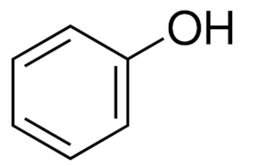
DETERMINATION OF ECOTOXICITY AND PHYTOTOXICITY OF PHENOL, RHODANIDE, AND CYANIDE

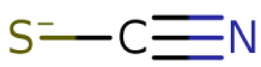
Ana Tutić[1], Pamela Bubaš[2], Donna Danijela Dragun[2], Leona Kuzmić[2], Lorenna Stanić[2], Martina Miloloža[2], Matija Cvetnić[2], Marinko Markić[2], Šime Ukić[2], Dajana Kučić Grgić[2]

[1]ASIO d.o.o., S. S. Kranjčevića 13, 31 326 Darda
[2]University of Zagreb Faculty of Chemical Engineering and Technology, Marulićev trg 19, 10 000 Zagreb

INTRODUCTION

- In recent years, emissions of industrial wastewater have increased considerably, leading to higher levels of pollutants in the environment.
- Phenol, rhodanide and cyanide are among the most common pollutants due to their extensive industrial use.
- The presence of these compounds in water bodies can lead to severe ecotoxicity and phytotoxicity, affecting both aquatic life and plant health.





In this work, the ecotoxicity of phenol, rhodanide and cyanide was tested on the marine bacterium *Vibrio fischeri*, the microalgae *Chlorella* sp., the bacterium *Pseudomonas putida*, and onion seeds *Allium cepa*.

MATERIALS & METHODS

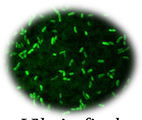
Phenol

Cyanide

Rhodanide

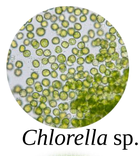
Preparation of solutions of phenol, cyanide, and rhodanide

The concentrations of the substances were: 1 mg/L, 10 mg/L, 25 mg/L, 50 mg/L, 75 mg/L, and 100 mg/L.



Vibrio fischeri

Pseudomonas putida



Chlorella sp.

Allium cepa

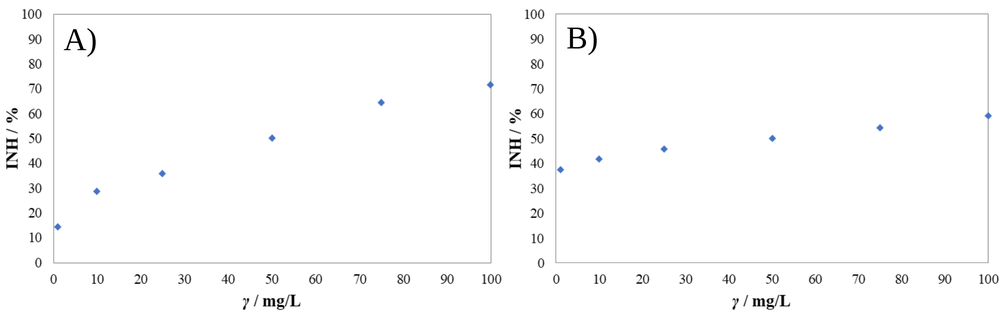
- Exposure time was 30 min
- Inhibition of bioluminiscence was monitored

- Exposure time was 72 h
- Inhibition of bacterial growth was determined

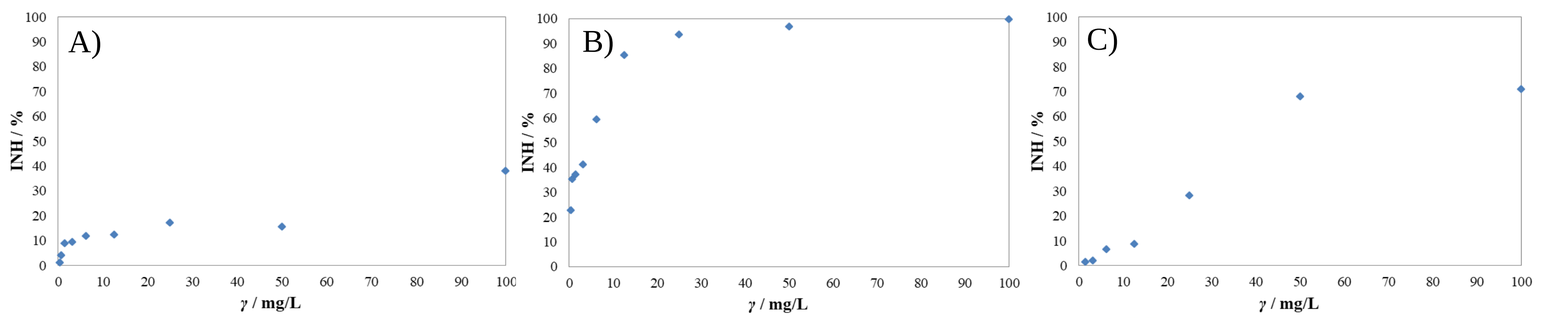
- Exposure time was 72 h
- Inhibition of growth of microalga was monitored

- Exposure time was 21 days
- Inhibition of growth of onion was determined

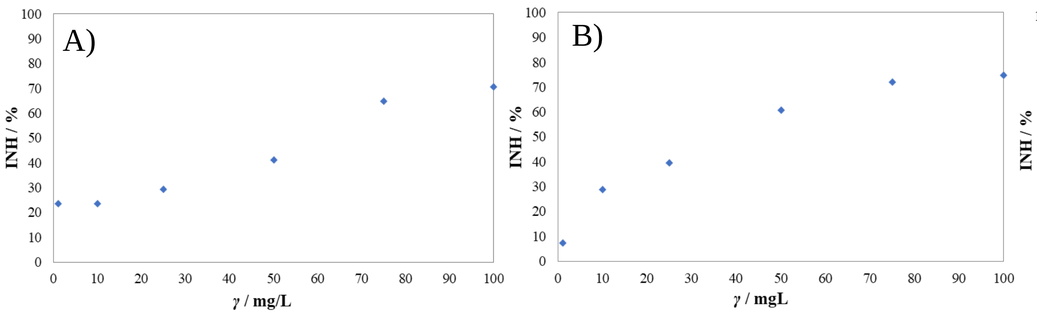
RESULTS



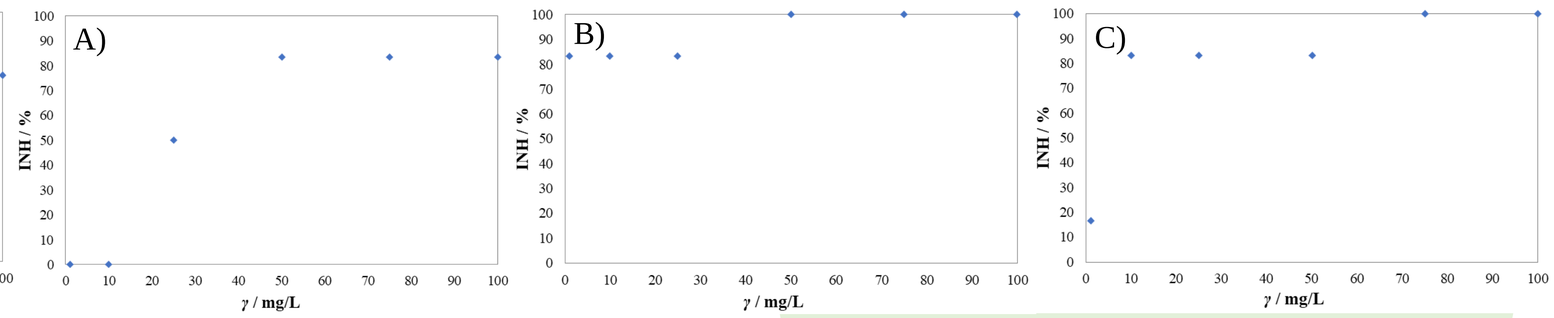
Inhibition of: A) *Chlorella* sp., B) *P. putida* growth after 72 h of exposure to concentrations of rhodanide in range 1 – 100 mg/L.



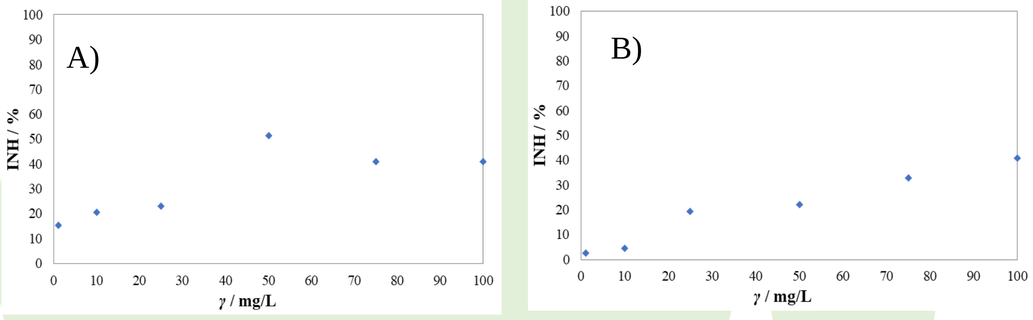
Inhibition of bioluminiscence of *Vibrio fischeri* after 30 min of exposure to concentrations of A) rhodanide, B) cyanide, and C) phenol in range 1 – 100 mg/L.



Inhibition of: A) *Chlorella* sp., B) *P. putida* growth after 72 h of exposure to concentrations of cyanide in range 1 – 100 mg/L.



Inhibition of *Allium cepa* growth after 21 days of exposure to concentrations of A) rhodanide, B) cyanide, and C) phenol in range 1 – 100 mg/L.



Inhibition of: A) *Chlorella* sp., B) *P. putida* growth after 72 h of exposure to concentrations of phenol in range 1 – 100 mg/L.

CONCLUSIONS

- The highest growth inhibition of the microalgae *Chlorella* sp. by phenol after 72 hours was 51.28%, while it was 40.49% for the bacterium *Pseudomonas putida*.
- The bacterium *Vibrio fischeri* showed the highest sensitivity with a bioluminescence inhibition of 99.81% at the highest cyanide concentration.
- The highest growth inhibition of *Pseudomonas putida* by rhodanide after 72 hours was 59.17%, while it was 71.43% for *Chlorella* sp.
- In the test with cyanide, the highest growth inhibition of *Pseudomonas putida* after 72 hours was 74.77% at a concentration of 100 mg/L, while for *Chlorella* sp. it was 70.59%.
- Cyanide proved to be the most toxic for onion seeds *Allium cepa* (INH = 100.00%).
- It can be concluded that all tested compounds are toxic to the tested organisms, although the organisms have different sensitivities. The microalgae *Chlorella* sp. showed a higher sensitivity to rhodanide and cyanide, while *Pseudomonas putida* and *Vibrio fischeri* were the most sensitive to cyanide.