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Poster Abstract Book

discoloured reaction zones are formed by living parenchyma cells in order to establish chemical barriers against invading microorganisms.
In *Robinia pseudoacacia* L., our model tree, flavonoids are accumulated during the formation of discoloured reaction zones. Cell death in the transition zones between discoloured and non-coloured tissues is characterized by high metabolic activity as shown by the synthesis of phenols, and should therefore create a strong sink for carbohydrates. Sink specific enzymes such as invertases and sucrose synthase supply energy and precursors for secondary metabolism via different pathways. The purpose of this study was to investigate the modification of sucrolytic competence characteristic for wood discoloration during compartmentalization of damage in standing trunks of *Robinia pseudoacacia*. After identification of genes coding for sucrose synthase, neutral, acid and cell wall bound invertases in wood of black locust, expression studies of these genes were performed in the discolouring tissues. Our data show that sucrose synthase and invertases are involved in this discolouration processes. With respect to invertases, tissue-specific and developmental-specific differences were found.

P03: 6

Climate change and the effects of increased air temperature on conifer cold hardiness

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Climate change will affect the functioning and productivity of temperate and boreal trees and forest ecosystems. We studied the regulation of photosynthesis and carbon metabolism in the evergreen conifer *Pinus banksiana* (Jack pine) in response to climate change scenarios. In a series of experiments we manipulated daylength and growth temperature during autumn growth conditions in order to disseminate the significance of each factor as environmental signal as well as their interactive effects on carbon uptake, structure and composition of the thylakoid membrane and changes in energy partitioning. Large-scale gene expression analysis further revealed an interactive effect of the autumn photoperiod and low temperature resulting in the enrichment of specific biological themes (GO categories). The enriched biological themes are distinct or have only little overlap with the enriched themes observed in conifer trees exposed to either autumn photoperiod or low autumn air temperature alone. Furthermore, both, physiological and gene expression data suggest that increased autumn air temperature combined with autumn photoperiod (and thus representing an increased length of the growing season under climate change scenarios) might not help to increase the carbon gain in Jack pine under these conditions.

P03: 7

Drought stress reaction of European aspen (Populus tremula L.) – a QTL-mapping approach

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Elevated aridity and scarcity of water are likely consequences of global warming in Central European ecosystems and will cause more negative minimum seasonal water potentials ($-\Psi_{min}$). $-\Psi_{min}$ exerts selective pressure on trees. Poplar varieties well adapted to more negative $-\Psi_{min}$ are badly needed for short rotation coppicing as well as for forestry in pioneer ecosystems. Our QTL-mapping study (quantitative trait loci) provides DNA-markers linked to water use efficiency and resistance to air embolism of *Populus tremula* L. Genetic linkage maps were constructed harbouring SSR and AFLP markers (software package JoinMap®). The average maternal recombination distance was reduced resulting in an approximately 19 % longer map for the female tree which was consistent with results from other aspen mapping projects. The maps were used for mapping of relevant quantitative traits (QTs), e.g. vessel length/diameter/cross section ratio, fibre length, wood density, signatures of stable isotopes ($\delta^{13}C$, $\delta^{18}O$) and radial increment. The QTs were measured separately for the growth rings of the seven-years-old mapping population showing a juvenilety effect on the physiological data. The ratio of the values of the respective trait in a drought and a non drought year (2003/2002) was used for QTL-mapping of drought reaction. At present, the maps are being enriched with additional SSR markers available from the International *Populus* Genome Consortium to allow comparative mapping with other poplar species and the transfer of candidate gene information to the aspen linkage maps.

P03: 8

European beech provenances under climate change: response of transpiration, chlorophyll fluorescence and tree ring growth

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The ongoing climate change will increase temperature by 1.5-2.5 K. As a consequence, precipitation will decrease and the increased frequency and severity of drought will affecting the growth of plants by water depletion in northern and eastern Germany. Already in the recent years drought periods affected the ecosystems in Western Europe. Furthermore, increasing temperature causes a shift of the zones of natural forest vegetation types as well as of the range of the beech (*Fagus sylvatica*) towards higher altitudes and to the north and – perhaps - northeast. Various ecotypes have developed in Europe under different local climate and soil conditions based on genetically differences. A provenance trial was established in Schädtbeck (Schleswig-Holstein) to compare the adaptability of beech provenances to climate changes. For the investigations 6 provenances from Austria, Czech Republic, Germany (Brandenburg, Harz), Romania and, Spain were selected representing a with range of climatic conditions from 575 mm to 1400 mm annual rainfall. Transpiration, leaf conductance and electron transport rates were determined during the summer in July 2006. Samples for tree ring growth were sampled covering the growth period between 1996 – 2006. The summer drought in 2003 had drastic effects on the tree growth in all provenances, while the recovery depends from the provenances.