



GRANADOS RIGOL, ELENA

Degree in Environmental Sciences  
Technician in soils and water polluted

# CHARACTERIZATION OF NATURALLY PRESENT MICROBIAL POPULATIONS AT SARDAS LANDFILL AND INQUINOSA FACTORY IN SABIÑANIGO (HUESCA)

*Granados, E.<sup>1</sup>, Herranz, C.<sup>2</sup>, Salvatierra, A.<sup>2</sup>, Guadaño, J.<sup>1</sup>, Fernández, J.<sup>3</sup>*

*<sup>1</sup>Empresa para la Gestión de Residuos Industriales, S.A., EMGRISA, Madrid, Spain*

*<sup>2</sup>Sociedad Aragonesa de Gestión Agroambiental, SARGA, Zaragoza, Spain*

*<sup>3</sup>Department of Agriculture, Livestock and Environment, Government of Aragon, Spain*

# INTRODUCTION

## MICROORGANISMS

- Decomposition of organic matter
- Nutrient recycling
- Primary production
- **BIOREMEDIATION**

**High diversity provides greater resilience and adaptation to disturbances.**

*ECOSYSTEM SERVICES*



# GOALS

ASSESS THE STATUS OF THE NATIVE BACTERIAL COMMUNITIES FOR:

- Know the state of microbial biodiversity
- Biorremediation techniques



# STUDY AREA



## TWO AREAS

OLD INQUINOSA  
FACTORY

SARDAS' LANDFILL

# MATERIAL AND METHODS

## 37 SAMPLES

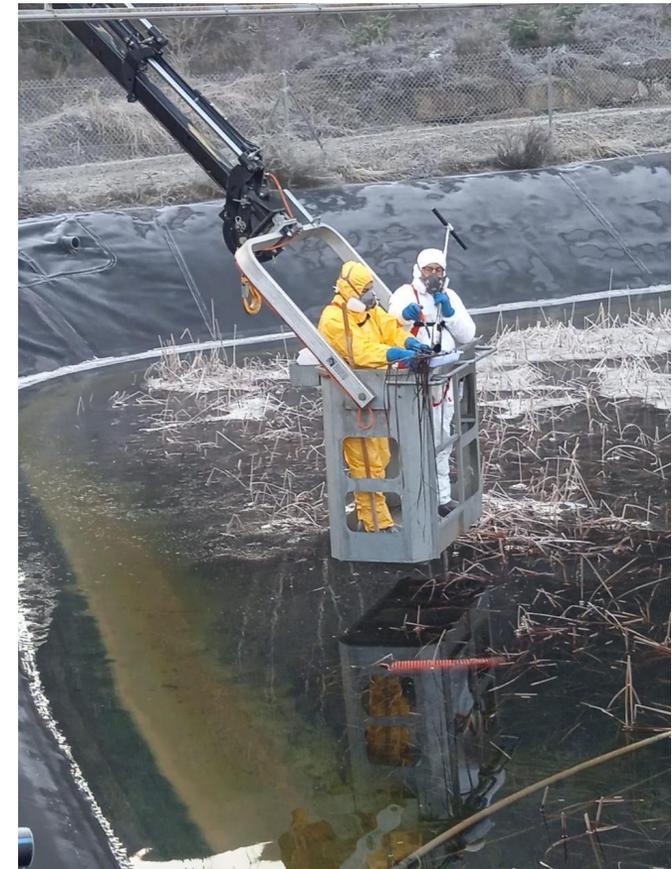
### INQUINOSA □ 8 SAMPLES

- 4 SOIL SAMPLES
- 4 GROUNDWATER SAMPLES



### SARDAS □ 29 SAMPLES

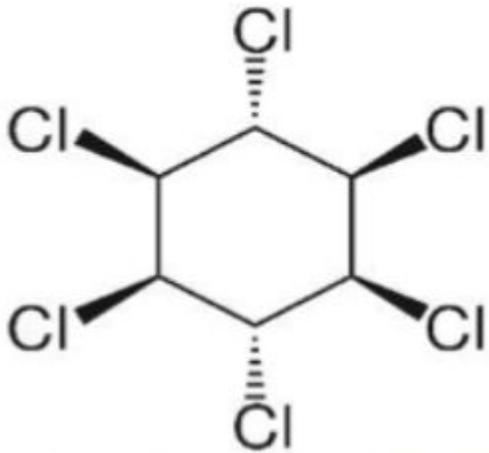
- 8 SOIL SAMPLES
- 7 SLUDGE OF OLD POND
- 6 GROUNDWATER SAMPLES
- 4 WATER SAMPLES OF OLD POND
- 4 VEGETATION SAMPLES



# MATERIAL AND METHODS

## Physicochemical characterization

- pH, EC, P, N, OM
- COC's.



## Microbiological characterization

- Total cultivable biomass.
- Cultivable specialized biomass.
- Community parameters (ecological and metabolic).
- Test of toxicity or tolerance to COC's.

# MATERIAL AND METHODS

## Microbiological characterization

### Total cultivable biomass:

Colony count in generic culture medium.

### Cultivable specialized biomass:

Colony count in restrictive culture medium.

- Just DANPL as a C source.



POOR SAMPLES:  $\leq 10^3$  UFC/g o ml

RICH SAMPLES:  $10^4 - 10^5$  UFC/g o ml

VERY RICH SAMPLES:  $\geq 10^6$  UFC/g o ml

# MATERIAL AND METHODS

## Microbiological characterization

### Community parameters

- Latency time
- Metabolic activity (AWCD)
- Ecological indices

✓ Shannon Evenness

✓ Simpson Diversity

✓ Shannon Diversity

0,1-1,5 Low

1,6 – 3,0 Medium

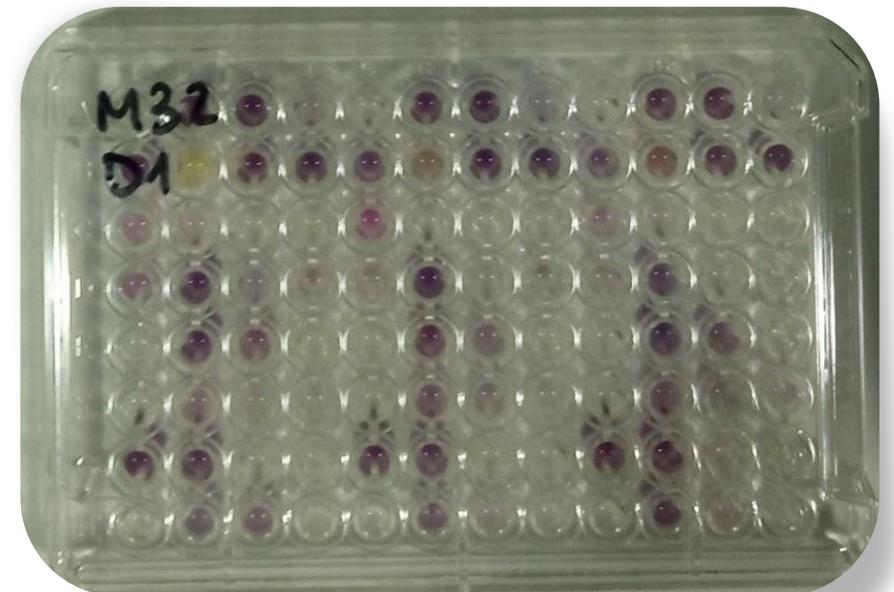
3,1 – 5,0 High



1

### Biolog EcoPlate™ Microplates

- 92 cells. 36 diferente C sources x 3
- Absorbance measurements
- Metabolic activity □ violete colour (tetrazolium)



# MATERIAL AND METHODS

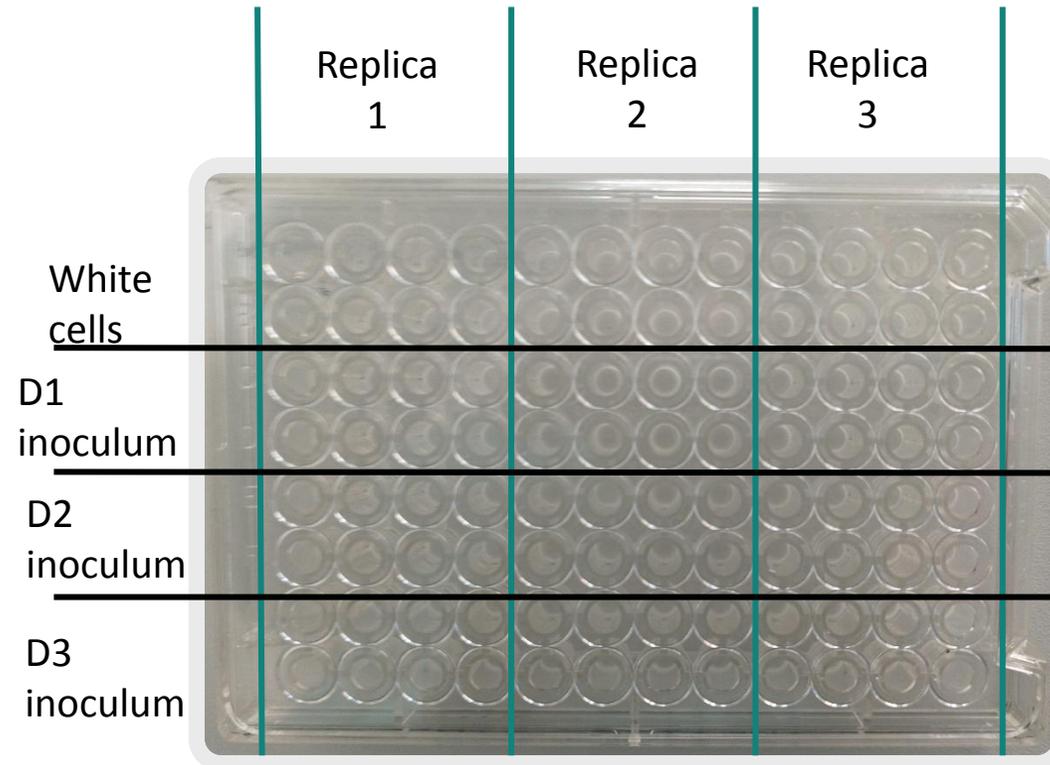
## Microbiological characterization

### TEST OF TOXICITY

#### Biolog MT2 Microplates

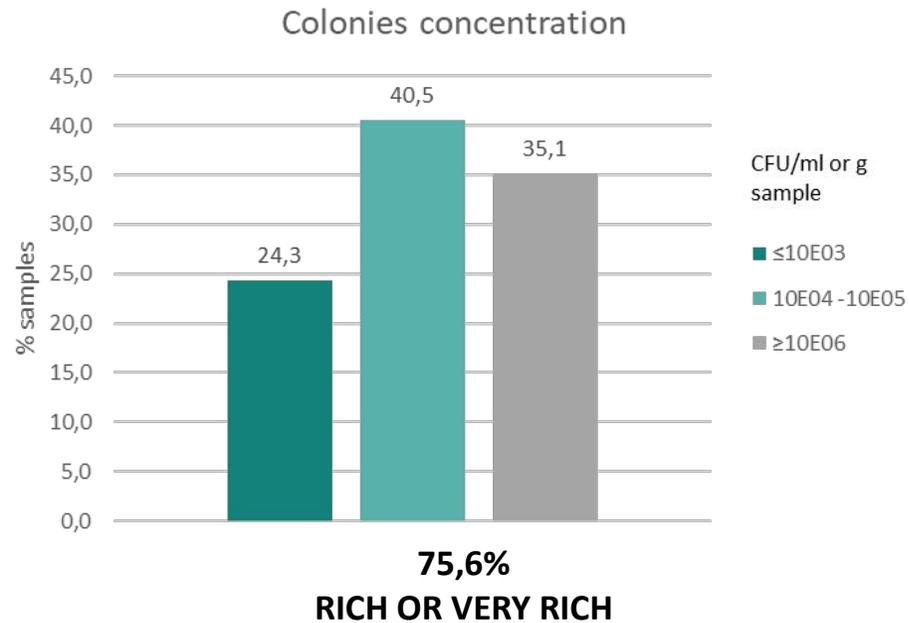
DANPL  
(1:1, 1:2, 1:5, 1:10, 1:25, 1:50, 1:100)

Dilution 1:1 □ 35000 ppb HCH

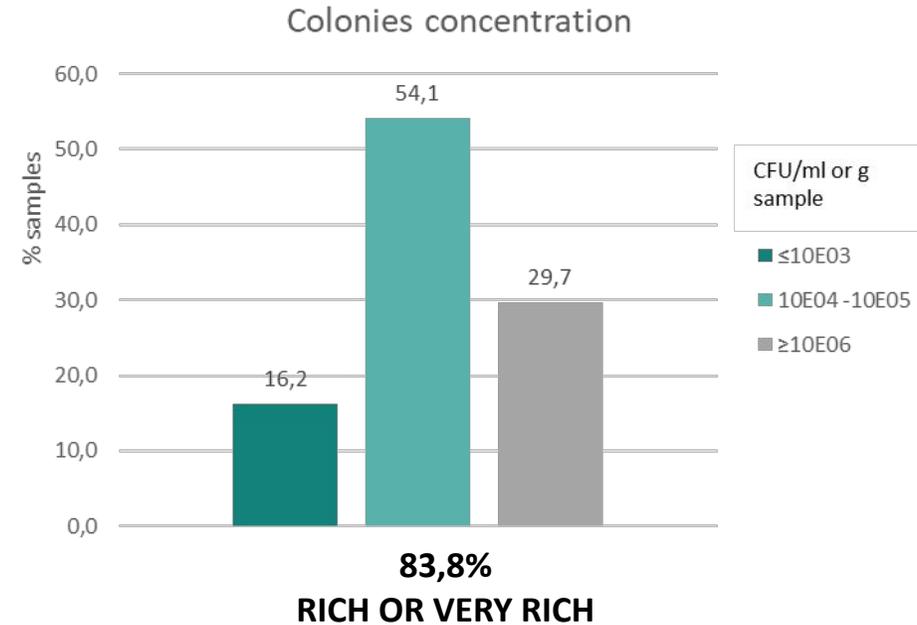


# RESULTS

## Total cultivable biomass



## Cultivable specialized biomass



Low results: water samples (9/37).

Highest results: vegetation samples.

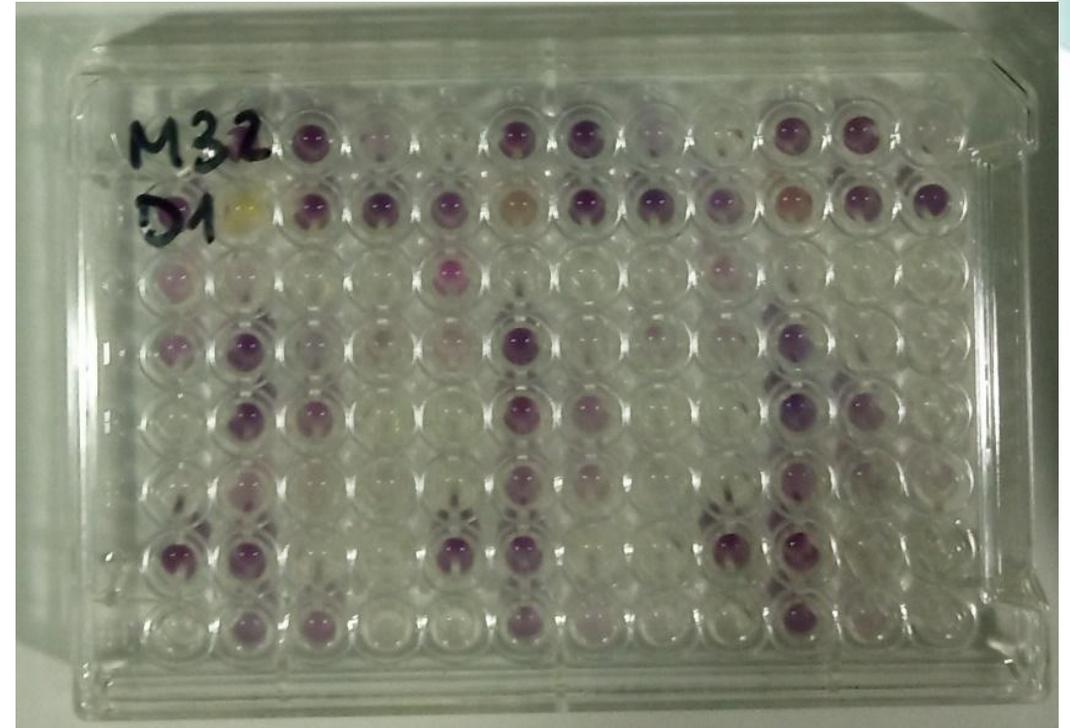
38% of samples have more UFC in restrictive medium than in general medium.

# RESULTS

## Community parameters

**Biolog EcoPlate** □ Just 3/37 samples have low metabolic activity. AWCD < 0,25 UA

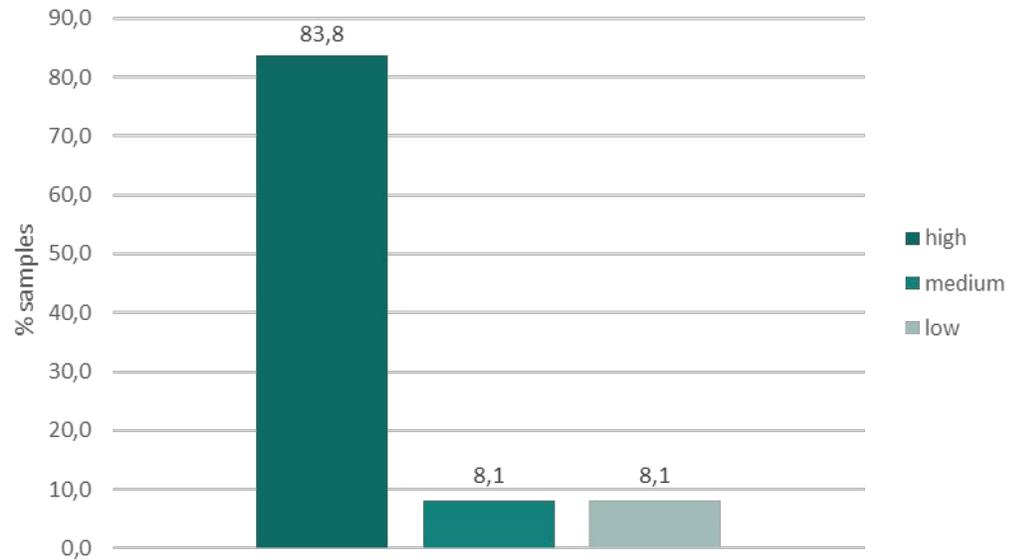
**Latency time:** 12-46 h. Less than 24 h in 76% of samples.



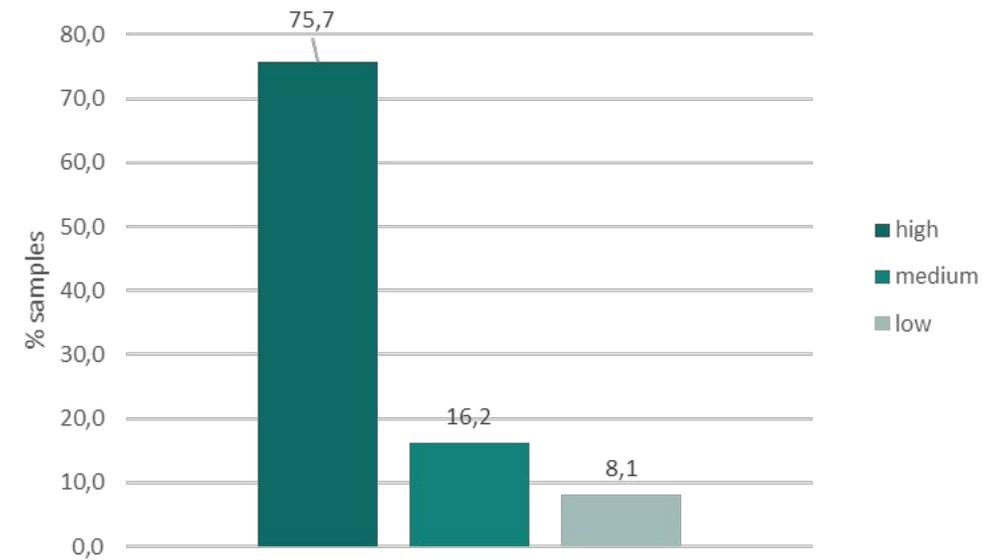
# RESULTS

## Community parameters: Diversity

### Shannon Diversity Index



### Simpson Diversity Index



Shannon Evenness Index:  $0,96 \pm 0,013$

# RESULTS

## Toxicity test

Metabolic activity in MT2 lower than in EcoPlate

- **Inquinosa:** 6/8 samples with significant metabolic activity.
- **Sardas:** 4/29.

### BEST RESULTS IN TOXICITY TEST

M19 INQUINOSA, S-21 BOREHOLE

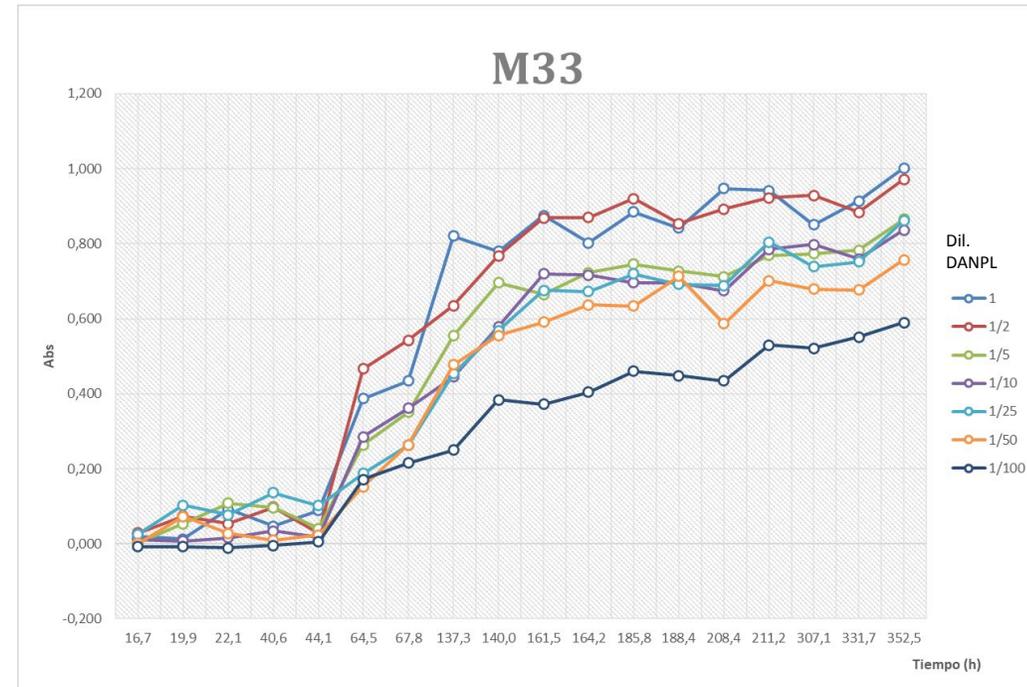
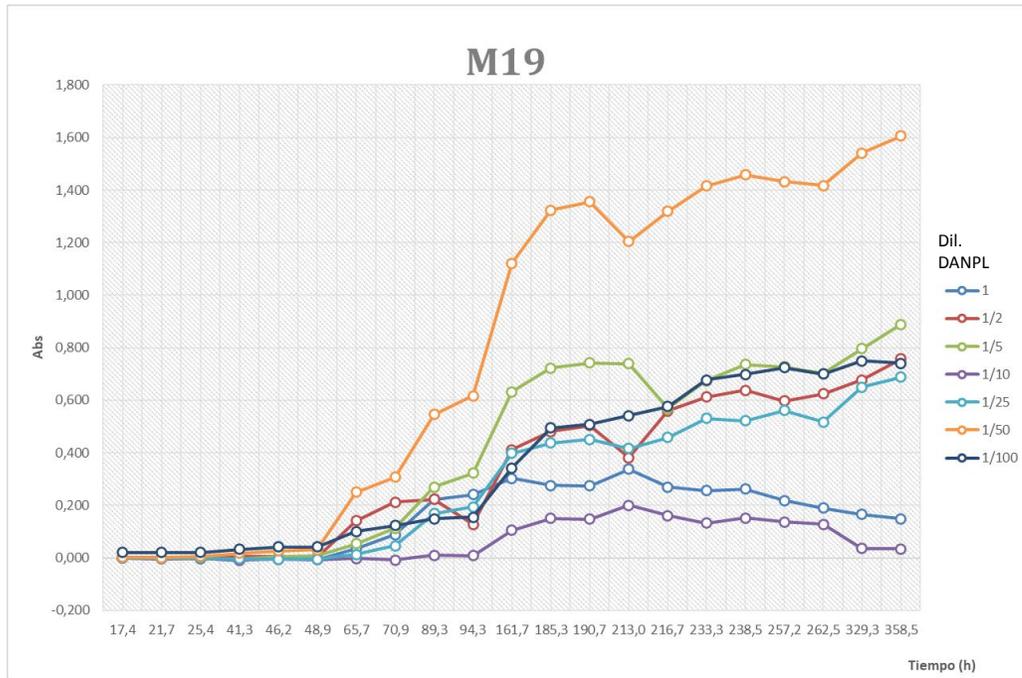


M33 SARDAS, ROOTS of *Phragmites sp.*



# RESULTS

## Toxicity test



- AWCD MT2 and AWCD EcoPlate very similar.
- M19 highest metabolic activity □ Max activity dil. 1:50.
- M33 highest toxicity resistance. Max activity dil: 1:1.

# CONCLUSIONS

- Good adaptation to environmental conditions.
- High diversity and density values.
- Restrictive culture medium: no competence, high growth.
- Good metabolic activity.
  
- M19 y M33 inoculums.

**BIOESTIMULATION**

**BIOAUMENTATION**



# THANKS FOR YOUR ATENTION

[egranados@emgrisa.es](mailto:egranados@emgrisa.es)

<https://www.emgrisa.es/>

