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Root phosphomonoesterase activity as dependent on soil phosphorus availability of common herbaceous plant species of Río de la Plata grasslands

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Río de la Plata natural grasslands harbor a high diversity of plant species on soils spanning a wide gradient of phosphorus (P) concentration. Half of the total soil P concentration is organic P (Hernandez et al., 1995). Although plant diversity is high, most of the herbaceous communities share the same matrix of species, leading to the question: do common species increase their root phosphomonoesterase activity as the resin P concentration of the soils decreases?

Objective: Quantify root phosphomonoesterase activity plant species of Río de la Plata grasslands (110 plant species from 21 families), growing in soils spanning a wide range of soil resin P concentrations.

Methods: Phosphomonoesterase activity was quantified in roots of common herbaceous species sampled in four plots of six natural grasslands, in Uruguay and South Brazil, following the protocol from Güsewell (2017). Resin P concentration was quantified for the same plots. Linear models were fitted, and ANOVA was performed using R.

Results, discussion and conclusions: The resin P concentration of six soils ranged from <1 to 12.5 ng P g⁻¹ soil ($p < 0.05$). From the 16 most common plant species, the correlation of enzyme activity with resin P concentration was negative or there was no trend, but for two species there was a significantly positive correlation (Fig. 1). *Carex phalaroides*, a sedge, was the only species with a significant negative correlation. The lack of a significant trend among 13 species may be due to the fact that when organic P concentration decreases plants rely on alternative P sources. The diversity of relationships between root enzymatic activity and soil resin P variations may play a role in the maintenance of plant diversity in the most P-depleted soil in natural grasslands of Rio de la Plata.

References

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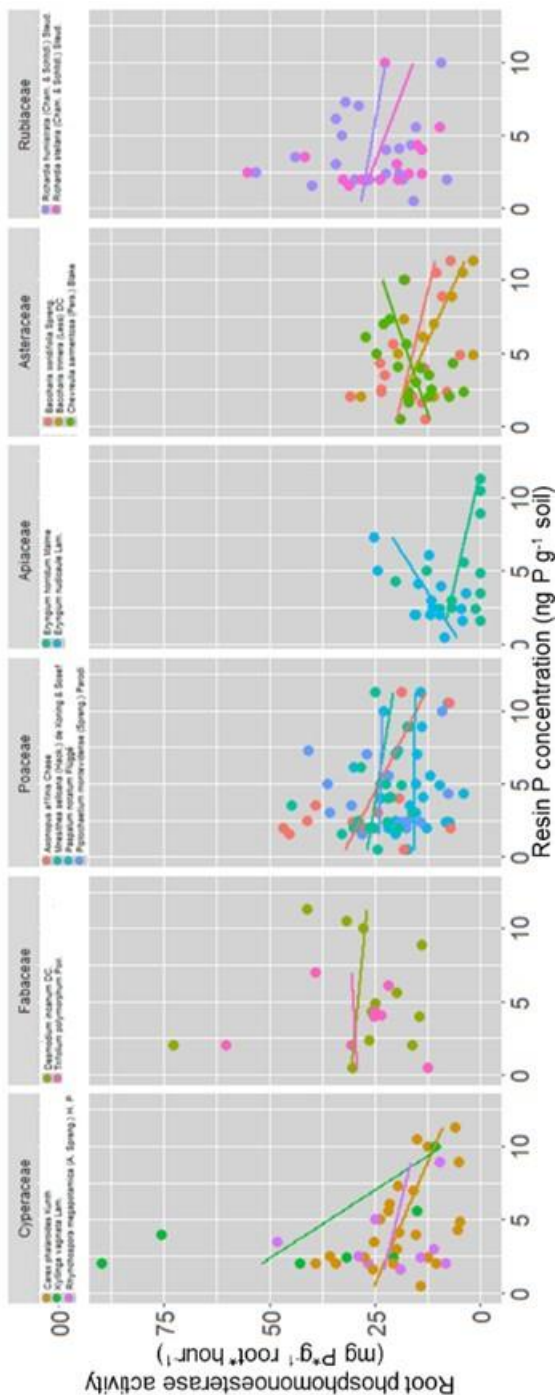


Figure 1: Root phosphomonoesterase activity relation with soil resin P concentration for 16 plant species of six most abundant plant families of Rio de la Plata grasslands. Significance of fitting models (p<0.05).