Strategies of polyextremotolerant black yeasts for survival in low water activity environments

Poster

Osmoadaptation and signal transduction , Mechanisms of osmotic stress response in halophiles

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From an anthropocentric perspective, environments such as glaciers, hyperarid deserts, and hypersaline lakes are often considered "extreme" because their chemical and physical conditions are hostile to most life forms. Although such environments differ in their prevailing stressors, and sometimes overlap in them, they share a common feature: low water activity, which limits the availability of biologically usable water. Once thought to be dominated by prokaryotes and archaea, these habitats are now known to host diverse extremotolerant fungi with adaptations spanning metabolism, physiology, reproduction, and morphology. Polyextremotolerant black yeasts are of particular interest for their ability not only to survive, but also to proliferate under conditions that are restrictive for most other life forms. Among them, *Aureobasidium pullulans* and *Hortaea werneckii* exemplify different ecological strategies: the former is a versatile generalist with broad environmental tolerance, while the latter is a halophilic specialist thriving in hypersaline habitats. Their persistence under salinity, low temperature, and desiccation/freezing is supported by unique adaptations such as compatible solute accumulation, membrane remodeling, and melanized cell walls, as well as specialized systems for scavenging reactive oxygen species (ROS) and transporters that maintain balanced ion concentrations inside the cell. To understand these remarkable adaptations, this work adopts a multilevel perspective that combines physiological assays, genomic and transcriptomic analyses, and the development of tools for targeted genetic

manipulation. The aim is to link their ecological success with the underlying mechanisms of stress tolerance. Beyond their relevance as model organisms for stress biology, they also provide insights into potential biotechnological applications and the capacity of eukaryotic life to persist in extraterrestrial environments.

Palabras Clave

(1) Hortaea werneckii, (2) Aureobasidium pullulanspolyextremotolerance, (3) stress adaptation, (4) black yeasts.

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