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Table S1. Soil texture and phosphorus fraction means ± SD for each study site (n = 5) in Guanacaste, Costa Rica. Here, Pi represents inorganic phosphorus fraction and Po represent organic fractions. See Fig. **S1** for stacked bar chart of Hedley phosphorus fractions.

Soil Variable	Horizontes			Santa Rosa			Palo Verde		
Sand (%)	52.8	±	1.1	36.5	±	4.0	36.4	±	7.9
Silt (%)	32.8	±	1.8	31.7	±	1.4	28.6	±	1.8
Clay (%)	14.4	±	0.9	31.8	±	3.7	35.0	±	6.6
Pi NaHCO3 (mg kg^{-1})	14.0	±	2.3	10.5	±	2.1	14.4	±	2.8
Po NaHCO3 (mg kg^{-1})	28.2	±	3.2	12.4	±	3.0	10.7	±	1.9
Pi NaOH (mg kg^{-1})	61.6	±	7.5	15.6	±	1.4	12.2	±	2.4
Po NaOH (mg kg^{-1})	272.2	±	22.3	123.6	±	15.5	119.2	±	13.3
Pi HCl (mg kg^{-1})	7.5	±	2.2	12.1	±	2.5	5.2	±	1.4
P residual (mg kg^{-1})	108.0	±	8.9	73.2	±	12.5	71.8	±	6.3
P fractions sum (mg kg^{-1})	489.8	±	41.3	247.4	±	34.0	231.6	±	16.7

Table S2. Significant root-root linear models for *Handroanthus ochraceus*. Each response trait was tested against all other root traits and tree DBH, and significance level was determined with ANOVA and Bonferroni-corrected p-values for multiple comparisons (significance p-value < 0.00625). Response variables were Box-Cox transformed (using lambda) to normalize residuals. For each model, the lambda, R^2 value, p-value and degrees of freedom (DF) are listed, and the estimate and standard error of explanatory variables are listed.

Response Trait (Box-Cox)	Explanatory Root Variables	Box-Cox Lambda	R^2	p-value	DF	Estimate	SE
Diameter	Specific Root Length	-1.31	0.95	<0.001	2	-0.07	0.002
	+ Root Tissue Density					-3.94	0.21
Respiration Rate	Specific Root Length	0.14	0.59	<0.001	1	0.05	0.004
Root Branching Intensity	Root Tissue Density	-0.34	0.18	<0.001	1	2.30	0.52
Phosphomonoesterase Activity	Mycorrhizal Colonization	0.02	0.17	<0.001	1	0.02	0.005
Mycorrhizal Colonization	Root N Concentration	0.59	0.16	<0.001	1	4.46	1.1
Root N Concentration	Mycorrhizal Colonization	-0.06	0.16	< 0.001	1	0.003	0.0008

Table S3. Significant root-soil linear models for *H. ochraceus*. Each response trait was tested against all other soil variables and tree DBH, and significance level was determined with ANOVA and Bonferroni-corrected p-vaues for multiple comparisons (significance p-value < 0.005). Response variables were Box-Cox transformed (using lambda) to normalize residuals. For each model, the lambda, R^2 value, p-value and degrees of freedom (DF) are listed, and estimate and standard error of explanatory variables are listed.

Response Trait (Box-Cox)	Explanatory Soil Variable	Lambda	R^2	p-value	DF	Estimate	SE
Phosphomonoesterase Activity	Bulk Density	-0.22	0.51	<0.001	1	-2.16	0.40
Mycorrhizal Colonization	Magnesium	0.79	0.48	<0.001	1	3.41	0.66
Root Nitrogen Concentration	Calcium	-0.14	0.29	<0.001	1	0.02	0.005
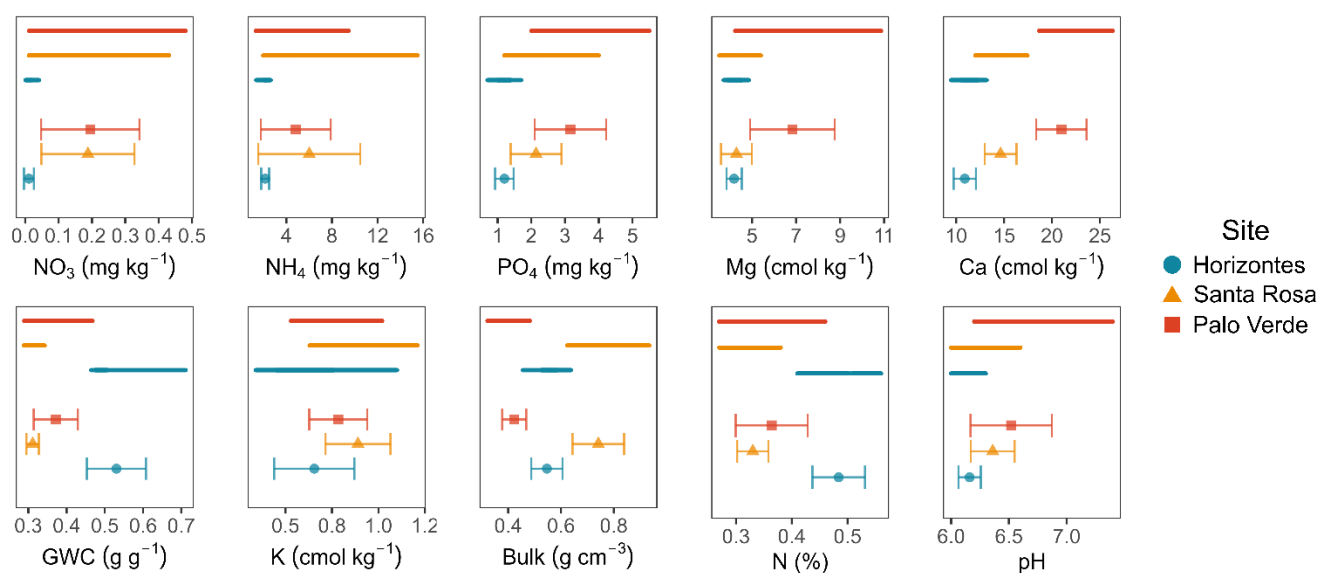
Figure S1. Raw soil data ranges for sites in Guanacaste, Costa Rica. Each line represents the range of values observed within each site (n = 3) for soils collected around trees (n = 10). Colored shapes at the bottom represent mean values (± SD) for each site. Plots are arranged from left to right, top to bottom by descending order of coefficients of variation. Bulk – bulk density, Ca – soil calcium cations, GWC – soil gravimetric water content, K – soil potassium cations, Mg – soil magnesium cations, N% – soil total N, NH_4 – soil ammonium-N, NO_3 – soil nitrate-N, PO_4 – soil orthophosphate-P.
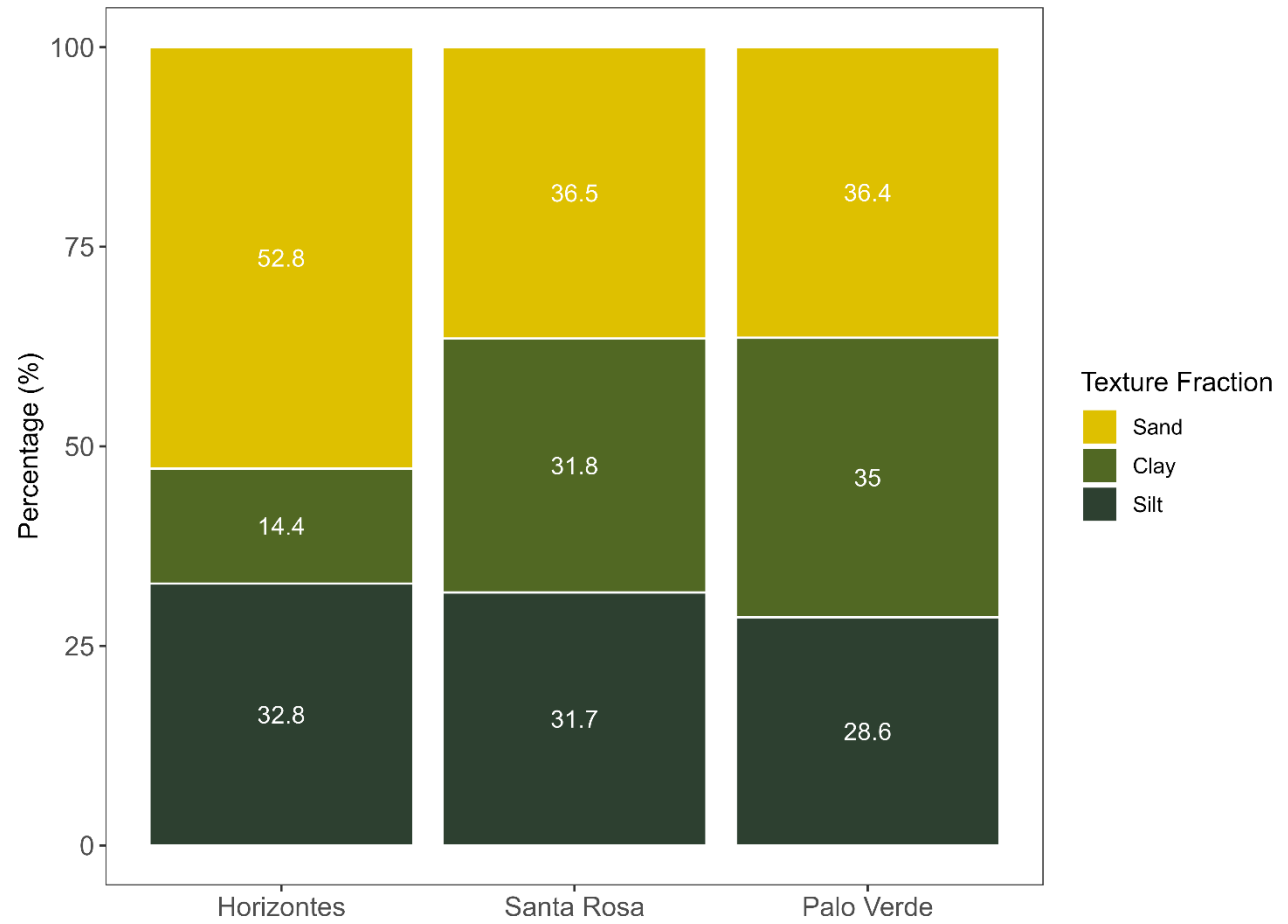
Figure S2. Mean soil texture fractions for each site in Guanacaste, Costa Rica (N = 15).
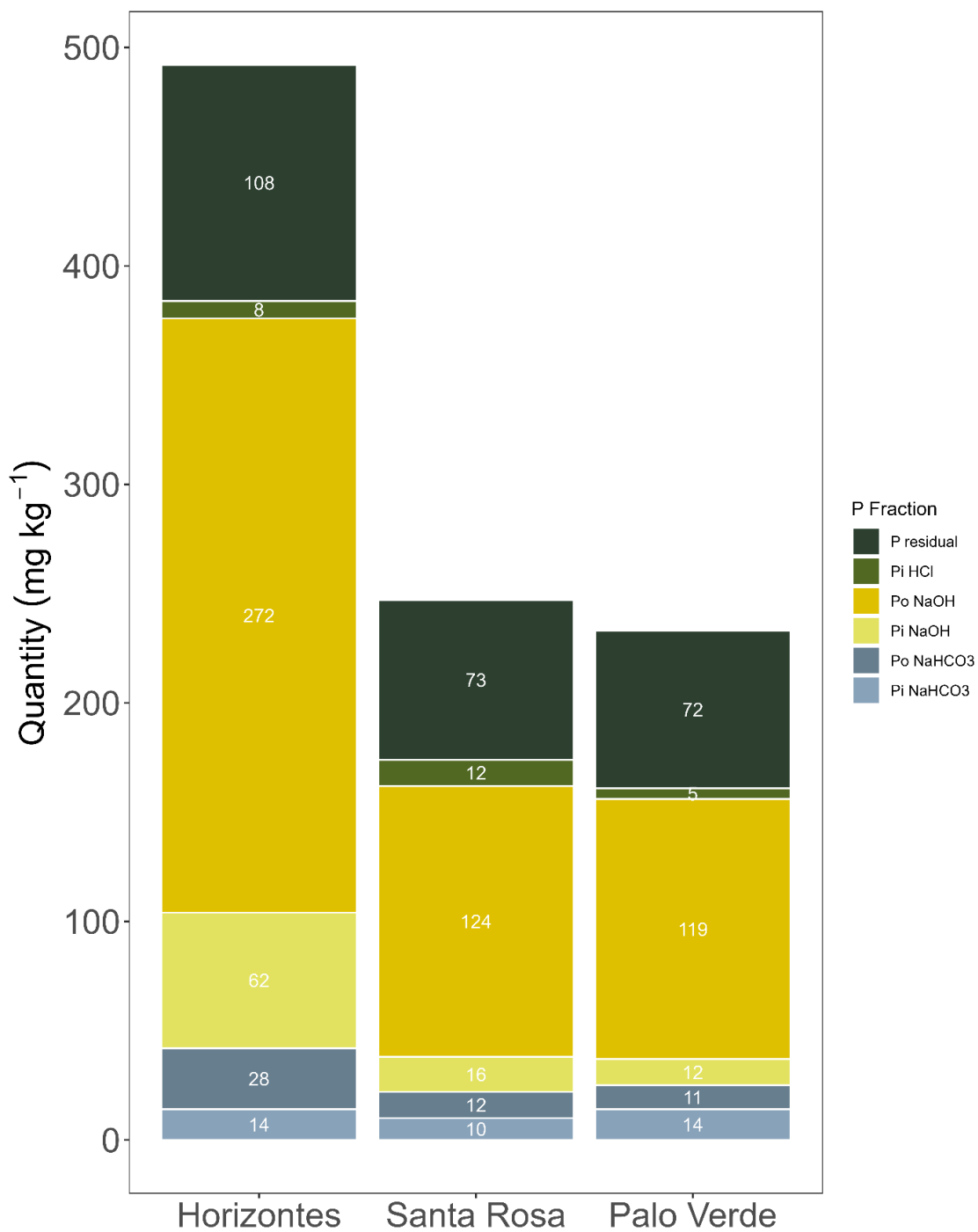
Figure S3. Mean Hedley phosphorus (P) fractions for soil samples pooled between the two nearest trees in each site (N = 15) in Guanacaste, Costa Rica. Pi = inorganic P, Po = organic P