Strategie AI-Driven per la gestione della nutrizione minerale delle piante in ambiente controllato

Development of improved protocols for crop nutritional management in controlled environment agriculture

Abstract:

The project aims to develop an advanced mineral nutrition protocol for the cultivation of horticultural or ornamental crops in controlled agricultural environments, focusing on greenhouses and vertical farms. The study will primarily take place at the DISTAL of the University of Bologna, utilizing various facilities such as AlmaVFarm, experimental laboratories, and greenhouses. The project will examine the impact of plant nutrition on photosynthetic efficiency and crop growth, optimizing the use of nutrients and water resources. The research involves developing an AI-driven protocol for the optimized management of nutrition. Expected results include scientific publications, presentations at international conferences, student supervision, technical reports, and outreach events. The ideal candidate should possess skills in plant physiology and stress management, and demonstrate proficiency in the English language.

Abstract (in Italian):

Il progetto mira a sviluppare un protocollo avanzato per la coltivazione di colture orticole o ornamentali in ambiente controllato, con focus su serre e vertical farms. Lo studio si svolgerà principalmente presso il DISTAL dell'Università di Bologna, utilizzando diverse strutture come AlmaVFarm, laboratori e serre sperimentali. Il progetto esaminerà l'impatto della nutrizione delle piante sull'efficienza fotosintetica e la crescita delle colture, mirando all'ottimizzazione nell'uso di nutrienti minerali e acqua. La ricerca prevede l'elaborazione di un protocollo AI-driven per la gestione ottimizzata della nutrizione. I risultati comprenderanno pubblicazioni scientifiche, presentazioni a conferenze internazionali, supervisione degli studenti, relazioni tecniche ed eventi di divulgazione. Il candidato ideale dovrebbe possedere competenze in fisiologia vegetale e gestione dello stress, e dimostrare conoscenza della lingua inglese.

The research project:

This research project aims to develop advanced AI-driven cultivation protocols specifically designed for controlled environment agriculture (CEA) systems, such as greenhouses and vertical farms. The innovation lies in the use of advanced AI-supported agronomic techniques to optimize plant nutrition management. It will be conducted in collaboration with ongoing research initiatives such as:

- **MUR-PRIN-2020ELWM82, CUP:J33C20002350001** Sustainable Vertical Farming (VFarm);
- **PRIMA-2242**: Demonstrating the socio-economic and ecological impacts of the Water, Energy, Food, and Ecosystem Nexus approach at the agricultural production and policy levels in Mediterranean Regions (FrontAgNexus);

- **Horizon -101083790**: Integrated and Circular Technologies for Sustainable City Region Food Systems in Africa (InCitis-Food).

Methodology and tasks:

The research will primarily be conducted in Bologna at the Department of Agricultural and Food Sciences (DISTAL) and will utilize its experimental facilities, including the experimental vertical farm (AlmaVFarm), the laboratories and experimental greenhouses.
The main research questions will focus on:

- Evaluating the effects of optimized plant nutrition on the photosynthetic efficiency and growth of horticultural and ornamental crops in controlled environments;
- Developing innovative protocols for the indoor cultivation of these crops, covering their entire lifecycle from nursery to harvest, with a specific emphasis on nutrient management;
- Implementing AI-driven techniques to optimize plant nutrition management, ensuring efficient nutrient use and promoting sustainable growth strategies.

Foreseen output

The research should lead to the implementation of the following output:

- Elaboration of at least 3 scientific articles – to be published in ISI-indexed peer reviewed journals.
- Presentation of project results in at least 1 international academic conference.
- Supervision of Bachelor, Master and PhD students, during their thesis or internship.
- Contribution to technical and financial reporting of activities linked to the research.
- Realization of dissemination events and workshops linked to the research output.

Requirements

The candidate must demonstrate research skills in agricultural sciences and technologies as well as potential application of Artificial Intelligence to food production in protected environment. Preferred qualifications include experience in conducting experiments on plant physiology, as well as knowledge of growth optimization techniques in controlled environments. Familiarity with common laboratory analyses in the field of horticultural and ornamental crop research is essential, along with a solid understanding of the applications of artificial intelligence in the management of crops in controlled environments. A good command of the English language is required, while the ability to communicate in Italian is preferred due to the necessary interaction with farmers, technical staff, and visitors to the experimental facilities.

Further information

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