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DEFLUORIDATION OF WATER BY MICROFLORA

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Reduction in fluoride content of artificial water by Cyanobacteria, *Candida and Saccharomyces* was studied. In four days, Cyanobacteria brought about 8% reduction in fluoride content while 4% reduction was shown by *Candida*. No change was observed with *Saccharomyces*. No morphological change was observed in the cells.

Keywords : Defluoridation; Microflora.

Fluoride is essential for human health but excessive intake of fluoride can result in dental and skeletal fluorosis in humans and cattle. The permissible limit of fluoride in drinking water is 0.6 to 1.2 ppm as suggested by WHO[1]. In northwest India, mainly Gujarat and Rajasthan have been identified as regions with severe flourosis problem. In these states ground water is the main source of drinking water. Due to excessive consumption, water level is decreasing by 0.6 mts/yr and as a result alkaline elements like fluoride, nitrates etc. get dissolved in water. The fluoride concentration of water in these states varies from 0.4-19 mg/l. Almost all the 32 districts of Rajasthan have been recognised as fluorosis prone areas[2]. Adsorption, ion exchange and precipitation are the techniques generally used for defluoridation of water[2]. Attempts are also being made to use aquatic macrophytes as defluoridating agents[3-5], but no serious attempt has been made to use microflora for defluoridation. In the present study an effort has been made to use microflora like Cyanobacteria, *Candida* and other yeasts to reduce the fluoride content of water.

Twelve mg sodium fluoride was dissolved in one litre of double distilled water to prepare the stock solution containing 5.26 mg/l fluoride. Experiment was conducted in four conical flasks each containing 250 ml of stock solution. One flask containing only stock solution was maintained as control, while the other three flasks were inoculated with a loopful of *Candida* sp, *Saccharomyces* sp and 500 mg mixture of cyanobacteria like *Oscillatoria* sp, *Aulosira* sp and *Tolypothrix* sp respectively. Cyanobacteria used in experiment were collected from local lakes and adapted in distilled water for three days. Flasks containing *Candida* and *Saccharomyces* were kept on the shaker at 24 ± 2°c, while the flask inoculated with cyanobacteria was maintained at room temperature (26 ± 2°C) in continuous light. After four days, contents of all the three flasks were centrifuged, filtered and the water was analysed for fluoride content. Three replicates were maintained for each experiment. Standard APHA[6] method was used for fluoride estimation. Microscopic study was done to observe any morphological change in microflora after four days.

As shown in Table 1, after four days, cyanobacteria showed 8.7% reduction in fluoride content of water while only 4% reduction was shown by *Candida*. No reduction in fluoride content was observed with *Saccharomyces*. Reduction in fluoride contents may be due to adsorption or absorption of fluoride. Bhardwaj *et al*[5] have also suggested decrease in fluoride levels with macrophytes due to absorption, adsorption or precipitation.

Morphologically the filaments and cells of cyanobacteria and *Candida* did not show any shrinkage, damage or bleaching. There was no clumping of the filaments or cells. It has been reported that macrophytes like *Spirodela, Hydrilla, Ceratophyllum, Najas* etc. were adversely affected in fluoride rich water[5] and hence were not suitable for fluoride removal. Since no morphological change was observed in cells of Cyanobacteria and *Candida*, it indicates their tolerance towards fluoride. Among

Table 1. Fluoride absorption by microflora after four days.

S. No.	Sample	Fluoride in mg/l after four days			% reduction (average)
		R1	R2	R3	
1	Control	5.26	5.26	5.26	-
2	*Saccharomyces*	5.26	5.26	5.26	0.00%
3	*Candida*	5.06	5.02	5.04	4.01%
4	Cyanobacteria	4.84	4.81	4.67	8.70%

cyanobacteria, *Candida* and *Saccharomyces*, Cyanobacteria proved to be better option for defluoridation. Cyanophyceae are known to occur in various effluents, therefore it can be said that it is a tolerant family[7-9]. Thus it can be said that cyanobacteria can easily be grown in fluoride rich water bodies to reduce its level. This is a preliminary study and extensive experiments are under way.

References

1. WHO 1984, *Fluorine and Fluoride. Environmental Health criteria*. WHO Geneva Publ no. 36.
2. Gupta S K 1997, *Ind. J. Env. Sci.* **1(2)** 149
3. Rao K V, Khandekar A K and Vaidyanandham D 1973, *Ind. J. Expt. Biol.* **11** 68
4. Shirke P A and Chandra P 1991, *Fluoride* **24(3)** 109
5. Bhardwaj S M, Sharma K P and Chaturvedi R K 1999, *J. of Environment and Pollution* **6(2&3)** 167
6. APHA 1985, American Public Health Association, New york
7. Sealm K, Chaturvedi K and Sahai R 1989, *J. Ind. Bot. Soc.* (Abstr.) **67** 4
8. Bandyapadhyay G and Santra S 1987, *Algal flora on paper mill waste-A sample survey*. Proc. 74th Ind. Sci. Cong. : Part 111 Abstr.
9. Jha G N, Gupta R K and Mathur S N 1989, *Jour. Ind. Bot. Soc.* (Abstr.) **67** 98