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In vitro evaluation of melliferous plant seed germination under field conditions with and without fire exposure – a preliminary study

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Beekeeping plays a vital role in biodiversity conservation and ecosystem resilience by ensuring pollination services for wild flora and agricultural crops. In Portugal, the production of Protected Designation of Origin (PDO) honey faces growing challenges due to landscape degradation, recurrent wildfires, and the spread of invasive species. These factors reduce the availability of melliferous flora, directly impacting the hive productivity and the economic sustainability of PDO honey production. This study evaluates the germination and regeneration two highly honeybee relevant plant species — Lavandula pedunculata and Cistus ladanifer— under burned and unburned conditions, while also assessing the germination capacity of the invasive Cytisus spp.

Experimental plots (100 m²) dominated by Lavandula pedunculata and Cistus ladanifer were established, with controlled fire applied to some plots, while others remained unburned as controls. Seeds were collected in August and September 2024 and subjected to in vitro germination trials. Two sterilization treatments were applied (7-12 minutes in bleach with Tween 80), along with two germination conditions: continuous light, or 7 days in darkness followed by light. Germination occurred in a growth chamber (16 h light / 8 h dark photoperiod, 22°C) using 9% water-agar medium autoclaved at 120°C and 1 atm for 15 minutes.

Lavandula pedunculata (unburned) showed the highest germination rates, reaching 100% under light and 94% under initial dark conditions with 12-minute sterilization. Burned Lavandula had lower germination (80%) and higher seedling mortality in darkness. Cistus ladanifer germinated more slowly, particularly under initial darkness, with 31.5% germination after 4 weeks when moved to light. Cytisus spp, an invasive species, showed strong post-fire germination potential, reaching 35% after 12 minutes of sterilization.

This work, developed under the BeeLand project, highlights Cistus ladanifer's ability to rapidly colonize degraded soils, with robust root and leaf development, particularly under dark conditions followed by light. Its pioneer role in ecological restoration, contributing to soil stabilization and facilitating native vegetation succession, is reinforced. These findings support integrating ecological restoration and sustainable land management to improve the resilience of honey-producing landscapes