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28. Wood formation is altered in poplar under ozone and/or elevated carbon dioxide

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The industrial development led to an increase in the concentration of atmospheric carbon dioxide but also resulted in an increase of tropospheric ozone concentrations. Ozone has been suggested to cause the greatest amount of damage to vegetation as compared to other gaseous pollutants. On the opposite, elevated carbon dioxide is usually observed to enhance tree photosynthesis and growth.

We investigated the effects of elevated carbon dioxide and/or ozone on wood formation in young poplars. Trees were bent in order to induce tension wood formation on the upper side of the stem and opposite wood on the lower side. Under ozone, lignin and cellulose biosynthesis decreased probably due to lower availability in carbon skeletons. Cellulose was more affected than lignin resulting in a reduction of cellulose to lignin ratio in wood. Wood anatomy and density was also modified by ozone. Tension wood was generally more altered than opposite wood. All these results showed a strong impact of ozone on wood formation and wood quality and suggested a coordinated regulation of lignin and cellulose synthesis. Elevated carbon dioxide had a low impact on wood formation but the combination with ozone resulted in an attenuation of ozone effects.

29. Shoot Development In Short Rotation Coppice Willow.

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Central to the suitability of willows for biomass production is the vigorous re-growth that occurs following the removal of apical dominance by coppicing. We are beginning to decipher the regulation of this process with respect to bud and shoot behaviour. A dedicated field trial was established in April 2008 comprising six genotypes contrasting in shoot number, stem diameter, and yield. After first coppice a subset of stools was extracted and examined for bud formation, position and number, revealing variation between genotypes in the proportion of buds that sprouted. This process is currently being repeated two years post-coppice, and followed in two mapping populations.

Preliminary QTL analysis placed two *More AXillary branching (MAX)* genes within a locus for shoot development in the K8 mapping population. The K8 alleles and alleles from diverse willow species have been cloned and used for transformation rescue of *Arabidopsis max* mutants. Variation in the degree of mutant rescue between allelic variants suggests functional allelic differences that could contribute to differences in coppicing phenotypes. Eleven new mapping populations have been generated with the aim of affirming, and discovering new, bud and shoot regulation QTLs.

This project aims to improve biomass willows in terms of increased yield and the production of biomass products tailored to a range of energy production processes.