Biospectra : ISSN: 0973-7057, Vol. 16(2), September, 2021, pp. 15-18
An International Biannual Refereed Journal of Life Sciences
3(PS).
Plant Science

ISSN : 0973-7057

Int. Database Index: 616 www.mjl.clarivate.com

Inhibitory effect of chromium compound on sporulation of blue green algae

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Received : 22nd May, 2021 ; Revised : 23rd June, 2021

Abstract- Hexavalent chromium compounds are genotoxic carcinogens. Chronic inhalation of hexavalent chromium compounds increases the risk of lung cancer. Chromium salt also shows inhibitory effect on sporulation of Blue Green Algae. In the present study effect of Chromium salt was observed on sporulation of *Anabaena macrospora*. In a short period (8th day), the lower concentration of Chromium salt does not affect akinete formation in *Anabaena macrospora* but the higher concentration inhibit spore formation. After a period of 16th day even the lowest concentration of Chromium salt inhibit akinete formation in *Anabaena macrospora*.

Key words: Hexavalent chromium, Carcinogens, Akinetes

INTRODUCTION

The methods of reproduction in Blue Green Algae are simple in type and multiplication is often effected largely by vegetative means. Apart from this, a number of Blue-green Algae form spores (akinetes and endospores), which are probably more widespread than is at present apparent. Sexual reproduction does not occur in Blue Green Algae.

Specially differentiated akinetes are met with particularly in *Nostocaceae* and *Rivulariaceae*, where they represent the usually method of perennation. They are constituted by spherical, oblong or cylindrical cells which are usually much enlarged and crowded with granular food-reserved, for the most part. Probably consisting of cyanophycean. The akinetes are provided with a firm membrane, which is usually differentiated into two layers, corresponding respectively to inner investment and cell-sheath. The outer envelope is thick, commonly yellow or brown in color, and occasionally shows sculpturing or other ornamentations. Sometimes it consists of more than one layer and, when this is so, the several layers may be differently constituted.

Hexavalent chromium compounds are genotoxic carcinogens. Chronic inhalation of hexavalent chromium compounds increases the risk of lung cancer. (The lungs are the most vulnerable, followed by the fine capillaries in kidneys and intestines). Soluble compounds, like chromic acid, are much weaker carcinogens. Chromate-dyed textiles or chromate-tanned leather shoes can cause or exacerbate contact dermatitis. Ingestion of chromium VI can also cause irritation or ulcers in the stomach and intestines.

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MATERIALS & METHOD

To evaluate the effect of Chromium salt on Sporulation of *Anabaena macrospora* different concentration of Potassium di-chromate was prepared and mixed in BG11 medium. Axenic culture of *Anabaena macrospora* inoculated in the medium and the akinete frequency was observed on 8th day, 12th day, 16th day, 20th day and 24th day.

Akinete frequency:

Frequencies of akinete were calculated as percent of total cell population under light microscope. At least 1000 cells were counted for each reading. Those cells which were having thick wall and were at least twice as long distinctly wider than average vegetative cell were considered as spores.

RESULT

Akinete frequency was calculated on 8th, 12th, 16th, 20th and 24th day in different concentration of Chromium salt and compared with control. On 8th day, number of akinete decreased above the concentration of 2% and in 4% and 5% concentration on any akinete formed. On 12th, 16th, 20th and 24th day akinete formation decreased event in 0.5% concentration of Chromium salt. No any akinete developed above the concentration of 1%. The result is shown in table no. 1 to 5.

Table No. 1- Effect of Chromium salt on Akinetes production in *Anabaena macrospora*

S.I No.	Days	Control			Treated with Potassium di-chromate		
		Sample no.	No. of Akinetes	Average	Conc. (%)	No. of Akinetes	Average
1	8	1	3		0.5	3	
2	8	1	4	3	0.5	3	3
3	8	1	3		0.5	3	
4	8	2	4		1	3	
5	8	2	4	4	1	2	2
6	8	2	3		1	2	
7	8	3	4		2	2	
8	8	3	3	4	2	3	2
9	8	3	4		2	2	
10	8	-	-	-	3	1	
11	8	-	-	-	3	1	1
12	8	-	-	-	3	1	
13	8	-	-	-	4	0	
14	8	-	-	-	4	0	0
15	8	-	-	-	4	0	
16	8	-	-	-	5	0	
17	8	-	-	-	5	0	0
18	8	-	-	-	5	0	

Table No. 2- Effect of Chromium salt on Akinetes production in *Anabaena macrospora*

S.I No.	Days	Control			Treated with Potassium di-chromate		
		Sample no.	No. of Akinetes	Average	Conc. (%)	No. of Akinetes	Average
1	12	1	5		0.5	3	
2	12	1	5	5	0.5	3	2
3	12	1	5		0.5	2	
4	12	2	6		1	1	
5	12	2	5	5	1	2	1
6	12	2	5		1	1	
7	12	3	4		2	1	
8	12	3	5	5	2	1	1
9	12	3	5		2	0	
10	12	-	-	-	3	0	
11	12	-	-	-	3	0	0
12	12	-	-	-	3	0	
13	12	-	-	-	4	0	
14	12	-	-	-	4	0	0
15	12	-	-	-	4	0	
16	12	-	-	-	5	0	
17	12	-	-	-	5	0	0
18	12	-	-	-	5	0	

Table No. 3- Effect of Chromium salt on Akinetes production in *Anabaena microspore*

Sl No.	Days	Control			Treated with Potassium di-chromate		
		Sample no.	No. of Akinetes	Average	Conc. (%)	No. of Akinetes	Average
1	16	1	7		0.5	1	
2	16	1	7	7	0.5	1	1
3	16	1	8		0.5	2	
4	16	2	8		1	1	
5	16	2	7	8	1	0	1
6	16	2	8		1	1	
7	16	3	8		2	0	
8	16	3	8	8	2	0	0
9	16	3	7		2	0	
10	16	-	-	-	3	0	
11	16	-	-	-	3	0	0
12	16	-	-	-	3	0	
13	16	-	-	-	4	0	
14	16	-	-	-	4	0	0
15	16	-	-	-	4	0	
16	16	-	-	-	5	0	
17	16	-	-	-	5	0	0
18	16	-	-	-	5	0	

Table No. 4- Effect of Chromium salt on Akinetes production in *Anabaena microspore*

S.I No.	Days	Control			Treated with Potassium di-chromate		
		Sample no.	No. of Akinetes	Average	Conc. (%)	No. of Akinetes	Average
1	20	1	8		0.5	1	
2	20	1	8	8	0.5	2	1
3	20	1	9		0.5	1	
4	20	2	8		1	1	
5	20	2	7	8	1	1	1
6	20	2	8		1	0	
7	20	3	8		2	0	
8	20	3	8	8	2	0	0
9	20	3	7		2	0	
10	20	-	-	-	3	0	
11	20	-	-	-	3	0	0
12	20	-	-	-	3	0	
13	20	-	-	-	4	0	
14	20	-	-	-	4	0	0
15	20	-	-	-	4	0	
16	20	-	-	-	5	0	
17	20	-	-	-	5	0	0
18	20	-	-	-	5	0	

Table No. 5- Effect of Chromium salt on Akinetes production in *Anabaena microspore*

Sl. No.	Days	Control			Treated with Potassium di-chromate		
		Sample no.	No. of Akinetes	Average	Conc. (%)	No. of Akinetes	Average
1	24	1	10		0.5	1	
2	24	1	10	10	0.5	2	1
3	24	1	9		0.5	1	
4	24	2	8		1	1	
5	24	2	9	9	1	1	1
6	24	2	9		1	0	
7	24	3	10		2	0	
8	24	3	10	10	2	0	0
9	24	3	9		2	0	
10	24	-	-	-	3	0	
11	24	-	-	-	3	0	0
12	24	-	-	-	3	0	
13	24	-	-	-	4	0	
14	24	-	-	-	4	0	0
15	24	-	-	-	4	0	
16	24	-	-	-	5	0	
17	24	-	-	-	5	0	0
18	24	-	-	-	5	0	

CONCLUSION

In the present study, it was observed that Chromium salt have adverse effect on Sporulation of Blue Green Algae. In a short period (8th day), the lower concentration of Chromium salt does not affect akinete formation in *Anabaena macrospora* but the higher concentration inhibit spore formation. After a period of 16th day even the lowest concentration of Chromium salt inhibit akinete formation in *Anabaena macrospora*.

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