## Question 2. Does the root microbial community affect plant fitness? Is there an interaction between root structure and root microbial community structure that influences plant fitness?

### ANCOVA tables within alone treatment testing diversity x root trait interactions (all root traits)

**Table A** Results of ANCOVA with type III sum of squares performed on plant fitness while controlling for Block, species evenness, root traits, and their two-way interactions across treatments.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| (Intercept) | 9.176 | 1 | 119.287 | <0.001\*\*\* |
| Sp. Evenness | 0.013 | 1 | 0.165 | 0.686 |
| Block | 6.624 | 3 | 28.703 | <0.001\*\*\* |
| PC1 | 0.001 | 1 | 0.013 | 0.91 |
| PC2 | 0.073 | 1 | 0.95 | 0.333 |
| PC3 | 0.271 | 1 | 3.523 | 0.064 |
| PC4 | 0.002 | 1 | 0.023 | 0.88 |
| Sp. evenness × PC1 | 0.005 | 1 | 0.067 | 0.796 |
| Sp. evenness × PC2 | 0.011 | 1 | 0.146 | 0.704 |
| Sp. evenness × PC3 | 0.007 | 1 | 0.087 | 0.769 |
| Sp. evenness × PC4 | 0.023 | 1 | 0.303 | 0.583 |

**Table B** Results of ANCOVA with type III sum of squares performed on plant fitness while controlling for Block, species Inverse Simpson Diversity, root traits, and their two-way interactions across treatments.

| **Term** | **SS** | **DF** | ***F*-value** | ***p*-value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 8.872 | 1 | 114.941 | <0.001\*\*\* |
| Inverse Simpson Diversity | 0.019 | 1 | 0.247 | 0.621 |
| Block | 7.528 | 3 | 32.509 | <0.001\*\*\* |
| PC1 | 0 | 1 | 0.004 | 0.947 |
| PC2 | 0.074 | 1 | 0.964 | 0.329 |
| PC3 | 0.243 | 1 | 3.144 | 0.08 |
| PC4 | 0.002 | 1 | 0.025 | 0.874 |
| Inverse Simpson Diversity × PC1 | 0.003 | 1 | 0.035 | 0.852 |
| Inverse Simpson Diversity × PC2 | 0 | 1 | 0.001 | 0.97 |
| Inverse Simpson Diversity × PC3 | 0.017 | 1 | 0.217 | 0.642 |
| Inverse Simpson Diversity × PC4 | 0.026 | 1 | 0.332 | 0.566 |

**Table C** Results of ANCOVA with type III sum of squares performed on plant fitness while controlling for Block, species richness, root traits, and their two-way interactions across treatments.

| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 8.994 | 1 | 117.688 | <0.001\*\*\* |
| Sp. Richness | 0 | 1 | 0.001 | 0.978 |
| Block | 6.882 | 3 | 30.02 | <0.001\*\*\* |
| PC1 | 0.009 | 1 | 0.121 | 0.729 |
| PC2 | 0.112 | 1 | 1.465 | 0.23 |
| PC3 | 0.33 | 1 | 4.312 | 0.041\* |
| PC4 | 0.002 | 1 | 0.029 | 0.865 |
| Sp. richness × PC1 | 0 | 1 | 0 | 0.985 |
| Sp. richness × PC2 | 0.017 | 1 | 0.227 | 0.635 |
| Sp. richness × PC3 | 0.009 | 1 | 0.117 | 0.733 |
| Sp. richness × PC4 | 0.083 | 1 | 1.083 | 0.301 |

### ANCOVA tables within alone treatment testing diversity x root architecture interactions

**Table D** Results of ANCOVA with type III sum of squares performed on plant fitness while controlling for Block, species evenness, root architecture, and their two-way interactions across treatments.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| (Intercept) | 9.891 | 1 | 130.351 | <0.001\*\*\* |
| *Sp.* Evenness | 0.035 | 1 | 0.457 | 0.501 |
| Block | 6.693 | 3 | 29.401 | <0.001\*\*\* |
| PC2 | 0.004 | 1 | 0.053 | 0.819 |
| *Sp*. evenness × PC2 | 0.038 | 1 | 0.507 | 0.478 |

**Table** Results of ANCOVA with type III sum of squares performed on plant fitness while controlling for Block, Inverse Simpson Diversity, root architecture, and their two-way interactions across treatments.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| (Intercept) | 9.648 | 1 | 126.083 | <0.001\*\*\* |
| Inverse Simpson Diversity | 0.01 | 1 | 0.136 | 0.713 |
| Block | 7.685 | 3 | 33.479 | <0.001\*\*\* |
| PC2 | 0.005 | 1 | 0.062 | 0.804 |
| Inverse Simpson Diversity × PC2 | 0.005 | 1 | 0.063 | 0.802 |

**Table E** Results of ANCOVA with type III sum of squares performed on plant fitness while controlling for Block, species richness, root architecture, and their two-way interactions across treatments.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| (Intercept) | 9.732 | 1 | 127.707 | <0.001\*\*\* |
| *Sp.* richness | 0.005 | 1 | 0.066 | 0.798 |
| Block | 6.936 | 3 | 30.339 | <0.001\*\*\* |
| PC2 | 0.007 | 1 | 0.098 | 0.755 |
| *Sp.* richness × PC2 | 0.035 | 1 | 0.464 | 0.497 |

## Question 3. Does the presence of competition influence the above relationships (ie in the presence of plant stress)?

### ANCOVA tables with treatment interaction including all root traits

**Table F.** Results for ANCOVA with type III sums of squares performed on plant fitness while controlling for species evenness, root traits, Treatment, and block and root by species evenness and Treatment by species evenness interactions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| (Intercept) | 2.878 | 1 | 37.567 | <0.001\*\*\* |
| Evenness | 0.186 | 1 | 2.431 | 0.123 |
| Treatment | 0.021 | 1 | 0.275 | 0.601 |
| Block | 6.526 | 3 | 28.389 | <0.001\*\*\* |
| PC1 | 0.008 | 1 | 0.103 | 0.75 |
| PC2 | 0.113 | 1 | 1.479 | 0.227 |
| PC3 | 0.241 | 1 | 3.144 | 0.08 |
| PC4 | 0 | 1 | 0.006 | 0.941 |
| Evenness × Treatment | 0.178 | 1 | 2.321 | 0.131 |
| Evenness × PC1 | 0.073 | 1 | 0.954 | 0.331 |
| Evenness × PC2 | 0 | 1 | 0.004 | 0.95 |
| Evenness × PC3 | 0.002 | 1 | 0.028 | 0.867 |
| Evenness × PC4 | 0.092 | 1 | 1.201 | 0.276 |
| Residuals | 6.283 | 82 |  |  |

**Table supplementary to Table F** showing results from *t-*tests on each model parameter.

| **Term** | ***b*** | **SE** | ***t*-statistic** | ***p*-value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 0.638 | 0.104 | 6.129 | <0.001\*\*\* |
| Sp. Evenness | -0.127 | 0.081 | -1.559 | 0.123 |
| Treatment: Competition | 0.052 | 0.099 | 0.525 | 0.601 |
| Block2 | 0.111 | 0.082 | 1.351 | 0.18 |
| Block3 | 0.737 | 0.086 | 8.526 | <0.001\*\*\* |
| Block4 | 0.411 | 0.083 | 4.943 | <0.001\*\*\* |
| PC1 | -0.012 | 0.038 | -0.32 | 0.75 |
| PC2 | -0.051 | 0.042 | -1.216 | 0.227 |
| PC3 | -0.14 | 0.079 | -1.773 | 0.08 |
| PC4 | 0.005 | 0.066 | 0.074 | 0.941 |
| Sp. Evenness × Treatment: Competition | 0.144 | 0.095 | 1.523 | 0.131 |
| Sp. Evenness × PC1 | -0.035 | 0.036 | -0.977 | 0.331 |
| Sp. Evenness × PC2 | 0.004 | 0.06 | 0.063 | 0.95 |
| Sp. Evenness × PC3 | -0.013 | 0.08 | -0.168 | 0.867 |
| Sp. Evenness × PC4 | 0.084 | 0.077 | 1.096 | 0.276 |

**Table G.** Results for ANCOVA with type III sums of squares performed on plant fitness while controlling for Inverse Simpson Diversity, root traits, Treatment, and block and root by Inverse Simpson Diversity and Treatment by Inverse Simpson Diversity interactions.

| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 3.641 | 1 | 46.149 | <0.001\*\*\* |
| Inverse Simpson Diversity | 0.024 | 1 | 0.304 | 0.583 |
| Treatment | 0 | 1 | 0 | 0.988 |
| Block | 7.515 | 3 | 31.75 | <0.001\*\*\* |
| PC1 | 0 | 1 | 0.001 | 0.98 |
| PC2 | 0.051 | 1 | 0.646 | 0.424 |
| PC3 | 0.208 | 1 | 2.636 | 0.108 |
| PC4 | 0.002 | 1 | 0.03 | 0.863 |
| Inverse Simpson Diversity × Treatment | 0.013 | 1 | 0.171 | 0.68 |
| Inverse Simpson Diversity × PC1 | 0.012 | 1 | 0.146 | 0.703 |
| Inverse Simpson Diversity × PC2 | 0.001 | 1 | 0.016 | 0.898 |
| Inverse Simpson Diversity × PC3 | 0.021` | 1 | 0.268 | 0.606 |
| Inverse Simpson Diversity × PC4 | 0.015 | 1 | 0.19 | 0.664 |
| Residuals | 6.47 | 82 |  |  |

**Table** supplementary to Table G showing results from *t-*tests on each model parameter.

| **Term** | ***b*** | **SE** | ***t*-statistic** | ***p*-value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 0.675 | 0.099 | 6.793 | <0.001\*\*\* |
| Inverse Simpson Diversity | -0.065 | 0.118 | -0.551 | 0.583 |
| Treatment: Competition | -0.001 | 0.094 | -0.016 | 0.988 |
| Block2 | 0.117 | 0.084 | 1.397 | 0.166 |
| Block3 | 0.755 | 0.086 | 8.789 | <0.001\*\*\* |
| Block4 | 0.414 | 0.084 | 4.917 | <0.001\*\*\* |
| PC1 | -0.001 | 0.037 | -0.025 | 0.98 |
| PC2 | -0.037 | 0.046 | -0.804 | 0.424 |
| PC3 | -0.136 | 0.084 | -1.623 | 0.108 |
| PC4 | -0.012 | 0.067 | -0.173 | 0.863 |
| Inverse Simpson Diversity × Treatment: Competition | 0.05 | 0.121 | 0.413 | 0.68 |
| Inverse Simpson Diversity × PC1 | -0.016 | 0.041 | -0.383 | 0.703 |
| Inverse Simpson Diversity × PC2 | -0.007 | 0.058 | -0.128 | 0.898 |
| Inverse Simpson Diversity × PC3 | 0.047 | 0.091 | 0.518 | 0.606 |
| Inverse Simpson Diversity × PC4 | -0.032 | 0.074 | -0.436 | 0.664 |

**Table H.** Results for ANCOVA with type III sums of squares performed on plant fitness while controlling for species richness, root traits, Treatment, and block and root by species richness and Treatment by species richness interactions.

| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 2.893 | 1 | 37.56 | <0.001\*\*\* |
| Sp. Richness | 0.084 | 1 | 1.086 | 0.3 |
| Treatment | 0.013 | 1 | 0.172 | 0.679 |
| Block | 6.765 | 3 | 29.273 | <0.001\*\*\* |
| PC1 | 0.015 | 1 | 0.192 | 0.662 |
| PC2 | 0.158 | 1 | 2.047 | 0.156 |
| PC3 | 0.311 | 1 | 4.032 | 0.048\* |
| PC4 | 0 | 1 | 0 | 0.985 |
| Sp. Richness × Treatment | 0.101 | 1 | 1.314 | 0.255 |
| Sp. Richness × PC1 | 0.031 | 1 | 0.402 | 0.528 |
| Sp. Richness × PC2 | 0.001 | 1 | 0.011 | 0.915 |
| Sp. Richness × PC3 | 0.008 | 1 | 0.104 | 0.747 |
| Sp. Richness × PC4 | 0.148 | 1 | 1.921 | 0.169 |
| Residuals | 6.317 | 82 |  |  |

**Table** supplementary to Table H with type III sums of squares showing results from *t-*tests on each model parameter.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | ***b*** | **SE** | ***t*-statistic** | ***p*-value** |
| (Intercept) | 0.642 | 0.105 | 6.129 | <0.001\*\*\* |
| Sp. Richness | 0.09 | 0.086 | 1.042 | 0.3 |
| Treatment: Competition | 0.042 | 0.1 | 0.415 | 0.679 |
| Block2 | 0.122 | 0.082 | 1.49 | 0.14 |
| Block3 | 0.751 | 0.087 | 8.591 | <0.001\*\*\* |
| Block4 | 0.417 | 0.084 | 4.958 | <0.001\*\*\* |
| PC1 | -0.017 | 0.039 | -0.439 | 0.662 |
| PC2 | -0.063 | 0.044 | -1.431 | 0.156 |
| PC3 | -0.16 | 0.08 | -2.008 | 0.048\* |
| PC4 | 0.001 | 0.068 | 0.018 | 0.985 |
| Sp. Richness × Treatment: Competition | -0.113 | 0.099 | -1.146 | 0.255 |
| Sp. Richness × PC1 | 0.023 | 0.036 | 0.634 | 0.528 |
| Sp. Richness × PC2 | -0.006 | 0.056 | -0.107 | 0.915 |
| Sp. Richness × PC3 | 0.024 | 0.075 | 0.323 | 0.747 |
| Sp. Richness × PC4 | -0.098 | 0.071 | -1.386 | 0.169 |

### ANCOVA tables focusing on PC2 with treatment interaction

**Table I** Results for ANCOVA with type III sums of squares performed on plant fitness while controlling for species evenness, root architecture, treatment, and block and root architecture by species evenness and treatment by species evenness interactions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | ***F*-value** | ***p-*value** |
| (Intercept) | 4.081 | 1 | 54.011 | <0.001\*\*\* |
| *Sp.* Evenness | 0.16 | 1 | 2.12 | 0.149 |
| Treatment | 0.117 | 1 | 1.554 | 0.216 |
| Block | 6.478 | 3 | 28.58 | <0.001\*\*\* |
| PC2 | 0.03 | 1 | 0.393 | 0.532 |
| *Sp.* evenness × Treatment | 0.111 | 1 | 1.468 | 0.229 |
| *Sp.* evenness × PC2 | 0.002 | 1 | 0.022 | 0.883 |

**Table J** Results for ANCOVA with type III sums of squares performed on plant fitness while controlling for Inverse Simpson Diversity, root architecture, treatment, and block and root architecture by Inverse Simpson Diversity and treatment by Inverse Simpson Diversity interactions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | **F-value** | ***p-*value** |
| (Intercept) | 4.731 | 1 | 60.973 | <0.001\*\*\* |
| Inverse Simpson Diversity | 0.002 | 1 | 0.031 | 0.86 |
| Treatment | 0.058 | 1 | 0.746 | 0.39 |
| Block | 7.644 | 3 | 32.841 | <0.001\*\*\* |
| PC2 | 0.012 | 1 | 0.153 | 0.697 |
| Inverse Simpson Diversity × Treatment | 0 | 1 | 0.003 | 0.955 |
| Inverse Simpson Diversity × PC2 | 0.001 | 1 | 0.007 | 0.932 |

**Table K** Results for ANCOVA with type III sums of squares performed on plant fitness while controlling for species richness, root architecture, treatment, and block and root architecture by species richness and treatment by species richness interactions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **SS** | **DF** | **F-value** | ***p-*value** |
| (Intercept) | 4.11 | 1 | 53.699 | <0.001\*\*\* |
| *Sp.* Richness | 0.077 | 1 | 1.009 | 0.318 |
| Treatment | 0.089 | 1 | 1.167 | 0.283 |
| Block | 6.807 | 3 | 29.644 | <0.001\*\*\* |
| PC2 | 0.033 | 1 | 0.428 | 0.515 |
| *Sp.* richness × Treatment | 0.067 | 1 | 0.875 | 0.352 |
| *Sp.* richness × PC2 | 0.003 | 1 | 0.035 | 0.852 |

## Results from full model including quadratic terms.

Table L

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | ***b*** | **SE** | ***t*-statistic** | ***p*-value** |
| (Intercept) | 0.691 | 0.111 | 6.231 | <0.001\*\*\* |
| Sp. Evenness | -0.142 | 0.082 | -1.745 | 0.085 |
| Sp. Evenness2 | -0.033 | 0.025 | -1.338 | 0.185 |
| Treatment: Competition | 0.027 | 0.1 | 0.266 | 0.791 |
| PC1 | -0.004 | 0.038 | -0.106 | 0.916 |
| PC2 | -0.046 | 0.042 | -1.087 | 0.28 |
| PC3 | -0.155 | 0.079 | -1.958 | 0.054 |
| PC4 | 0.014 | 0.066 | 0.205 | 0.838 |
| Block2 | 0.12 | 0.082 | 1.465 | 0.147 |
| Block3 | 0.742 | 0.086 | 8.613 | <0.001\*\*\* |
| Block4 | 0.399 | 0.083 | 4.803 | <0.001\*\*\* |
| Sp. Evenness × Treatment: Competition | 0.17 | 0.096 | 1.766 | 0.081 |
| Sp. Evenness × PC1 | -0.041 | 0.036 | -1.137 | 0.259 |
| Sp. Evenness × PC2 | 0.01 | 0.06 | 0.164 | 0.87 |
| Sp. Evenness × PC3 | -0.004 | 0.08 | -0.054 | 0.957 |
| Sp. Evenness × PC4 | 0.04 | 0.084 | 0.478 | 0.634 |

Table M

| **Term** | ***b*** | **SE** | ***t*-statistic** | ***p*-value** |
| --- | --- | --- | --- | --- |
| (Intercept) | 0.676 | 0.117 | 5.776 | <0.001\*\*\* |
| Sp. Richness | 0.104 | 0.089 | 1.164 | 0.248 |
| Sp. Richness2 | -0.019 | 0.029 | -0.659 | 0.512 |
| Treatment: Competition | 0.029 | 0.102 | 0.285 | 0.776 |
| Block2 | 0.114 | 0.084 | 1.359 | 0.178 |
| Block3 | 0.75 | 0.088 | 8.552 | <0.001\*\*\* |
| Block4 | 0.401 | 0.088 | 4.556 | <0.001\*\*\* |
| PC1 | -0.013 | 0.039 | -0.341 | 0.734 |
| PC2 | -0.061 | 0.044 | -1.38 | 0.172 |
| PC3 | -0.166 | 0.081 | -2.06 | 0.043\* |
| PC4 | 0.011 | 0.069 | 0.153 | 0.879 |
| Sp. Richness × Treatment: Competition | -0.136 | 0.105 | -1.294 | 0.2 |
| Sp. Richness × PC1 | 0.034 | 0.04 | 0.849 | 0.398 |
| Sp. Richness × PC2 | -0.005 | 0.056 | -0.09 | 0.928 |
| Sp. Richness × PC3 | 0.031 | 0.076 | 0.403 | 0.688 |
| Sp. Richness × PC4 | -0.074 | 0.08 | -0.922 | 0.359 |

Table N

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | ***b*** | **SE** | ***t*-statistic** | ***p*-value** |
| (Intercept) | 0.672 | 0.1 | 6.746 | <0.001\*\*\* |
| Inverse Simpson Diversity | -0.055 | 0.119 | -0.459 | 0.648 |
| Inverse Simpson Diversity2 | 0.02 | 0.026 | 0.752 | 0.454 |
| Treatment: Competition | -0.014 | 0.095 | -0.151 | 0.88 |
| Block2 | 0.12 | 0.084 | 1.429 | 0.157 |
| Block3 | 0.746 | 0.087 | 8.591 | <0.001\*\*\* |
| Block4 | 0.415 | 0.084 | 4.91 | <0.001\*\*\* |
| PC1 | 0 | 0.037 | -0.007 | >0.99 |
| PC2 | -0.035 | 0.046 | -0.774 | 0.441 |
| PC3 | -0.144 | 0.084 | -1.705 | 0.092 |
| PC4 | -0.014 | 0.067 | -0.206 | 0.837 |
| Inverse Simpson Diversity × Treatment: Competition | 0.036 | 0.122 | 0.295 | 0.769 |
| Inverse Simpson Diversity × PC1 | -0.022 | 0.042 | -0.524 | 0.602 |
| Inverse Simpson Diversity × PC2 | -0.002 | 0.059 | -0.029 | 0.977 |
| Inverse Simpson Diversity × PC3 | 0.026 | 0.096 | 0.268 | 0.789 |
| Inverse Simpson Diversity × PC4 | -0.053 | 0.079 | -0.674 | 0.502 |