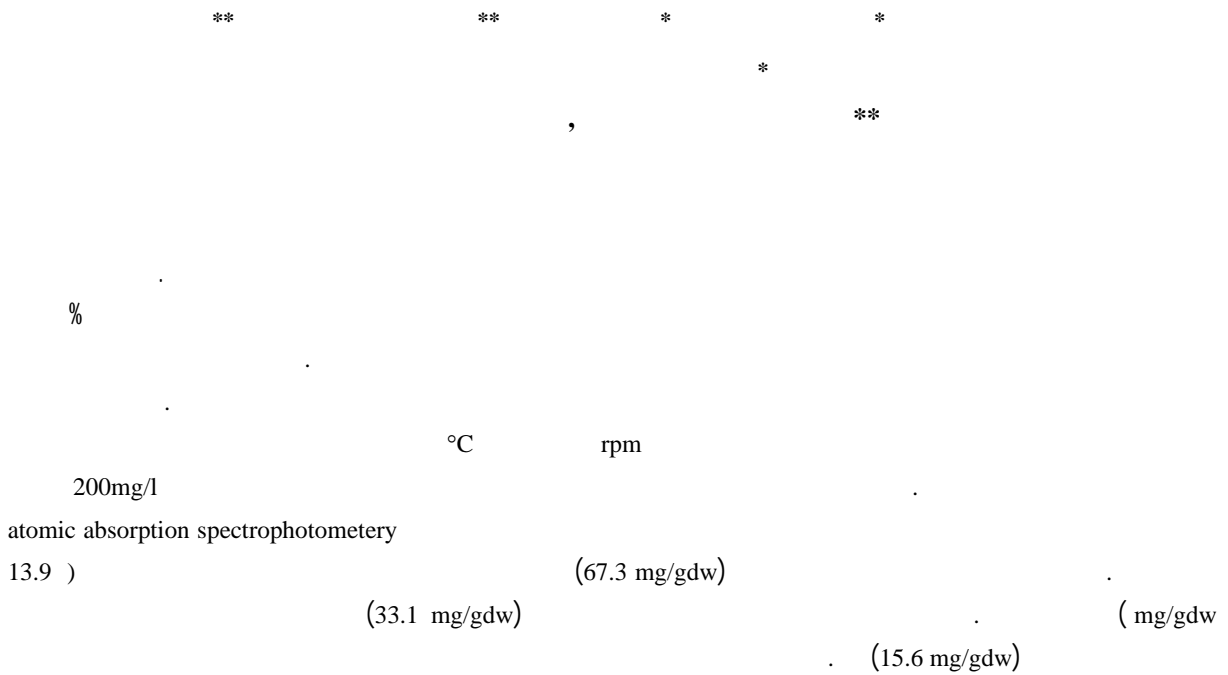


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Cesium Biosorption in Halophilic and Halotolerant Bacteria and Investigation of Effects of Environmental Factors on Biosorption

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Abstract

Halophilicity of bacteria may play a role in their capability for absorption of heavy metals and oxianions. In this study, 67 isolates from a soil sample (Gaw-khooni marsh) were isolated by cultivation on salty (5%) and salt-free nutrient media. Salt-dependency of bacteria was investigated. Thereafter, halophiles and halotolerants were differentiated from each other. Selected strains were studied through cesium-biosorption experiments. To do this, primary and secondary precultures were prepared through cultivation in flasks and incubation in a shaking incubator at 30°C and 150 rpm. Constant amounts of centrifuged and washed cells were added into solutions containing 200 mg Cs 1-1. Then treated cells were separated and the remaining cesium concentration was measured by AAS method. Maximum absorption was observed in one of halotolerant strains (67.3 mg/gdw) and the minimum was observed in halophilic strain (13.9 mg/gdw). The results showed that the halotolerants possesses increased absorbing capacity, (with average amount of 33.1 mg/gdw) than those of halophilic bacteria (15.6 mg/gdw).

Keywords: cesium, biosorption, halophile, halotolerant.

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()

()

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()

()

VP

Bergey Manual of

Systematic Bacteriology

rpm °C () % ()

%

°C

% %

OD

rpm

% % %

%

(NaCl)

()

rpm

°C

)

ml

(

mgCs/l

%

rpm

°C

%

rpm

%

atomic absorption spectrophotometry

%

Flam atomic absorption spectr

(AAS)

%

)

AA220.varian

(

H₂S

°C

(NaCl)

°C

rpm

. ()

()

ml

mgCs/l

rpm

°C

°C

rpm

rpm

ml

(16n)

mgCs/l

rpm

°C

rpm

atomic

(AAS) absorption spectrophotometry

pH

pH

. ()

°C

rpm

$$q = C_i - C_f (V/S)$$

$$q = \quad (\text{mg/gdw})$$

$$C_i = \quad (\text{g/l})$$

$$C_f = \quad (\text{g/l})$$

$$V = \quad (\text{L})$$

$$S = \quad (\text{g})$$

mgCs/l

ml

/ NaOH HCL

pH

rpm

°C

rpm

pH

% % % %

°C °C °C °C °C °C

rpm

rpm

°C

rpm

.()

mgCs/l

ml

(NaCl)

rpm

°C

rpm

rpm

°C

.()

mgCs/l

ml

NaCl % % % % % %

rpm

°C

rpm

°C

rpm

/ / / mg

mgCs/l

ml

.()

°C

rpm

rpm

rpm

°C

.()

ml

mgCs/l

rpm

°C

rpm

°C

rpm

mgCs/l

ml

() .

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()

) .

()

16SrRNA

(AAS)

(

atomic absorption spectrophotometry)

32n 20n 15n 16n

(flame

Bacillus

subtilis Bacillus Bacillus mycoides circulans

() Bacillus licheniformis

Bacillus circulans

16n

32n

%

Bacillus licheniformis

22h 13h 10h

Halobacillus

Halomonas meridiana Halomonas elongata litoralis

() %

()

pH

()

pH

10h

(22h 13h 10h)

/ Halobacillus litoralis

%

20n 15n)

Halomonas elongata

(%

32n

%

16n

% / %

)

% % 13h

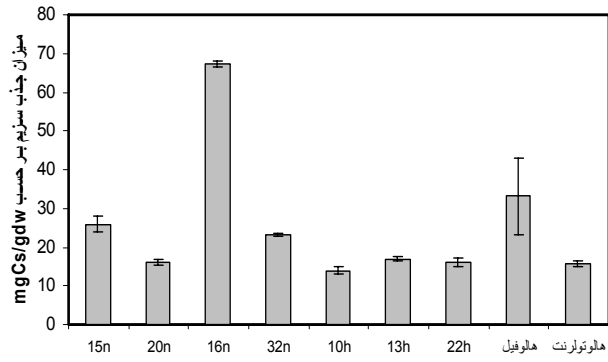
(

22h

()

22h	13h	10h	32n	20n	15n	16n	
-	-	+	+	+	+	+	
-	-	+	+	+	+	+	
+	+	+	+	+	+	+	
+	+	+	+	+	+	+	
							H₂S
	+		+		+	+	
			+	+	+		VP
+	+	+	+	+	+	+	
		+	+	+		+	
		+	+	+		+	
+	+	+	+	+		+	
			+	+	+	+	
		+	+	+	+	+	
+			+	+	+	+	
+	+	+	+	+	+	+	
	+	+				+	
	+		+	+	+	+	
+	+	+					
+	+	+	+	+	+	+	pH = /
+	+	+	+	+	+	+	pH = /
+		+	+	+	+	+	%
+	+	+	+	+	+	+	%
+	+	+	+	+	+	+	%
+	+	+	+			+	%
							°C
+	+	+		+	+	+	°C
+	+	+	+	+	+	+	°C
+	+	+	+	+	+	+	°C
			+	+			°C
+	+	+					
+							
							pH
							(%)
							(%)

% : +
% :



rpm

pH=

°C

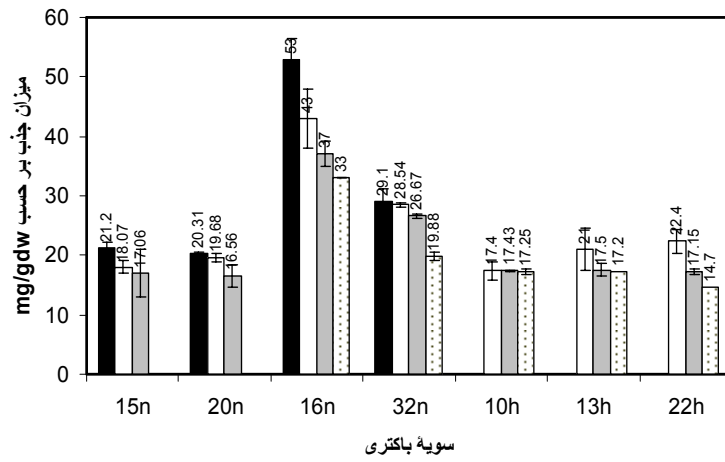
ppm

(/ mgCs/gdw)

()

/ mgCs/gdw

% / / mgCs/gdw



pH=

°C

%



%



%

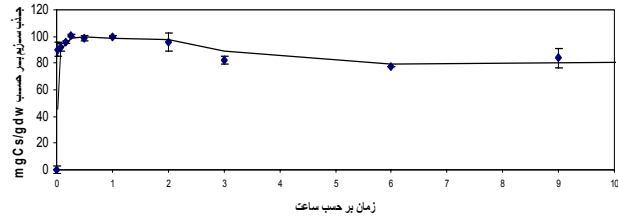


%

ppm

rpm





ppm rpm pH= °C

pH

pH

pH

pH

()

pH .()

pH

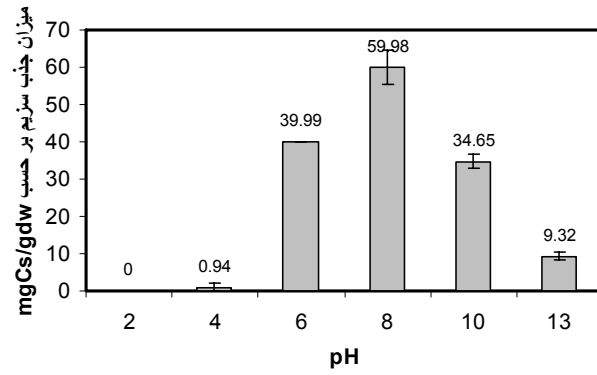
mgCs/gdw

pH=8

mg/l

pH

/

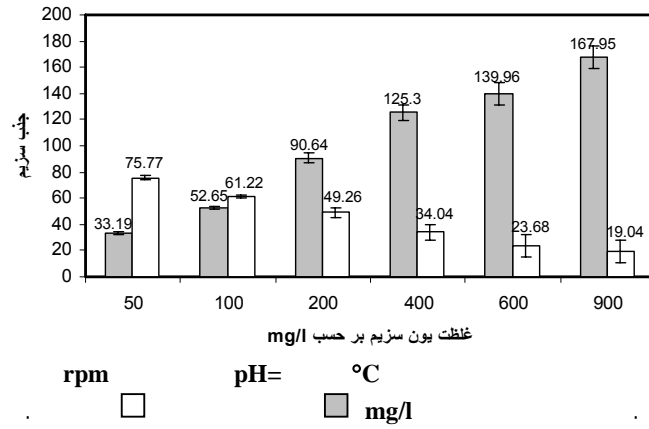


ppm

rpm

°C

pH



/ mgCs/gdw

mgCs/gdw

mg/l

/ / mg

()

mg/l

/ mg

% /

(/ mgCs/gdw)

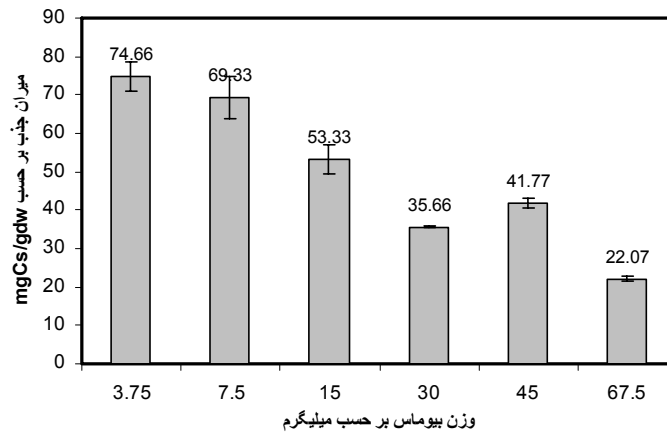
mg/l

)

/ mg

% /

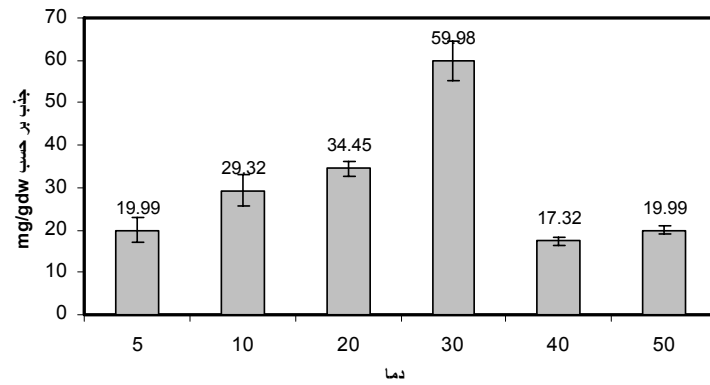
(/ mgCs/gdw)



rpm

pH= °C

ppm



ppm

rpm

pH=

()

°C

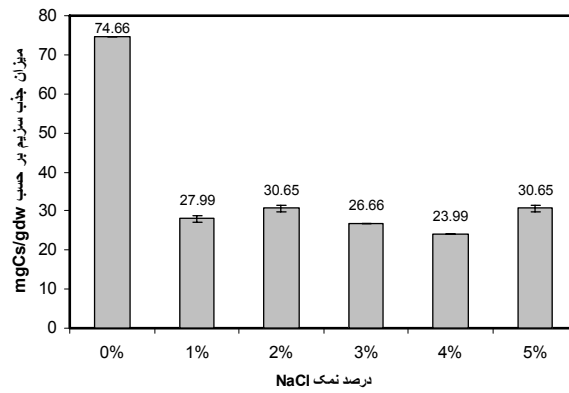
°C

()

(NaCl)

°C

°C



rpm

pH=

°C

(NaCl)

ppm

% %

NaCl

% % % %

()

Cs⁺ Na⁺

()

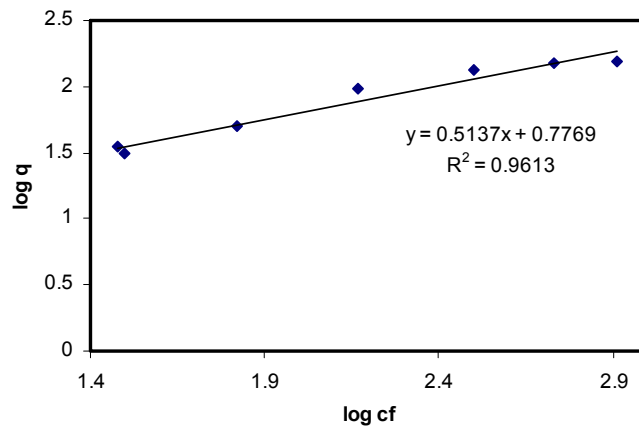
/

/

/ mgCs/gdw

/ mgCs/gdw

% /



rpm

pH=

°C

E.coli . .

TrkD

.()

. Kdp Trk :

.()

/ mgCs/gdw

(Hailei)

Thermus tibetanG6

/ mgCs/gdw

(Avery)

/ / $\mu\text{molCs/g}$

mM

Synechocystis pcc6803

.()

NaCl

1mM

mM

.()

1mM

(Swanson Williams)

(Ivshina)

.()

pH / mgCs/gdw
 / mgCs/gdw
 ()
 pH
 pH

(biosorption)
 (bioaccumulation)
 ()
 16n ()

Cu(II), pb(II) and Ni(II). Water Research. 39:2167-2177; (2005).
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