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Biotoxicity analysis of fishes in fresh water, untreated and biotreated silk dyeing effluent

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Abstract: The work has been focused on the biotoxicity analysis of fishes in raw silk dyeing effluent and biotreated by *Pseudomonas fluorescens*. The biotoxicity analysis was performed continuously from 0 hr till 96 hrs. The cumulative percentage mortality rate were noted for every 12 hrs for fishes grown in fresh water, untreated and biotreated Silk dyeing effluent and compared to determine the efficiency of *Pseudomonas fluorescens* degraded Silk dyeing effluent in survival of aquatic life and can be recommended as a safe technology.

Keywords - *Pseudomonas fluorescens*, Degradation, Silk dyeing effluent.

INTRODUCTION

Water pollution caused by industrial effluent discharges has become an alarming trend worldwide 1. The colored effluents are not only aesthetically unacceptable, reduces the photosynthetic activity of aquatic flora, which causes depletion of dissolved oxygen, ultimately leading to death and putrifaction of aquatic animals [2]. However, the release of coloured wastewaters represents a serious environmental problem and a public health concern. Colour removal, especially from textile wastewaters, has been a big challenge

over the last decades, and up to now there is no single and economically attractive treatment that can effectively decolourise dyes[3]. The attractive features of biological treatment or biodegradation are low cost, renewable and regenerative activity and little or no secondary hazard [4]. The ubiquitous rhizosphere microflora like *Pseudomonas fluorescens,* forming symbiosis with plant roots and acting as biofertilizers, bioprotactants, and biodegraders[5].

MATERIALS AND METHODS

Collection of Silk dyeing effluent: The silk dyeing effluent was collected from the small scale industry located at Seelanaickenpatti in salem district and the technical details were also obtained. The collected effluent was taken flask a specific microbe about 2×10^5 cfu was inoculated with a loop of culture of *Pseudomonas fluorescens* incubated at 28^0C in shaking incubator at 150rpm for 10 days. At 24 hours interval the samples were analyzed for degradation. 5 ml was centrifuged at 5000 rpm for 15minutes and the samples were taken for analysis.

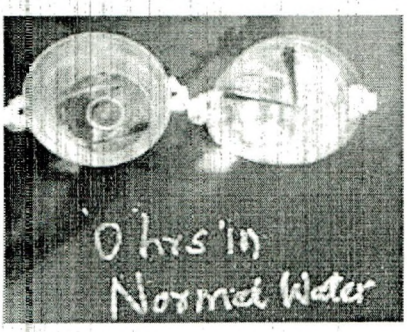
Bioassay Test: The experimental fish were collected from an aquarium and stored in well aerated tanks. The fish were fed with protein foods for a week. Two days prior to the start of the experiment the protein food was stopped. One group of individuals was acclimated in fresh water and they acted as the control, the second group in crude silk dyeing effluent and the third group in bio treated effluent. About 96 hrs was chosen for the bioassay and the mortality rate was noted.

RESULTS AND DISCUSSION

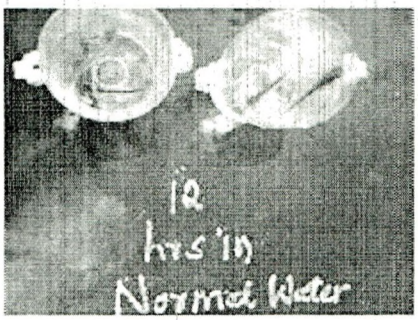
Table- 1: Bioassay test in fresh water, untreated and biotreated effluent

S.no	Fish exposed	No. of Individuals exposed	Percentage of mortality						
			0hr	12h	24h	48h	72h	96h	%
1.	Fresh water (Serve as control)	6	-	-	-	-	-	-	0
2.	Crude Silk dyeing effluent (100%)	6	-	6	-	-	-	-	100
3.	Biotreated silk dyeing effluent (with *Pseudomonas fluorescens)*	6	-	-	-	-	-	-	0

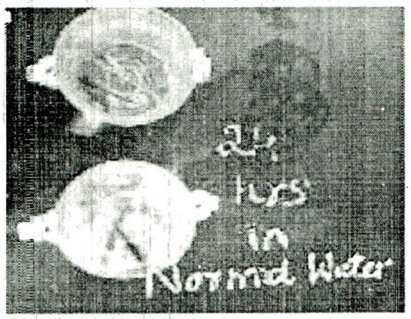
Plate 1: Bioassay Test in fresh water and crude silk dyeing effluent



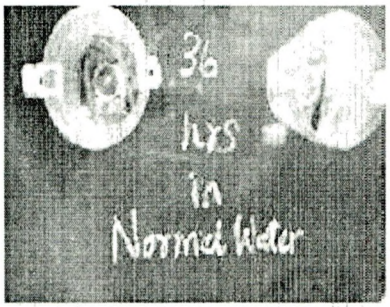
N 1.1



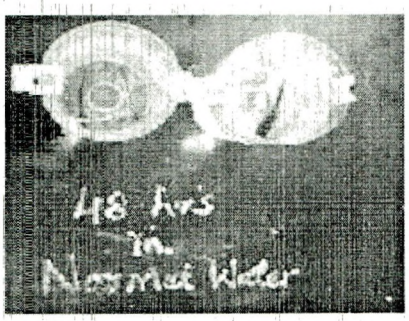
N 1.2



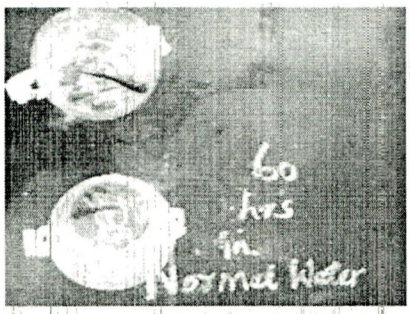
N 1.3



N 1.4



N 1.5



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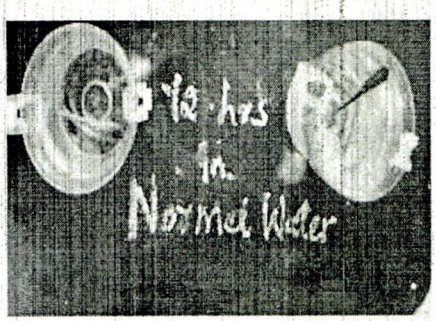
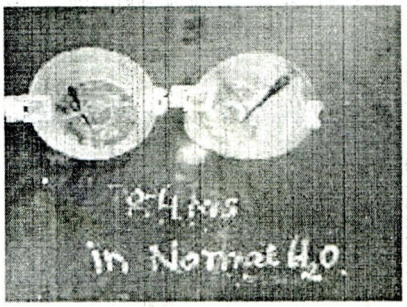


N 1.7

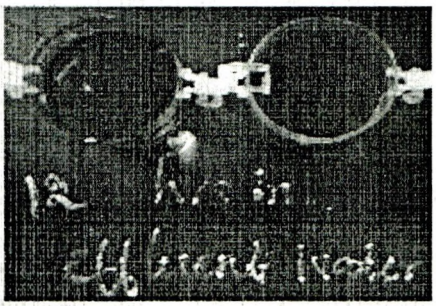


N 1.8

N 1.9

Fig.1.N 1.1 - 1.9: Fishes grown in fresh water observed from 0 hr-96 hrs. The pictorial representation confirms 0% mortality.

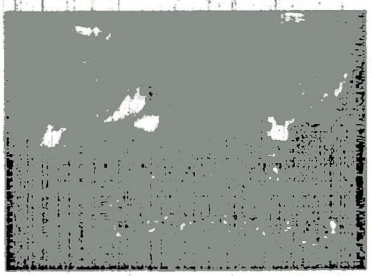
E 1.1



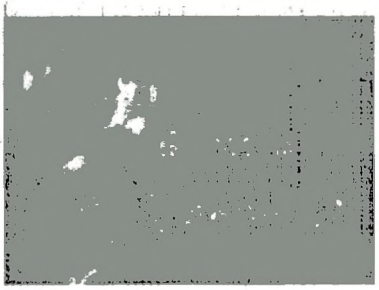
E 1.2

Fig.2 E 1.1 - 1.2: Fishes grown in the crude silk dyeing effluent water within 0 hr-12 hrs. The pictorial representation confirms the 100% mortality.

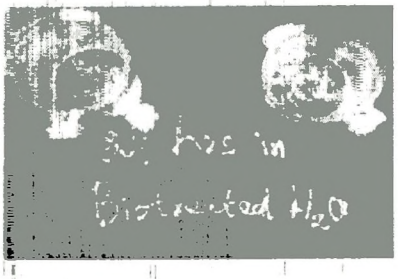
Bioassay test in biotreated effluent



E 3.1

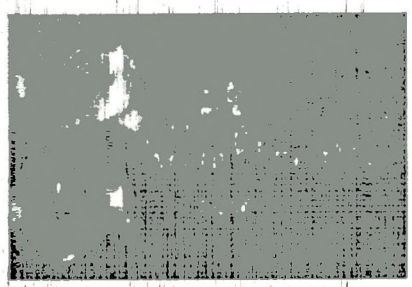


B 3.2



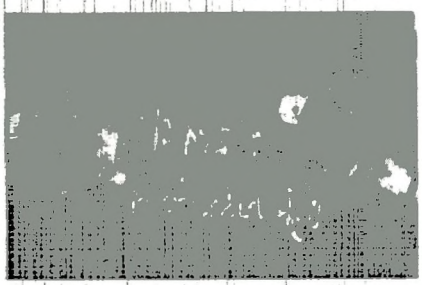
B 3.3

B 3.4



B 3.5

B 3.6



B 3.7

B 3.8

B.3.9

Fig B 3.1-3.9: Fishes grown in the biotreated silk dyeing effluent water by Pseudomonas fluorescens observed from 0-96 hrs. The pictorial representation confirms the 0% mortality. The fishes grown in fresh water was shown in plate 1 (N 1.1-1.9)

Effluent water discharges to receiving waters characterized by alkaline pH values could exacerbate NH_3–N toxicity and threaten the viability of various fish species[6].The heavy metals when exposed to organisms, constitutes a particular risk that they have the tendency to accumulate in vital organs[7] .Heavy metals and chemicals are metabolic inhibitors of living organisms. They exert toxic effects in the organisms at tissue level, cellular, sub cellular level and molecular level which interact with the protein leading to denaturation, precipitation, enzyme inhibition.

It was clear from the **table 1 and plate 1** that the fishes allowed to grow in well aerated tanks containing fresh water survived till 96hrs of experimental period whereas those in crude effluent survived only upto 12 hrs. The fishes were allowed to grow in biotreated silk dyeing effluent by *Pseudomonas fluorescens* was also observed till 96 hrs and evaluated to be 0% mortality analogous to fishes grown in fresh water.

Similar results were found in *Labeo rohita* fish exposed to 0.5mg/ml of copper and zinc with 100% mortality[8]. The effluent is capable of causing death of some fish and macro-invertebrates because the oxygen required by these aquatic habitats will be consumed by micro organisms[9] and decrease in oxygen consumption of the fish[10]. Laboratory studies had revealed the ability of the bacteria in the removal of chemicals and heavy metals from industrial effluent[11] .Thus biotreated water supports the survival of the fishes.

CONCLUSION

The biotoxicity analysis reveals that the fishes can survive in biotreated effluent water similar to fresh water fishes. Thus the biotreated silk dyeing effluent by *Pseudomonas fluorescens* was analysed to be safe for the aquatic fishes and this technology can be recommended as the safest one.

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