

# Biodegradation of Bisphenol A and Bisphenol S by *Labrys portucalensis* strain F11

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## Scope and Aims

The possible effects of Bisphenol A (BPA) on human health have been increasingly commented on especially as an endocrine disruptor, which has led to some attempts to remove it from some consumer products, often labeled as "BPA-free". However, some of the common replacers are also bisphenols (BPs), such as Bisphenol S (BPS) which may have similar physiological effects in organisms<sup>[1]</sup>. Traces of BPA can reach the environment through inadequate or inefficient removal during wastewater treatment. From the different techniques to remove BPs, biodegradation seems to be the most effective<sup>[2]</sup>. *Labrys portucalensis* strain F11 is a bacterium that has been isolated from an industrially contaminated area and has been shown to degrade a variety of pharmaceuticals and aromatic compounds<sup>[3]</sup>.

**The main aim of the present was to evaluate the ability of the bacterial strain *Labrys portucalensis* F11 to biodegrade BPA and BPS in synthetic mineral medium (MM) and also in a real municipal wastewater.**

## Methodology

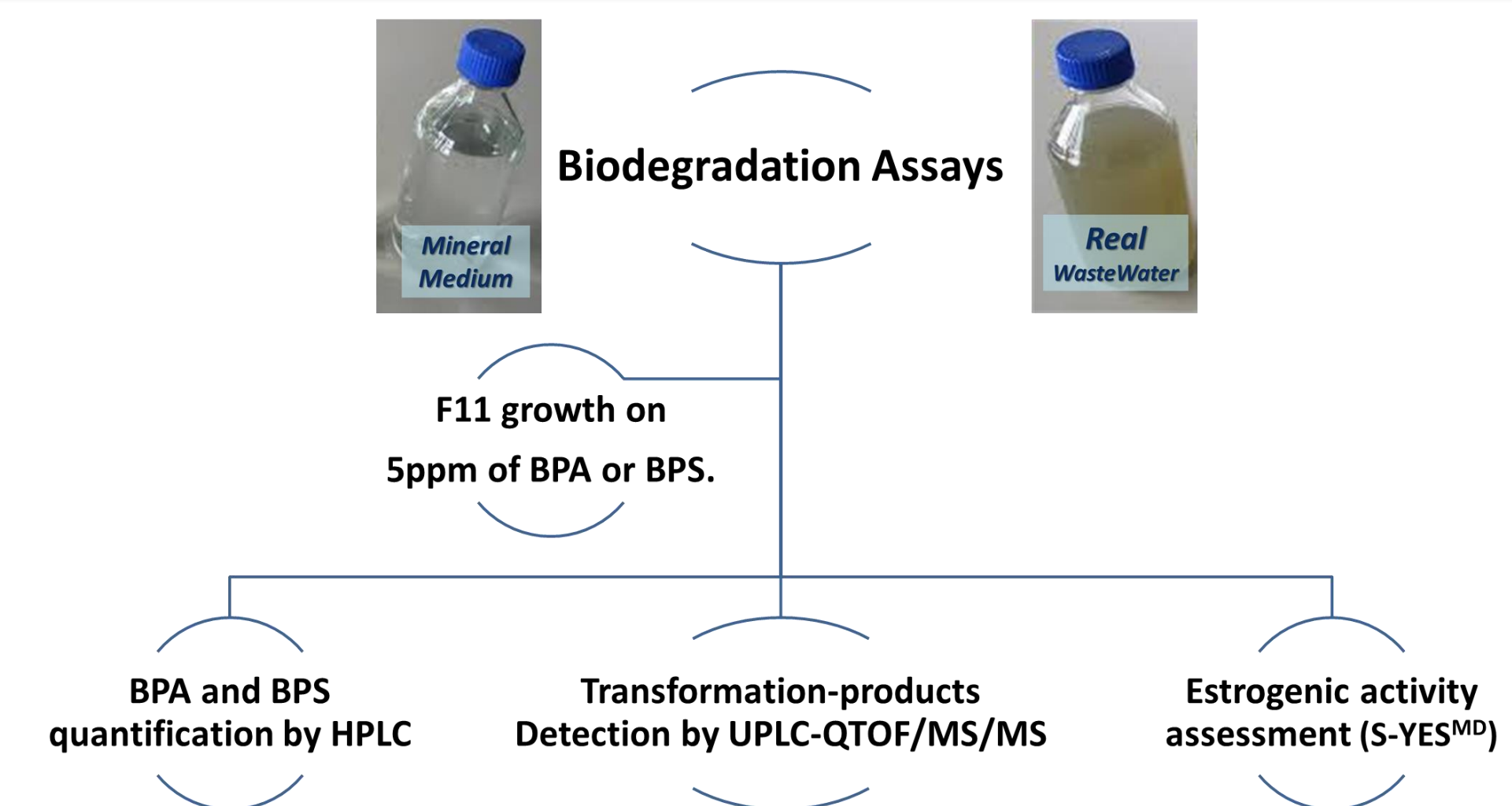


Fig 1. Experimental procedure scheme. (S-YES<sup>MP</sup> commercial test kit from New Diagnostics)

## Results

### Degradation of BPA and BPS by *L. portucalensis* F11 in Mineral Medium supplemented with 5ppm of Bisphenol

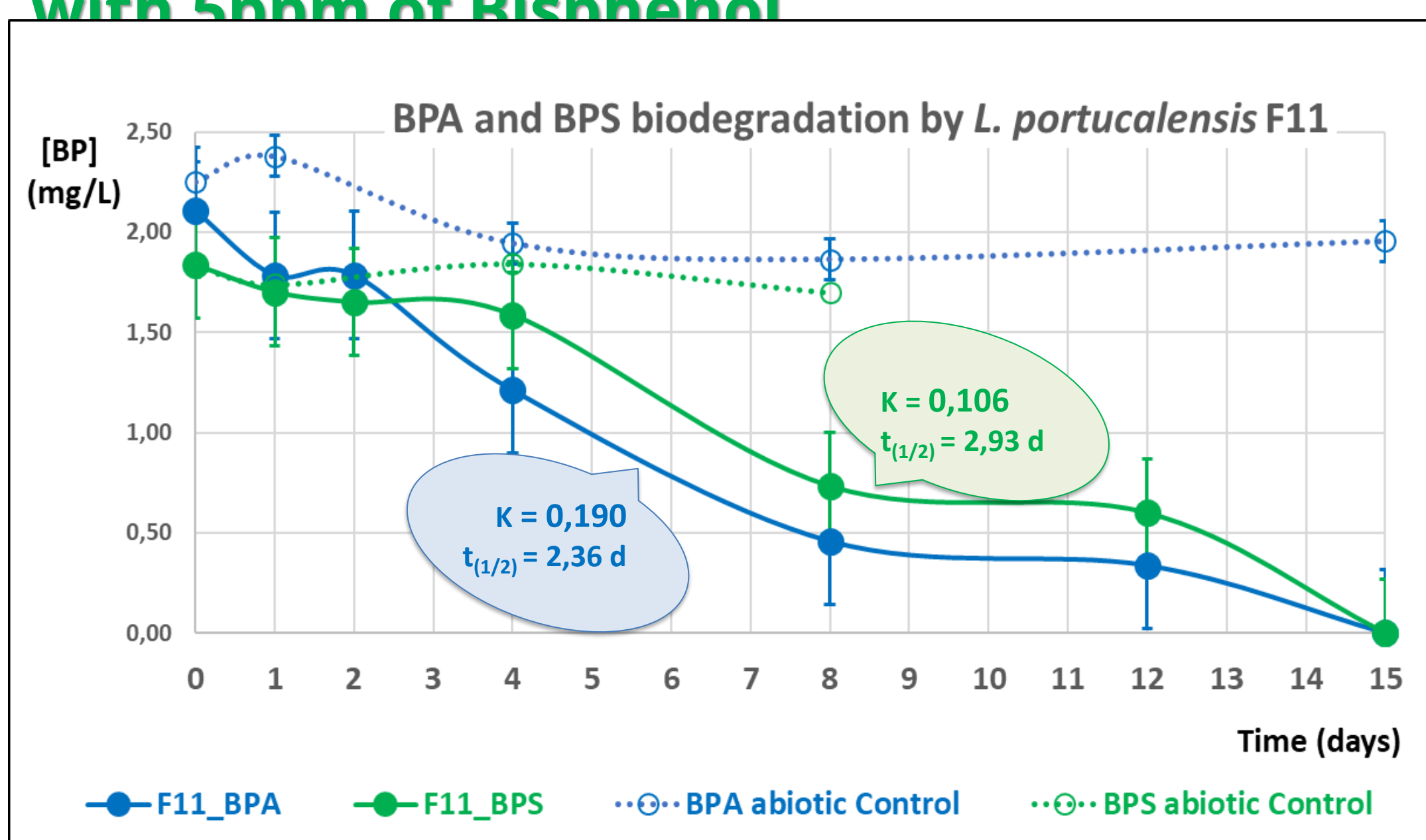


Fig 2. Bisphenol A and Bisphenol S biodegradation by *Labrys portucalensis* F11 in Mineral Medium supplemented with 5,9mM acetate and 5ppm of BPA or BPS.

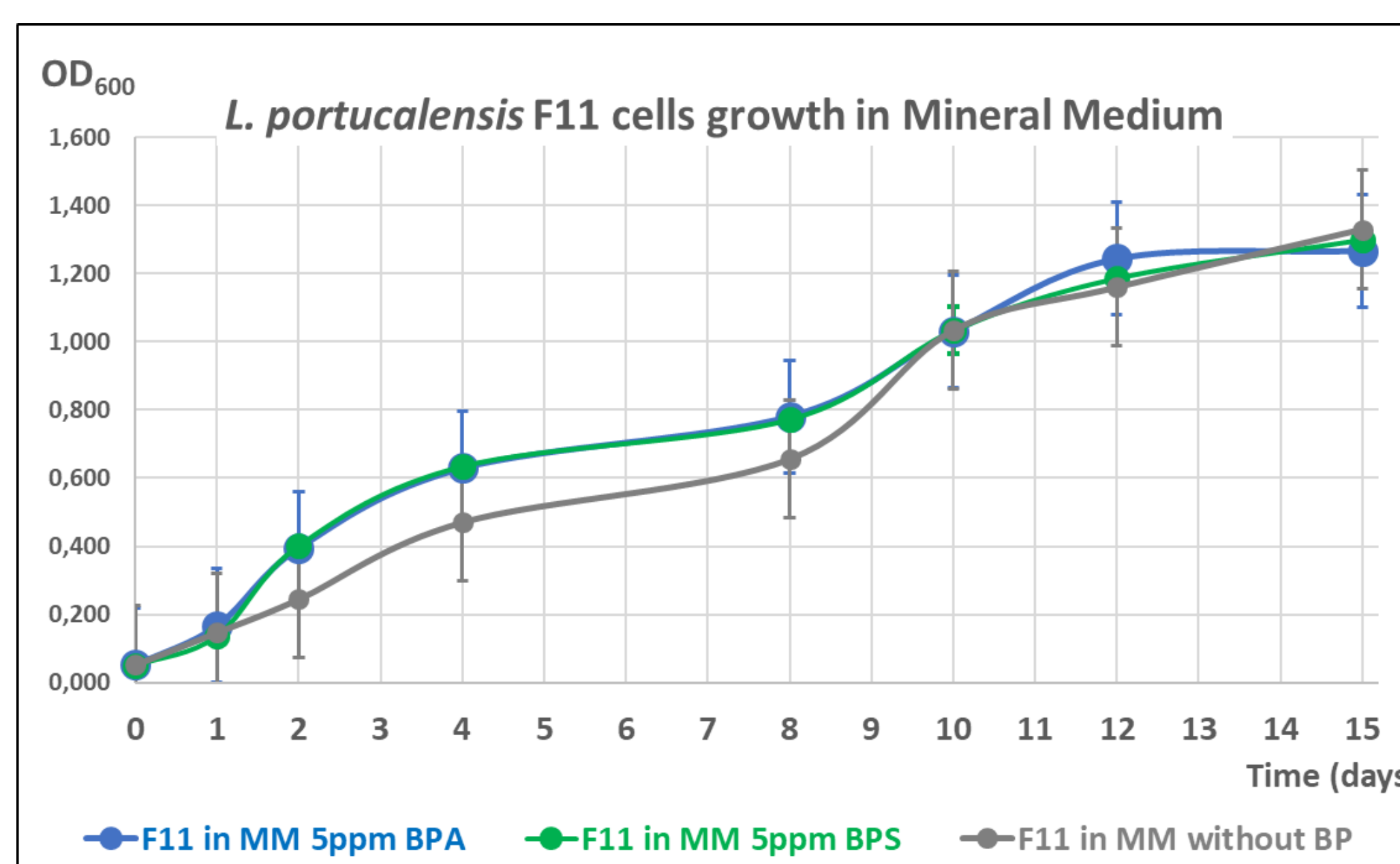


Fig 3. *Labrys portucalensis* F11 cells growth in Mineral Medium supplemented with 5,9mM of acetate and 5ppm of BPA or BPS.

### Estrogenicity

Table 1. Estrogenic Activity Results.

Assay	Sample	E.A. [4]	R.E.A. (%) [4]
Mineral Medium Matrix	Mineral Medium	0,274	2,69%
	TO MM 5ppm BPA	3,627	95,76%
	Tf F11 BPA	0,305	3,54%
	Tf Cabiocic BPA	3,635	96,00%
	TO MM 5ppm BPS	0,177	0,00%
WasteWater Real Matrix	WasteWater	0,604	11,84%
	TO WW 5ppm BPA	3,322	87,31%
	Tf (WW + F11) BPA	0,078	0,00%
	Tf WW BPA	0,104	0,00%
	Tf Cabiocic BPA	3,552	93,70%
WasteWater Real Matrix	TO WW 5ppm BPS	0,623	12,37%
	Tf (WW + F11) BPS	0,102	0,00%
	TF WW BPS	0,185	0,21%
	Tf Cabiocic BPS	0,175	0,00%

E.A. Estrogenic Activity and R. E. A. (%) Relative Estrogenic Activity were calculated based on (Bistan et al., 2012).

### Degradation of BPA and BPS by *L. portucalensis* F11 in Wastewater supplemented with 5ppm of Bisphenol

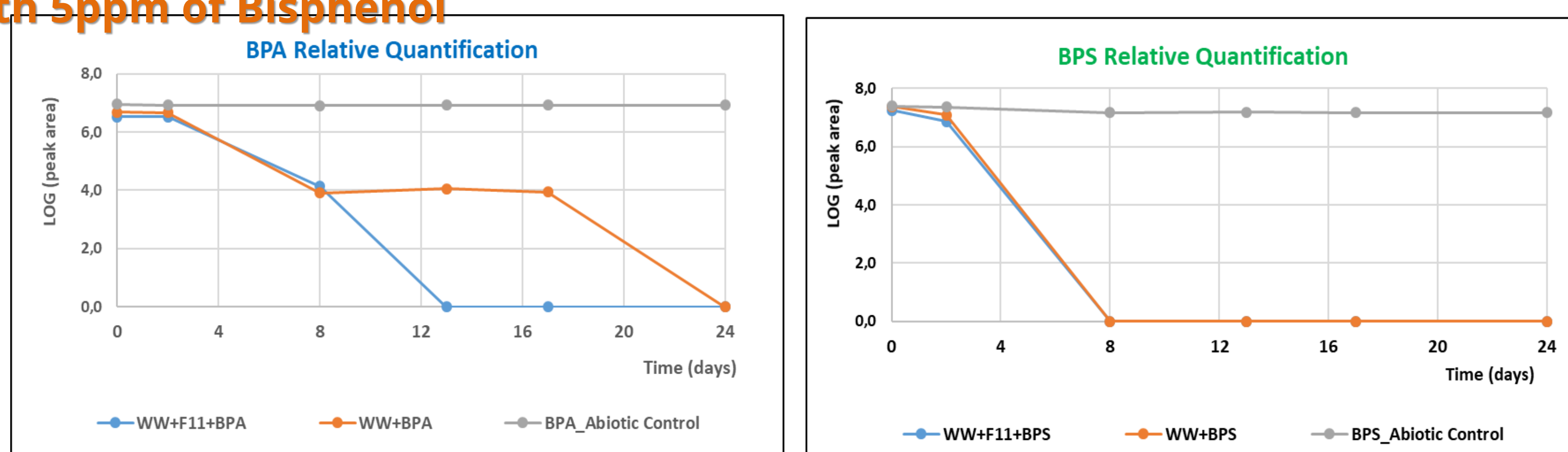


Fig 4. Bisphenol A and Bisphenol S biodegradation by *L. portucalensis* F11 in Wastewater.

#### In Mineral medium

- BPS shows no estrogenic activity in MM
- *L. portucalensis* F11 decrease BPA estrogenicity by ca. 92%

#### In Wastewater

- *L. portucalensis* F11 removed estrogenicity of BPA

## Conclusions

- ✓ In **mineral medium** with acetate, *L. portucalensis* F11 was able to **full degrade 5 ppm of BPA or BPS in 15 days** at room temperature.
- ✓ In **real wastewater** matrix:
  - BPA was fully removed in samples **with *L. portucalensis* F11 cells in 13 days**, 17 days before the samples without strain F11,
  - BPS was fully removed in **8 days** in samples with and without F11 strain.
- ✓ BPS shows **no significant estrogenicity**.
- ✓ Biodegradation products of BPA biodegradation by F11 strain **have ≈ 90% less estrogenic activity**.

➢ *Labrys portucalensis* F11 evidence the ability to **degrade BPA and BPS**.

➢ To the best of our knowledge, this is the **first report of BPS complete degradation** by a **single bacterial strain** isolated from the

### References:

- [1] Rochester JR & Bolden AL. *Environ Health Perspect.* 2015  
 [2] Noszczyńska M & Piotrowska-Sieget Z. *Chemosphere.* 2018  
 [3] Moreira IS et al. *Biodegradation.* 2012  
 [4] Bistan et al. *Food Technol. Biotechnol.* 2012

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