The New Frontier in Mediterranean Mycology: Terana caerulea, Spectroscopic and Ecological Characterization, and Biosensory Applications

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Terana caerulea is a rare basidiomycete fungus distinguished by its striking deep blue pigmentation, produced by unique natural compounds known as corticine pigments. In February 2025, the species was recorded for the first time in southern Italy, growing on dead olive wood in a coastal area of Apulia. This finding represents an important contribution to Mediterranean mycology and highlights the ecological relevance of microclimatic conditions such as high humidity and diffuse blue light. The study combines ecological observations with spectroscopic analyses to investigate the optical and chemical behavior of the fungal pigments. Results show a strong absorption in the blue region of the visible spectrum and a clear sensitivity of pigment production to environmental variables, including light exposure and substrate composition. These characteristics indicate that the pigmentation of T. caerulea is not merely decorative, but closely linked to adaptive and regulatory mechanisms. Based on these properties, the research proposes the development of TERA-PROBE, an innovative environmental biosensor that exploits the photo-responsive behavior of Terana caerulea pigments. The system is conceived as a bio-inspired monitoring tool capable of translating environmental changes into measurable optical signals, with potential applications in air quality monitoring and ecological surveillance. This work goes beyond the documentation of a rare fungal occurrence: it presents Terana caerulea as a model organism at the intersection of ecology, chemistry and biotechnology, demonstrating how living systems can inspire sustainable technologies for environmental monitoring and protection.

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