STUDY OF TOXICITY AND BIOACCUMULATION OF DIFFERENTS CD AND PB CONCENTRATION IN *ULOTHRIX CYLINDRICUM*

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SUMMARY

The green alga *Ulothrix cylindricum* was cultured under different concentrations of Cd (0.5, 1,2 and 4 mg/l) and Pb (5, 10, 20 and 40 mg/l). Growth rate of alga was slightly decreased at low concentration and inhibited by high suited metals concentration, Cd was acutely toxic to alga at all concentrations and it was more toxic than Pb in low concentration.

Flame atomic absorption spectrophotometer was used to determine the accumulated metals in the alga. The accumulation of Cd and Pb has increased with increased of the exposure period. The inhibition averages were increased with the increase of the metal concentration as well as elongating the exposure period.

Keywords /Ulothrix, **heavy metal**, **toxicity**, **accumulation**.

Introduction

Water pollution by heavy metals in industrial waste effluents is now a global problem [1].The nondegradation of inorganic pollutants like heavy metals creates hazard when discharged into water body. The main source of heavy metals pollution are mining, milling and surface finishing industries, which discharge a variety of toxic metals into the environment [2].many industries discharge the heavy metals lead and cadmium in their waste water, these metals are toxic heavy metals and are considered non-essential for living organisms.[3]

The effect of heavy metals on aquatic organisms is currently attracting wide attention, particularly in studies related to industrial and other opogenic pollution. The enrichment of water with trace metals through sewage and other anthropogenic sources has become a severe problem. This situation has resulted in numerous studies or the effect of heavy metals on microalgae [4, 5].

Accumulation of heavy metals in environment has been extensively studied using fresh water microalgae due to their ability to concentrate and tolerate high metal levels [6, 7]. Algae can accumulate heavy metals from their aquatic environment [8]. Using living algae to remove toxic metals from contaminated water could be advantageous, since they are ubiquitous and have colonized almost all part of the world. They can be grown easily and have very simple growth requirements. An advantage of using living organisms over dead biomass is that they have fast growth rate and hence produce a regenerating supply of metal removal material [9]. The present study was carried out to examine the effect of different Cadmium and Lead concentrations on the Growth rate and accumulation in *Ulothrix cylindricum*

Material and Methods

The filamentous green algae were isolated from fresh water; samples were collected from Euphrates river near Nassiriyah park in Nassiriyah city Southern Iraq. These green alga were isolated and identified according to Prescott (1978) and smith (1933)[10,11].While purification and mass culturing of these alga carried out according to stein 1973[12] The alga was grown in Chu.10 medium [13] in the laboratory under controlled conditions: $28 \pm 2\ C^{\circ}$ and subjected to light of $7\ Em^{-2}S^{-1}$ supplied cool white fluorescent tubes with photoperiod of 14:10 light and dark cycle. The final pH of the solution was 7.5 by using (Hcl or Nacl). Ten days old algae were used in the experiments.

The modified Chu. No.10 medium was supplemented with four nominal concentration of Cd^{++} prepared from $CdCl_2$ (0.5, 1, 2 and 4 ppm) and Pb from $PbCl_2$ (5, 10, 20 and 40 ppm). Cultured in nutrient medium without heavy metals served as control and all experiments were performed in triplicate. The total chlorophyll content was determined by absorption spectrophotometer according to the method described by Arnon [14].The total accumulation of the two metals in alga was determined using a flame atomic spectrophotometer [15]; ANOVA and analysis of covariance were considered for statistical analysis purpose.

Results and Discussion

The effect of different Cadmium and Lead on the chlorophyll content of *Ulothrix cylindricum* at different Cd and Pb concentrations and exposure times are shown in Table (1) and (2) respectively, low concentration of Cd led to decrease in the Chlorophyll-a of alga after four days from experiments. On the other hand, higher concentration (more than 0.5mg/l) inhibited growth rate after tow days of experiments and the alga dead after eight days at 2 ppm of Cd. There was no chlorophyll content in the end days.

The chlorophyll content was also inhibited by different concentrations of Pb, the degrees of inhibitions were correlated to the different concentrations of Pb 5 ppm of Pb led to a decrease in the growth rate of alga, the other concentrations of Pb inhibited the growth rate of alga in different levels. 40 ppm was the inhibitoriest concentration of growth rate. Total chlorophyll content of alga exposed to Cd and Pb at every concentration decreased significantly from those of control after two days of exposure. The lowest total chlorophyll contents were found in alga exposed to 4 ppm of Cd and 40 ppm of Pb. But Cd was more toxic than Pb in low concentration on chlorophyll.

The inhibition of growth rate of *Ulothrix* sp. by metals coincided with previous studies on this topic, Fargasova [16], El-Najar [17] and Al-Ashoor [18] whom studied the effect of heavy metals on algae, found that the growth rate of alga decrease with low concentration of the metals because of the Cd^{++} and Pb^{++} at high concentration can destroy chloroplast and thaylokoid membrane of alga. It is well known that Cd^{++} can cause disorganization of chloroplast leading to a reduction of the photosynthetic pigments [15]. The decline in chlorophyll might be caused by a reduction in the synthesis of chlorophyll, possibly by decreasing chlorophyllase activity by disorderness of chloroplast in photosystem I. The high concentration of Pb effect on cell division of alga in stationary phase consequently inhibits the growth rate [19].

The changes of Cd and Pb concentration in the alga are shown in figures (1) and (2), respectively. The concentration of the studied metals in alga gradually increases; in the other hand, it increases after tow days of exposure. The highest average of accumulation was in six days of measurement for each metal. There were significant increases of metals in algal tissue when exposure time and metal concentration were increased. The metals were not detected in the controls.

Several studies have found that high levels of metals accumulation in algae [20,21]. The high concentration of Cd causes damaged cell membrane by their effect on compounds of cell phosphorus lipid and their release Cd ions to the media [22]. Pb accumulation in the surface and in inner alga cell wall by free absorption [23].

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دراسة سمية وتراكم تراكيز مختلفة من الكادميوم والرصاص في *Ulothrix cylindricum*

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الخلاصة

في الدراسة الحالية تم تنمية الطحلب الأخضر *Ulothrix cylindricum*. في تراكيز مختلفة من الكادميوم (٠.٠٥، ١، ٢ و٤ ملغم/ لتر) والرصاص (٥، ١٠، ٢٠ و ٤٠ ملغم/ لتر) وفي الظروف المختبرية الثابتة. ثبطت تراكيز العناصر المضافة إلى وسط نمو الطحلب وبمستويات مختلفة وأختلف التثبيط بإختلاف التراكيز المضافة وفترة القياس.وكان الكادميوم ذوسمية حاده للطحلب في كل تراكيزه وكان اكثر سمية من الرصاص في التراكيز المنخفضه. أستخدم جهازمطياف الامتصاص الذري اللهبي لتحديد كمية العناصر المتراكمة في الطحلب .أن معدل تراكم عنصري الكادميوم والرصاص تزايد بزيادة فترة القياس حيث أزداد معدل الثبيط بزيادة التراكيز بالأضافة الى فترة القياس.

Table (1) Effect of different concentration of cadmium on growth rate of *Ulothrex* sp.

Time	Days				
	0	2	4	6	8
Control	4.051	5.581	7.623	9.354	15.912
0.5ppm	4.049	4.037	3.614	3.116	2.531
1ppm	4.153	4.021	3.317	2.611	2.011
2ppm	4.150	3.701	2.461	2.223	1.161
4ppm	4.050	2.841	1.219	0.621	0

Table (2) Effect of different concentration of lead on growth rate of *Ulothrex* sp.

Time	Days				
	0	2	4	6	8
Control	4.141	5.732	8.644	12.119	16.447
5ppm	4.407	4.219	3.947	3.711	3.265
10ppm	4.407	4.183	3.716	3.501	2.664
20ppm	4.279	4.062	3.431	3.101	2.134
40ppm	4.381	3.107	2.611	1.453	0.478

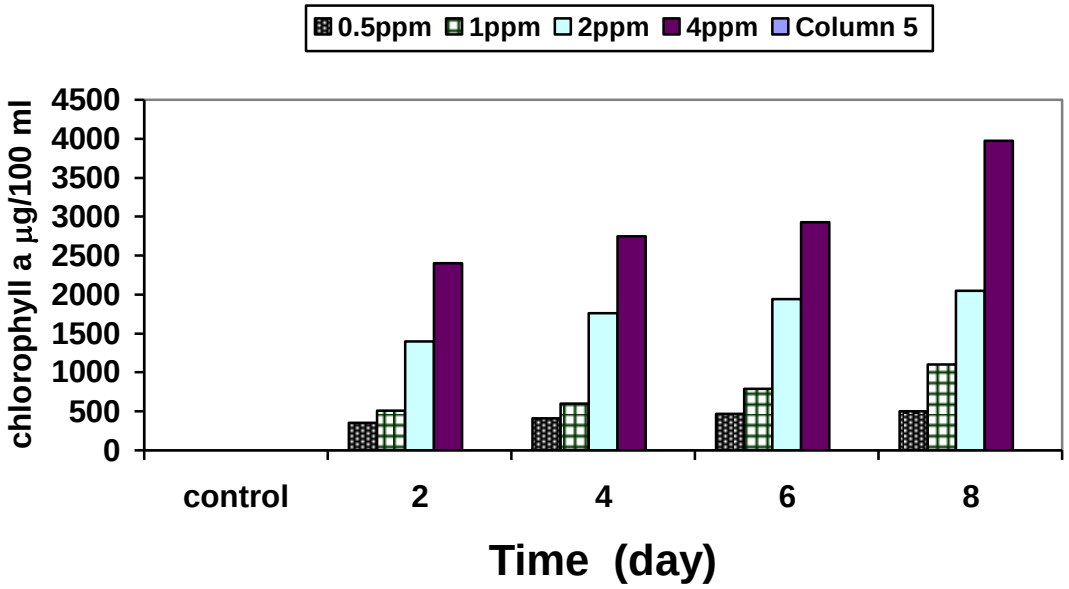

Figure (1) The accumulation of Cadmium by *Ulothrix* sp. Cell at different concentrations

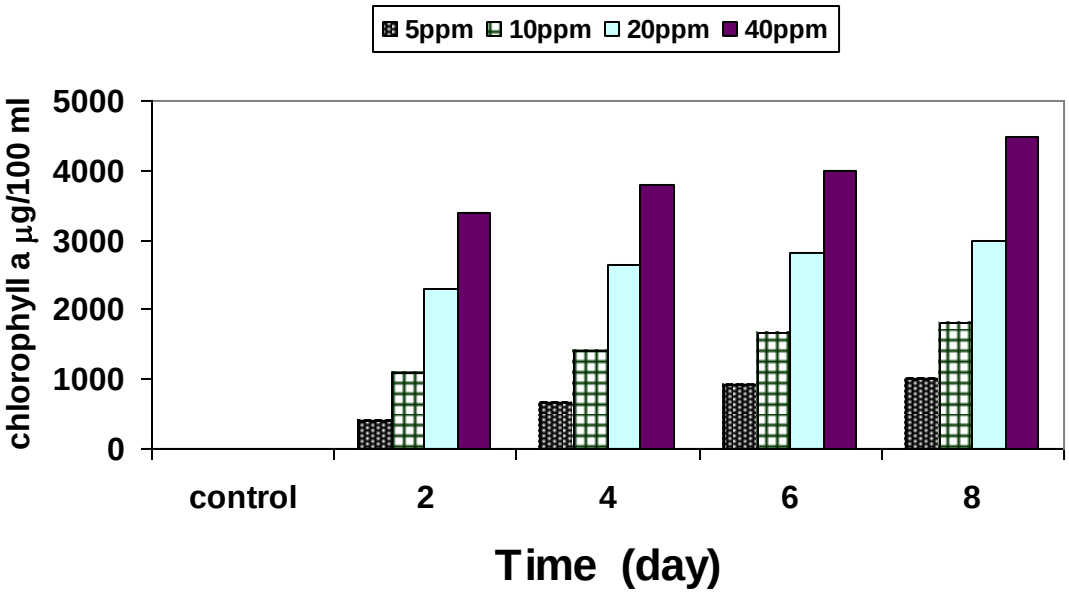

Figure (2) The accumulation of Lead by *Ulothrix* sp. Cell at different concentrations