

# Effect of calcium addition on Sugar Maple seedling growth

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## Study Information

### Title

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### Description

In this miniproject, I use the HBR maples dataset (Juice and Fahey 2019) from the lterdatasampler R package Horst and Brun (2023) to study the effect of calcium addition on the growth of Sugar Maple (*Acer saccharum*) seedlings. Specifically, I ask the questions: Does calcium treatment affect (1) leaf dry mass and/or (2) stem dry mass? I use a simple t-test to look for a difference in these characteristics between seedlings that were on calcium-treated and reference sites.

### Hypotheses

Alternative hypothesis: Calcium treatment affects Sugar Maple seedling growth (non-directional).

Null hypothesis: Calcium treatment does not affect Sugar Maple seedling growth.

If calcium treatment affects Sugar Maple seedling growth, there will be a difference in leaf dry mass and stem dry mass between seedlings sampled on the calcium-treated sites and those on the reference sites.

## Design Plan

### Study type

**Experiment.** A researcher randomly assigns treatments to study subjects, this includes field or lab experiments. This is also known as an intervention experiment and includes randomized controlled trials.

### Blinding

No blinding is involved in this study.

## Study design

Juice and Fahey (2019) sampled seedlings on calcium-treated and reference sites using randomly placed transects. They collected data on various characteristics including leaf dry mass and stem dry mass, by sampling seedlings every ten steps.

## Randomization

N/A

## Sampling Plan

### Existing data

**Registration prior to analysis of the data.** As of the date of submission, the data exist and you have accessed it, though no analysis has been conducted related to the research plan (including calculation of summary statistics). A common situation for this scenario when a large dataset exists that is used for many different studies over time, or when a data set is randomly split into a sample for exploratory analyses, and the other section of data is reserved for later confirmatory data analysis.

### Explanation of existing data

I am using existing data, but have not looked at this data beyond the structure of the dataset (ie, which variables it includes).

### Data collection procedures

See Juice and Fahey (2019) for details.

### Sample size

See Juice and Fahey (2019) for details.

### Sample size rationale

NA

### Stopping rule

NA - sampling stops at the end of the transect.

## Variables

### Manipulated variables

- Calcium level (either calcium is added or it is not - two levels)

## Measured variables

The measured variables I will analyze are:

- Stem dry mass (grams)
- Leaf dry mass (grams)

## Indices

NA

## Analysis Plan

### Statistical models

A two-tailed t-Test will be performed to look for differences in average stem mass and average leaf mass between calcium-treated and reference site seedlings.

### Transformations

For the “watershed” variable, I will recode the “W1” level to “treated,” for clarity.

### Inference criteria

### Data exclusion

I will not exclude data from the analyses.

### Missing data

Rows missing for data for stem and leaf dry mass will be removed for the respective t-Tests (eg, a row with missing stem dry mass but not leaf dry mass will be removed for the stem dry mass t-Test, but will be kept for the leaf dry mass t-Test).

### Exploratory analyses (optional)

NA

## Other

### Other (Optional)

NA

## References

- Horst, A., and J. Brun. 2023. Lterdatasampler: Educational Dataset Examples from the Long Term Ecological Research Program.
- Juice, S., and T. Fahey. 2019. Health and mycorrhizal colonization response of sugar maple (*Acer saccharum*) seedlings to calcium addition in Watershed 1 at the Hubbard Brook Experimental Forest. Environmental Data Initiative.