Windthrow damage in Picea abies is associated with physical and chemical stem wood properties

ID 83691
Author(s) Meyer, Fabian Daniel; Paulsen, Jens; Koerner, Christian
Author(s) at UniBasel Körner, Christian ; Paulsen, Jens ;
Year 2008
Title Windthrow damage in Picea abies is associated with physical and chemical stem wood properties
Journal Trees
Volume 22
Number 4
Pages / **Article-Number** 463-473
Keywords forest, stem fracture, mechanics, treerings, dendrology, nutrients, carbohydrates, spruce, Switzerland
On 26 December 1999, the windstorm ”Lothar” hit large parts of western and central Europe. In Switzerland, windthrow losses reached 12.7 Mio m(3) of timber, corresponding to 2.8 times the annual national timber harvest. Although these exceptional losses were due to extreme peak velocities, recent changes in tree nutrition may have increased forest susceptibility. Previous controlled environment experiments revealed that wood density (associated with wood stiffness) tends to increase in elevated CO2, and to decrease when N-availability is enhanced (e.g., by soluble N-deposition). Such changes in wood quality could theoretically influence the risk of wind damage. We used the ”Lothar” windstorm as a ”natural experiment” to explore links between damage and wood properties. In 104 windthrow sites across the Swiss Plateau, more than 1,600 wood cores from (1) broken, (2) uprooted and (3) still standing (not damaged) spruce trees (Picea abies) were collected in February and March 2000. Wood properties, treering width and chemistry of the wood samples were analysed. Broken trees showed wider treerings in the decade 1990-99 compared to non-broken trees (either uprooted or undamaged trees). Broken trees also showed lower non-structural carbohydrate (NSC) concentration in sapwood, reflecting active structural carbohydrate sinks associated with fast growth. There was also a trend for higher tissue N-concentrations in broken trees. No significant differences between damage types were found in wood density and wood shrinkage during desiccation. We conclude that stem breakage risk of P. abies is associated with a stimulation of growth in the past decade and with changes in tree nutritional status. However, the risk for windthrow of whole spruce trees (uprooted but not broken) was not related to the studied wood parameters.
Publisher Springer-Verlag
ISSN/ISBN 0931-1890
edoc-URL http://edoc.unibas.ch/dok/A5250820
Full Text on edoc No;
Digital Object Identifier DOI 10.1007/s00468-007-0206-3
ISI-Number WOS:000257385200006
Document type (ISI) Article