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A SHORT NOTE ON WATER QUALITY IN WELLS NEAR SEWAGE FARM AT TIRUPATI, ANDHRA PRADESH

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Abstract

Tirupati municipality is maintaining a sewage farm at Tirupati for treatment and disposal of wastewater. Hydrogeochemical studies indicate pollution of groundwater. In order to prevent pollution of groundwater due to sewage irrigation, it is necessary to treat the sewage water before applying to farming.

Introduction

The major problem of many municipalities in India and abroad is the disposal of huge quantities of domestic sewage and industrial wastes. To treat these wastewaters and bring them to the required norms suitable for discharge into rivers is a costly process, and so, many municipalities are practising sewage irrigation or sewage farming as an alternative treatment and method of wastewater disposal. Tirupati is one such municipality, which is maintaining a sewage farm at Tirupati as a method of treatment and disposal of wastewater. The average quantity of wastewater entering the sewage farm is estimated at 1970 m^3/day at the inlet and the quantity of wastewater leaving the farm at the outlet is estimated as 35 m^3/day by float method (Kotaiah and Pratap Mouli, 1982). This indicates that only 1.8 per cent of wastewater is leaving the sewage farm; the remaining is lost as a result

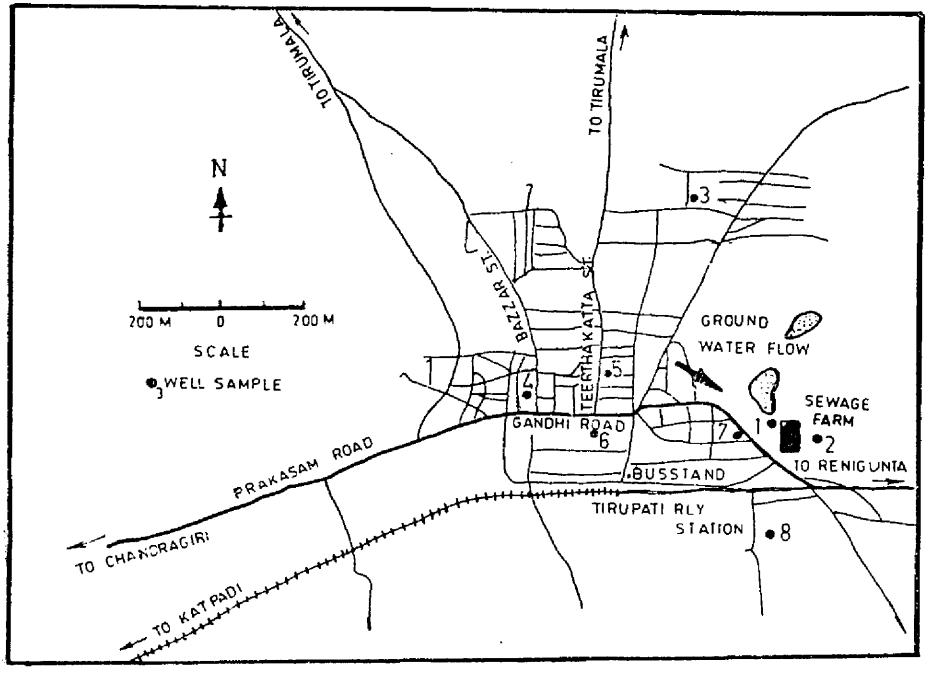

Figure 1. Location of sewage farm in Tirupati Municipality.

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TABLE I. Chemical analysis of groundwater samples collected (Sample location are given in Figure 1)

Constituent	Sample No. 1		Sample No. 2		Sample No. 3		Sample No. 4		Sample No. 5		Sample No. 6		Sample No. 7		Sample No. 8	
	mg/1	meq/1	meg/1	meq/1	mg/1	meq/1	mg/1	meq/1	mg/1	meq/1	mg/1	meq/1	meg/1	meq/1	meg/1	meq/1
Calcium (Ca)	85	4.242	90	4.491	20	0.998	48	2.395	42	2.096	54	2.695	62	3.094	34	1.697
Magnesium (Mg)	48	3.948	57	4.689	8.3	0.683	22	1.810	22	1.810	53	4.360	55	4.524	18	1.481
Sodium (Na) + Potassium (K) as Na	122	5.307	280	12.180	47	2.044	17	0.740	48	2.088	50	2.175	220	9.570	240	10.570
Carbonate (CO_3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.1	0.237
Bicarbonate (HCO_3)	424	6.950	455	7.457	52	0.852	80	1.311	144	2.360	196	3.212	388	6.359	440	7.212
Sulphate (SO_4)	98	2.040	134	2.790	5.5	0.114	20	0.416	10	0.208	20	0.416	51	1.062	26	0.541
Chloride (Cl)	157	4.429	390	11.002	98	2.765	112	3.159	122	3.442	194	5.473	346	9.761	200	5.642
Phosphate (PO_4)	1.2	0.038	2.0	0.063	0.2	0.006	0.2	0.006	0.3	0.095	0.3	0.095	0.2	0.006	0.3	0.095
Nitrate (NO_3)	6.9	0.111	8.6	0.139	0.8	0.013	1.2	0.019	1.4	0.022	1.0	0.016	0.8	0.013	0.8	0.013
Total Dissolved solids	1100		1340		177		361		393		550		1037		817	
Hardness as $CaCO_3$	410		460		84		210		196		352		380		160	
Alkalinity as $CaCO_3$	350		375		43		66		118		168		318		420	
Specific conductance (Micro mhos/cm at 25°C)	1640		1980		280		580		610		853		1600		1320	
Dissolved oxygen	3.8		3.4		6.2		6.8		6.6		6.8		6.8		6.6	
pH	7.2		7.2		7.8		7.6		7.7		8.0		7.3		8.4	

of evaporation and percolation. Hydrogeological and geochemical studies were made near the sewage farm to know the pollution of groundwater due to sewage irrigation.

Methods of Study

Eight groundwater samples were collected (Fig. 1) from the wells and were analysed following (Rainwater and Thatcher, 1960; Brown *et al* 1970; APHA, AWWA, WPCF, 1976) for various constituents and properties (Table I). Out of the eight groundwater samples, two samples (1 and 2) were collected on either side of the sewage farm approximately in the direction of groundwater flow which is north-west to south-east. Sample number 1 was from a distance of 6 m from the inlet of sewage farm and sample number 2 from a distance of 15 m from the outlet channel. The remaining six samples were collected from wells away from the sewage farm. The results were compared and found that the groundwater samples from the wells near the sewage farm are showing very high values of pollutants than those samples from other locations indicating that the groundwater near the sewage farm is polluted due to extensive long term sewage farming.

The depth to water table in wells 1 and 2 near the sewage farm is around 7.8 m from the surface at the time of investigation while the depth to water table in other wells was around 15 m. This indicates that wells 1 and 2 are receiving water from the sewage farm by percolation. Low content of dissolved oxygen in the two wells indicate that these wells are contaminated with biodegradable organic carbon. Extensive algal growth also has been found by visual observation in the two wells near the sewage farm indicating that these two wells are receiving nutrients from percolating sewage.

An ideal sewage farm should be developed to reduce the infiltration rate of wastewater into the soil, the drainage pipes should be laid effectively to decrease the percolation of wastewater into the groundwater and crops like leafy crops, seed crops, grain crops, and fruits like banana can be grown in the sewage farm, so that the constituents like phosphates and nitrates get removed from the wastewater (Russell *et al* 1976).

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