Assisted Regeneration of *Quercus robur* (L.) From Laboratory to the Field in the Castelporziano Presidential Estate (Roma, Italy).

PhD student: Nour Zaher [1] (nour.zaher@unitus.it)

Tutors: Paolo De Angelis [1], Dario Papale [1], Elena Kuzminsky [1].

[1] University of Tuscia, Viterbo, Italy.

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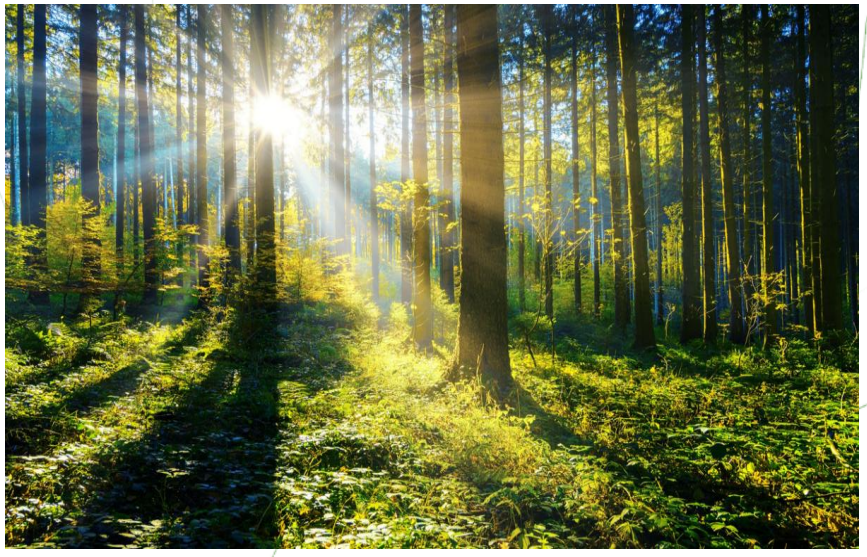
Introduction



- **Mediterranean Oak Forests are Declining**
  - Climate change
  - Oak dieback
  - Challenges and low natural regeneration rates

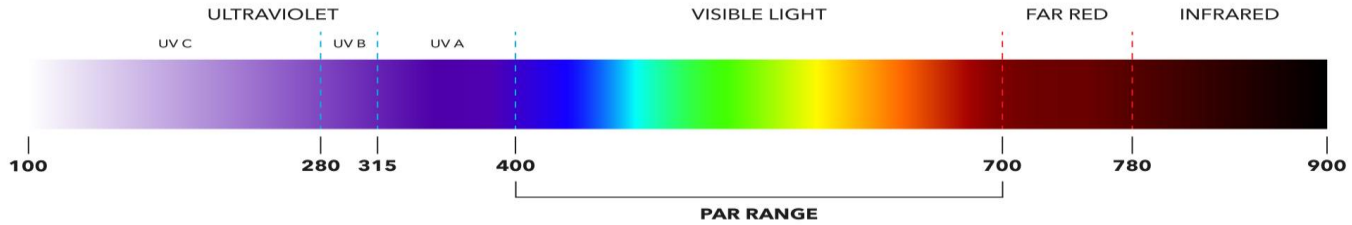
- **Restoring Mediterranean Ecosystems is Crucial**
  - Biodiversity
  - Resilience, Conservation and Regeneration
  - Ecological stability, Sustainability

Objectives

- **Vegetative Propagation Techniques** through epicormic shoot induction from *Quercus robur* branches.

- **Eco-physiological Monitoring** and responses to the dynamic light regime **(sunflecks)** on *Quercus robur* regeneration in Castelporziano (Roma, Italy).

- **Monitoring Radiation Dynamics**



  - One of the most important meteorological variables measured in terrestrial ecosystems.
  - Photosynthetically active radiation **(PAR),** 400 to 700 nm.

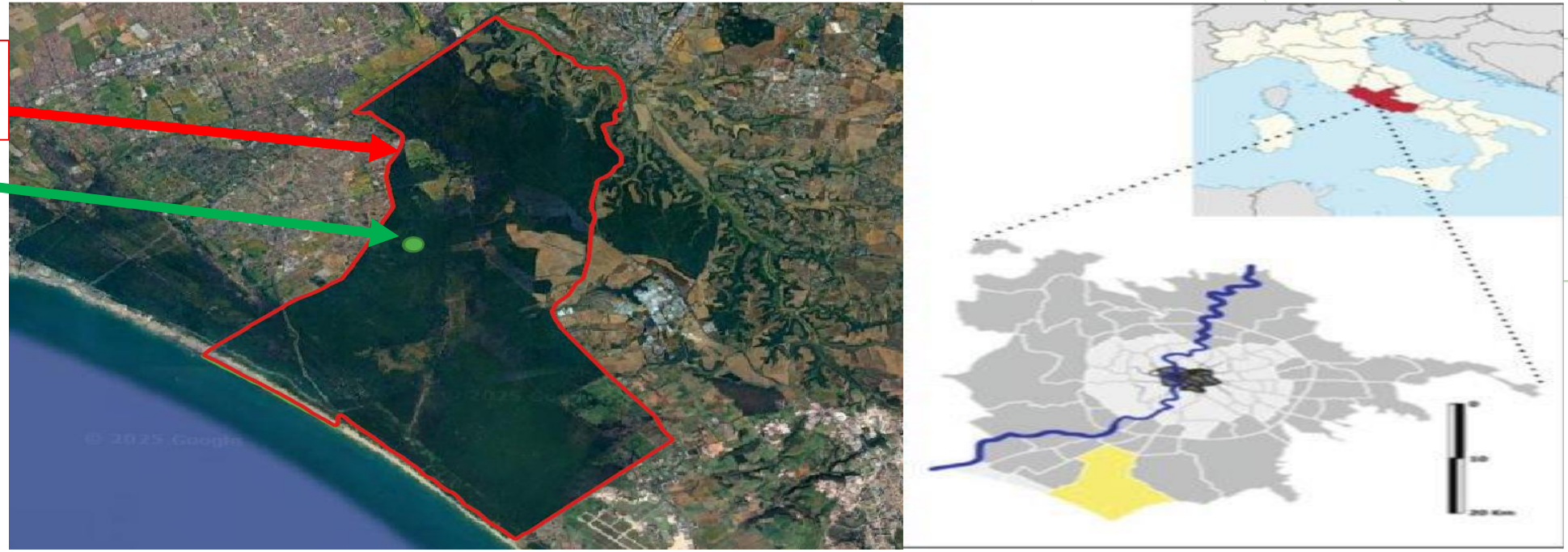
Materials and Methods

Study area: Presidential Estate of Castelporziano (Roma, Italy).

- Mediterranean biodiversity hotspot, located 25 km from the center of Rome.
- Typical Mediterranean ecosystems, Nature reserve listed among protected areas.
- The Mediterranean forest of Castelporziano is dominated by oak species.

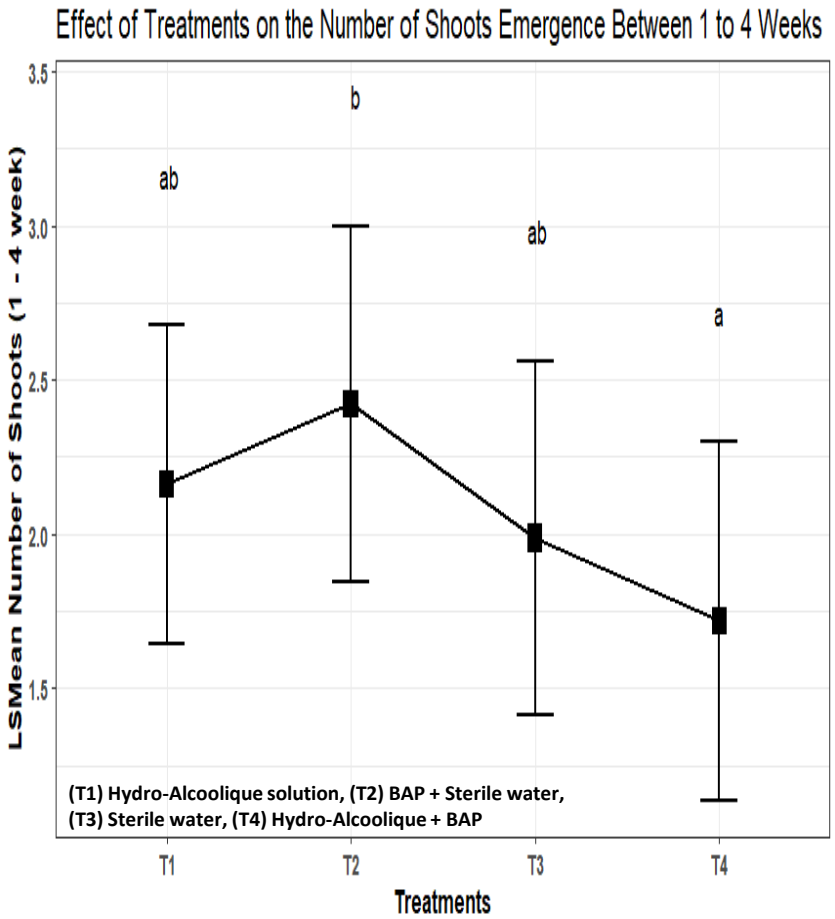
Castelporziano borders (red line)

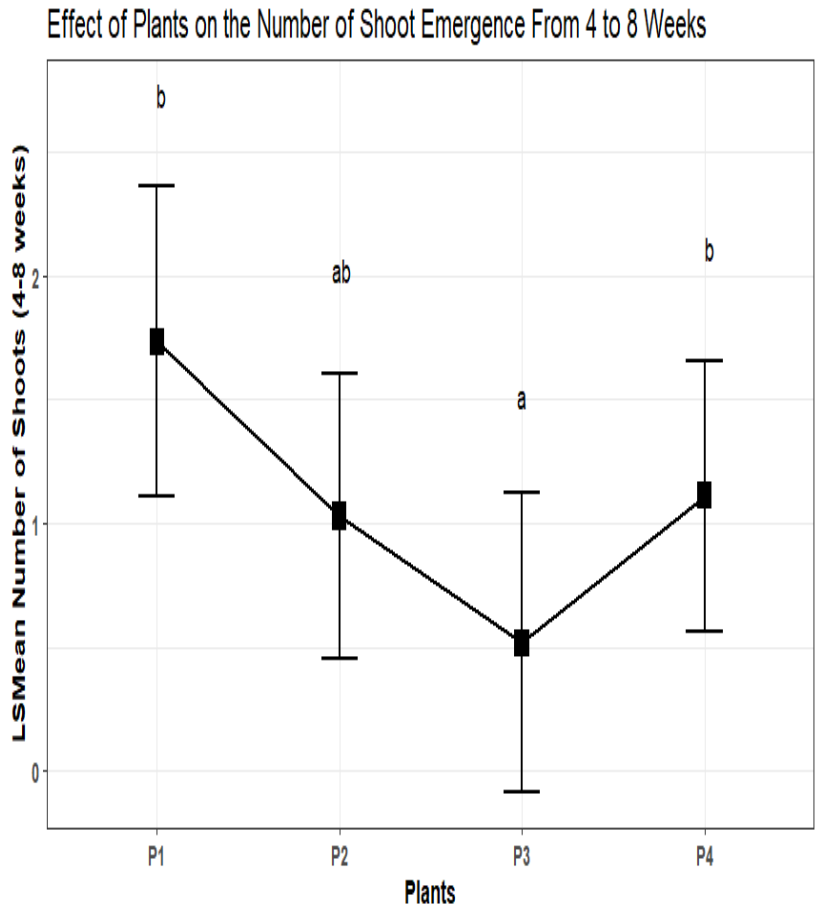
Study Area (Campo di Rota)

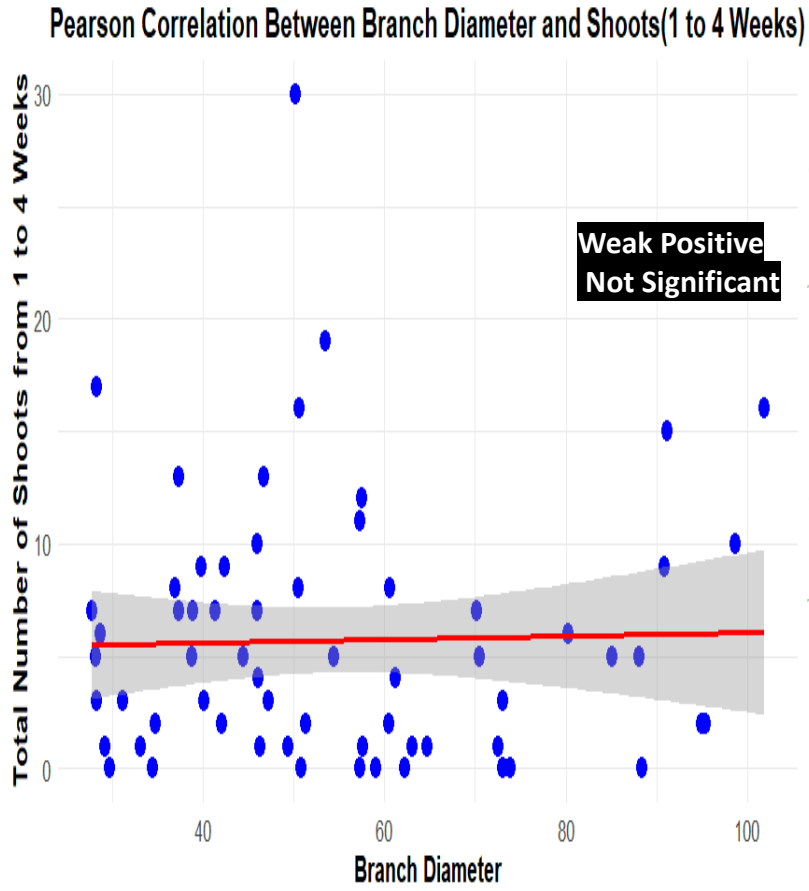


Study area (Castelporziano), on the right, a general description of the Study Area Castelporziano (yellow), Municipality of Rome (dark gray), City of Rome (light gray and black) (Recanatesi *et al.*, 2020).
On the left, Castelporziano borders (red line), Campo di Rota (green point).

Results: Vegetative Propagation Experiment







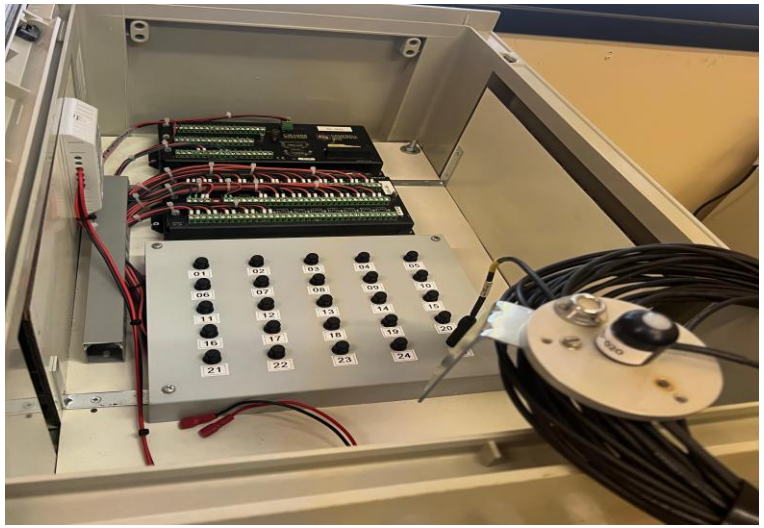
✓ **Significant Treatment Effect (ANOVA** : p-value = 0.00483) ✓ **Significant Plant Effect (ANOVA**: p-value = 1.68e-07)

Post-Hoc Analysis (Tukey's HSD Test)

r **= 0.026**

Radiation Dynamics Measurements (PAR)

- **Light monitoring: radiation dynamics measurements** in Castelporziano and greenhouse at Tuscia University.
- Using a network of calibrated **quantum sensors.**
- Quantification of **sunflecks** dynamics (duration, frequency, and cumulative PAR) required for successful regeneration.
- Evaluate the impact of **light dynamics** on *Quercus* regeneration in Castelporziano.



Quantum sensors installed in Castelporziano (Campo di Rota), and the greenhouse at Tuscia University

Eco-physiological Measurement

- **Gas exchanges and Fluorescence** measured with (LI-6800 Portable Photosynthesis System), under contrasting light conditions (homogeneous shadow vs. sunflecks).
- Evaluate the dynamic response of the photosynthetic, water use efficiency, interactions with water stress.

Preliminary Results:

- Seedlings exposed to dynamic light conditions exhibited improved photosynthetic and water-use efficiency compared to those under shade.

Conclusions

This integrated approach, combining biotechnological techniques, Eco-physiological measurement and radiation dynamics monitoring, aims to provide guidelines for assisted regeneration in Castelporziano (Roma, Italy).

Our findings will contribute to adaptive forest management, conservation, and reforestation strategies, enhance resilience of Mediterranean oak ecosystems, and support regeneration efforts at Castelporziano under climate change.

Nour Zaher [1], Paolo De Angelis [1], Dario Papale [1], Elena Kuzminsky [1].

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THANKS!

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