THE ROLE OF PHOSPHORUS IN EXPLAINING PLANT BIODIVERSITY PATTERNS AND PROCESSES IN A GLOBAL BIODIVERSITY HOTSPOT

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South-western Australia is recognised as a global biodiversity hotspot , where the greatest plant diversity is found on the most severely phosphorus (P)-impoverished soils in kwongan (or kwongkan), the term used for south-western Australian sandplain vegetation . Mycorrhizas are known to enhance plant P acquisition, but non-mycorrhizal plant families (*e.g.*, Proteaceae) feature most prominently on the poorest soils, and these families are uncommon on soils containing more P. Almost all Proteaceae produce carboxylate-releasing cluster roots, which are capable of mobilising scarcely available P and micronutrients, including manganese (Mn). They effectively 'mine' these nutrients, as opposed to 'scavenging' them from the soil solution further away from the root surface, as mycorrhizas do. In addition to efficient acquisition of P from soil, south-western Australian Proteaceae species also use the acquired P very efficiently in photosynthesis. South-western Proteaceae also show a tremendous capacity to remobilise P from senescing and contain a large amount of P in their seeds. The traits referred to here help explain the ecological success of non-mycorrhizal species on severely P-impoverished soils in south-western Australia. These same traits may also have allowed non-mycorrhizal families to diversify in these severely nutrient-impoverished environments.

In south-western Australia, there are about 700 Proteaceae species, and they are also a prominent non-mycorrhizal plant family in the P-impoverished fynbos, in the biodiversity hotspot of south-western South Africa, with >350 species. In strong contrast, the Proteaceae are a poorly represented plant family in the P-impoverished *campos rupestres* of the cerrado in Brazil, another global biodiversity hotspot. Most intriguingly, the pattern of non-mycorrhizal species featuring prominently on the most severely P-impoverished soils is very similar to that in kwongan. The non-mycorrhizal, 'P-mining' role played by Proteaceae is taken over by other families.

Non-mycorrhizal species with carboxylate-releasing P-mining strategies feature prominently on the wold's most P-impoverished soils. They coexist with mycorrhizal species and may even facilitate their growth. Since carboxylates not only mobilise P, but also Mn, leaf Mn concentrations might be used as a proxy for the carboxylate-releasing strategy.