Xylem International Meeting

BOOK OF ABSTRACTS
Impact of increased air humidity on xylem hydraulic properties of hybrid aspen


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Abstract:
Climate models predict greater increases in the frequency of precipitation rather than in amount and a consequent rise in atmospheric humidity at high latitudes by the end of the century. Increasing air humidity has an inevitable effect on water fluxes through vegetation, thereby influencing tree functioning and condition of forest ecosystems. We investigated specific hydraulic conductivity ($k_{\text{max}}$) and vulnerability to cavitation of stems in hybrid aspen coppice grown under elevated relative humidity of air. Artificial cavitation in the stem segments was induced by air injection method at air entry pressures of 1.0, 1.5 or 2.0 MPa with a cavitation chamber.

$k_{\text{max}}$ decreased from 4.42 in control to 3.94 kg m$^{-1}$ s$^{-1}$ MPa$^{-1}$ ($P=0.002$) in humidification treatment, while the trend was well correlated ($R^2=0.440$, $P<0.001$) with increasing wood density. Humidified trees exhibited smaller ($P=0.003$) foliage area at the same xylem cross-sectional area resulting in 34% higher Huber values compared to the control. The treatments differed by neither native embolism level nor susceptibility to dehydration-induced cavitation. Increasing air humidity reduces hydraulic efficiency of hybrid aspen trees expressed on xylem area basis and causes substantial changes in resource allocation between photosynthetic and water transport tissues. This climate trend does not influence stem vulnerability to cavitation.