Effects of drought stress on carbon assimilation and allocation for a fruiting arabica coffee plant explained by ^{13}C-CO_2 pulse labelling

By

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Overview

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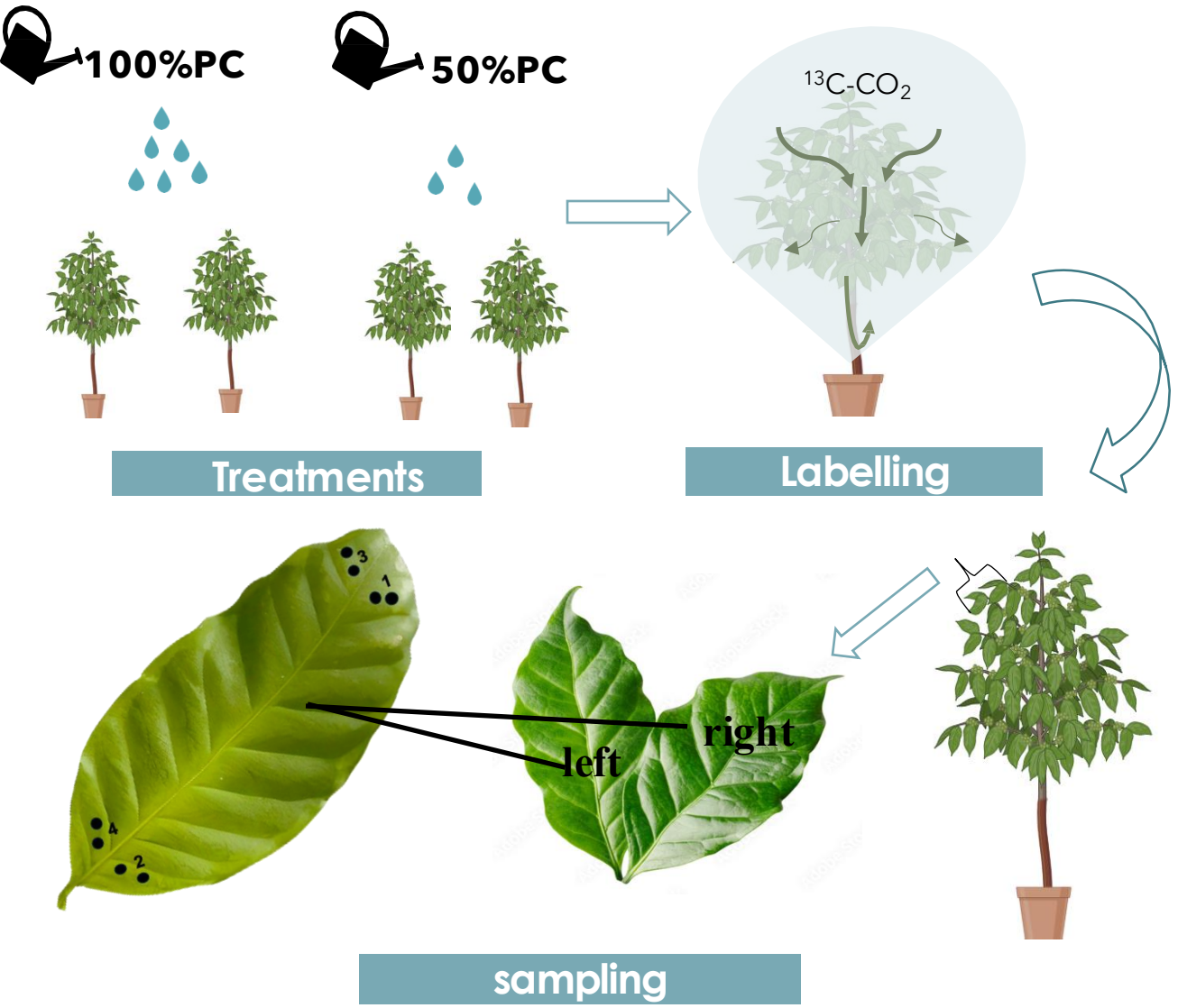
- Drought stress alterations; **C-assimilation and allocation**
- Alterations are **inadequately documented**
- Estimate **C-dynamics** for question such as;
  - ❖ Are **fluxes in leaf position** (left or right) affected by drought
  - ❖ what is the **source – sink relationship** between the **leaf age** cohorts?
  - ❖ What is the source–sink relationship among the compartments

Set up and sampling



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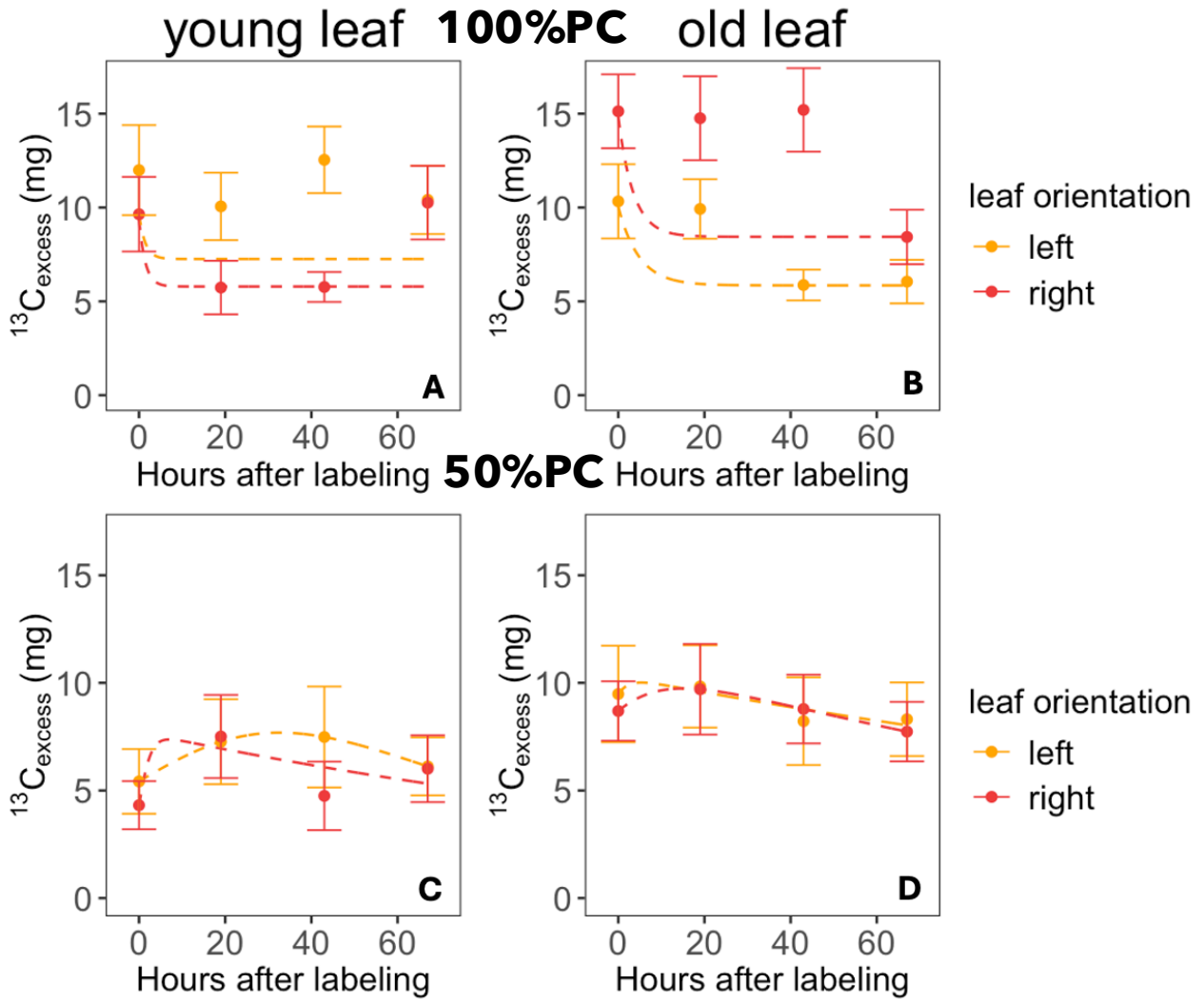
- 32 – 4year old Venecia (***Coffea arabica. L***)
- Labelled in a Greenhouse with **^{13}C-CO_2** for 3h exposure
- **Sampling**
  - **Young and old leaf pairs** at 10, 11, 12, and 13day of stress
  - Destructive harvesting at 15day after stress (**Fruits, young leaves , old leaves , stem , roots)**
  - Analysis for **$^{13}C_{excess}$** in the punches and bulk from the bulk (IRMS)

Results

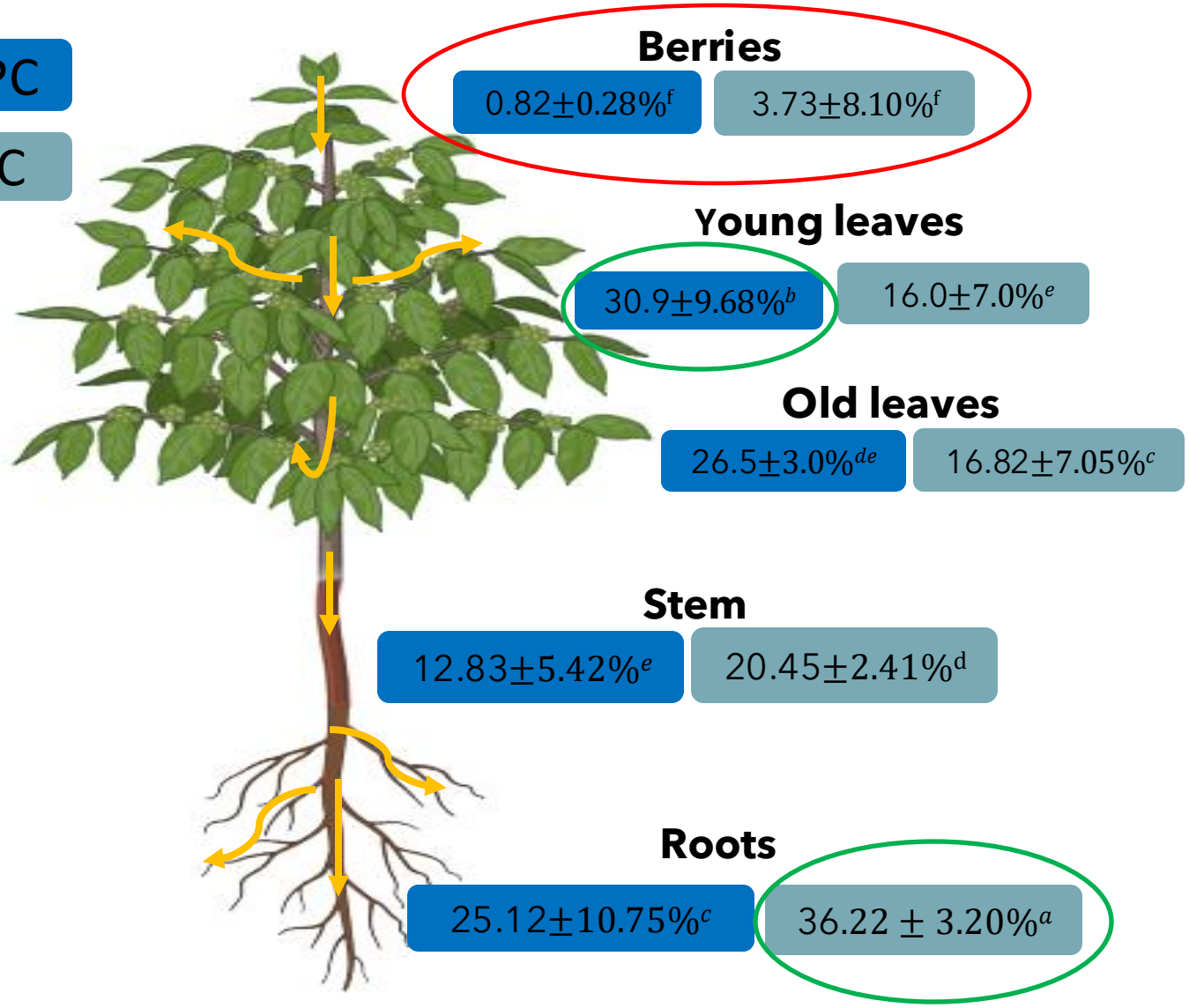
Leaf carbon fluxes

- Stress **decline** of $^{13}C_{excess}$ uptake to 5.4 -10.3 mg
- 100%FC- **Net export** followed with **steady state** (respiration/distribution equals export)
- 50%FC - **A net import** initially then an **export** to other parts



C-allocation

- Increase in all compartments except the young leaves
- Young leaves decreased by 48%
- Highest allocation to roots (50%PC)



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Summary

1. ^{13}C labelling successfully reveals new insights in C-fluxes

2. old leaves are at an advantage in assimilation

3. Allocation increases to the fruits by **4%,** reduces to **16%** for young leaves