

# Impact of Bat guano on the salinity of aquatic ecosystem

Bharambe CM<sup>1</sup> and Autkar Vivek K<sup>2</sup>

<sup>1</sup>Department of Zoology, Vidnyan Mahavidyalaya, Malkapur, Dist. Buldana (MS) India

<sup>2</sup>Jijamata Mahavidyalaya, Buldana (MS) India

Email: vivekautkar@gmail.com

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## ABSTRACT

The word guano originated from the “Quichua language” of the Inca civilization and means the droppings of bat. The bats forage at night for insect over a particular area, and they return to the old temples during the day to sleep and care for their young’s. They attach themselves to ceiling, and their excrement accumulates one floor below. In some situation the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance. Bat guano was collected from the temple of Lonar crater Lonar, Buldana District, Maharashtra. The bat guano, it dissolved in water of Purna River, (10:100) concentration was prepared and kept undisturbed till 30 days and parameters was noted at an interval of 2 hour and thereafter 5 days for about 24 hour and 30 days respectively. Resulted into increasing in the salinity content of Purna water after the addition of bat guano. Our investigation results indicate that bat guano used for bioremediation of aquatic ecosystem.

**Keywords:** Bioremediation, bat guano, industrial effluents, water pollutants etc.

## INTRODUCTION

Lonar crater is situated in village Lonar in Buldana District of Maharashtra, India. It has an almost perfectly circular shape and accumulated with water in the deeper part of basin. Rocks in the crater reveal many characteristic features of the moon rocks. There are many old temples on the peripheral boundary of thereafter which have now become roosting places for bats. Ramgaya Temple has become the source of sweet drinking water, as this is the only sweet water stream available in the crater; rest of the crater water is highly saline. Kamalja Devi temple is situated at the southern base of the crater. 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 leopard found in it many time (Bharambe, 2008).

## BAT GUANO

The word guano originated from the “Quichua language” of the Inca civilization and mean “the dropping the bat”. The bats forage at night for insect over a particular area, and they return to the old temple during the day to sleep and care of their young. They attach themselves to ceiling, and their

excrement accumulates on the floor below. In some situation the guano can reach depth of feet in many years and appeared as guano-hip, and it has a valuable importance (Bharambe, 2008).

**BAT GUNO AND BIOREMENDATION**

One of the most serious universal, international problems facing us today is the removal of harmful compounds from industrial and municipal waste. If it is discharged in to lakes and rivers, a process called eutrophication occurs (Prince, 2003)

Environmental contamination whether it is from industrial or municipal toxic waste that degrades the various environmental 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, Knezevich, 2006).

A marvelous symbiosis exists between the microorganisms and bat guano. Bacteria in the mammalian intestinal tract aid in the breakdown of food during digestion. These organisms synthesis enzymes capable of degrading a vast array of substance. Immnumerable microbes are regularly excreted along with waste product 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 billion of bacteria, and a single guano deposit may contain thousands of bacteria species. Guano being rich

in bioremediation microbes cleans up toxic substance, (Barry *et al.*, 1997). At present we do not know these species.

**MATERIAL METHODS**

To study the impact of bat guano on water, 10mg bat guano was dissolved in 100ml of experimental water (10:100 proportions) for every time. After addition of bat guano in water, then the water was analyzed for the change in its chloride contents. The change in water parameter was noted after every two hour up to 24 hour. Thereafter, the sample was kept undisturbed and analyses were carried out for 30 days at an interval of 5 days. The water was analyzed by using standard methods for water analysis suggested by APHA (1998), Aaranson (1970) and Bharambe (2008).

**RESULTS**

When bat guano was dissolved in river water with salinity 5.00. After 2 hour the salinity was found to be changed to 7.13 and after 4 hours increased gradually and it reached to 7.47 after 24 hours (Table, 1). The river water was kept undisturbed till 30 days and the salinity was noted after every 5 days upto 30 days. After 5 days the salinity was seen to be increased upto 30 days and then it remained constant after 30 days of observations (Table, 2).

**DISCUSSION**

Edenborn, (1992) reported a number of bacteria species associated with the bat guano belonging to genera, *Azospirillum*, *Flavobacterium*, *Pseudomonas*, *Rhizobium* and *Serratia*. He also suggested that this bacterium has high bioremediation capacity and also demonstrated aerobic methane oxidizing bacteria, *Methylomonas* and *Methylococcus* in bat guano.

**Table 1: Impact of bat guano on salinity of water content at an interval of 2 Hrs.**

Ps	Sg	Time (Hrs)												
		0	2	4	6	8	10	12	14	16	18	20	22	24
S	W1	288	288	288	288	288	288	288	288	288	288	288	288	288

All the values are the mean of five replicates. Ps-parameter; Sg-sampling; W1-Water from Purna River

**Table 2: Impact of bat guano on salinity of water content at an interval of 5 days**

Ps	Sg	Time (Days)							
		0	1	5	10	15	20	25	30
S	W1	288	284	210	188	172	170	160	150

All the values are the mean ±SE of five replicates; Figures in parenthesis indicates percent change over the result

The bacterial enzyme capable degrades a number of substances (Dvorak,*et. al.*, 1992; Edenborn,*et. al.*, 1992). Keleher, (1996)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.

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

## CONCLUSION

Other than municipalities, various industries disposing off the industrial effluents are the worst polluters of the 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 to study the impact of bat guano with its rich microbial flora on water content of Purnariver. The results revealed that with a period of 30 days, there was a remarkable change in the salinity of river water, thus stabilizing the river water salinity, suggesting that water can be effectively treated by bat guano because if the salinity of sample was acidic salinity change to alkaline and vice-versa.

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

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