MICRO BIOTEC 15

Congress *of* Microbiology *and* Biotechnology

December **2015**

University of Évora

EDITOR
Ana Teresa Caldeira, António Candeias, António Pereira and M. Rosário Martins
HERCULES Laboratory

GRAPHIC DESIGN
Nuno Carriço & Vanda Amaral

PRINT
GRECA – Artes Gráficas, Lda

ISBN
978-989-99475-2-8

Degradation of the fungicide metalaxyl by Mucorales strains

M. Rosário Martins[1], Cledir Santos[2], Pablo Pereira[3] and Nelson Lima[4]

(1) Departamento de Química, Escola de Ciências e Tecnologia & Instituto de Ciências Agrárias e Mediterrânicas, Universidade de Évora, Portugal.
(2) Depart. de Ciencias Químicas y Recursos Naturales, BIOREN, Universidad de La Frontera, Chile .
(3) Instituto Nacional de Investigação Agrária e Veterinária, Portugal.
(4) Centro de Engenharia Biológica, Micoteca da Universidade do Minho, Portugal.

A large amount of fungicides, such as metalaxyl [methyl N-(methoxyacetyl)-N-(2,6-xylyl)-DL-alaninate], are currently used against Oomycetes that cause downy mildew in several agricultural crops, including vineyards. These compounds are potentially harmful for terrestrial and aquatic environments, as well as to human health due to their carcinogenic and mutagenic properties. Recently, there has been an increase of interest in using Mucorales to degrade fungicides compounds using nonspecific extracellular enzymes. In this study several Mucorales strains of *Absidia, Gongronella* and *Rhizopus* were used to screening their metalaxyl degradation abilities.

Gongronella sp. CCMI 1101 (MUM 10.263) and *Rhizopus orizae* (previously identified as *R. stolonifer*) CCMI 1105 (MUM 10.260) were isolated from a vineyard soil contaminated with repeated treatments with a commercial fungicide containing metalaxyl. These two strains after submitted to a selective enrichment with metalaxyl were annotated as CCMI 1100 (MUM 10.262) and CCMI 1104 (MUM 10.261), respectively [1]. The other strains were obtained from MUM, CCMI and CBS culture collections.

After selective screening on solid medium containing a metalaxyl gradient concentration up to 100 $mg.L^{-1}$, six strains (*Absidia glauca* CBS 101.08, *Gongronella butleri* CBS 179.28, *Gongronella* sp. CCMI 1000, *R. oryzae* CCMI 1004, *R. oryzae* CCMI 244 and, *R. oryzae* CCMI 900) with high tolerance were selected for liquid biodegradation studies. The liquid cultures were performed using *Yeast Nitrogen* medium supplemented with 100 $mg.L^{-1}$ metalaxyl and 5 $g.L^{-1}$ sucrose. Biomass concentration was determined by dry weight. The metalaxyl was determined by UV-HPLC technique.

Results show on day 21 that all strains were able to degrade metalaxyl in ranged from 71 to 83%. The mycelium adsorption contributes similarly in all cases between 55 and 58%. The two best degraders were *A. glauca* CBS 101.08 and *R. oryzae* CCMI 1004 with 81 and 83%, respectively. *A. glauca* CBS 101.08 produced less biomass (1.4 $g.L^{-1}$) than *R. oryzae* CCMI 1004 (2.5 $g.L^{-1}$). The degradation process and the mycelium adsorption were not positively related with the biomass production.

In conclusion, these results suggest that Mucorales, in special *A. glauca* and *R. oryzae*, can be explored in soil bioremediation.

[1] M. R. Martins, P. Pereira, N. Lima, J. Cruz-Morais, Archives of Environmental Contamination and Toxicology, 65, 2013, 67.