

PhD in AGRIFOOD AND ENVIRONMENTAL SCIENCES

CALL 2026 – CYCLE 42

Tentative title: UV-C light and grapevine patho-physiology: exploring the potential role of short-wave ultraviolet radiation in disease control, berry quality and abiotic stress responses

Acronym: ULTRAVINE

Co-funding body: Free Green Nature srl

Registered office: COLLE UMBERTO - Via Del Lavoro n. 31/B, Treviso

VAT Number: IT05101340262

Supervisor 1: Michele Faralli

<https://webapps.unitn.it/du/en/Persona/PER0242627/Didattica>

<https://www.linkedin.com/in/michele-faralli-931585100/>

Supervisor 2: Annachiara Berardinelli

Supervisor 3: Gerardo Puopolo

Context / Synthetic description of the project

UV-C radiation, although naturally absent at the Earth's surface, is increasingly investigated in viticulture as a sustainable physical elicitor due to its high biological activity. In grapevines, UV-C exposure triggers oxidative signaling and defense-related responses that modulate secondary metabolism, resulting in changes in berry composition, including enhanced accumulation of phenolic compounds with positive implications for grape quality and antioxidant potential. Increased resistance against major fungal pathogens such as *Plasmopara viticola* (downy mildew) and *Erysiphe necator* (powdery mildew) has been also reported. Furthermore, UV-C treatments may affect leaf gas exchange regulation and plant water-use strategies.

To enhance oxidative pressure and improve treatment efficacy, in this project, UV-C applications will be combined with hydrogen peroxide, acting as a complementary oxidative agent capable of amplifying stress signalling and defence responses. The effectiveness of UV-C will be evaluated through experiments conducted both in controlled environments and in vineyard conditions. This integrated approach will allow the assessment of physiological responses, *iWUE* modulation, berry quality traits, and disease incidence across different UV-C doses and application timings. The outcomes of this study will contribute to defining optimized UV-C-based strategies for improving grape quality, enhancing plant tolerance to climate change, and supporting sustainable disease management in viticulture.

Keywords (max five): UV-C, pathogens, leaf physiology, berry quality