

# TOXICOLOGICAL RESPONSE AND DEGRADATION CAPACITY OF TWO GREEN MICROALGAE, UPON EXPOSURE TO SELECTED ORGANIC POLLUTANTS



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## INTRODUCTION

Organic compounds represent one group of the most ubiquitous environmental pollutants – owing namely to their widespread use as fungicides and solvents, and affect both soil and groundwater. Given the ecological positioning of microalgae – at the base of most aquatic food webs, and hence critical to many ecosystems, studies on the toxicological response of microalgal cells are in order.

In our research effort, two green microalga species - *Scenedesmus obliquus* and *Scenedesmus pleiomorphus*, previously isolated from a stream nearby an industry-intensive region in Northern Portugal, were exposed to 50 ppm of each of eight pollutants for periods of up to 8 d, to test their growth response and degradation capacity.

## MATERIALS and METHODS

### Pollutants:

Phenol

4-Fluorophenol (FP)

2,4-Difluorophenol (DiFP)

2-Fluorobenzoate (FB)

2-Chlorophenol (CP)

2,4-Dichlorophenol (DiCP)

4-Nitrophenol (NP)

2,4-Dinitrophenol (DiNP)



*Sc. obliquus* and *Sc. pleiomorphus*

300 mL- batch cultures

25±1°C; 24h light

[Initial Pollutant]= 50 ppm

20 mL- samples taken for 8 d

centrifuged at 4000 rpm, 15 min, 4°C

Growth monitoring via O.D. (600 nm)

Removal and biodegradation via HPLC

## RESULTS AND DISCUSSION

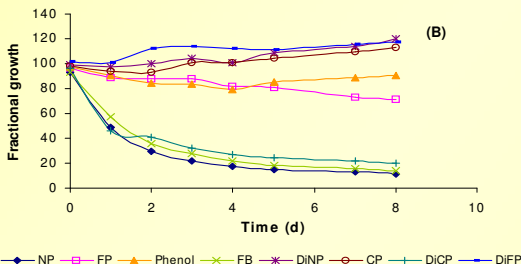
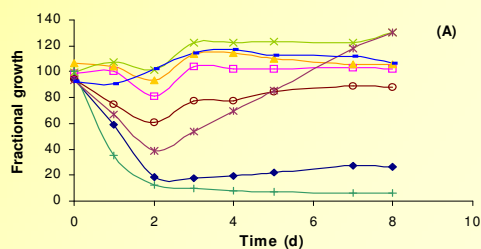


Fig. 1: Fractional growth of *Sc. obliquus* (A) and *Sc. pleiomorphus* (B), in the presence of each pollutant, represented as percentage of control

Only 4-nitrophenol and 2,4-dichlorophenol were toxic to both microalgae, whereas 2-fluorobenzoate inhibited growth of only *Sc. pleiomorphus* (Fig. 1).

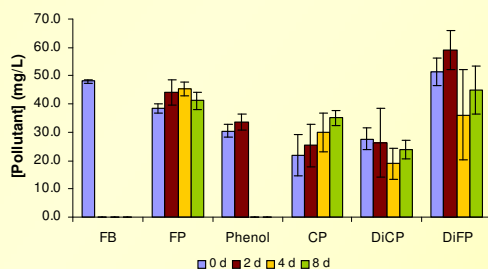


Fig. 2: Degradation of organic pollutants by *Sc. obliquus*, at selected sampling times

Both phenol and 2-fluorobenzoate were biodegraded by *Sc. obliquus* (Fig. 2), and the stoichiometric amount of F<sup>-</sup> released into the culture medium was consistent with removal of the latter (Fig. 3).

4-Nitrophenol and 2,4-dinitrophenol were not biodegraded by either microalga (data not shown).

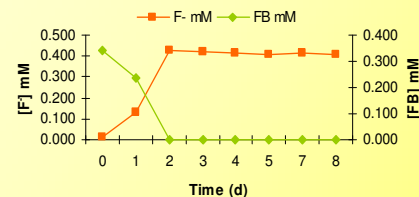


Fig. 3: Degradation of 50 ppm (0.343 mM) of 2-FB, as indicated by F<sup>-</sup> released and FB taken up

*Sc. pleiomorphus* could not degrade any of the organic pollutants tested.

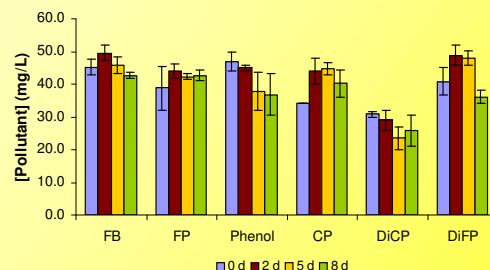


Fig. 4: Degradation of organic pollutants by *Sc. pleiomorphus*, at selected sampling times

## CONCLUSIONS

Only *Sc. obliquus* was able to biodegrade (two out of the eight) organic pollutants supplied (phenol and 2-fluorobenzoate).

Despite lack of inhibitory effect upon growth of said two microalgae, none of the other compounds were removed from the culture medium.

### Acknowledgments:

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