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Phosphorus availability in terrestrial ecosystems does not constrain symbiotic N₂ fixation rate

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Introduction and Objective

Symbiotic N₂ fixation (SNF) is a major input flux in terrestrial ecosystems. The process has been extensively studied and the factors controlling it, like phosphorus (P), are well identified. Phosphorus is also limiting plant growth in many parts of Earth and is thus of great importance for carbon sequestration in the current context of global change. Although the interactions between P and SNF have been identified as one of the few important research areas on N₂ fixation, the way P controls SNF is still a source of controversy and remains unclear. Considering the importance of SNF for ecosystems, our aim was to elucidate the dependency of this process on P availability in soils of the world.

Material and Methods

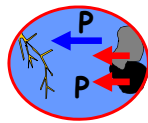
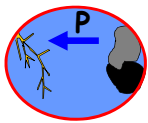
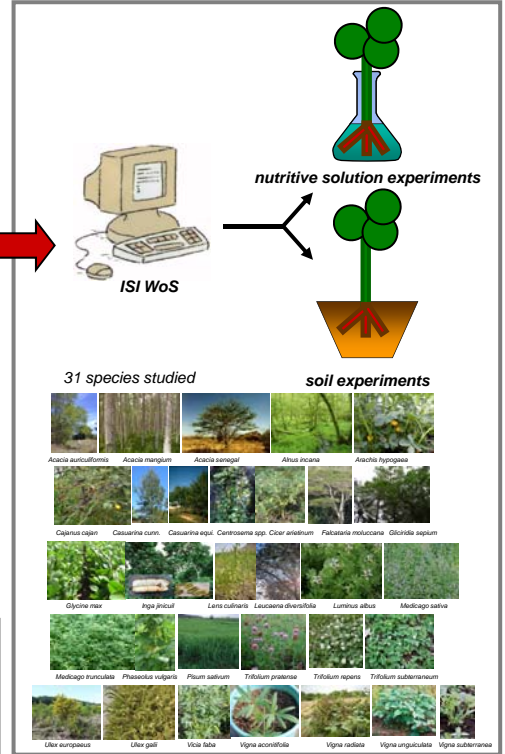
We compiled published studies which measured the SNF of plants under different levels of P supply. The results of this compilation were put into a global perspective by comparing them with an extensive analysis of soil phosphorus status throughout the world.

• Compilation of SNF studies under different levels of P supply

We used the ISI Web Of Science database to find published literature on the effect of P supply on SNF of plants grown in natural soils (in the field or in pots) or artificial irrigated substrates (e.g. perlite or hydroponics).

• Worldwide data on P in soils

We used the ISI Web Of Science database to find published literature characterizing water-P (PO₄ soluble in soil water) or labile-P (water soluble PO₄ + soil P fractions available for plants; Hedley fractionation method) in the top layer of the mineral soil or in the forest floor. Data were collected throughout the world. Each continent (North America+West Indies+Central America; South America; Europe; Africa; Asia; Oceania+Pacific) represented 9–33% of our dataset. All biomes, climates (continental to tropical), land uses (croplands, forests, grasslands and savannas) and soil types were represented.



Results and Discussion

