

Supplemental Table S1. Phenol oxidase and net peroxidase net absorbance units in native Alaska, California and Costa Rica soils as a function of time measured with PYGL, DOPA and ABTS. Values are mean \pm SEM (n=3 cores for each enzyme). N.D. = Not Detectable.

Location	Time (hr)	Native soil: Phenol Oxidase			Native soil: Net Peroxidase		
		PYGL	DOPA	ABTS	PYGL	DOPA	ABTS
Delta Junction, AK	0.0	0.009 \pm 0.012	N.D.	N.D.	0.050 \pm 0.036	N.D.	0.007 \pm 0.023
Delta Junction, AK	0.5	0.031 \pm 0.014	N.D.	N.D.	0.145 \pm 0.040	0.089 \pm 0.022	0.058 \pm 0.029
Delta Junction, AK	1.0	0.045 \pm 0.014	N.D.	N.D.	0.165 \pm 0.052	0.141 \pm 0.023	0.095 \pm 0.044
Delta Junction, AK	1.5	0.053 \pm 0.013	N.D.	N.D.	0.185 \pm 0.059	0.174 \pm 0.028	0.137 \pm 0.055
Delta Junction, AK	2.0	0.056 \pm 0.016	N.D.	N.D.	0.190 \pm 0.065	0.210 \pm 0.019	0.165 \pm 0.066
Delta Junction, AK	2.5	0.062 \pm 0.020	N.D.	0.005 \pm 0.009	0.198 \pm 0.073	0.197 \pm 0.032	0.170 \pm 0.061
Delta Junction, AK	3.0	0.068 \pm 0.017	N.D.	0.013 \pm 0.016	0.216 \pm 0.073	0.199 \pm 0.043	0.213 \pm 0.071
Irvine, CA	0.0	N.D.	N.D.	0.109 \pm 0.007	N.D.	N.D.	N.D.
Irvine, CA	0.5	N.D.	N.D.	0.255 \pm 0.015	0.027 \pm 0.007	0.021 \pm 0.020	N.D.
Irvine, CA	1.0	0.006 \pm 0.002	N.D.	0.325 \pm 0.014	0.043 \pm 0.007	0.021 \pm 0.017	N.D.
Irvine, CA	1.5	0.012 \pm 0.010	N.D.	0.380 \pm 0.011	0.046 \pm 0.009	0.030 \pm 0.018	N.D.
Irvine, CA	2.0	0.014 \pm 0.017	N.D.	0.423 \pm 0.013	0.052 \pm 0.011	0.041 \pm 0.013	N.D.
Irvine, CA	2.5	0.014 \pm 0.017	N.D.	0.461 \pm 0.020	0.059 \pm 0.013	0.049 \pm 0.017	N.D.
Irvine, CA	3.0	0.019 \pm 0.016	N.D.	0.514 \pm 0.013	0.059 \pm 0.023	0.065 \pm 0.016	N.D.
Nicoya Peninsula, CR	0.0	N.D.	0.020 \pm 0.004	0.167 \pm 0.052	N.D.	0.012 \pm 0.017	N.D.
Nicoya Peninsula, CR	0.5	N.D.	0.005 \pm 0.005	0.087 \pm 0.028	0.277 \pm 0.092	0.305 \pm 0.039	0.028 \pm 0.108
Nicoya Peninsula, CR	1.0	N.D.	N.D.	0.092 \pm 0.026	0.435 \pm 0.094	0.408 \pm 0.026	N.D.
Nicoya Peninsula, CR	1.5	N.D.	N.D.	0.109 \pm 0.034	0.507 \pm 0.093	0.458 \pm 0.014	0.025 \pm 0.136
Nicoya Peninsula, CR	2.0	N.D.	N.D.	0.112 \pm 0.033	0.565 \pm 0.087	0.500 \pm 0.015	0.011 \pm 0.133
Nicoya Peninsula, CR	2.5	N.D.	N.D.	0.106 \pm 0.034	0.603 \pm 0.091	0.525 \pm 0.017	0.010 \pm 0.128
Nicoya Peninsula, CR	3.0	N.D.	0.004 \pm 0.006	0.101 \pm 0.031	0.632 \pm 0.083	0.548 \pm 0.019	0.009 \pm 0.125

Supplemental Table S2. Phenol oxidase and net peroxidase net absorbance units in autoclaved Alaska, California and Costa Rica soils as a function of time measured using PYGL, DOPA and ABTS as substrates. Values are mean \pm SEM (n=3 cores for each enzyme). N.D. = Not Detectable.

Location	Time (hr)	Autoclaved soil: Phenol oxidase			Autoclaved soil: Net Peroxidase		
		PYGL	DOPA	ABTS	PYGL	DOPA	ABTS
Delta Junction, AK	0.0	0.029 \pm 0.042	0.017 \pm 0.023	N.D.	0.075 \pm 0.070	N.D.	0.254 \pm 0.112
Delta Junction, AK	0.5	0.057 \pm 0.035	0.015 \pm 0.008	N.D.	0.264 \pm 0.068	0.209 \pm 0.023	0.578 \pm 0.181
Delta Junction, AK	1.0	0.075 \pm 0.034	0.032 \pm 0.014	N.D.	0.315 \pm 0.073	0.285 \pm 0.025	0.678 \pm 0.176
Delta Junction, AK	1.5	0.094 \pm 0.035	0.039 \pm 0.012	N.D.	0.349 \pm 0.072	0.327 \pm 0.030	0.751 \pm 0.166
Delta Junction, AK	2.0	0.119 \pm 0.039	0.052 \pm 0.019	N.D.	0.356 \pm 0.074	0.344 \pm 0.036	0.804 \pm 0.140
Delta Junction, AK	2.5	0.126 \pm 0.034	0.053 \pm 0.027	N.D.	0.379 \pm 0.071	0.382 \pm 0.023	0.808 \pm 0.120
Delta Junction, AK	3.0	0.129 \pm 0.029	0.059 \pm 0.032	N.D.	0.399 \pm 0.068	0.411 \pm 0.022	0.833 \pm 0.108
Irvine, CA	0.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Irvine, CA	0.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Irvine, CA	1.0	N.D.	N.D.	N.D.	0.011 \pm 0.012	N.D.	N.D.
Irvine, CA	1.5	N.D.	N.D.	N.D.	0.031 \pm 0.014	N.D.	N.D.
Irvine, CA	2.0	N.D.	N.D.	N.D.	0.041 \pm 0.022	0.002 \pm 0.016	N.D.
Irvine, CA	2.5	N.D.	N.D.	N.D.	0.050 \pm 0.015	0.009 \pm 0.017	N.D.
Irvine, CA	3.0	0.007 \pm 0.030	N.D.	N.D.	0.057 \pm 0.023	0.029 \pm 0.021	N.D.
Nicoya Peninsula, CR	0.0	N.D.	0.018 \pm 0.005	N.D.	N.D.	0.002 \pm 0.003	N.D.
Nicoya Peninsula, CR	0.5	N.D.	0.010 \pm 0.002	N.D.	0.042 \pm 0.027	0.132 \pm 0.026	N.D.
Nicoya Peninsula, CR	1.0	N.D.	N.D.	N.D.	0.124 \pm 0.046	0.170 \pm 0.035	N.D.
Nicoya Peninsula, CR	1.5	N.D.	N.D.	N.D.	0.170 \pm 0.042	0.182 \pm 0.036	N.D.
Nicoya Peninsula, CR	2.0	N.D.	N.D.	N.D.	0.208 \pm 0.044	0.196 \pm 0.037	N.D.
Nicoya Peninsula, CR	2.5	N.D.	N.D.	N.D.	0.215 \pm 0.041	0.198 \pm 0.036	N.D.
Nicoya Peninsula, CR	3.0	N.D.	N.D.	N.D.	0.218 \pm 0.043	0.198 \pm 0.039	N.D.

Supplemental Table S3. Phenol oxidase and net peroxidase net absorbance units in combusted Alaska, California and Costa Rica soils as a function of time measured using PYGL, DOPA and ABTS as substrates. Values are mean \pm SEM (n=3 cores for each enzyme). N.D. = Not Detectable.

Location	Time (hr)	Combusted soil: Phenol oxidase			Combusted soil: Net Peroxidase		
		PYGL	DOPA	ABTS	PYGL	DOPA	ABTS
Delta Junction, AK	0.0	N.D.	N.D.	N.D.	N.D.	N.D.	0.008 \pm 0.067
Delta Junction, AK	0.5	N.D.	N.D.	N.D.	0.111 \pm 0.013	0.056 \pm 0.031	0.268 \pm 0.143
Delta Junction, AK	1.0	0.004 \pm 0.040	N.D.	N.D.	0.216 \pm 0.047	0.105 \pm 0.040	0.370 \pm 0.134
Delta Junction, AK	1.5	0.016 \pm 0.033	N.D.	N.D.	0.312 \pm 0.055	0.153 \pm 0.043	0.454 \pm 0.106
Delta Junction, AK	2.0	0.043 \pm 0.044	N.D.	N.D.	0.364 \pm 0.065	0.229 \pm 0.030	0.514 \pm 0.092
Delta Junction, AK	2.5	0.055 \pm 0.045	N.D.	N.D.	0.422 \pm 0.074	0.207 \pm 0.023	0.536 \pm 0.091
Delta Junction, AK	3.0	0.065 \pm 0.042	N.D.	N.D.	0.459 \pm 0.094	0.223 \pm 0.027	0.601 \pm 0.055
Irvine, CA	0.0	N.D.	N.D.	0.042 \pm 0.010	N.D.	N.D.	N.D.
Irvine, CA	0.5	N.D.	0.013 \pm 0.030	0.054 \pm 0.025	0.048 \pm 0.051	0.062 \pm 0.014	0.078 \pm 0.025
Irvine, CA	1.0	N.D.	0.016 \pm 0.030	0.060 \pm 0.025	0.140 \pm 0.049	0.099 \pm 0.015	0.152 \pm 0.037
Irvine, CA	1.5	N.D.	0.022 \pm 0.037	0.048 \pm 0.023	0.205 \pm 0.041	0.136 \pm 0.023	0.251 \pm 0.026
Irvine, CA	2.0	N.D.	0.030 \pm 0.041	0.036 \pm 0.020	0.263 \pm 0.042	0.173 \pm 0.030	0.330 \pm 0.029
Irvine, CA	2.5	0.002 \pm 0.044	0.021 \pm 0.036	0.032 \pm 0.010	0.311 \pm 0.037	0.218 \pm 0.029	0.303 \pm 0.080
Irvine, CA	3.0	0.026 \pm 0.047	0.030 \pm 0.040	0.044 \pm 0.022	0.342 \pm 0.026	0.242 \pm 0.038	0.439 \pm 0.035
Nicoya Peninsula, CR	0.0	N.D.	N.D.	0.060 \pm 0.021	N.D.	N.D.	N.D.
Nicoya Peninsula, CR	0.5	0.005 \pm 0.022	0.025 \pm 0.016	0.156 \pm 0.062	N.D.	0.025 \pm 0.042	N.D.
Nicoya Peninsula, CR	1.0	0.083 \pm 0.012	0.018 \pm 0.012	0.230 \pm 0.061	0.058 \pm 0.096	0.057 \pm 0.033	N.D.
Nicoya Peninsula, CR	1.5	0.133 \pm 0.029	0.043 \pm 0.025	0.340 \pm 0.085	0.097 \pm 0.116	0.060 \pm 0.017	N.D.
Nicoya Peninsula, CR	2.0	0.175 \pm 0.030	0.071 \pm 0.046	0.404 \pm 0.084	0.127 \pm 0.139	0.069 \pm 0.013	N.D.
Nicoya Peninsula, CR	2.5	0.195 \pm 0.028	0.092 \pm 0.045	0.423 \pm 0.079	0.152 \pm 0.175	0.088 \pm 0.026	0.028 \pm 0.085
Nicoya Peninsula, CR	3.0	0.224 \pm 0.033	0.091 \pm 0.033	0.433 \pm 0.070	0.168 \pm 0.186	0.116 \pm 0.010	0.062 \pm 0.071

Supplemental Table S4. Activity ratios of Phenol Oxidase and Peroxidase in diverse soils as a function of assay substrate.

Sample origin	Phenol Oxidase			Peroxidase		
	PYGL	DOPA	ABTS	PYGL	DOPA	ABTS
Boreal Forest, AK	N/A	N/A	N/A	6.60	2.00	1.00
Hardwood Forest, OH	8.44	N/A	1.00	42.78	34.17	1.00
Hardwood Forest, OH	13.57	0.43	1.00	1272.00	151.60	1.00
Semiarid Grassland, NM	27.69	14.74	1.00	110.00	9.86	1.00
Piñon Juniper Woodland, NM	27.71	14.75	1.00	N/A	N/A	N/A
Ponderosa Pine Forest, NM	110.00	58.33	1.00	19.61	20.88	1.00
Subalpine Spruce Forest, NM	10.83	5.77	1.00	N/A	N/A	N/A
Tropical Rainforest, Costa Rica	0.50	0.39	1.00	5.61	2.43	1.00
Antarctic Dry Valley, Antarctica	257.00	9.00	1.00	14.81	12.86	1.00
Antarctic Dry Valley, Antarctica	5.50	2.83	1.00	14.09	41.27	1.00

Activity ratios for individual sites were only calculable for sites in which activity was measurable with all three substrates. This constrained the sample size to N=9 sites for Phenol Oxidase, and N=8 sites for Peroxidase.