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MYCOTOXICOLOGICAL STUDIES UNDER MICROGRAVITY: AN INNOVATION FOR FOOD SAFETY AND SECURITY

Abstract

Unlike other exposures such as light, temperature, wind or chemicals that one part or portion of an organism is shaded from; gravity cannot be shaded, as everything on the Earth is equally exposed to gravitational-field. Fungi don't have sensory-hairs or nerves like animals; neither do they have amyloplasts like plants but they still respond to gravity. Observing the behaviour of fungi during morphogenesis in microgravity will establish the more the significance of the force of gravity in determining the architecture and construction of fungal multicellular structures. More-so, the application of microgravity on fungi by scientists for social-economic benefits such as food safety and food security is paramount. Therefore, fungi can be used as laboratory species and a representative as an ideal space explorer through real and simulated microgravity platforms. Fungi have low-level of organisation and good handability, they are easy to culture, undemanding in behavior, and can go from birth to death within few days to a couple of weeks to one month on the average. "Omics" refers to high-throughput approaches for investigating basic cellular processes. Examples are genomics, proteomics, transcriptomics and metabolomics. These are some of the possible areas of investigation of fungal cultures under microgravity environment. The effects of microgravity on fungal production of secondary metabolites is of great interest, as some of these metabolites can be toxic to humans, while other metabolites can have several practical uses. All omics research towards mycotoxin control, enzymatic detoxification, resistance approaches, biopesticides and biofungicides are paramount. Fungal metabolites for example are indispensable substances in modern research. Analyzing and studying fungi toxins (mycotoxicology) is key to food security. The adoption of the methods that retains mycotoxin levels as low as possible is crucial for the food industry, particularly

the heat-stable ones. These chemical compounds (mycotoxins) are the outcome of secondary metabolism. Therefore, the aim of this study is to review how fungi coordinate their growth to react to microgravity giving a better insight to their regulatory mechanisms for food security, and contributing knowledge to the possible benefits of newly produced fungal enzymes (for food processing, driving food security), organic acids (useful in food and beverage industries), amino acids, nucleic acids, antibiotics etc. Other biological findings and benefits from fungi's high specificity of action for biological control measures (e.g. pest and pathogens) are also of other advantages of fungi's study under microgravity. The microgravity impact benefits on selected fungi are enumerated as examples.