Monitoring of biotic and abiotic components in an experimental urban plantation in Campobasso

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Abstract
In recent years, biodiversity conservation has gained increasing relevance, as it underpins key ecosystem processes and functions. In this context, understanding how urban afforestation influences biodiversity through changes in structural and environmental conditions is essential, especially in human-modified landscapes where new plantations may create habitats and enhance ecosystem services. Within the framework of the National Recovery and Resilience Plan (PNRR), several experimental afforestation projects have been initiated across Italian cities, including Milan, Pistoia, Rome, and Campobasso. In 2024, a new plantation was established in Parco dei Pini, an urban green area in Campobasso, with the aim of evaluating the effects of the intervention on the biotic and abiotic components of the urban ecosystem. The experimental system includes three planting schemes with contrasting tree–shrub compositions, in addition to a control plot left to spontaneous evolution. The planting designs combine different proportions of trees and shrubs, including 70% trees and 30% shrubs, 70% shrubs and 30% trees, and "serial shrubs" characterized by concentric, high-density bands of woody species. A multilevel monitoring protocol was implemented to assess plantation development and ecosystem responses. Tree performance was evaluated through dendrometric measurements and mortality surveys, microclimatic conditions were recorded through a meteorological station, ground-dwelling arthropods were monitored monthly using pitfall traps, and soil samples were collected to characterize physical and chemical properties. Among the biological indicators, particular attention was given to soil-associated arthropods, especially Carabidae and Staphylinidae, as useful groups for assessing ecological quality and early colonization dynamics. The integrated analysis of vegetation development, soil fauna, microclimate, and edaphic conditions will provide useful insights for urban restoration and biodiversity-friendly planning in Mediterranean environments.

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