



Plant silicon content vs phytolith abundance: uses, differences and their power combined

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The field of silicon research in plants and the critical zone is fast -growing, in part through novel synergies between agronomy, palaeontology, biogeochemistry, pedology and ecology. In these fields, there are different ways to assess plant silicon accumulation, with the most frequent to measure silicon content, or to isolate and count phytoliths to gain information about uptake and function/taxonomy respectively. What do the two measures tell us, how are they different quantitatively, and what can we learn when we combine them? Silicon (Si) accumulation in non-woody shoots and leaves is an informative plant trait, with some species accumulating very little while in others Si comprises >10% of their dry mass. The use of Si by leaves as a resource for defence against herbivory, and a strengthening component and to alleviate the impacts of a range of biotic and abiotic stresses is increasingly well understood and there are strong phylogenetic patterns in shoot/leaf Si accumulation. New studies show that Si is important in the roots of herbaceous plants as a defence against herbivores. However, we know little about the functions or magnitude of Si accumulation in wood, or its impact on ecosystem Si cycling and budgets, despite the enormous ecological, practical and commercial importance of this plant tissue. Recent papers and vintage reports suggest there may be substantial variation in wood Si concentration across species, but the significance of this variation is unclear. Using wood as a case study, Si accumulation in this organ both in total amount and phytolith morphology across taxa is considered to explore cross-field synergies, purported functions for Si in wood and where there still may be gaps in our understanding of ecosystem Si budgets, especially in the interaction between plants and soils.