Angela Cunha et al., J Bacteriol Parasitol 2017, 8:6(Suppl)
DOI: 10.4172/2155-9597-C1-040

Photodynamic inactivation of phytopathogenic fungi with natural and synthetic photosensitizers

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Diseases caused by phytopathogenic fungi on vine and fruit trees are associated with important economic losses. With the aim of reducing the environmental impacts of traditional fungicides used in agriculture, innovative approaches to inactivate fungi in environmental matrices are being investigated. In this context, the photodynamic effect, in which the combination of a photosensitizer, visible light and molecular oxygen leads to the formation of cytotoxic species of oxygen, represents a promising perspective. The objective of this work was to evaluate the efficiency of photodynamic inactivation (PDI) of model phytopathogenic fungi (*Lasiodoplodia theobromae* and *Botrytis cinerea*) with natural (curcumin and riboflavin) and synthetic (cationic porphyrin Tetra-Py-Me$^+$ and toluidine blue O) photosensitizers. Exposure to natural sunlight during 7 day-night cycles, in presence of 500 µM of Tetra-Py-Me+ or 500 µM toluidine blue O, attenuated the growth of *L. theobromae* by 35% and 26%, respectively (Figure 1). Curcumin and riboflavin failed to cause significant inactivation. Light alone (light control) and exposure to the photosensitizer in the absence of light (dark control) did not affect the growth of *L. theobromae*. On the contrary, the growth of *B. cinerea* was significantly inhibited by light alone. Tetra-Py-Me$^+$ and toluidine blue O caused 90% and 93% attenuation of growth, respectively, in relation to the dark control. PDI with the natural photosensitizers was also not significant. The results confirm that PDI with porphyrins or phenothiazines may be further explored as a viable alternative to chemical fungicides in the control of phytopathogenic fungi. However, repeated treatments may be required considering that in field conditions, fungi may recover from sub-lethal damage, during the night period.

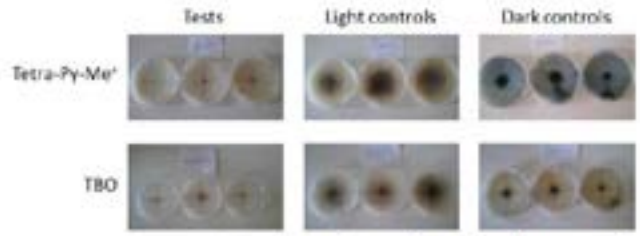

Figure 1: Photodynamic inactivation of *Lasiodoplodia theobromae* with the cationic porphyrin Tetra-Py-Me$^+$ and the phenothiazine dye Toluidine Blue O (TBO), upon exposure to natural sunlight during seven day-night cycles.

Biography

Angela Cunha is an Assistant Professor in the Biology department of the University of Aveiro, Portugal and a Researcher at the Centre for Environmental and Marine Studies. She has been involved in lecturing graduate and post graduate courses in the fields of Microbiology and Genetics and is currently the Director of the Bachelor Course in Biology. Her main research field is the distribution and activity of microorganisms in the environment, microbial bioremediation tools and interactions of microorganisms with plants in the perspectives of disease control, plant growth promotion and microbe-assisted phytoremediation.

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