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Xylem embolism spread is largely prevented by interconduit pit membranes until the majority of conduits are gas-filled

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摘要	Xylem embolism resistance varies across species influencing drought tolerance, yet little is known about the determinants of the embolism resistance of an individual conduit. Here we conducted an experiment using the optical vulnerability method to test whether individual conduits have a specific water potential threshold for embolism formation and whether pre-existing embolism in neighbouring conduits alters this threshold. Observations were made on a diverse sample of angiosperm and conifer species through a cycle of dehydration, rehydration and subsequent dehydration to death. Upon rehydration after the formation of embolism, no refilling was observed. When little pre-existing embolism was present, xylem conduits had a conserved, individual embolism-resistance threshold that varied across the population of conduits. The consequence of a variable conduit-specific embolism threshold is that a small degree of pre-existing embolism in the xylem results in apparently more resistant xylem in subsequent dehydrations, particularly in angiosperms with vessels. While our results suggest that pit membranes separating xylem conduits are critical for maintaining a conserved individual conduit threshold for embolism when little pre-existing embolism is present, as the percentage of embolized conduits increases, gas movement, local pressure differences and connectivity between conduits increasingly contribute to embolism spread.
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