

analysis indicated photosynthetic processes were down regulated if weeds were present during the CWFP. Interestingly, weed removal after the middle of the CWFP did not revive photosynthetic gene expression to control levels. These treatments also reduced measured photosynthesis levels in the corn. We conclude that weeds permanently inhibit crop photosynthetic abilities, and that loss of photosynthetic capabilities may result in observed yield losses. Further work is continuing to determine if chromatin remodeling and/or regulation by specific transcription factors are responsible for permanent down regulation of photosynthetic genes.

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P15011 Relationships between internal conductance, leaf photosynthetic properties, leaf water potential, and water use efficiency in eight hybrid poplar clones after a moderate water stress

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Internal conductance (g_i) has been shown to impose significant limitations to net CO_2 assimilation (A) in various species during water stress. Although the relationship between g_i and A has received much attention during the last decade, the links between g_i and plant hydraulics have not been examined. The purpose of this study was to investigate the relationship between g_i , A , stomatal conductance (g_s), maximum rate of carboxylation (V_{cmax}), leaf water potential (Ψ_1), water use efficiency (WUE) and plant biomass of 8 hybrid poplar clones following a moderate drought stress. After 4-6 weeks of reduced irrigation (0.25 vs. 0.08 $\text{cm}^3 \text{cm}^{-3}$, Control vs. Stressed), leaf gas exchange was measured on one mature leaf per tree ($n=3$ per clone per treatment). Leaf water potential was measured on all trees before harvesting below- and aboveground biomass. Net CO_2 assimilation generally scaled conservatively with g_i and g_s among all individuals, but there were marked differences in A , g_s , g_i , and V_{cmax} among clones. Surprisingly, in several clones, the photosynthetic capacity and gas exchange properties of mature leaves were little affected by water stress. However, for the remaining drought-sensitive clones whose net CO_2 assimilation decreased with decreasing soil water content and lower Ψ_1 , the photosynthetic loss was predominantly due to a reduction in g_s , rather than V_{cmax} or g_i . Overall, water stressed plants had reduced biomass and increased intrinsic WUE, although no significant differences were observed among clones. Further experiments are needed to determine the relationships between g_i and plant hydraulic properties, such as time response of g_i and Ψ_1 during a drought stress.

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P15012 Effects of long-term (10 years) exposure to elevated CO_2 and O_3 on trembling aspen carbon and nitrogen metabolism at the aspen FACE (Free-Air Carbon Dioxide Enrichment) study site

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This study was conducted at the Aspen Free-Air Carbon Dioxide Enrichment (FACE) experimental site, Rhinelander, WI, (USA). Since 1998, 12 experimental rings planted in 1997 underwent four different treatments: control; elevated CO_2 (560 ppm); elevated O_3 (1.5X ambient) and elevated CO_2 (560 ppm) + O_3 (1.5X ambient). In our study, foliage samples of *Populus tremuloides* Michx. were collected in the summer of 2006, 2007 and 2008 from each of three clones; namely, 216 (O_3 tolerant), 271 (intermediately O_3 tolerant) and 259 (O_3 sensitive) growing within the aspen only sector of each ring. Samples were analyzed for polyamines, amino acids, chlorophyll, and soluble proteins. The results described below are averaged over three years. Under control conditions, O_3 tolerant clone 216 had the highest concentrations of putrescine, glutamic acid, arginine, proline, and GABA; metabolites that typically increase in response to abiotic stress. In contrast, the sensitive clone 259 had the lowest concentrations of these metabolites. With a few exceptions, stress related N metabolites in all clones varied similarly in response to treatments. When comparing clone 271 to clone 216, the observed lower concentrations of putrescine and GABA combined with published data on lower isoprene emissions and faster growth of clone 271 support the hypothesis that clone 271 has a growth dominated strategy (i.e. allocation of extra C to growth relative to N). Tolerant clone 216, on the other hand, allocated more C to secondary metabolites and to processes other than growth; and thus was more tolerant to O_3 stress at the expense of reduced growth. The ratio of common polyamines (spermidine:putrescine) was also another good predictor of overall growth differences between the two clones.

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P15013 Early inhibition of photosynthesis is induced under long photoperiod to re-establish the balance between carbon assimilation and its use in growing organs.

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It has recently been shown that day length influences the carbon allocation pattern between sources and sinks in order to insure that plants do not become carbon depleted at the end of the night. However, much less is known concerning the response of plants to day length in conditions of carbon surplus. Sink and source activities were investigated in a



Plant Biology 2010 Abstract Supplement



Bringing together the global community of plant biologists.

Joint Annual Meetings of the American Society of Plant Biologists and
the Canadian Society of Plant Physiologists -
La Société Canadienne de Physiologie Végétale

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