

## **The effect of unidirectional stem flexing on shoot and root morphology and architecture in young *Pinus sylvestris* trees**

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### **Abstract**

Mechanical stresses experienced by a tree during lateral loading may cause alterations in both shoot and root growth (thigmomorphogenesis). Many of the previous studies on this subject have concentrated on shoot responses to lateral loads, while root system responses to stresses caused by external loading have been investigated only in more recent years, and even then only rarely in trees. This study presents the effect of unidirectional stem flexure, mimicking wind loading, of young Scots pines on their root system morphology and architecture. Apart from the changes caused to the parts of the tree above ground, unidirectional periodical flexing induced an increase in total root CSA and larger biomass allocation to the roots parallel to the plane of flexing which, in turn, resulted in a larger number of major lateral roots with larger CSA in the plane of flexing. Since there were no significant differences in root:shoot ratio or the mechanical properties of wood between flexed and unflexed trees in this study, the increase in the lateral resistance in flexed trees was associated with the greater proportion of total root biomass allocated to the proximal major lateral roots, which was an adaptive mechanism for improvement of the tree's anchorage.