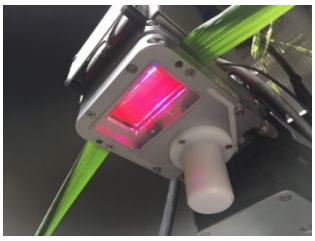
Research Project

Project CRESI PAPRICA : Phenotyping for Mitigation of Photosynthetic Limitations in Rice under Increased Atmospheric CO2



Objectives

The increase in atmospheric carbon dioxide (eCO2) concentration associated with climate change is affecting fundamental physiological processes in plants and thus agricultural yields. Carbon dioxide levels in the atmosphere are higher today than they have been in 800,000 years, reaching 419 parts per million (ppm) in May 2021, which from an agricultural impact perspective is not without consequence. In response to eCO2, some rice varieties are indeed limited in their ability to increase their photosynthesis due to an accumulation of sugars in the stems, until the leaves become clogged. Detecting whether a plant is sensitive to carbohydrate accumulation by biochemical assays, or assessing its photosynthetic capacity by physiological measurements, is a time-consuming, laborious and costly task, and is still a bottleneck for large-scale varietal evaluation.

This project aims to develop for the first time, through a dedicated experiment in a highly controlled environment, a new phenotyping method based on the use of near-infrared spectroscopy, to access complex functional traits in rice (photosynthetic limitation parameters) and biochemical traits (leaf sugar content), whose rapid evaluation still remains a challenge and a methodological barrier.

We propose to develop a multidisciplinary approach covering the continuum of physiological analysis and biochemistry of the plant, integrating new and powerful analysis methods offered by new mathematical methodologies of deep learning and statistics.

Duration

March 2022 – Dec 2022

Leader

Denis Fabre (Cirad)

Geographical Dimension

France (CIRAD) - Montpellier

Partners

CIRAD (Agap Institut : PhenoMen Team, DEFI Team, PHIV Platform, Ecophysiology Platform, Biochemistry Platform)

Funding

CIRAD

Keywords

high throughput phenotyping, photosynthesis, reflectance, near infrared spectroscopy, interdisciplinarity, climate change, CO2, artificial intelligence.