ENZYMES OF ALKALIPHILIC FUNGI ISOLATED FROM GRUTAS DE NOMBRE DE DIOS CAVES, CHIHUAHUA, MEXICO

Paola A. Rodríguez-Ramos, F. Javier Zavala Díaz de la Serna, Gpe. Virginia Nevárez-Moorillón;
Universidad Autónoma de Chihuahua, Facultad de Ciencias Químicas, Chihuahua C.P. 31125
E-mail: vnevare@uach.mx, paola_mariposa@hotmail.com

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Introduction Bacteria and fungi are capable of colonizing almost every habitat. Caves are not an exception and are considered as extreme environments for life because the energy resources are limited; therefore, caves provide ecological niches for the study of biological diversity (1). To survive, microorganisms produce useful biomolecules like exoenzymes and antibiotics, which could have applications of biotechnological importance (2, 3).

The objective of work was to isolate alkalophilic fungi from inside the Grutas de Nombre de Dios caves, and identify their capacity to produce amylases, lipases, cellulases and proteases.

Materials and methods A total of 11 points were selected inside the cave to observe the biodiversity of culturable molds at pH 9 (alkalophiles) grown at room temperature. Isolates were obtained in M9 minimal plates added with 0.5% glucose (pH 9.0), and were restreaked to obtain pure cultures. Enzymatic activities of pure culture were tested on Pontecorvo media culture added with milk powder (1%), carboxymethylcellulose (CMC) (1%, tested with Congo Red stain) (4), starch (1%, revealed with iodine solution) and tributiryn (1% and 0.01% de methylene blue) to test for protease, cellulases, amylases and lipases. Plates were incubated a room temperature during 10 days.

Results A total of 47 different fungal strains were isolated from the different sampling points (Table 1).

Table 1. Differents sampling points and the respective number of fungal strains isolated and tested.

Sampling point	Abbrev.	Isolated	Enzymatic test
Capilla	Cap	2	2
Túnel	Tun	1	1
Águila	Ag	4	1
Plata	Pl	4	0
Hacia Torre	HT	2	1
Torre de Pisa	TP	9	5
Candiles	Cand	4	2
Verde	Vde	4	3
Arriba	Arr	0	0
Helictitas	Hel	0	0
Mena de óxido de fierro	Fe	17	14

For enzymatic activity, 29 mold strains were tested, and results showed that all strains were positive for at least one of the enzymes. Most of the strains were positive for carboxymethylcellulose degradation, and many of them demonstrated multiple exoenzymatic capacities (Figure 1). Results are a good approximation that show the enzymatic capacities of molds found in caves, but further studies are needed in order to characterize selected fundal strains.

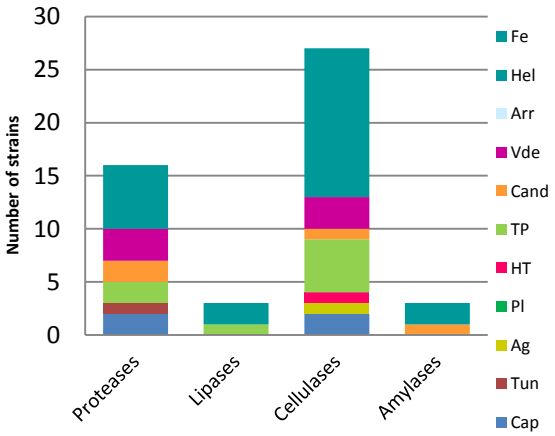

Figure 1. Number of positive strains to differents enzymes, separated by sampling point (colors).

Conclusion It was demonstrated that diversity of microorganisms found in Grutas de Nombre de Dios caves need to be further assessed, in order to describe the habitat and to identify strains with potential biotechnological applications.

References

1. Bastian F. and Alabouvette C. (2009) International Journal of Speleology, 38 (1), 55-60.
2. Elvidge, S. (2011) *Chemistry & Industry*. June: 17-19
3. Barton, H. (2006) *Journal of Cave and Karst Studies*; 68 (2): 43-54.
4. Castellanos, F., Sandoval, A., Urtiz, N., Pedraza, M. (2006) *Acta Universitaria* 16: 22-28.