



21-22 November, 2024

## ECOTOXICOLOGICAL EFFECTS OF COPPER AND MANGANESE COMPOUNDS ON BIOCHEMICAL PARAMETERS IN *LEMNA MINOR*

AGACHI Bianca-Vanesa<sup>1</sup>, VULPE Constantina Bianca<sup>2</sup>, ROMAN Diana-Larisa<sup>1</sup>

<sup>1</sup> Department of Biology, Faculty of Chemistry, Biology, Geography & Advanced Environmental Research Laboratories, West University of Timisoara, 16 Pestalozzi & 4 Oituz, 300115 & 300086 Timisoara, Romania

<sup>2</sup> Department of Chemistry-Biology, Institute for Advanced Environmental Research, West University of Timisoara, Oituz 4C, 300086 Timisoara, Romania

**Abstract:** Heavy metals are possible aquatic contaminants that are frequently used in a variety of industries. Copper and manganese are heavy metals whose ecotoxicological impacts on aquatic ecosystems must be identified. This study examined the ecotoxicological effects of copper and manganese chlorides and sulfates on various biochemical parameters of the aquatic plant common duckweed, *Lemna minor*. A growth inhibition test was conducted, followed by the preparation of two types of extracts. The biochemical parameters of interest were evaluated from these extracts, including chlorophyll content, reducing sugars and protein concentration, as well as the enzymatic activity of catalase and guaiacol peroxidase. The results highlighted that copper chloride and copper sulfate reduced chlorophyll content compared to manganese chloride and manganese sulfate. The concentration of reducing sugars was not strongly influenced by any tested compound. Protein concentration was low compared to the negative control at the higher tested concentrations of copper chloride and sulfate and manganese sulfate. Catalase activity was decreased at all tested concentrations of copper chloride, while the other three tested compounds reduced catalase activity at the higher tested concentrations. Enzymatic activity was reduced by the highest tested concentration of the four compounds of interest regarding guaiacol peroxidase, with copper chloride also reducing enzymatic activity at the lower tested concentrations. These results emphasize a potential ecotoxic effect of copper and manganese chloride and sulfate on *Lemna minor* plants, effects reflected in some biochemical parameters.

### • Introduction

Heavy metals are commonly employed in many different industries and may be aquatic contaminants.

It is necessary to determine the ecotoxicological effects of heavy metals like copper and manganese on aquatic environments.

### • Results and discussions

The results highlighted that copper chloride and copper sulfate reduced chlorophyll content compared to manganese chloride and manganese sulfate (**Fig. 1**).

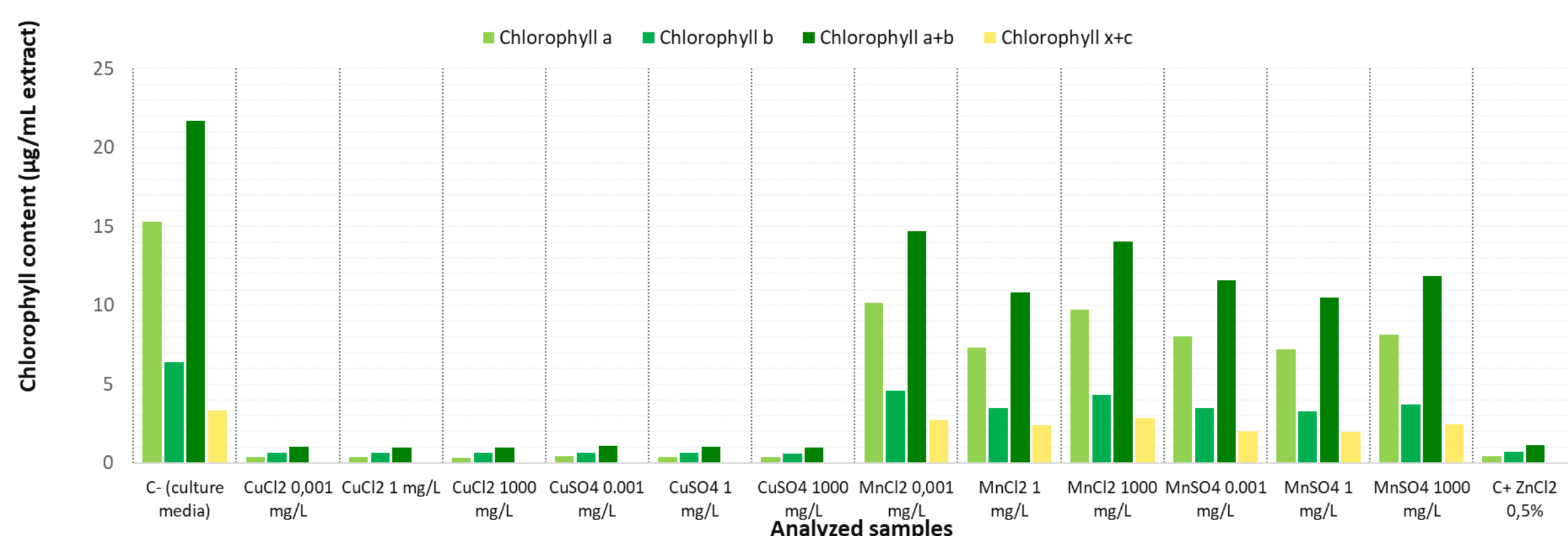


**Fig. 1.** Chlorophyll content of analyzed samples

Protein concentration was low compared to the negative control at the higher tested concentrations of copper chloride and sulfate and manganese sulfate (**Fig. 3**).

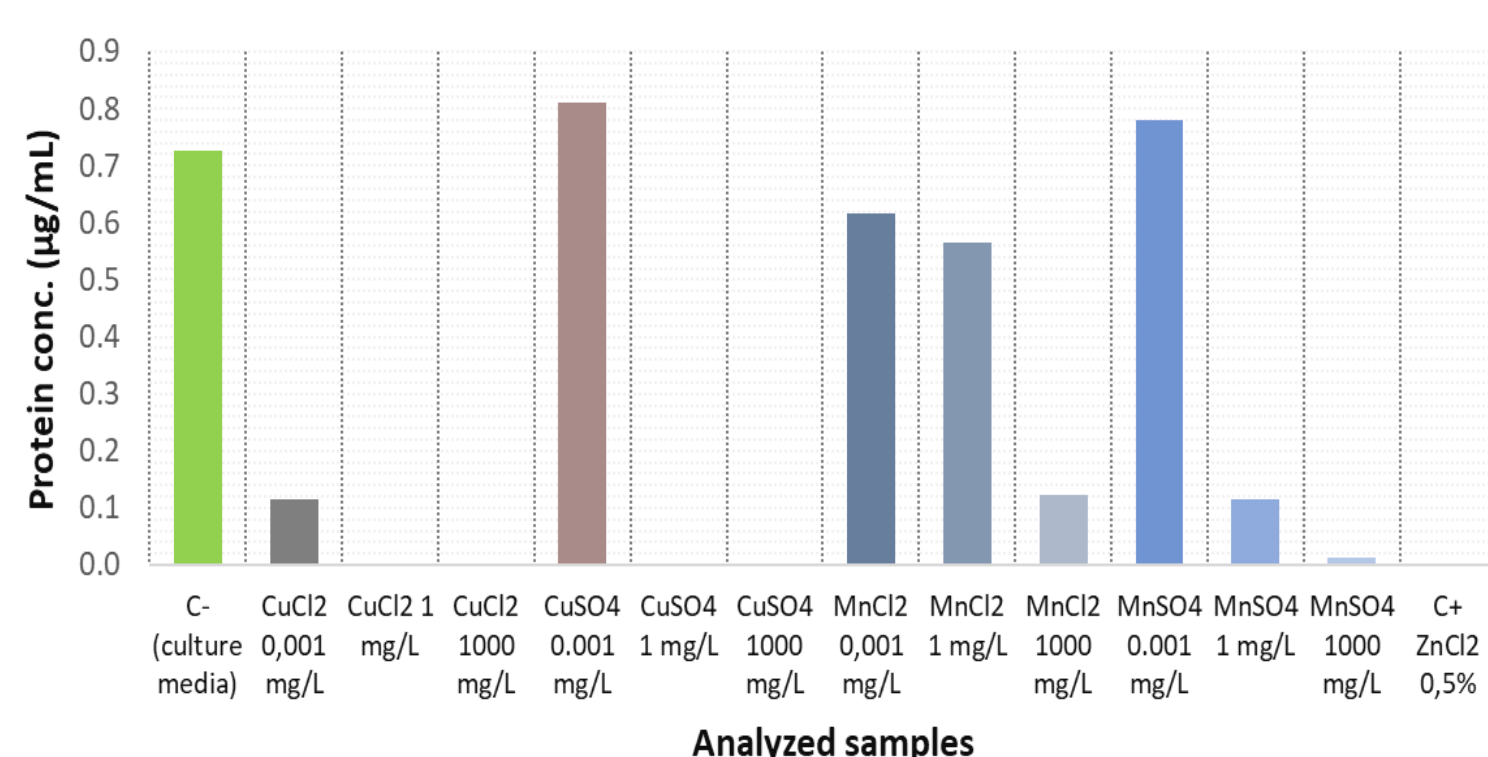


**Fig. 3.** Protein concentration of analyzed samples

### • Material and method

- a duckweed growth inhibition test was carried out by exposure to two salts of Cu and Mn, namely chloride and sulphate, at three concentrations each
- the plants obtained at the end of the test were used to obtain two types of extracts necessary for the determination of biochemical parameters such as:
  - Chlorophyll content
  - Reducing sugars concentration
  - Protein concentration
  - Catalase activity
  - Guaiacol peroxidase activity

The concentration of reducing sugars was not strongly influenced by any tested compound (**Fig. 2**).

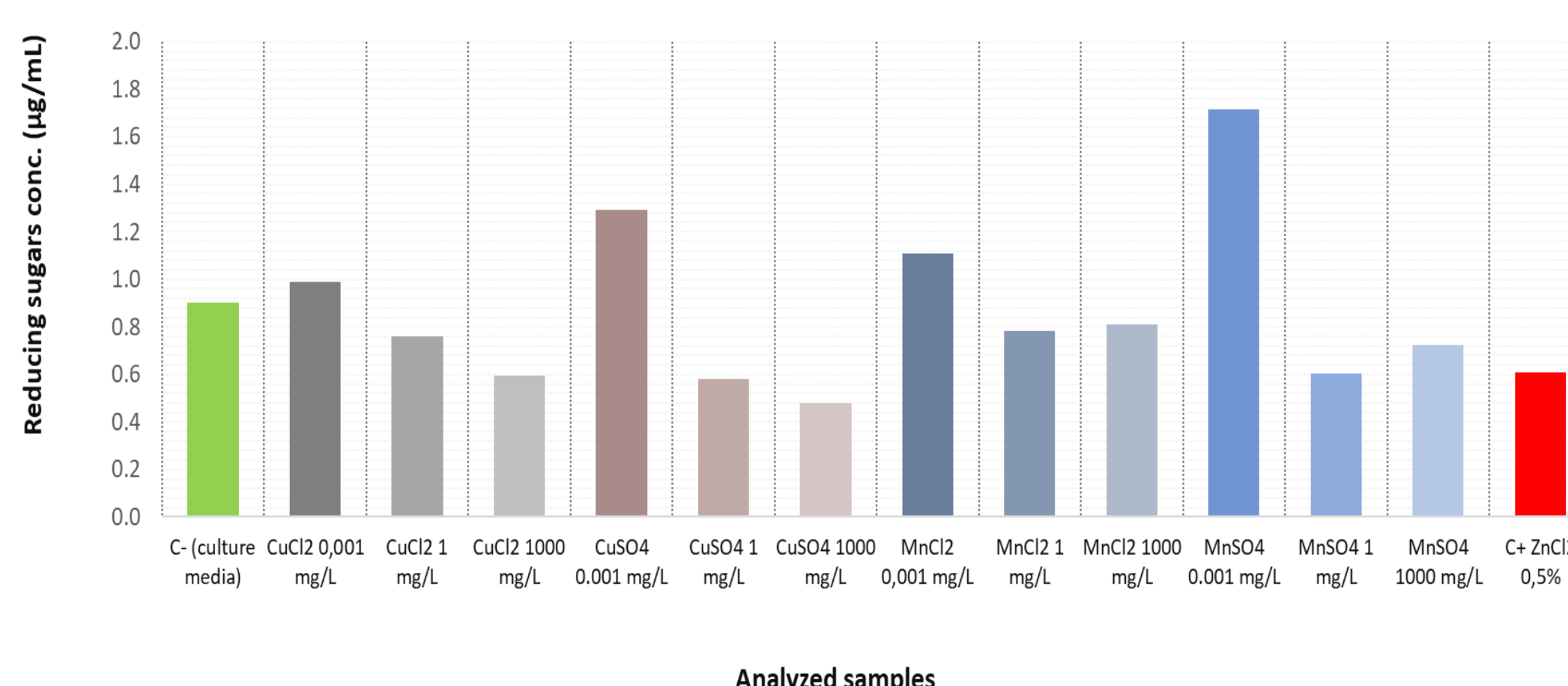


**Fig. 2.** Reducing sugars concentration of analyzed samples

Catalase activity was decreased at all tested concentrations of copper chloride, while the other three tested compounds reduced catalase activity at the higher tested concentrations (**Fig. 4**).

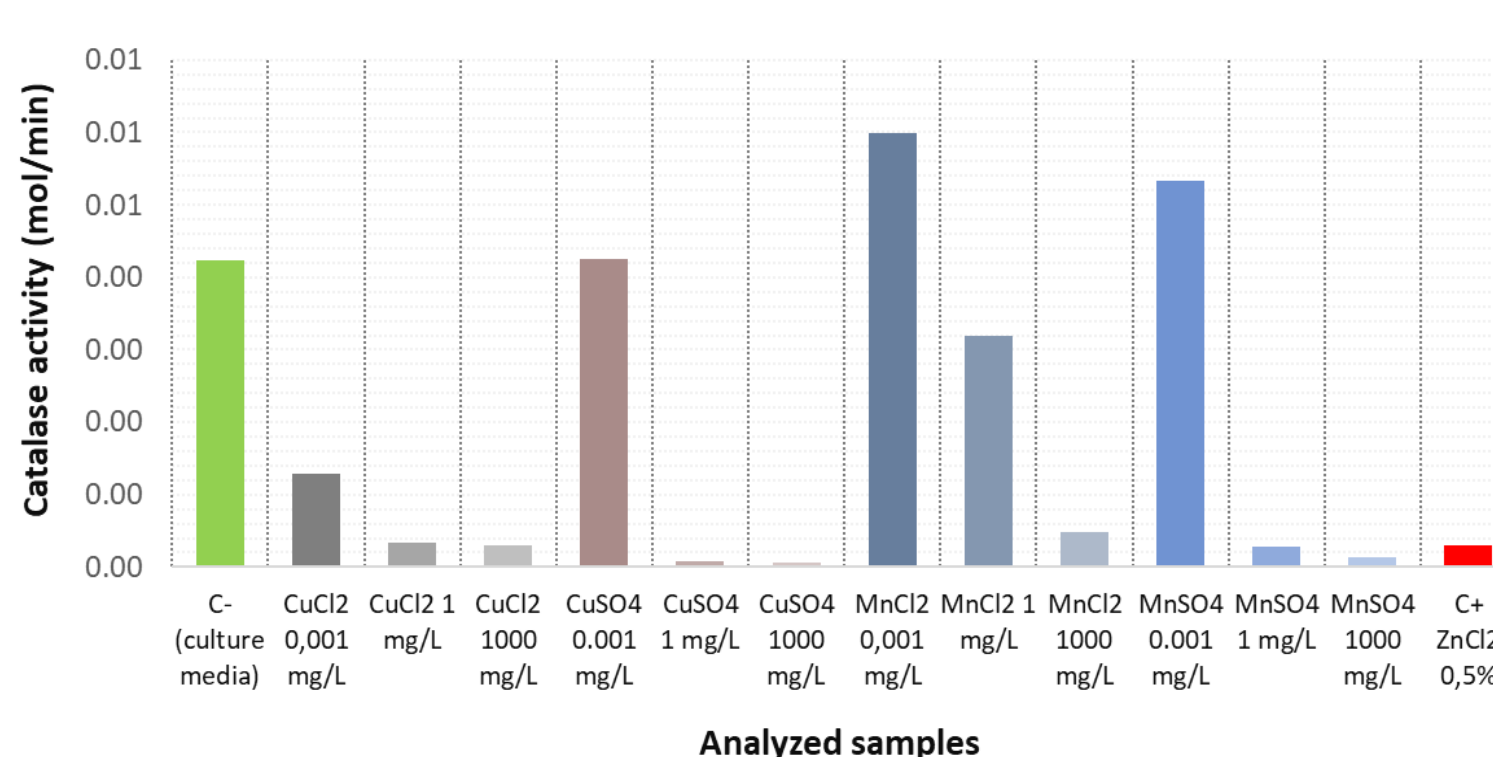


**Fig. 4.** Catalase activity of analyzed samples

Enzymatic activity was reduced by the highest tested concentration of the four compounds of interest regarding guaiacol peroxidase, with copper chloride also reducing enzymatic activity at the lower tested concentrations (**Fig. 5**).

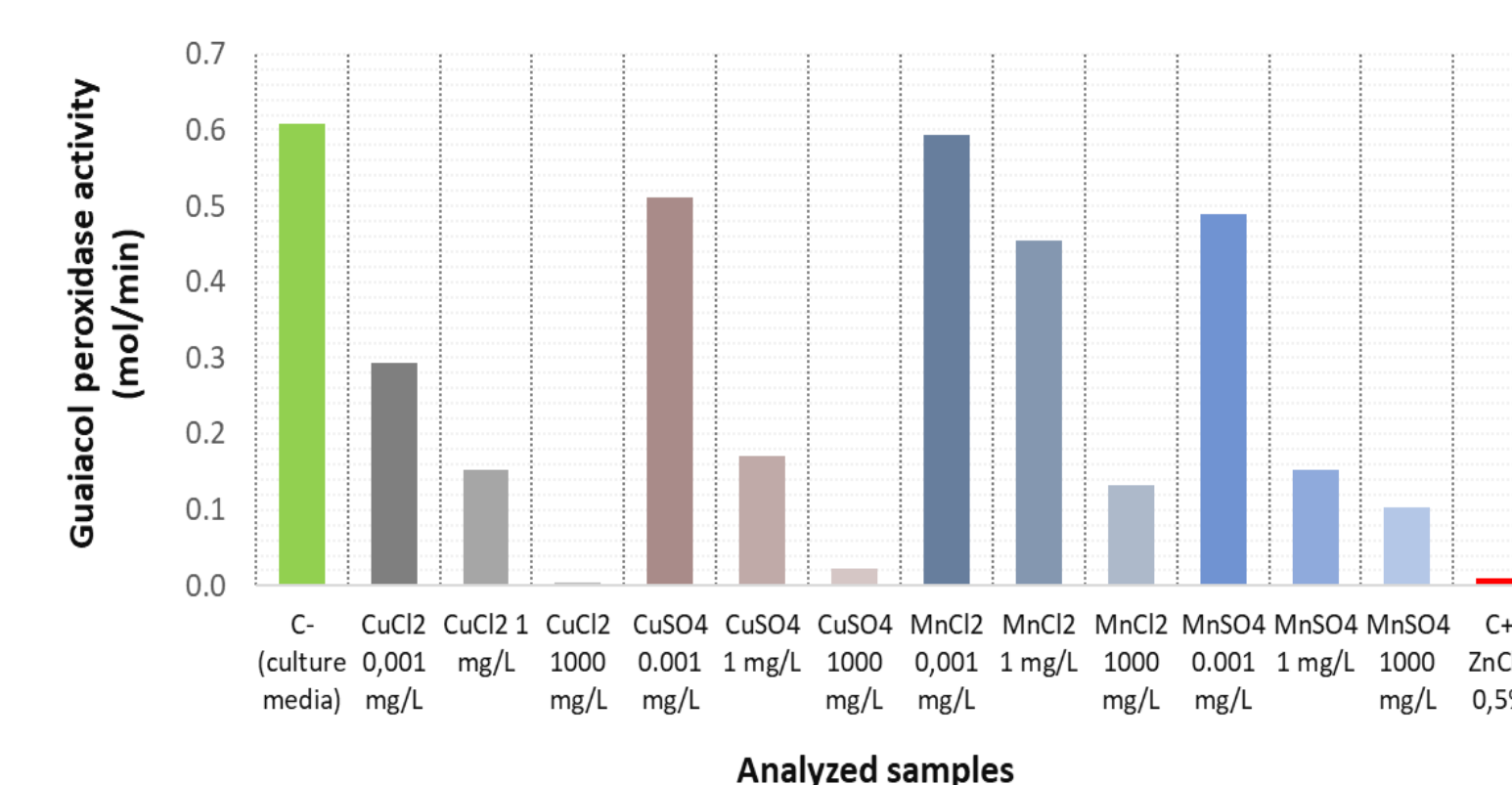


**Fig. 5.** Guaiacol peroxidase activity of analyzed samples

### • Conclusions

These results emphasize a potential ecotoxic effect of copper and manganese chloride and sulfate on *Lemna minor* plants, effects reflected in some biochemical parameters.