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Vulnerability to embolism in herbaceous and secondarily woody species

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Abstract:

There is a common idea that most herbaceous species refill their embolized vessels each night via positive root pressure, meaning that there is no need to become resistant to embolism. Our study assesses the range in vulnerability to embolism in herbaceous species, and evaluates whether closely related secondarily woody species are always more embolism resistant than their herbaceous ancestors. Therefore, three non-related plant groups are investigated: 1) grass species, 2) the Gentianaceae sister pair *Blackstonia* (herbaceous) and *Ixanthus* (woody), and 3) the daisy lineage (Asteraceae) with herbaceous (*Leucanthemum*, *Chamaemelum*) and woody members (*Argyranthemum*). Surprisingly, the grass dataset shows an extraordinary range in P50, ranging from 0.5 – 7.5MPa. This suggests that at least in the resistant species daily refilling does not occur, although this needs to be quantified. The anatomy of the grass stems shows a tight trade-off between P50 and stem lignification. Within the daisy lineage, all the woody species are more embolism resistant than their herbaceous relatives, but the *Blackstonia-Ixanthus* sister group has a similar P50 value (-4.5MPa), showing that more woodiness/lignification does not always go hand in hand with more embolism resistance.