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THE ABILITY OF Chlorella sp. ON REDUCING Zn CONCENTRATION OF SWEATER IN LABORATORY

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ABSTRACT

Research on the use of Chlorella sp. on reducing of Zn concentrations was conducted in order to know Zn concentration which is maximally absorbed by Chlorella sp.

In the preliminary experiment, there was the range of Zn concentration that caused the highest population growth of Chlorella sp. was 0.1 – 0.4 ppm. In the main experiment, it was divided into five concentrations and one control with three replications. Each of concentrations was treated on Chlorella sp. culture with the first Zn concentration (0.0042 ppm) in the medium culture. Those concentrations were 0.05 ppm, 0.15 ppm, 0.35 ppm, 0.45 ppm. All of the concentrations were given on the day of 5. The density of cells which was used for each flask was 100,000 cells/ml. The fertilizers used for each flask were : ZA, Urea, TSP, $FeCl_3$, EDTA.

The result showed that there was an interaction between the population growth of Chlorella sp. and the reducing of Zn concentration. The highest population growth of Chlorella sp. was found in the treatment of 0.15 ppm Zn concentration.

Key words : Chlorella sp., Zn Concentration.

I. INTRODUCTION

Zn is used in lots of industries such as textile, soda colestic, electronic, and etc. If the industries discharge sewage without treatments, it will induce water pollution and will influence the living organism. But in a little amount, Zn is used as micronutrient for some aquatic organisms.

Chlorella sp. is one of the aquatic organisms (microalgae) which needs Zn as micronutrient for its growth. It can absorb and regulate Zn within their bodies (Darmono, 1995).

According to Wiessener (1962), Zn is the constituent of carbonic anhydrase enzyme which has a role in photosynthetic proscess. That is why, it is possible to use Chlorella sp. to reduce Zn on the wastewater before discharging to the river or to the sea.

The aim of this research is to know Zn concentration which is maximally

absorbed by Chlorella sp. Hopefully, it could be one of the alternatives in managing the wastewater which is contaminated by Zn.

II. METHODS

2.1. The Preliminary Experiment

The preliminary experiment was performed to find the range of Zn concentration which still can tolerated for the growth of Chlorella sp. Each of Zn concentrations was treated on Chlorella sp. culture with the first Zn concentration (0.0042 ppm) in the medium culture, on the day of 5 (phase exponential). The concentration were 0.1 ppm, 0.4 ppm, 0.7 ppm. The experiment was ended on the day of 10.

2.2. The Main Experiment

The range of Zn concentration which caused the highest population growth of Chlorella sp. in the preliminary experiment was 0.1 – 0.4 ppm. Then, it was divided into five concentrations and one control with three replications. The concentrations were 0.05 ppm, 0.15 ppm, 0.25 ppm, 0.35 ppm, 0.45 ppm. They were respectively given the Chlorella sp. Culture with the first Zn concentration (0.0042 ppm) in the medium culture on the day of 5 (phase exponential). Then, the experiment was ended on the day of 10.

2.3. Collecting And Analysing Data

The number of Chlorella sp. cell was counted using haemocytometer everyday. The Zn concentrations were analyzed using AAS at the beginning and at the end of treatments

Analysis of variance was calculated based on F test value, followed by LSD.

III. RESULT AND DISCUSSION

All of Zn concentrations treatment have a significant effect on the Chlorella sp. population. After the day of 5, 0.7042 ppm and 1.0042 ppm of Zn concentration showed the decreasing of population in a significant value (Fig. 1). In 0.4042 ppm concentration, the population growth of Chlorella sp. was normal, but the population was not as big as on the 0.0042 ppm (control) and 0.1042 ppm. The maximal population growth was found on the 0.1042 ppm concentration. The best range for the population growth of Chlorella sp. in the preliminary experiment was in between 0.1042 and 0.4042 ppm, so the concentrations in the main experiment were 0.0542 ppm, 0.1542 ppm, 0.2542 ppm, 0.3542 ppm, 0.4542 ppm, respectively.

From figure 2, it was shown that the maximal population growth on the 0.1542 ppm concentration. Above this concentration, Chlorella sp. could still grow, but the population decreased when the Zn concentration increased.

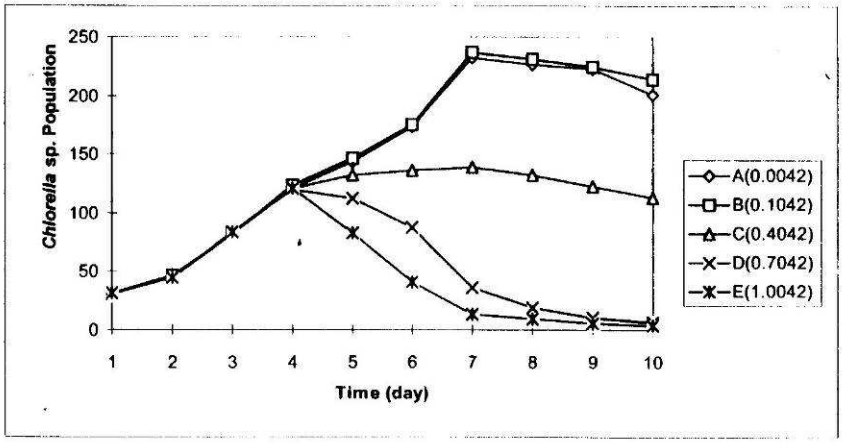

Figure 1. The population Growth of Chlorella sp. in The Preliminary Experiment

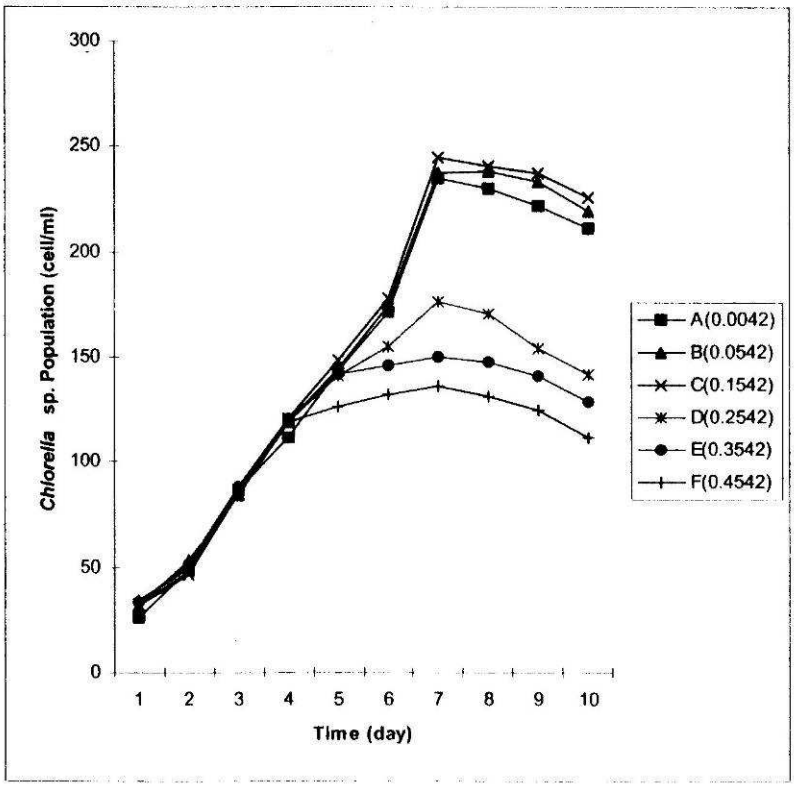

Figure 2. Population Growth of Chlorella sp. in The main Experiment.

It could be understood since Zn metal was used by Chlorella sp. as a cofactor of carbonic anhydrase enzyme. According to Oh-Hama Miyachi (1992), Carbonic anhydrase has an important role in the photosynthetic process and may enhance the rate of photosynthetic.

It catalyses a reversible reaction of $CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3$

There was an interaction between the percentage reducing of Zn concentration with Chlorella sp. population. A high Chlorella sp. population was followed by a high the percentage reducing of Zn (Fig. 3).

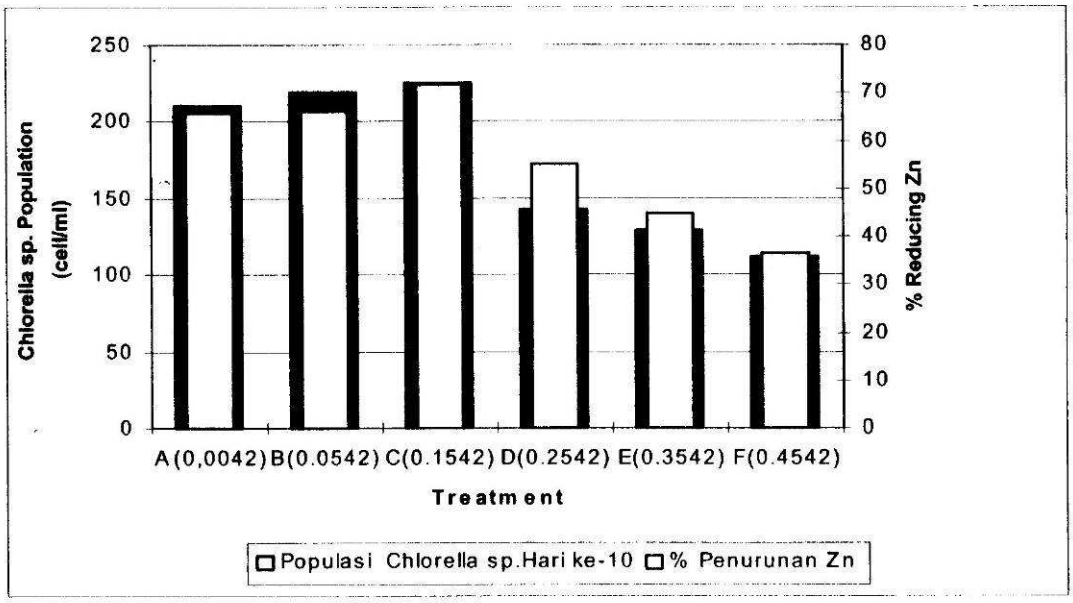

Figure 3. Histogram of Interaction Between Zn Decreasing Percentage and Chlorella sp.

IV. CONCLUSION

There was an interaction between the reducing of Zn concentration and the Chlorella sp. population. A high Chlorella sp. population was followed by a high the percentage reducing of Zn. The highest reducing of Zn (71,6%) was occurred at 0.1542 ppm.

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