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Chemical Nature of Sewage Treated Water Using For Agricultural Purposes (Bikaner)

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ABSTRACT
Bikaner is a desert city and situated in North-West part of the Rajasthan state. It has very hot and dry climatic condition during summer and almost near 0^0C in water season. Now a day, as the very fast advancement of human being are noticed (civilization), the water as their basic needs are uses more and more. Water uses in numerous way like washing, bathing, shower, toilet and small factories etc. In Bikaner city, four natural slops the sewage water goes in sewage treatment plant, which is situated in Vallabh garden area 7 k.m. away of the city. In this treatment plant, three anaerobic and two aerobic sewage stabilizing ponds are situated. After the treatment of sewage water the effluent of that are uses for agricultural purposes, from which vegetables and crops are grown. The use of treated sewage water in agricultural purposes is beneficial for sustainable development. The chemical parameters (DO, BOD, Total Hardness) were observed during the study period (March 2010 to May 2011) to understand the chemical nature of sewage water.
KEYWORDS - *Sewage Treatment plant, anaerobic ponds, Aerobic ponds.*

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I. INTRODUCTION

The expending consumption of consumers goods, quantity of wastes are increasing rapidly in our country. Use quantities of various wastes generated by uncontrolled urbanization rapid industrialization and extensive agricultural practices. The chemical composition of sewage varies from day to-day or even from hour, it also various considerable between different areas because they produce the wastes of different characters. Nutrients, toxicants, organic and inorganic constituents and different species of microorganisms are major components of wastes. Waste is corrosive, ignitable, reactive, toxic, radioactive, infectious, bio accumulative, carcinogenic, mutagenic and teratogenic. Sewage treatment is a process by which contamination of sewage water can be reduced or even eliminated. Geographically Bikaner has natural slops and is divided in four drainage zones-Vallabh garden, Shivbari, Murlidhar vyas nagar and Gangasahar. In Vallabh garden zone, people of above seven lakh the main part of the old city as well as half of the Bikaner population is connected. This zone has almost 6,500 sewer connection and about 78 Km. long sewer lines. This sewage water taken up by the sewage treatment plant where it is treated by primary & secondary treatment process, by anaerobic and aerobic sewage stabilization ponds. Chemically municipal sewage contain mainly oxygen-demanding materials, sediments, grease, oil, scum, salts, algae nutrients, pesticides, refectory organic materials.

II. MATERIALS & METHODS

The State of Rajasthan, having an area of 3,42,274 km^2 , constitutes the largest State of the Indian republic. It extends between $23^o3'N$ and $30^o12'N$ latitudes, and $69^030'E$ and $78^o17'E$ longitudes (Fig.1). The Aravalli range, running from Sirohi in the SW to Khetari in the NE, bisects the state into two unequal parts. The north-western region constitutes the major part of the Indian desert while the south-eastern region is a combination of semiarid and fertile lands. Bikaner, where the study has been carried out, occupies a central position in the former region (28^oN and $73^o17'E$, MSL 228 m). India, in general, has a tropical monsoon climate, but the area under investigation, being a hot desert, shows a typical arid climate. In this region the average annual rainfall ranges from 25 to 37 cm. Low and irregular rainfall is responsible for a general dearth of vegetation. Most of the rain occurs in months of July and August in short and stormy showers with a relatively high intensity. The three monsoonal months i.e., July-September, however, provide 75 to 90% of the total annual rainfall. Dry violent winds, strong dust storms, wide diurnal and seasonal variations in temperature, paucity of food and usable water are the common features of the area. The annual minimum and maximum temperatures at Bikaner are recorded close to freezing point and 48^oC respectively. Three main seasons are recognized as the summer (March to June), the monsoon (July to October), and the winter (November to February).The soil of the region remains dry for much of the year and is prone to wind erosion. High velocity

winds blow soil from the region and causing shifting sand dunes within the area. A dry atmosphere, high temperature, low rainfall, scarcity of water, intense illumination and higher rate of transpiration are the major characteristics of desert. The hot winds called 'Loo' are common in the area in the months of May and June. Due to scarcity of water and extreme of temperature the biota is much varied represented. These are mainly shrubs, bushes, grasses and few trees xerophytes have widespread branched stems. Some succulent's plants like cactus also present in desert. Insects, reptiles, rodents, birds, camels are chief animals of desert. The study was carried at two types of water bodies situated about 6 Km. south of Bikaner district at sewage treatment plant of Vallabh Garden. The sewage stabilization ponds situated in sequence of deep anaerobic and shallow aerobic ponds hold the sewage water with the varying degree of pollution load, particularly the organic one. These included three anaerobic stabilizing ponds and two aerobic stabilizing ponds. The flow chart in sewage treatment plant is shown in Fig. 1.

The sewage water o the Bikaner city are drain in a 1600 mm diameter pipes and run towards the Vallabh Garden area. Hence two filter membranes works wiz. 40 mm diameter coarse screen and 20 mm diameter fine screen. After that the sewage water comes in a tank, where three detritor (fans) work which separates the large sludge of 0-20 mm size. After remove of large sludge particles sewage water goes in a distribution chamber. From distribution chamber, three separate pipes go to three inlet chambers of anaerobic ponds. Depth, length and width of these inlet chambers size are 6 meter, 5 meter and 4 meter. These inlet chambers open in three separate anaerobic ponds. The maximum depths of these anaerobic ponds are 6 meter and have cemented walls on the inner and outer surface. Lengths and widths of these ponds are 83.5 meter and 22.5 meter. Two outlets chamber of second anaerobic ponds are opens into both aerobic ponds (First and second). While a separate opening of first anaerobic pond to first aerobic and third anaerobic to second aerobic pond is also present. The maximum depths of these ponds are 3 meter. These ponds have cemented walls on the inner and outer surface. Lengths and widths of these ponds are 395 meter and 130 meter. Both these aerobic ponds have four inlets chamber. Length, widths and depths outlet chamber of these ponds are 10 meter, 4 meter and 2 meter. Outlet chambers of 2 aerobic ponds are flowing towards Vallabh Garden and agricultural fields through a pipe line.

III. RESULT & DISCUSSION

DO:

During the study period, dissolve oxygen were not recorded from all the anaerobic stabilizing ponds. The DO was observed in both aerobic stabilizing ponds as ranging between 4.12 mg/l. to 8.65 mg/l. It was highest recorded as 8.65 mg/l. in Aug. 2010 in first aerobic stabilizing pond and lowest as 4.12 mg/l. in first and second, both aerobic stabilizing ponds.

BOD:

In compare to above parameter, the biological oxygen demand (BOD) was highest in all the three anaerobic stabilizing ponds as 145 mg/l. to 360 mg/l. While it was seems lower as 66.5 mg/l. to 114.0 mg/l. in two aerobic stabilizing ponds. The value was recorded highest as 360 mg/l. in first and second anaerobic stabilizing pond in July 2010 and noted lower in Sept. 2010 at both aerobic stabilizing ponds. (Gupta *et al.*, 2003).

Total Hardness:

Chemical variable like hardness in all three anaerobic stabilizing ponds are ranging between 116 mg/l. to 190 mg/l. The highest value of these ponds were observed in the month of Feb. 2011, while the lowest value of same stabilizing ponds recorded in the month of March, 2010. The value of hardness in both aerobic ponds recorded as 100 mg/l. in March, 2011 as lowest, while 175 mg/l. in Oct. 2010 as highest. Total hardness is imparted mainly by the Ca and Mg ion which a part from sulphate, Chloride and Nitrate are found in combination with carbonate & bicarbonates

IV. CONCLUSION:

The effluent of the sewage treatment plant is used in agricultural purposes. The Chemical analysis of Bikaner Sewage treatment plant show that it is not fit for some extent for agricultural processes. By the sewage treatment plant, the various chemical which are harmful for main kind are removed. The study also observed that in the township like Bikaner and near by areas face dreadful health problems leading to a number of diseases subsequent to consumption of the vegetables of the sewage water.

Table 1. Monthly average of chemical variables at first Anaerobic stabilizing pond of sewage treatment plant, Bikaner during March 2010 to May 2011. Values are expressed in mg/l. except otherwise mentioned.

Months Variables	March 2010	April 2010	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	March 2011	April 2011	May 2011	Total Average
DO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOD	150	165	180	155	360	350	320	290	258	270	282	230	145	170	190	234.3
Hardness	116	142	160	172	166	174	182	176	160	166	180	190	118	140	164	160.4

Table 2. Monthly average of chemical variables at second Anaerobic stabilizing pond of sewage treatment plant, Bikaner during March 2010 to May 2011. Values are expressed in mg/l. except otherwise mentioned.

Months Variables	March 2010	April 2010	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	March 2011	April 2011	May 2011	Total Average
DO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOD	155	160	180	160	360	350	330	300	260	274	280	290	150	160	190	239.9
Hardness	118	144	162	170	160	176	180	174	164	166	182	188	120	146	160	160.7

Table 3. Monthly average of chemical variables at third Anaerobic stabilizing pond of sewage treatment plant, Bikaner during March 2010 to May 2011. Values are expressed in mg/l. except otherwise mentioned.

Months Variables	March 2010	April 2010	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	March 2011	April 2011	May 2011	Total Average
DO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOD	160	170	185	160	310	345	330	300	258	274	280	240	155	165	180	234.1
Hardness	120	140	160	168	160	174	178	174	158	164	180	188	120	142	162	159.2

Table 4. Monthly average of chemical variables at first Aerobic stabilizing pond of sewage treatment plant, Bikaner during March 2010 to May 2011. Values are expressed in mg/l. except otherwise mentioned.

Months Variables	March 2010	April 2010	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	March 2011	April 2011	May 2011	Total Average
DO	7.86	6.10	6.09	6.68	5.11	8.65	8.26	5.70	6.29	4.32	4.13	4.12	7.87	6.09	5.31	6.17
BOD	92.5	83.0	85.0	77.5	67.0	79.0	66.5	114.0	96.0	77.0	106.0	93.5	92.5	88.5	81.5	86.6
Hardness	105	122	161	168	148	161	160	171	141	155	154	162	100	120	163	146.1

Table 5. Monthly average of chemical variables at second Aerobic stabilizing pond of sewage treatment plant, Bikaner during March 2010 to May 2011. Values are expressed in mg/l. except otherwise mentioned.

Months Variables	March 2010	April 2010	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	March 2011	April 2011	May 2011	Total Average
DO	7.87	7.08	5.31	6.88	5.50	8.45	8.46	6.68	5.90	4.12	4.91	4.32	8.06	7.08	5.90	6.43
BOD	88.5	86.0	85.0	73.5	70.0	76.0	66.5	104.0	87.5	77.0	101.0	97.5	96.5	88.5	76.5	84.9
Hardness	107	119	161	167	150	163	163	175	142	154	156	164	103	120	166	147.3

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