

## Physiological Effects of Some Heavy Metals on Blue green Alga *Oscillatoria amoena* (Kuetz. Gomont)

Ahmed Shaker Abdul Jabbar

Thi Qar University ,College of Science ,Dept. of Biology

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### Abstract

The effect of  $\text{Co}^{++}$  and  $\text{Cd}^{++}$  on the growth rate and photosynthesis efficiency of bluegreen alga *Oscillatoria amoena* was studied under controlled laboratory conditions. These metals were treated with alga at different concentrations media (1, 2 and 5 ppm) of both elements. The growth rate of alga was inhibited by different concentrations of metals.  $\text{Cd}^{++}$  was more toxic than  $\text{Co}^{++}$ .

The results concerning the effects of different concentrations of heavy metals on photosynthesis ( $\text{O}_2$  evolution) has shown reduction of the amount of  $\text{O}_2$  evolution by alga in response to the increase of  $\text{Cd}^{++}$  and  $\text{Co}^{++}$  concentrations, photosynthesis was more sensitive to  $\text{Cd}^{++}$  concentration than to that of  $\text{Co}^{++}$ .

**Keywords:** Blue green algae, Heavy metals, growth rate, photosynthesis.

### Introduction

Ecosystems are increasingly affected by various anthropogenic impacts such as excess of nutrition causing eutrophication, toxic contamination of industrial, agricultural and domestic origin. Typical results of human activities proved to elevate of heavy metals present in fresh water and those microelements Lead, Cadmium and Mercury, are most specific [1, 2].

They are considered to be among the most important pollutants to the aquatic ecosystems due to their environmental persistence and tendency to

be concentrated in aquatic organisms [3]. Heavy metals are dissolved in water or sorbet to particulate matter and become hazardous to the human health either by drinking water or through food chain [4]. Also, heavy metals showed harmful effects even at low concentration on the aquatic organisms including plankton and aquatic plants [5]. The present investigation reveals the effects of Cadmium and Cobalt on some physiological aspects of *Oscillatoria amoena*

### Materials and Methods

Filaments of bluegreen alga *O.amoena* were collected from Euphrates River in Nassiriyah city, about 1000 m far from Al-Nassiriyah electricity station, south of Iraq. These myxophyta were isolated and identified according to Smith and Prescott [6, 7], while purification and mass culturing of these alga were carried out according to Stein [8], and were modified according to Weideman *et al.* [9] and grown axenically in modified Chu-10 medium [10], at pH 7.5 and subjected to light of  $72 \text{ Em}^{-2} \text{ S}^{-1}$  supplied by cool white fluorescent tubes with photoperiod of 14:1, light and dark cycle was at  $28 \pm 2 \text{ C}^\circ$  [11]. Stock solution of  $\text{CdCl}_2$  and  $\text{CoCl}_2$  was prepared in double distilled water passed through a Millipore

membrane filter (0.45  $\mu\text{m}$ ). For each metal, a range of concentrations has been used (1, 2 and 5 ppm). Very careful techniques have been used in the preparation of these media.

Chlorophyll-a was extracted in 90% acetone and is determined according to Marker *et al.* [12]. The measurement of photosynthetic activity ( $\text{O}_2$  evolution) by oxygen electrode was enclosed in 10 ml reaction vessel and connected to an oxygen analyzer [13]. ANOVA test, and analysis of variance were considered for statistical analysis purpose.



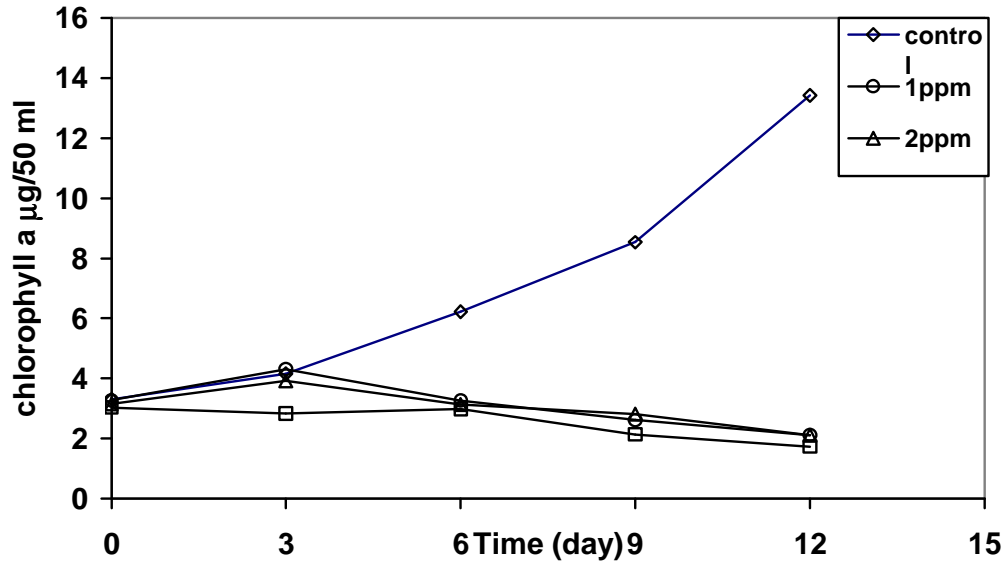


Figure (1): Effect of different concentration of Cobalt on growth rate of *Oscillatoria omoena*.

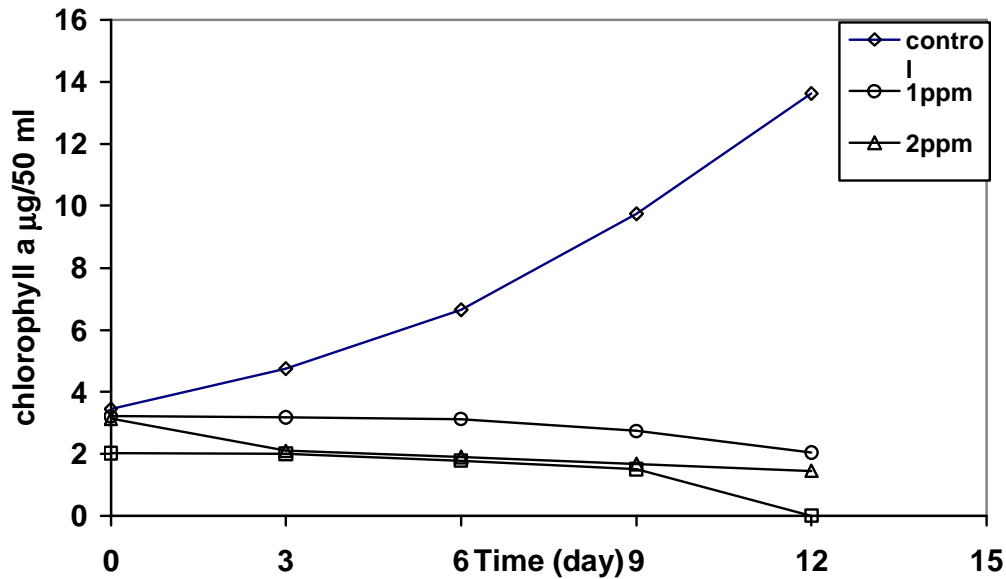


Figure (2): Effect of different concentration of Cadmium on growth rate of *Oscillatoria omoena*.



**التأثيرات الفسيولوجية لبعض العناصر الثقيلة في الطحلب الأخضر المزرق**  
***Oscillatoria amoena* (Kuetz. Gomont)**

أحمد شاكر عبد الجبار  
قسم علوم الحياة ، كلية العلوم ، جامعة ذي قار

**الخلاصة**

تم دراسة تأثير عنصري (الكادميوم والكوبلت) الثقيلين على معدلي النمو والبناء الضوئي (بدلالة إنتاج الأوكسجين) في الطحلب *Oscillatoria amoena*, أحد الطحالب الخضراء المزرقفة في الظروف المختبرية الثابتة حيث ثبتت تراكيز العناصر المضافة (1 و 2 و 5 ملغم/ لتر) معدل نمو الطحلب وازداد معدل التثبيط بزيادة التراكيز المضافة وبزيادة فترة القياس وكان الكادميوم أكثر سمية من الكوبلت. كما ثبتت العناصر المضافة معدل إنتاج الأوكسجين إذ أنخفض معدل البناء الضوئي للطحلب تدريجياً بزيادة التراكيز المضافة وبزيادة فترة القياس وكان الكادميوم أكثر تثبيطاً حيث أظهر تأثيراً في الساعة الأولى من القياس بينما لم يظهر الكوبلت أي تأثير في الساعة نفسها.