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Water Hyacinth for Treatment of Dairy Waste Water

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A B S T R A C T :

Dairy industry is considered to be largest source of food processing wastewater in many countries. Huge amount of water is used during processing of milk, this result in generation of high volume of effluent containing dissolved sugars, proteins, fats etc. which are mainly organic in nature. Thus dairy effluent is characterized by high concentration of organic matter, high BOD and COD. Effluent with such characteristics cannot be used for land irrigation purpose and cannot be discharged into public sewer or surface water. Thus proper treatment of dairy wastewater is necessary before disposal. Dairy wastewater is readily biodegradable can be treated easily with conventional treatment techniques. Disposal problem of biological sludge i.e. hazardous waste etc. Hence there is need for developing low cost technique for dairy wastewater treatment. Phytoremediation is one of such techniques which is defined as use of plants micro-organisms to remove harmless pollutants from contaminated water. In this study an attempt is be made to assess efficiency, suitability of aquatic plants like water hyacinth to treat dairy wastewater.

In the present study experiments were conducted in lab for assessment of dairy waste water quality in Prabhat dairy plant near Sangamner .The capacity of this dairy is 5,00,000 lit. per day and generates huge amount of waste water daily. This dairy discharges this waste water nearby agricultural zone. The unscientific discharging of waste water creates lots of environmental problems in this area causing water pollution. In this regard study is to treat the waste water generated from the dairy industry by water hyacinth

Keywords BOD-Biochemical Oxygen Demand**,** COD-Chemical Oxygen Demand**,** IS-Indian Standards TDS-Total Dissolved Solids**,** EC-Electrical Conductivity**,** WHO-World Health Organization DO-Dissolved Oxygen**,** MPN-Most Probable Number **,**MPCB-Maharashtra Pollution Control Board**,** WHUP-Water Hyacinth Utilization Project

1. Main text

The water hyacinth has successfully resisted of its eradication by chemical, biological, mechanical or hybrid means .water hyacinth of CW based requires only 13% of the energy as compared to conventional sewage treatment plant for the same quantity of sewage that is a viable and cost effective option for the treatment of domestic sewage in a developing economy. It has a huge potential for removal of the vast range of pollutants from waste waterand has the ability to grow in severe polluted waters .It is also used to improve the quality of water by reducing the levels of organic, inorganic heavy metals .Presence of its fibrous root system and broad leaves help them to absorb higher concentrations of heavy metals. It readily reduces the level of heavy metals in acid mine drainage water and silver from industrial wastewater in short time .Here introduce the paper, and put a nomenclature if necessary, in a box with the same font size as the rest of the paper. The paragraphs continue from here and are only separated by headings, subheadings, images and formulae. The section headings are arranged by numbers, bold and 9.5 pt. Here follows further instructions for authors.
Practical applications of water hyacinth-The plant itself although more than 95% water, has a fibrous tissue and a high energy and protein content, and can be used for a variety of useful applications. Below we will consider a number of possible uses for the plant, some which have been developed and others which are still in their infancy or remain as ideas only1.3 Practical applications of water hyacinth-

5 Necessity

The literature review has shown that 6 to 10 lit of waste water is generated per liter of milk processed. The processing capacity is 5lac lit. of milk per day. This indicates that about 10ltr of waste water is produced per lit of milk and the water quality is detoriated near the dairy zone .It makes the water unsafe for drinking and irrigation purpose. It is observed that the people living in this area having health and hygienic problems such as allergic, asthmatic skin irritation gastro intestinal diseases etc.

1.6 Objective

1. To study dairy industry waste water characteristics.2)To study use of Water hyacinth plant for dairy industry waste water treatment.

3To find out new low cost technology for treating dairy industry waste. 4. Cost analysis of different treatment methods for treating dairy waste

water. 5. Use the plant species which are native for recycling of waste water in water bodies. 6. The potential use of treated waste water for Irrigation purpose.

Indian Dairy Structure

India has a unique pattern of production, processing and marketing/consumption of milk, which is not comparable with any large milk producing country. Approximately 70 million rural households (primarily, small and marginal farmers and landless laborers) in the country are engaged in milk production. 0ver 11 million farmer are organized into about 0.1 million village Dairy Cooperative Societies with about 110 farmers per society. Of the total milk produced, about 50 % is retained by the producers for domestic consumption leaving about 50 % as the marketable surplus

3.1 Study Area

The Prabhat dairy is located at Sangamner. The daily milk processing quantity is about 5,00000 lit/day .It has been found that due to discharging of dairy waste water in to the farm the people living in this area faces many environmental and health problems.

Structure3.2 Characteristics of raw wastewater

The initial characteristic of the wastewater shows that BOD is very high and the waste is highly biodegradable. The nitrogen content is good enough for biological treatment.

Table No.1 **Date: 13-11-2014**

SN	Parameter	Unit	Value
1	pH	-	7.6-7.8
2	Alkalinity	mg/L as $CaCO_3$	62
3	Total solids	mg/L	1835-1850
4	Total dissolved solids	mg/L	620
5	Suspended solids	mg/L	----------
6	BOD_5@ 20^0C	mg/L	1226-1425
7	COD	mg/L	1860-1915
8	Oil and grease	mg/L	230
9	Chlorides	mg/L	175
10	TKN	mg/L	85
11	P	mg/L	22

3.3Constructed Wetlands with Water Hyacinth:

The most developed and widely used phyto-remediation application is the useof constructed wetlands (artificial marshes) for wastewater treatment. Constructed wetlands are either free water surface systems [FWS] with shallowwater depths or subsurface flow system [SFS] with water following laterallythrough the sand or gravel.

- Free Water Surface System [Fws]
- Subsurface Flow Systems [SSF]
- Aquatic Plant System [Aps]

Fig. No.1 Free Water Surface System [Fws] and Subsurface Flow Systems [SSF]

3.5Methods of Analysis:

Approximately 50 liters of raw effluent from dairy was brought to the laboratory in plastic containers and the experiments were set up in steel boxes. The plants used for the study was an emergent wetland plant water hyacinth. The experimental plants were initially subject tostabilization in tanks containing well water for one month for acclimatization. The base of the tank was filled with gravel and wetland soil up to three inches in height. Ten liters of the respective dilutions of the effluent were prepared and then transferred to steel boxes of size 24x24x35cm. For eachexperimental set, two controls were maintained with ten liters of well water and ten liters of raw effluent. For treatments, the plants which maintained in the stock tanks were collected, cleaned and introduced in the experimental tanks. Approximately 1Kg each experimental plant used for the study, each occupying half of tanks. Five no's of each experimental setup was maintained. 500ml each of water and effluent from the respective treatment sets were collected periodically foranalyzing the changes in its physico-chemical characteristics subsequently with an interval of 1 days up to 15 days.

Results of analysis

The ground water parameters analyzed for dairy waste water around the site .These samples were analyzed during November 2014.The results are tabulated below:

Table No.4 Result Date: 13-27 November 2014

Sr.No.	Parameter	Unit	Desired limit	Pond No.1	Pond No.2	Pond No.3	Pond No.4	Pond No.5	Remark
1	Phosphorous	Mg/Lit	11.7	--	--	--	--	--	
2	P^H	----	7.2-7.6	6.9	7.0	7.0	7.0	7.0	
3	Temp.	° c	25-38	29	30	28	28.5	29	
4	Turbidity	NTU	50	9.0	11.2	11.6	9.5	12	
5	Alkalinity	Mg/Lit	600	62	61.8	61.5	60	58.2	
6	SS	Mg/Lit	760	1830	1821	1801	1795	1750	
7	TDS	Mg/Lit	1060	698	862	870	1453	1395	
8	BOD	Mg/Lit	1240	20	340	540	560	575	
9	COD	Mg/Lit	84	600	935	1155	1185	990	
10	Chlorides	Mg/Lit	105	175	165	322	170	356	

4.1 Performance appraisal water hyacinth ponds:

The BOD removal performance of all the five ponds is monitored regularly and is presented in table .
Performance of POND – I (Liquid Depth 10 cm)

Table No.5

Day	pH	C.O.D.	B.O.D.
	-	mg/L	mg/L
1	7.6	1860	1226
2	7.6	1770	1136
3	7.5	1520	885
4	7.4	1380	740
5	7.4	1160	530
6	7.2	950	320
7	7.0	830	240
8	6.9	780	190
9	6.9	690	105
10	6.9	650	65
11	6.9	640	55
12	6.9	635	49
13	6.9	620	36
14	6.9	605	23
15	6.9	600	20

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