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LYNGBYA SP. AS A BIOSORBENT FOR NICKEL AND CADMIUM IONS FROM AQUEOUS SOLUTIONS

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ABSTRACT
Different concentrations (1, 2, 3, 4 and 5) ppm of both Nickel and Cadmium were depended to expose *Lyngbya sp.* to them, in order to test it ability to be as absorbent for Nickel and Cadmium. The results do not appear a good efficiency to remove Ni from aqueous solutions by the alga, where higher percentage 30% in the sixth day for 1and 3 ppm and in the fourth day for 5 ppm. The higher mean value of removal percentage of Nickel was 25% which recorded in 3ppm. However , the results of Cadmium do not showed the better ,because the higher percentage was 54% for 5 ppm was recorded after one day from exposure , moreover the mean of the percentage (22.5 ,16.25,8.33, 6.25 and 40%) for the concentrations 1,2,3,4 and 5 ppm, respectively. Overall, *lyngbya sp.* does not appear a good efficiency to remove both Nickel and Cadmium ions from aqueous solutions. Many explanations were mentioned in this paper, but as a conclusion and most accepted explanations includes, that the properties of secondary metabolites in nature are not completely understood.

KEYWORDS: *lyngbya sp*, bio removal, heavy metals.

INTRODUCTION

Heavy metals pollution is one of the most important environmental problems today, various industries produce and discharge wastes containing different heavy metals into the environment , such as mining and smelting of metalliferous , surface finishing industry, energy and fuel production, fertilizer and pesticide industry and application, metallurgy , iron and steel, electroplating, electrolysis, electro-osmosis, leatherworking, photography, electric appliance manufacturing metal surface treating, aerospace and atomic energy installation *etc*[1]. Phytoremrdiation is the process in which algae are employed to remediate environmental pollution, phytoremedation was defines as involves the use of macroalgae or microalgae for effective removal or biotransformation of pollutants, including nutrients and xenobiotics from wastewater and CO_2 from waste air [2]. Integrating algae biomass production with phyco-remediation seems to address most of the economics and problems associated with mass cultivation. A part from cleaning the environment from the onslaught of ever increasing pollution, valuable and cheaper biomass is generated from wastewater, effluents and sludge if appropriate algal species are identified and grown in industrial wastes[3]. Use of algal biomass as a biosorbent is emerging as an attractive, economical and effective proposition because of certain added advantages of algae over others[4&5], algae have low nutrient requirements, being autotrophic they produce a large biomass, and unlike other biomass and microbes, such as bacteria and fungi, they generally do not produce toxic substances. Binding of metal ions on algal surface depend on different conditions like ionic charge of metal ion, algal species and chemical composition of the metal ion solution [6- 8].

Classification of the alga
Kingdom:Bacteria
Phylum: Cyanobacteria
Order: Oscillatoria
Genus: *Lyngbya sp.* Agardh Ex Gomont,1892…….[9]

MATERIALS & METHODS

Lyngbya sp, was exposed to different concentrations (1, 2, 3, 4, and 5) ppm for both Ni and Cd , the stock solutions of both elements were prepared according to the following common equation : $C_1V_1=C_2V_2$ where:
$\mathbf{C_{1=}}$ first concentration, $\mathbf{V_{1=}}$ first volume (of standard solution), $\mathbf{C_{2=}}$ second concentration (wanted to get it), $\mathbf{V_{2=}}$ second volume. The axenic culture of the alga was taken from the central environmental laboratory in Ibn-Al-Haitham College for pure Sciences, University of Baghdad.
The alga was cultivate in BH11-minerlas medium which specialized to culture Cyanobacteria , 25°C and pH 7.5 with light intensity 380 µ anchtain\m^2\sec. were depends for cultivation , with light period about 16 hours and 8 hours of dark according to[10]. To assess the ability the ability of alga to adsorb both the elements was depend on removal percentage values. The alga was exposed to these concentrations and later would point the ability of alga to remove and tolerate Ni and Cd by comparing the initial concentration of these two elements which is exposed to alga and the concentrations of it in filtrate (usually, the alga separate from the solution of culture and Ni or Cd by filtration) and then measure the concentration of Ni and

Cd in filtrate by using atomic absorption device in central laboratory of college of Science\ Baghdad university.

RESULTS & DISCUSSION

The results (Table-1) was showed that the alga be with low ability to remove Nickel from contaminated aqueous solutions, where the mean removal percentage were 16.25 , 25 , 9.37 and 11 % for the concentrations 1, 2, 3, 4 and 5 ppm , respectively. These results may because the chemical precipitation and electrochemical treatments are ineffective, especially when ion concentration in aqueous solution is lower than 50 mg\l [11].

TABLE 1: Removal percentage of Nickel by *Lyngbya Sp.*

Days	Concentrations (ppm)				
	1	2	3	4	5
1	10	Zero	23.34	12.5	Zero
2	10	Zero	23.34	12.5	20
4	20	15	23.34	27.5	30
6	30	20	30	7.5	6
8	30	5	30	7.5	18
10	10	Zero	23.34	7.5	12
12	10	Zero	23.34	Zero	2
14	10	zero	23.34	zero	zero
Mean	16.25	5	25	9.37	11

Usually, the major factors that affect the biosorption processes are: initial metal ion concentration, temperature, pH, biomass concentration in solution, However, pH seems to be the most important parameter in the biosorption processes. It affects the solution chemistry of the metals, the activity of the functional group in the biomass and the competition of the metallic ions [12,13]. Also, the biomass concentration in the solution seems to influence the specific uptake; for lower values of biomass concentration leads to intervene between the binding sites. Table (2) ensured the low ability of *Lyngbya Sp.* to absorb some heavy metals like cadmium except in 5 ppm which can remove 54% from the contaminated aqueous solution with this metal.

TABLE 2: Removal percentage of Cadimum by *Lyngbya Sp.*

Days	Concentrations (ppm)				
	1	2	3	4	5
1	20	Zero	13.34	17.5	54
2	30	Zero	16.67	10	48
4	30	10	23.34	15	44
6	20	20	13.34	7.5	50
8	20	20	zero	zero	28
10	20	25	zero	zero	28
12	20	25	zero	zero	34
14	20	30	zero	zero	34
Mean	22.5	16.25	8.33	6.25	40

Totally, *Lyngbya Sp. do not exceed* 50% as removal percentage from cadmium concentrations.There are many reasons may explains the inferred results from this research; the responsibility of the specific up take decrease due to metal concentration shortage in solution [14]. In this study, BG11-minerals medium which specialized to cultivate cyanobacteria was used, So cyanobacteria species were exhibited best growth at lower salinity of ppt , also some reports mentioned that cyanobacteria can adapt to the variations in salinity but all cyanobacteria are not halo tolerant [15]. Usually, difference in the cell wall composition among the different groups of microorganisms, algae, bacteria , cyanobacteria and fungi, cause significant differences in the type and amount of metal ion binding to them. Algal cell walls are mainly cellulosic. The potential metal binding groups in this class of microbes are carboxylates. Amines, imidazoles, phosphtes , sulfhydryls , sulfates and hydroxyls. Of these, amines and imidazoles are positively charged when protonated and may build negatively charged metal complexes [16]. It was found that the muramic acid and diaminopimelic acid were found in Lyngbya walls but in none of others[17]. In spite of all previous information's, some studies indicates that the properties of secondary metabolites in nature are not completely understood [18,19].

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