RootBoost: towards a robust stimulation of plant root growth

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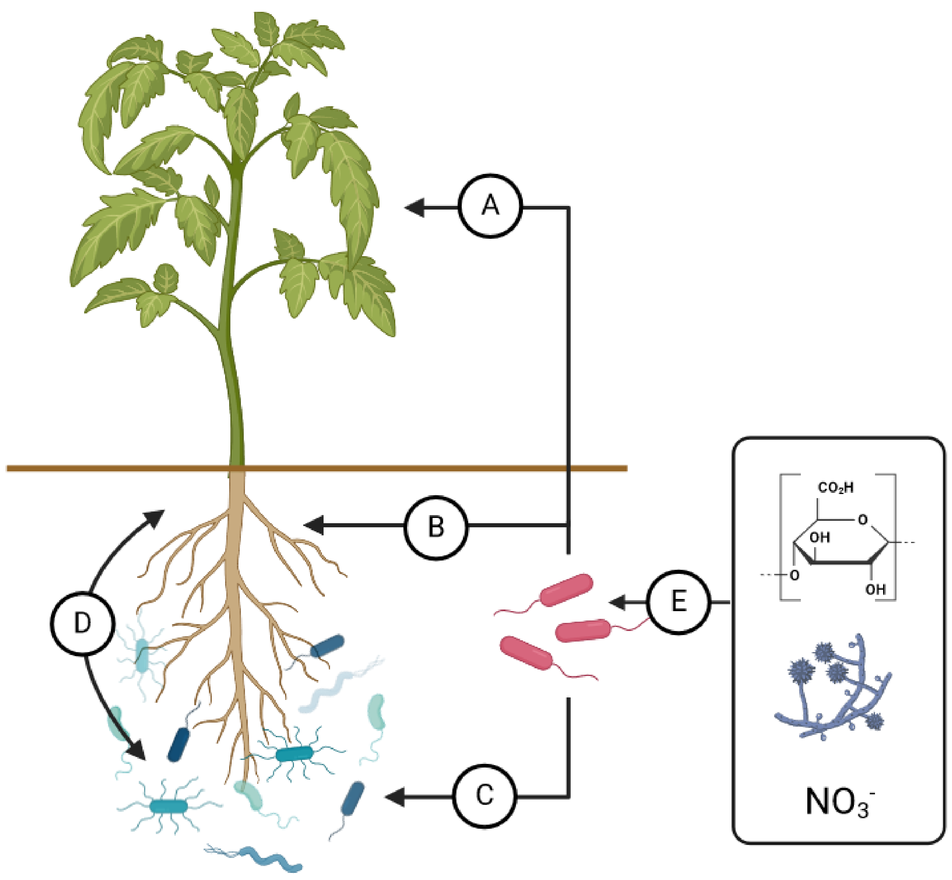
Root systems play a major role in the growth and health of cultivated plants, and they are in constant interaction with numerous microorganisms. The use of agricultural inputs such as **biostimulants** and **biopesticides** aims at improving the crops' development and natural defenses. However, the efficacy of biocontrol or biostimulation products varies depending on the pedoclimatic conditions, which may limit their widespread use, and **soil microbial communities** (microbiota) represent another factor of variability. Additionally, some microbiota members have biostimulant properties as well as bioprotection traits against phytopathogens through complementary mechanisms. In this context, the **RootBoost project** aims at addressing two issues related to the bioactivity of **Plant Growth-Promoting Rhizobacteria** (PGPR),

Modulation of PGPR bioactivity on tomato

Hypothesis 1: the biostimulant and induced systemic resistance (ISR) activities of a PGPR strain can be modulated with another microorganism and/or selected organic substances

- Evaluation of the bioactivity of a *Bacillus velezensis* strain on tomato growth **(A)**, root system architecture (RSA) **(B)**, and ISR
- Characterization of the microbial communities (microbiota) in a standardized substrate, and changes due to PGPR inoculation **(C)**
- Analysis of interaction mechanisms between substrate microbiota and the plant **(D)**
- Assessment of modulation of *B. velenzensis* bioactivity, with addition of *Trichoderma harzianum*, pectin and/or nitrate **(E)**, on the evaluated variables (plant biomass, RSA, metagenomics…)
- Eventually, application of limiting growth conditions (water stress) are also considered



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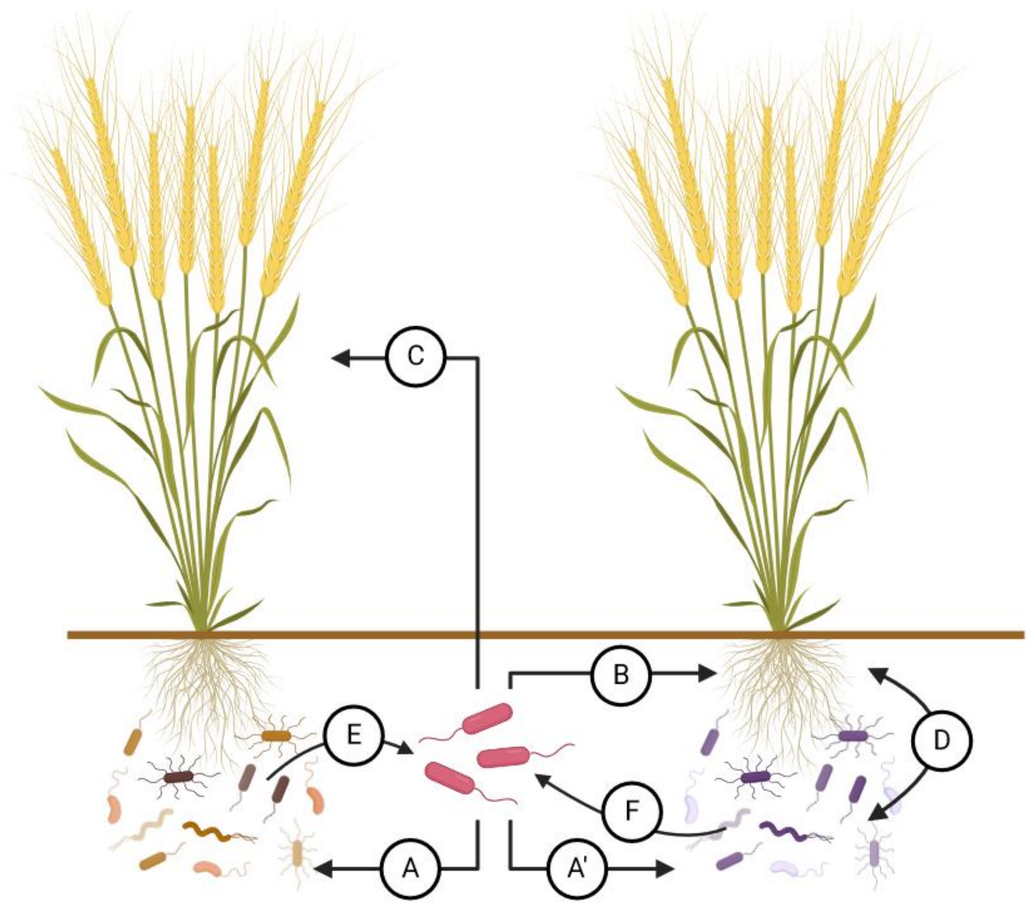
Robustness of PGPR efficacy on wheat



Hypothesis 2: the efficacy of a PGPR strain is influenced by the soil microbial communities

- Characterization of the microbiota in several contrasting soils from Walloon crop fields, and changes due to PGPR inoculation **(A & A')**
- Evaluation of the bioactivity of a *Bacillus velezensis* strain on wheat growth **(B)**, RSA **(C)**, and ISR
- Analysis of interaction mechanisms between soils microbiota and the plant **(D)**
- Assessment of the robustness of *B. velenzensis* bioactivity on the evaluated variables (plant biomass, RSA, metagenomics…), and interaction with soils microbiota **(E & F)**
- Eventually, application of limiting growth conditions (*i.e.* water stress and nitrogen deficiency)

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Suggested references:

Massart *et al* (2015) – paper on challenges and opportunities with plants microbiota
Le Mire *et al* (2016) – review on biostimulants and biopesticides implementing strategies
Nguyen (2018) – *PhD* thesis on rhizobacteria bioactivity on wheat growth with N deficiency
Anckaert *et al* (2021) – book chapter on the use of *Bacillus* spp as biocontrol agents

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Program ERDF 2021-2027
Project PHENIX Biocontrol ULiège-SPW (ID 428)