants grown in the lab and in the field in order to find out what the most prominent differences were, that potentially could lead to over- or underestimations of the importance of certain processes. Compared to plants grown under natural conditions, “indoor plants” have larger leaves, modified leaf shape and longer petioles. Pigment composition is drastically different, “indoor plants” had only ca 31 % xanthophyll pigments. There are also significant differences in Lhcb antenna protein composition, while Lhcb1 and Lhcb2 levels are up to three times elevated, differences in the PSI antenna were much smaller, only the low-abundant Lhca5 protein had altered levels. Both isoforms of early-light-induced protein (ELIP) are absent in “indoor plants”, the capacity to perform NPQ is reduced but the capacity to perform state transitions were similar. Interestingly, field-grown plants had a very high capacity to perform state transitions. In fact, field-grown plants had faster state transition kinetics than all indoor plants even having smaller antenna. To better investigate the role of ELIPs, that should have a more prominent role under natural conditions, we estimated the growth and Darwinian fitness in the field of plants lacking ELIPs and, somewhat surprisingly, found that it did not differ from wild type.