**What does “wood functional trait” mean? Conduit diameter-plant size predictability and links to individual and community performances**

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Ecological studies try to reveal patterns of functional traits for understanding their role in adaptation and tradeoffs. A functional trait is defined as a measurable property, often at the individual level, that strongly influences organismal performance. For being useful the functional traits should have wide interspecific variability (e.g. bird beak shape) but be relatively invariant within species. Xylem conduit diameter has traditionally been regarded as being a central functional trait capable of explaining suitable habitat for a given species (e.g. wet vs. dry environments). However, recent theoretical optimality models and experimental data show that conduit size, when standardized for tree height, is almost invariant in relation to sites, habits, and lineage. Within individuals, there is a highly predictable increase in conduit diameter towards the stem base (cell widening). This universal pattern allows trees to compensate increase in hydraulic resistance with growth in height. As a consequence of the optimal xylem network, all leaves are supplied at the same rate and perform similarly. The universality of this pattern makes it possible to scale tree functionality up to ecosystem structure by using only the simple scaling of crown volume (e.g. leaf area) with height and the principle of maximum community resource use. We applied such an approach in three tropical forests in the Congo Basin with different degrees of disturbances and show that our approach can be used for estimating the degree of old-growthness of diverse forest communities.

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