TRhizo-localAdaptation

Local Adaptation Index Correlations

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Contents

Load Packages & Data

```
## Load the tidyverse
library(tidyverse)

## Read in data
global.local.adaptation.correlation.data <- read_rds(
  file = "data/global_local_adaptation_correlation_data.rds"
)
rural.local.adaptation.correlation.data <- read_rds(
  file = "data/rural_local_adaptation_correlation_data.rds"
)
urban.local.adaptation.correlation.data <- read_rds(
  file = "data/urban_local_adaptation_correlation_data.rds"
)
```

Local - Nonlocal$_{Global}$ Local Adaptation Correlations

Ambient N

```
## Filter data by Ambient N treatment
global.ambient.N.local.adaptation.correlation.data <- global.local.adaptation.correlation.data %>%
  filter(Nitrogen == "Ambient_N")

## Aboveground biomass and belowground biomass
cor.test(
  global.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Global,
  global.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.913 [0.823, 0.958]
# t = 11.830, df = 28, P < 0.001

## Aboveground biomass and nodule density
cor.test(
  global.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Global,
  global.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.194 [-0.518, 0.179]
# t = -1.046, df = 28, P = 0.305

## Aboveground biomass and fixing nodule density
cor.test(
  global.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Global,
  global.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.186 [-0.186, 0.512]
# t = 1.0041, df = 28, P = 0.324

## Belowground biomass and nodule density
cor.test(
  global.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Global,
  global.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.301 [-0.597, 0.067]
# t = -1.671, df = 28, P = 0.106

## Belowground biomass and fixing nodule density
cor.test(
  global.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Global,
  global.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
```

```r
)
# r = 0.037 [-0.327, 0.392]
# t = 0.198, df = 28, P = 0.844

## Nodule density and fixing nodule density
cor.test(
  global.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Global,
  global.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.733 [0.507, 0.865]
# t = 5.709, df = 28, P < 0.001
```

N Addition

```r
## Filter data by N Addition treatment
global.N.addition.local.adaptation.correlation.data <- global.local.adaptation.correlation.data %>%
  filter(Nitrogen == "N_Addition")

## Aboveground biomass and belowground biomass
cor.test(
  global.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Global,
  global.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.734 [0.502, 0.867]
# t = 5.608, df = 27, P < 0.001

## Aboveground biomass and nodule density
cor.test(
  global.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Global,
  global.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.418 [0.061, 0.681]
# t = 2.394, df = 27, P = 0.024

## Aboveground biomass and fixing nodule density
cor.test(
  global.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Global,
  global.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.225 [-0.154, 0.547]
# t = 1.200, df = 27, P = 0.240

## Belowground biomass and nodule density
cor.test(
  global.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Global,
  global.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.253 [-0.125, 0.567]
# t = 1.361, df = 27, P = 0.185

## Belowground biomass and fixing nodule density
cor.test(
  global.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Global,
  global.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.062 [-0.311, 0.419]
```

```r
# t = 0.324, df = 27, P = 0.749

## Nodule density and fixing nodule density
cor.test(
  global.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Global,
  global.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Global,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.841 [0.685, 0.923]
# t = 8.061, df = 27, P < 0.001
```

Local - Nonlocal$_{\text{Rural}}$ Local Adaptation Correlations

Ambient N

```
## Filter data by Ambient N treatment
rural.ambient.N.local.adaptation.correlation.data <- rural.local.adaptation.correlation.data %>%
  filter(Nitrogen == "Ambient_N")

## Aboveground biomass and belowground biomass
cor.test(
  rural.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Rural,
  rural.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.792 [0.604, 0.896]
# t = 6.864, df = 28, P < 0.001

## Aboveground biomass and nodule density
cor.test(
  rural.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Rural,
  rural.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.095 [-0.440, 0.274]
# t = -0.505, df = 28, P = 0.618

## Aboveground biomass and fixing nodule density
cor.test(
  rural.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Rural,
  rural.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.188 [-0.185, 0.513]
# t = 1.0123, df = 28, P = 0.320

## Belowground biomass and nodule density
cor.test(
  rural.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Rural,
  rural.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.214 [-0.533, 0.159]
# t = -1.159, df = 28, P = 0.256

## Belowground biomass and fixing nodule density
cor.test(
  rural.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Rural,
  rural.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
```

```r
)
# r = -0.031 [-0.387, 0.333]
# t = -0.166, df = 28, P = 0.870

## Nodule density and fixing nodule density
cor.test(
  rural.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Rural,
  rural.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.688 [0.436, 0.840]
# t = 5.023, df = 28, P < 0.001
```

N Addition

```
## Filter data by N Addition treatment
rural.N.addition.local.adaptation.correlation.data <- rural.local.adaptation.correlation.data %>%
  filter(Nitrogen == "N_Addition")

## Aboveground biomass and belowground biomass
cor.test(
  rural.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Rural,
  rural.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.792 [0.599, 0.898]
# t = 6.731, df = 27, P < 0.001

## Aboveground biomass and nodule density
cor.test(
  rural.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Rural,
  rural.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.396 [0.034, 0.666]
# t = 2.238, df = 27, P = 0.034

## Aboveground biomass and fixing nodule density
cor.test(
  rural.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Rural,
  rural.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.424 [0.069, 0.684]
# t = 2.436, df = 27, P = 0.022

## Belowground biomass and nodule density
cor.test(
  rural.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Rural,
  rural.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.305 [-0.069, 0.604]
# t = 1.665, df = 27, P = 0.108

## Belowground biomass and fixing nodule density
cor.test(
  rural.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Rural,
  rural.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.399 [0.038, 0.668]
```

```r
# t = 2.261, df = 27, P = 0.032

## Nodule density and fixing nodule density
cor.test(
  rural.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Rural,
  rural.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Rural,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.819 [0.647, 0.912]
# t = 7.429, df = 27, P < 0.001
```

Local - Nonlocal$_{\text{Urban}}$ Local Adaptation Correlations

Ambient N

```
## Filter data by Ambient N treatment
urban.ambient.N.local.adaptation.correlation.data <- urban.local.adaptation.correlation.data %>%
  filter(Nitrogen == "Ambient_N")

## Aboveground biomass and belowground biomass
cor.test(
  urban.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Urban,
  urban.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.947 [0.890, 0.975]
# t = 15.563, df = 28, P < 0.001

## Aboveground biomass and nodule density
cor.test(
  urban.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Urban,
  urban.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.087 [-0.434, 0.282]
# t = -0.463, df = 28, P = 0.647

## Aboveground biomass and fixing nodule density
cor.test(
  urban.ambient.N.local.adaptation.correlation.data$AG_Biomass_LA_Urban,
  urban.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.158 [-0.214, 0.491]
# t = 0.849, df = 28, P = 0.403

## Belowground biomass and nodule density
cor.test(
  urban.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Urban,
  urban.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.197 [-0.520, 0.176]
# t = -1.064, df = 28, P = 0.296

## Belowground biomass and fixing nodule density
cor.test(
  urban.ambient.N.local.adaptation.correlation.data$BG_Biomass_LA_Urban,
  urban.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
```

```r
)
# r = 0.095 [-0.275, 0.440]
# t = 0.503, df = 28, P = 0.619

## Nodule density and fixing nodule density
cor.test(
  urban.ambient.N.local.adaptation.correlation.data$Nod_Density_LA_Urban,
  urban.ambient.N.local.adaptation.correlation.data$Fix_Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.757 [0.546, 0.878]
# t = 6.133, df = 28, P < 0.001
```

N Addition

```
## Filter data by N Addition treatment
urban.N.addition.local.adaptation.correlation.data <- urban.local.adaptation.correlation.data %>%
  filter(Nitrogen == "N_Addition")

## Aboveground biomass and belowground biomass
cor.test(
  urban.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Urban,
  urban.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.644 [0.356, 0.820]
# t = 4.289, df = 26, P < 0.001

## Aboveground biomass and nodule density
cor.test(
  urban.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Urban,
  urban.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.301 [-0.081, 0.606]
# t = 1.611, df = 26, P = 0.120

## Aboveground biomass and fixing nodule density
cor.test(
  urban.N.addition.local.adaptation.correlation.data$AG_Biomass_LA_Urban,
  urban.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.110 [-0.275, 0.464]
# t = 0.563, df = 26, P = 0.578

## Belowground biomass and nodule density
cor.test(
  urban.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Urban,
  urban.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.052 [-0.327, 0.417]
# t = 0.267, df = 26, P = 0.792

## Belowground biomass and fixing nodule density
cor.test(
  urban.N.addition.local.adaptation.correlation.data$BG_Biomass_LA_Urban,
  urban.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = -0.193 [-0.528, 0.194]
```

```r
# t = 1.004, df = 26, P = 0.325

## Nodule density and fixing nodule density
cor.test(
  urban.N.addition.local.adaptation.correlation.data$Nod_Density_LA_Urban,
  urban.N.addition.local.adaptation.correlation.data$Fix_Nod_Density_LA_Urban,
  method = "pearson",
  alternative = "two.sided"
)
# r = 0.819 [0.641, 0.913]
# t = 7.265, df = 26, P < 0.001
```

R Session Information

Table 1: Packages required for data management and analysis.

Package	Loaded Version	Date
dplyr	1.1.2	2023-04-20
forcats	1.0.0	2023-01-29
ggplot2	3.4.2	2023-04-03
kableExtra	1.3.4	2021-02-20
knitr	1.43	2023-05-25
lubridate	1.9.2	2023-02-10
purrr	1.0.1	2023-01-10
readr	2.1.4	2023-02-10
stringr	1.5.0	2022-12-02
tibble	3.2.1	2023-03-20
tidyr	1.3.0	2023-01-24
tidyverse	2.0.0	2023-02-22