Geophysical Research Abstracts
Vol. 18, EGU2016-2328, 2016
EGU General Assembly 2016

Winter wheat optimizes allocation in response to carbon limitation

Jianbei Huang (1), Almuth Hammerbacher (2), Susan Trumbore (1), and Henrik Hartmann (1)
(1) Max Planck Institute for Biogeochemistry, Jena, Germany, (2) Max Planck Institute for Chemical Ecology, Jena,Germany

• Plant photosynthesis is not carbon-saturated at current atmospheric CO_2 concentration ($[CO_2]$) thus carbon allocation priority is of critical importance in determining plant response to environmental changes, including increasing $[CO_2]$.

• We quantified the percentage of daytime net assimilation (A) allocated to whole-plant nighttime respiration (R) and structural growth (SG), nonstructural carbohydrates (NSC) and secondary metabolites (SMs) during winter wheat (Triticum aestivum) vegetative growth (over 4 weeks) at glacial, ambient, and elevated $[CO_2]$ (170, 390 and 680 ppm).

• We found that R/A remained relatively constant (11-14%) across $[CO_2]$ treatments, whereas plants allocated less C to growth and more C to export at low $[CO_2]$ than elevated $[CO_2]$; low $[CO_2]$ grown plants tended to invest overall less C into NSC and SMs than to SG due to reduced NSC availability; while leaf SMs/NSC was greater at 170 ppm than at 680 ppm $[CO_2]$ this was the opposite for root SMs/NSC; biomass, especially NSC, were preferentially allocated to leaves instead of stems and roots, likely to relieve C limitation induced by low $[CO_2]$.

• We conclude that C limitation may force plants to reduce C allocation to long-term survival in order to secure short-term survival. Furthermore, they optimized allocation of the available resource by concentrating biomass and storage to those tissues responsible for assimilation.