PHD project starting 1st October 2026 supported by FIS project – BIOPOP

Decoding Bioenergetic Pathway Interactions to Unlock the Potential of Plant Productivity

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Abstract
Photosynthetic organisms are primary producers on Earth, meeting the energy demand of most life formsThe study of the metabolism of photosynthetic organisms is crucial to enhance crop yield and meet the needs of a growing global population in a sustainable manner.
Our research targets the **four metabolic pathways** that shape how plants produce biomass. Sunlight is the energy source for the synthesis of ATP and NADPH during the **light-dependent phase of photosynthesis (I)**. These energy-rich molecules are harnessed by the Calvin-Benson cycle for **carbon fixation (II)**. A substantial portion of this energy is also utilized by **photorespiration (III)**, which recycles glycolate, a byproduct of RuBisCO oxygenase activity. **Mitochondrial respiration (IV)** is also active in photosynthetic cells, converting reducing power into ATP.
The BIOPOP project will leverage a collection of *Physcomitrium patens* lines, each with genetically modified to target one of the four major bioenergetic pathways. These plants will undergo detailed characterization, with the activity of the four pathways quantified across all available genotypes. Functional data will be integrated with RNA sequencing and metabolomic data to gain a comprehensive understanding of the alterations induced by modifications in energetic metabolism. Ultimately, the generated data will be utilized to build a holistic representation of how the bioenergetic pathways interact within a plant cell, ultimately determining biomass productivity. This work will enable identifying new genetic targets that will be used for translational research for the development of crop varieties with increased productivity to meet future agricultural demand.
The Photosynthesis Lab (https://fotosintesi.biologia.unipd.it/) has 20+ years of expertise in the biochemistry and molecular physiology of photosynthesis. We are based at the Department of Biology of the University of Padova where you will have access to excellent shared facilities and an international environment. Our extensive national and international network offers unique opportunities for an up-to-date training. Our PhD School provides training in grant writing and intellectual property, preparing you to your future steps.

Meet us:
https://www.instagram.com/plant.lab.unipd/
https://x.com/PUnipd;

Reference bibliography

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