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Effective Microorganisms (EM) Technology for Water Quality Restoration

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Abstract: River,lake and pond water pollution is a global problem. However, rising pollution of rivers,lake and pond in India is a significant concern for the Indian government and population. India is home to about 20 major river basins. Unfortunately, most rivers and river basins in India are victims of pollution.However, pollutant impurities that impede adequate supply of water have a detrimental effect on the quality and harmful for living organisms including aquatic life. For the reduction of water pollution level, various chemical and biological treatments are available but the emergence of an amazing technology of a multiculture of anaerobic and aerobic beneficial microorganisms is presently gaining popularity due to its environmentally friendly nature. This effective microorganism (EM) technology uses naturally occurring microorganisms which are able to purify and revive nature. Applications of EM by through Bhosa Ball using the have been experimented in Yamuna rivers water.Principal objective of enhancing and improving the water quality. The role of EM-based Bhosa Ball,water restoration approach for sustainability of water resources and prospects of modeling are also discussed. Results clearly demonstrated the effectiveness of this technique for restoration of water quality of degraded/polluted river water. Valuable lines for further research and acceptance of EM technology for the future are thus suggested as it is believed to be the key to sustained environmental improvement and offers a real opportunity for eco-innovation.

Keywords: **Effective Microorganisms (EM),Bhosa Ball, water pollution, water treatment .**

1.Introduction

Bhosa Ball

Effective fermentation bacteria in EM Bhosa Ball will help to decompose sludge.In polluted rivers, accumulated sludge (rotten organic material) is in a state of oxygen deficiency, since there is a little oxygen dissolved in the water. Inside the sludge, harmful fermentation bacteria (putrefactive bacteria) produce harmful gases such as methane, ammonia and hydrogen sulfide by decomposing organic matter without oxygen. When EM Bhosa Balls (EM aggregates of high density), are added into water in this condition, they become embedded in the surface of the sludge and effective fermentation bacteria contained in Bhosa Balls start to decompose the sludge. At the same time, phototrophic bacteria consume harmful gasses, so foul odors will be contained.

Making Bhosa Ball

Figure 1. Preparation of Bhosa Ball

Figure .2- Mixing of Ingredient

Figure 3 - Prepared Bhosa Ball

1.1 Preparation:

(1) We take 2 kg wheat bran (Bhosa). Add 700 ml water . Mixing tub filled to about 3/4 full with wheat bran.

(2) Add the molasses(black) in water. Fully dissolve the molasses in the water. We can use hot water to help dissolve the molasses fastly.

(3) Add the EM-1 solution.

(4) Mixed it properly.

(5) Put the mixed wheat bran into an airtight bags.

(6) Label the bucket follows:

(a) Bhosa
(b) Fermenting
(c) Today's date
(d) Ready: <two weeks after Today's date>

(7). Keep the fermenting wheat bran (bhosa) at room temperature, airtight. Keep away from direct sun light.

(8). After two weeks, the Bhosa Ball is ready to use.

The microbes in EM•1

EM-1 ingredients (U.S. version as of May 2010). EM-1 Microbial Inoculant (full name) is OMRI Listed (Organic Materials Review Institute), omri.org, and can be used by certified organic operations.

ACTIVE INGREDIENTS:

Microorganisms: 1 million colony forming units/cc (units/ml), 1%: Lactobacillus plantarum, Lactobacillus casei, Lactobacillus fermentum, Lactobacillus delbrueckii, Bacillus subtilis, Saccharomyces cerevisiae, Rhodopseudomonas palustris.

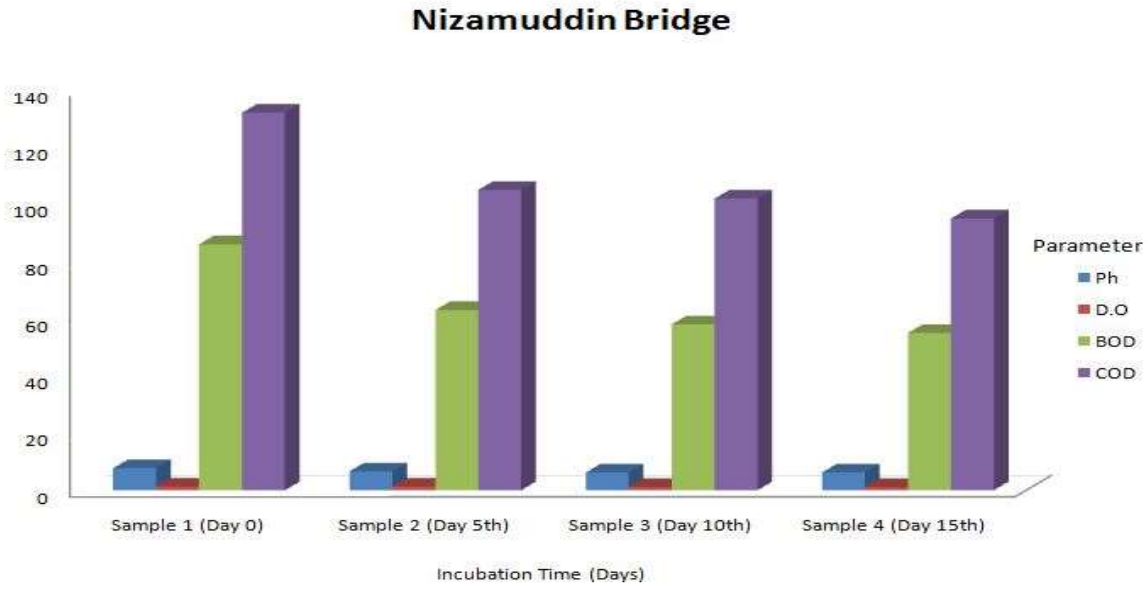
INACTIVE INGREDIENTS:

96% Water and 3% Molasses Lactic Acid Bacteria L. plantarum - in saliva (first isolated); liquefies gelatin [foods found in: sauerkraut, pickles, brined olives, kimchi, Nigerian ogi, sourdough, cheeses, fermented sausages, stockfish] L. casei - in human intestine and mouth; known to improve digestion and reduce lactose deficiency and constipation ; complements growth of L. acidophilus [foods found in: cheddar cheese, green olives] L. fermentum [foods found in: sourdough] L. delbrueckii [foods found in: yogurt, mozzarella cheese, pizza cheese, Hartkäse, Berg-Alpkäse, Bleu de Bresse, Bleu de Gex, Fourme d'Ambert] Bacillus subtilis - commonly found in soil; can survive extreme heat; natural fungicidal activity; used in alternative medicine; can convert explosives into harmless compounds; used in safe radionuclide waste; produces amylase enzyme (present in saliva; breaks down starch into sugar) [foods found in: Japanese natto (fermented soy beans), Korean cheonggukjang (fermented soybean paste)] Yeast Saccharomyces cerevisiae - brewing and baking, top-fermenting yeast (ale) [foods found in: baked breads, coffeecakes, pastries, croissants] [beverages found in: beer, wine, mead, cider, vinegar]

2.Test Result of Bhosa Ball in Waste Water Sample at Nizamuddin Bridge & Shahdara Drain:

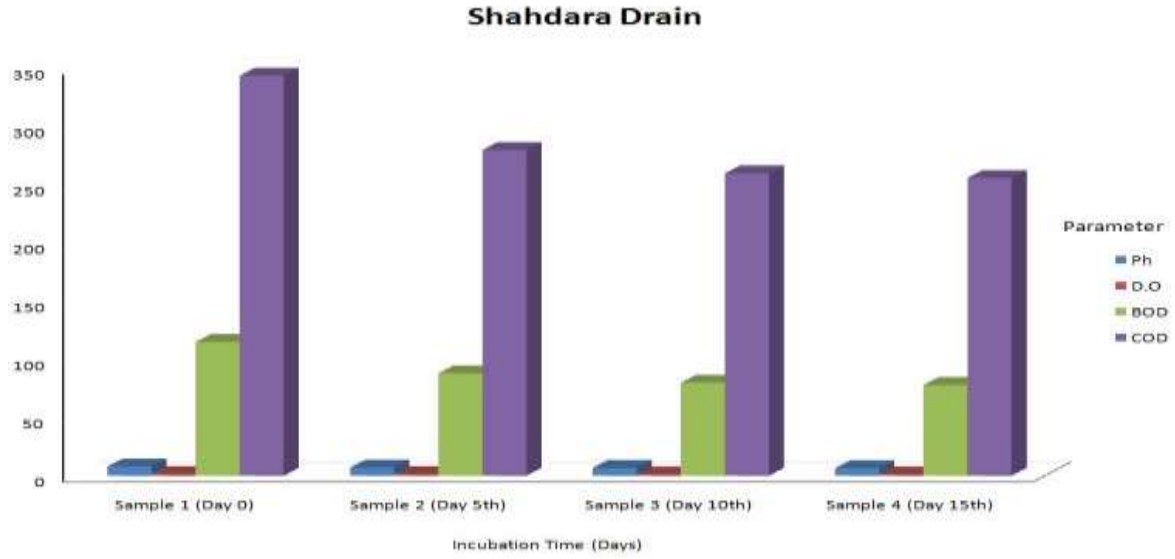
NIZAMUDDIN BRIDGE

PARAMETER	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4
	INCUBATION TIME (DAYS)			
	0	5	10	15
PH	7.7	6.6	6.2	6.2
D.O	1.3	1.3	1.1	1.1
BOD	86	63	58	55
COD	132	105	102	95



SHAHDARA DRAIN

PARAMETER	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4
	INCUBATION TIME (DAYS)			
	0	5	10	15
PH	7.9	6.9	6.7	6.5
D.O	1.5	1.5	1.2	1.2
BOD	115	88	80	78
COD	344	280	260	256



3. CONCLUSIONS AND RECOMMENDATIONS

The EM Bhosa Balls should be adopted locally. It is emerging as one of the environmental solutions towards reducing water pollutants and thus improving water quality in our lakes,ponds and drains. The results of this study is that effectiveness of EM technology in the river protection, and will be continually used as a basis for the extension of EM technology in India in helping to recover, reinforce and sustain our river ,lake and pond nature. EM is easy and convenient for use.It is safe and unharmful. It have low cost and economically effective and this has increases the effectiveness of application of this technology.

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