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MisTigation project

Impacts of Climate Change on *Miscanthus* Root Exudation and Rhizosphere-Induced Greenhouse Gas Emissions

Cross border research unit BioEcoAgro
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Context


Miscanthus sinensis

- *Miscanthus sinensis* is a perennial energy crop requiring minimal fertilizer and pesticide, with reduced environmental impact and benefits for ecological services (like preserving drinking water quality or carbon storage). This species is studied due to its better drought-tolerance than the widely cultivated *Miscanthus x giganteus*.
- Its nutrient allocation to belowground parts involves specific strategies that affect rhizosphere processes (like exudation), nutrient cycling, and potentially greenhouse gas (GHG) emissions. Understanding these rhizosphere interactions is key to validating the crop's low-impact profile.
- While some studies address individual climate stressors, the combined effects of multiple climate variables on rhizosphere dynamics remain largely unexplored.

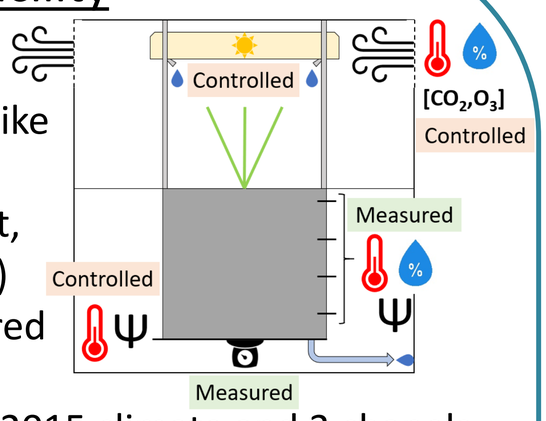
Objectives

- Quantify carbon and nitrogen root exudation of *Miscanthus sinensis* under a current and future climate
- Compare carbon and nitrogen root exudation of *Miscanthus sinensis* between key phenological moments during one growing season
- Assess the impact of root presence on CO_2 and N_2O emissions at key phenological moments

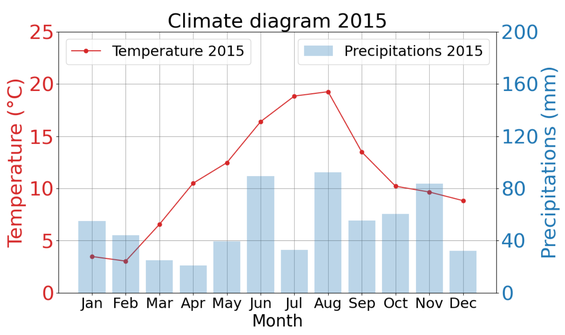
Material and methods

Ecotron facility

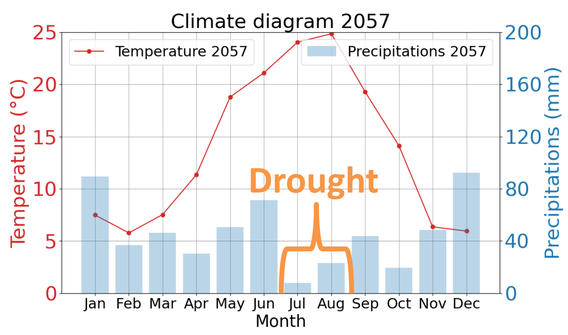
- Controlled climate in a field-like environment (T°, precipitation, light, CO_2, O_3, humidity)
- $3m^3$ of structured soil
- 3 chapels with 2015 climate and 3 chapels with 2057 climate, 10 studied plants of *Miscanthus sinensis* per chapel



Simulated climates



Year 2015 : Observed data, representative of current climate (CO_2=400ppm)



Year 2057 : Model simulated data, representative of extreme future climate (CO_2=615ppm)

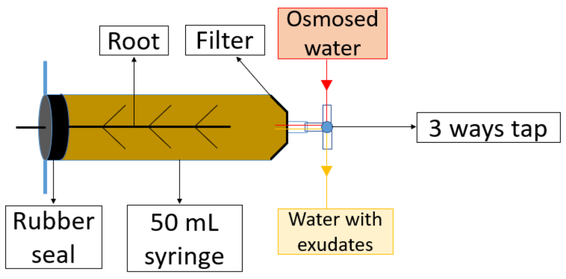
Isolated roots



Roots are isolated thanks to fine mesh structure (25µm)

Root exudation

- Exudates will be collected using a syringe technic at different key periods (cf timeline)

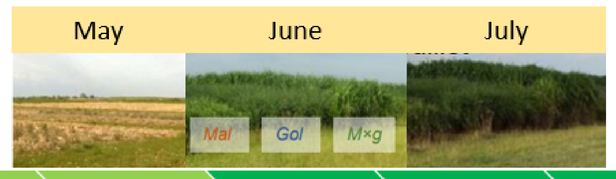


- Amino acids and soluble sugars will be quantified in exudates

Gaseous emissions

N_2O and CO_2 will be measured in the fine mesh structures, with or without roots at different key periods (cf timeline)

Timeline



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