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Bio reduction of water content fluoride by Bat Guano

Bharambe CM[1] and Choudhari Sharda N[2]

[1]Department of Zoology, *Vidnyan Mahavidyalaya, Malkapur Dist- Buldana (MS)
[2]C S Kothari Jr College Nandura, Dist- Buldana (MS)
Email: jscmb0128@rediffmail.com

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ABSTRACT

Bat guano is an old faecal matter of bat was collected from the old temples located in the rim of Lonar crater of Lonar, Buldana District, Maharashtra (India). It is known for the degradation of pollutants. The various drinking water sources of District Buldana has the characteristics of the presence of fluoride, which is cause serious problems in human beings. In the present study an attempt has been made to employ the Bat guano to reduce the fluoride of the drinking water sources. There was a significant decrease of fluoride against controls. There were 31.88, 22.63, 14.82 10.47, 8.52, 5.5, 2.1, 1.2, 0.7 and 0.6 reduction in the fluoride, at the interval of 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 days in the water content after the application of Bat guano. The results are discussed with fluoride pollution reduction. Our investigation indicates that bat guano used for degradation of water pollutants and bioremediation of aquatic ecosystems and also for waste water treatments.

Key words: Bioremediation, Waste water, Fluoride, Bat guano etc.

INTRODUCTION

Lonar crater is situated in village Lonar in the Buldhana District of Maharashtra, India. It has an almost perfectly circular shape and accumulated with water in the deeper parts of basin. Rocks in the crater reveal many characteristic features of the moon rocks. There are many old temples on the peripheral boundary of the crater which have now become roosting places for bats. Morache temple (Peafowl's temple) is now famous for existence of thousands of bats and peacocks. Waghache temple (Leopards temple) is also famous for bats and people have seen leopard found in it many times.

Bat guano

The word guano originated from the Quichua language of the Inca civilization and means "the droppings of bat". The bats forage at night for insects over a particular area, and they return to the old temples during the day to sleep and care for their young. They attach themselves to ceiling, and their excrement accumulates on the floor below. In some situations the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance.

BIOREMEDIATION AND BAT GUANO

One of the most serious universal, international problems facing us today is the removal of harmful compounds from industrial and municipal as well as anthropogenic waste. If it is discharged into lakes and rivers, a process called eutrophication occurs (Prince, 2003). Environmental contamination whether it is from industrial or municipal or anthropogenic toxic waste that degrades the various environments is a vital concern to the public. Thus it is crucial to develop and implement accurate means to clean and preserve our precious and deteriorating environment. Although there are many techniques in cleaning environmental contaminations, one process has the most potential, namely bioremediation. Bioremediation, or commonly referred to as biodegradation, is a process in which microbes such as bacteria, fungi, yeast, or micro algae are involved in degrading toxic wastes (Pace, 1997 and Knezevich, 2006).

A marvelous symbiosis exits between the microorganisms and bat guano. Bacteria in the mammalian intestinal tract aid in the breakdown of food during digestion. These organisms synthesize enzymes capable of degrading a vast array of substances. Innumerable microbes are regularly excreted along with waste products and together with other organisms; they constitute the microbial population of a bat guano deposit (Steele, 1989).

Large populations of bat deposit thousands of kilograms of dropping annually. An ounce of bat guano contains billions of bacteria, and a single guano deposit may contain thousands of bacterial species. Guano being rich in bioremediation microbes cleans up toxic substances, (Barry et al., 1997; Bharambe 2008). At present we do not know these species.

MATERIAL METHODS

To study the impact of bat guano on sugar factory effluent, 10 mg bat guano was dissolved in 100 ml of drinking water (10:100 proportions). After addition of bat guano in water, the samples were kept undisturbed and analysis was carried out for 100 days at an interval of 10 days for the change in its fluoride contents. The change in water content fluoride was noted after every 10 days upto 100 days hours. The water was analyzed by using standard methods for water analysis suggested by APHA (1998) and Bharambe (2008).

RESULTS & DISCUSSION

When bat guano was dissolved in water with fluoride (31.88), after 10 days the fluoride was found to be decreased gradually to (0.60) up to 100 days (Table, 1). The water was kept undisturbed till 100 days and the fluoride was noted after every 10 days up to 100 days. After 100 days the fluoride was seen to be remained constant during observations (Table, 1).

Tilak et al. (2005) and Bharambe (2008) reported a number of bacterial species associated with the bat guano belonging to genera, Azospirillum, Alcaligens, Arthrobacter, Acinetobacter, Bacillus, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Pseudomonas, Rhizobium and Serratia. He also suggested that this bacterium has high bioremediation capacity. Hutchens et al. (2004) had demonstrated aerobic methane oxidizing bacteria, Methylomonas and Methylococcus in bat guano.

The bacterial enzymes capable of degrading a number of substances (Martin, 1991; Dvorak *et al*., 1992; Edenborn *et al.,* 1992; Bechard *et al.,* 1994; White and Chang, 1996; Frank, 2000; Kaksonen, *et al*., 2003; Vallero *et al*., 2003; Boshoff, *et al*., 2004; Miranda, 2005; Seena, 2005; Tilak *et al.,* 2005).

Murphy (1989) demonstrated a nutritious broth formation when the bat guano was added in water and further he proved that this broth supported the growth of numerous microbes.

Table, 1: Impact of bat guano on water content fluoride at an interval of 10 days.

Experiment	Sg	Time (days) and Fluoride content of water (mg/l)									
		0	10	20	30	40	50	60	70	80	90
Control	W1	31.88	31.91	31.94	31.95	31.96	31.96	31.96	31.97	31.97	31.97
Experimental	W2	31.88	22.63	14.82	10.47	8.52	5.50	2.10	1.20	0.70	0.60

All values are the mean of five replicates; Sg – Sampling; W1 – Control water from drinking source without bat guano; W2 – Water from drinking source with bat guano.

CONCLUSION

Alley and Mary (1996) stated that an ounce of bat guano contains billions of bacteria and thousands of bacterial species and these bacteria are important to bioremediation. Sridhar et al. (2006) and Pawar *et al.* (2004) examined the fungal fauna of bat guano and used for bioremediation of Lack soil.

Other than municipalities, various industries disposing off the industrial effluents are the worst polluters of the aquatic resources. It is of utmost importance, hence, to prevent the pollution of aquatic resources by all possible means to control its quality from further deterioration. Applying microorganisms for industrial pollution control is an area of interest all over the world.

In the present investigation is an attempt to study the impact of bat guano with its rich microbial flora on bioremediation of industrial effluents. The results revealed that within a period of 100 days, there was a remarkable reduction in the physico-chemical parameters of industrial effluents, thus stabilizing the industrial effluents, suggesting that industrial effluents can be effectively treated by bat guano.

No much work has been carried out on the bat guano in India and hence it was thought to study the impact of bat guano from and to assess the feasibility of the bat guano as supplementary bioremediatant.

Conflicts of interest: The authors stated that no conflicts of interest.

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