

Physicochemical and Biological Characteristics of Soils Amended with Dairy Waste Water Flooded Soils in Wyra, Khammam Dist, Andhra Pradesh, India.

B. Lalitha Kumari

Department of Botany, University Arts & Science College,
Kakatiya University, Warangal -506 001. Telangana, India

E-mail: lalitha21prasad@gmail.com



Licensed by GSPG

ABSTRACT

Physicochemical, biological characterization and enzyme activities of soils irrigated with dairy effluents was undertaken during 2013-14. The maximum soil temperature was recorded 39°C in the May. The soil colour varied from light red. The pH range was 6.9 – 7.6. The field capacity, percent of pore space, conductivity, total alkalinity, chlorides, phosphates and nitrates were maximum during winter. Marginal variations were recorded in the chemical constituents between sewage amended and control soils. The bacterial population was maximum during March to May in dairy amended soils.

Keywords: Total Alkalinity, Chlorides and Nitrates

INTRODUCTION

Rapid industrialization and urbanization is introducing potentially harmful chemical and biological substances in soil. The soil contamination around cities causes changes in biological populations in an ecosystem. Now a days disposal of dairy effluents and sewage sludge on agricultural land is becoming a wide spread practice and these contain large amounts of toxic pollutants and they could be retained and accumulated in soils. Substantial work has been done on chemistry of toxic elements and heavy metals in soils and their toxicity to their biological systems. The toxic substances in the waste water accumulated soils are absorbed by the crops (cereals, vegetables, leafy crops) and cause damage directly and indirectly due to enzymatic hydrolysis within plant cells. In this regard, an attempt was made to investigate the physico-chemical and biological characteristics of dairy effluents of flooded soils in Wyra, Khammam District.

Sampling Site:

Dairy industry situated in Wyra, on state highway from Hyderabad to Rajahmundry. It is 24kms away from Khammam city. It was started in the year 1990 with handling capacity of 80,000 liters per day. It has twelve milk routes and 76 milk collection centers and 4361 milk producers in Wyra, Khammam District is resourceful and having good potential of milk. In order to develop the dairy activities and enhancement of milk production and procurement in district, the national cooperative development corporation has come-up for financial assistance with an out lay of Rs. 12 crores. The processes of dairy industry include fat tests, acidity tests etc. with various chemicals such as H₂SO₄, HNO₃ amyl alcohol, caustic soda etc, excess amount of milk sugar lactose and casein. Approximately 125 kg of polythene paper is used to prepare sackets per day. During all these process enormous amounts of effluents were released and without any treatment these are drained into nearby soils causing an unhealthy situation around this industry causing

damage to agriculture soils (paddy, chilies). In view of this, soils adjacent to this industry were analyzed.

MATERIALS AND METHODS

The dairy effluents flooded soils were selected and collected for analysis 5 – 15 cms depth. For comparison near soil served as control. Soils were air dried and crushed to parts in 2mm screen. The physical, chemical and biological characteristics were analyzed following methods suggested by Trivedy et al. (1987).

RESULTS AND DISCUSSION

The physical properties of the soils from July 2013 to June 2014 are presented in Table-1. The maximum soil temperature was recorded 39°C in the month of May. The pH was 7.0 in control site, while it ranged between 6.9 – 7.6 in polluted soils. Ajmal and Khan 1984 effects of industrial dairy effluents on soil and crop plants. The colour of the soils in dairy flooded soils varied from light red to dark brown while the control soils were always red. The bulk density of the soils was maximum during winter season with a range of 1.12 – 1.43.

Table-1. Physical Characteristics of dairy effluents flooded soils and control soils

S.No.	Month/ Year	Sites	BD	PS	FC%	WHC%	EC	PWC
1.	July 2013	1.Dairy	1.31	50.6	18.1	22.9	0.98	7.89
		2.Control	1.19	55.1	17.9	24.2	0.62	8.35
2.	Aug 2013	1.Dairy	1.29	51.3	16.3	20.1	0.8	6.93
		2.Control	1.23	53.6	17.1	23.4	0.46	8.07
3.	Sept 2013	1.Dairy	1.41	46.8	16.3	22.9	0.84	7.89
		2.Control	1.26	52.5	16.2	22.8	0.17	7.85
4.	Oct 2013	1.Dairy	1.26	52.5	14.6	21.8	0.32	7.52
		2.Control	1.39	47.6	15.1	20.3	0.37	7.01
5.	Nov 2013	1.Dairy	1.17	55.9	13.2	20.4	0.26	7.04
		2.Control	1.26	52.5	17.4	21.9	0.19	7.55
6.	Dec 2013	1.Dairy	1.16	50.2	14.3	20.8	1.59	7.12
		2.Control	1.36	46.7	12.4	19.7	0.52	6.79
7.	Jan 2014	1.Dairy	1.36	48.7	13.1	20.6	2.48	7.13
		2.Control	1.42	46.4	15.4	20.2	0.68	6.96
8.	Feb 2014	1.Dairy	1.32	50.2	13.2	22.6	2.68	7.19
		2.Control	1.41	46.7	12.4	21.8	0.72	7.59
9.	March 2014	1.Dairy	1.21	54.3	16.8	25.4	1.79	8.76
		2.Control	1.23	53.6	11.2	20.6	1.02	7.79
10	April 2014	1.Dairy	1.26	55.1	12.1	24.3	0.98	8.38
		2.Control	1.32	50.2	11.9	20.3	0.98	8.38
11.	May 2014	1.Dairy	1.19	55.1	12.4	25.6	2.28	8.8
		2.Control	1.38	47.9	15.3	24.8	0.44	8.89
12.	June 2014	1.Dairy	1.36	48.7	17.1	25.9	0.94	9.62
		2.Control	1.28	51.7	16.3	24.9	1.28	8.93
	Mean	1.Dairy	1.28	51.6	14.2	21.5	7.86	1.31
		2.Control	1.31	50.4	16.6	22.4	0.49	7.84
	Standard Deviation	1.Dairy	1.81	2.95	2.12	3.28	1.55	1.72
		2.Control	1.72	3.16	1.92	1.61	1.08	0.91
	Standard Error	1.Dairy	0.54	1.13	0.64	0.51	1.29	0.47
		2.Control	0.52	0.95	1.73	0.84	0.33	0.28

BD: Bulk Density(gm cm³), % of PS: Percentage of pore space, %FC : Percentage of Field Capacity, EC: Electrical Conductivity mMhos, PWC: Permanent Wilting coefficient

Jeevan rao et al 2003/ Physical properties and elemental analysis of urban soil waste. The percentage of water holding capacity was high during the month of March (26.27%) low in July (19.9%). The percentage of pore space was maximum in March (57.4%) minimum in February (42.8%). Electrical conductivity was measured and found to be the maximum in December (3.90Mho/cm) and Minimum was in September (6.55). Chakravarthy and Sharma 2006 Impact of Shifting cultivation on physical chemical properties and microbial population in soils.

The chemical features of soils were analyzed and the data were presented in Figures 1-10. The total alkalinity was maximum (3.60mg/100gm) in the month of February in winter. Chlorides were maximum (60mg/100g) in the month of March in summer. Plant nutrients calcium range was 22 – 60mg/100g. magnesium was high in the month of March, 60mg/100g. calcium carbonate percentage was high in the month of February (46%) potassium

content was also maximum during summer, in the month of May, While the amount of iron was maximum in 0.7 ppm. The basic nutrients in the soils sulfates were found to be maximum 182mg/100g in April and phosphates were maximum (24mg/100g) in the month on May. Chhonkar and Tarafdar 1984n stated in Accumulation of phosphates in soils. Marwaha 1998, Manivikasam 2002, Sharma and Minhas 2004. Nitrate content was high during summer months (0.76mg/100g). Ammonia content was high in summer in April and Marginal variation in this chemical constituents was recorded between dairy industry, polluted and control soils. The organic matter percentage was maximum during the month of November (winter), the amount of organic carbon was maximum in dairy effluents flooded soils than in control soils. Hitoichishiga 1997 stated in the Decomposition of fresh and composed organic materials in soils.

The soil microorganisms which determine the arrangement of the soils were enumerated and presented in Table–2. The bacterial population were maximum during May in dairy soils, while they were maximum in March in controlled soils. Chang 1984, Kulkarni 1992, Noorjahan et al 2003. Noorjahan et al 2004.

Table-2. Bacterial (1x 10⁶g), Fungal (IX 10⁵), Actinomycetes (1X 10⁵g) colonies in Polluted and Control soils.

S.No.	Month/Year	Site1 Dairy	Site 2 Control	Site3 Dairy	Site 4 Control	Site5 Dairy	Site 6 Control
1.	July 2013	148	42	11	9	14	11
2.	Aug 2013	132	61	74	14	13	7
3.	Sep 2013	156	46	7	6	9	5
4.	Oct 2013	142	28	17	9	25	23
5.	Nov 2013	64	34	11	10	16	12
6.	Dec 2013	96	62	9	7	27	15
7.	Jan 2014	62	69	8	16	11	6
8.	Feb 2014	154	41	9	13	14	9
9.	March 2014	56	34	12	11	12	7
10	April 2014	84	123	19	9	15	6
11	May 2014	164	46	24	13	19	11
12.	June 2014	236	94	29	17	16	13
	Mean	124.6	56.6	19.1	11.2	15.9	10.4
	Standard Deviation	51.9	27	18.5	3.44	11.9	5.43

Figure-1. Total Alkalinity Concentration (mg/100g) in Sewage Irrigated and control soils

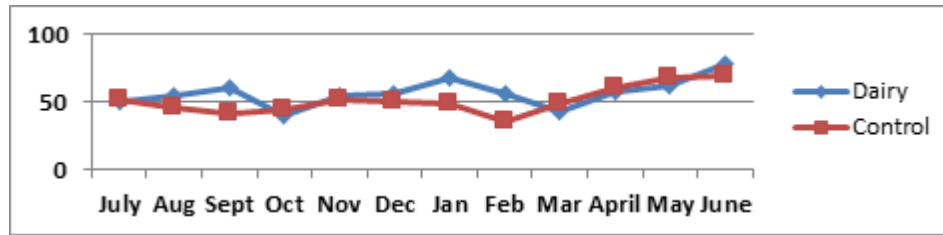


Figure-2. Chlorides Concentration (mg/100g) in Sewage Irrigated and control soils

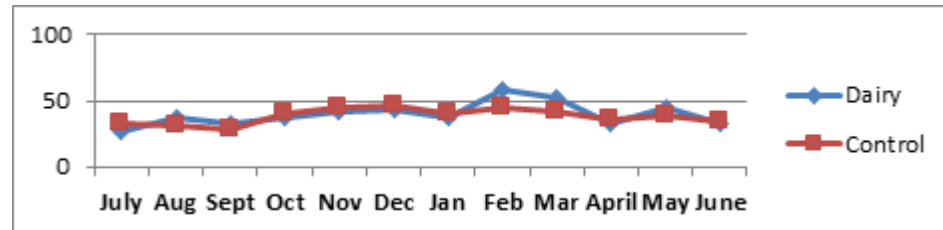


Figure-3. Calcium Concentration (mg/100g) in Sewage Irrigated and control soils

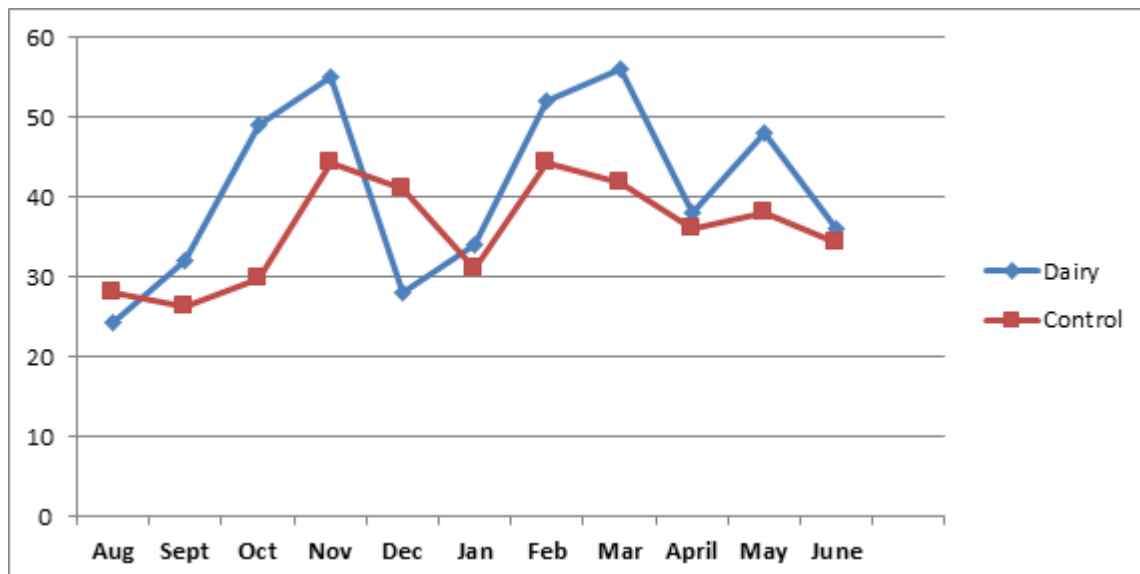


Figure-4. Organic Matter Percentage in Sewage Irrigated and control soils

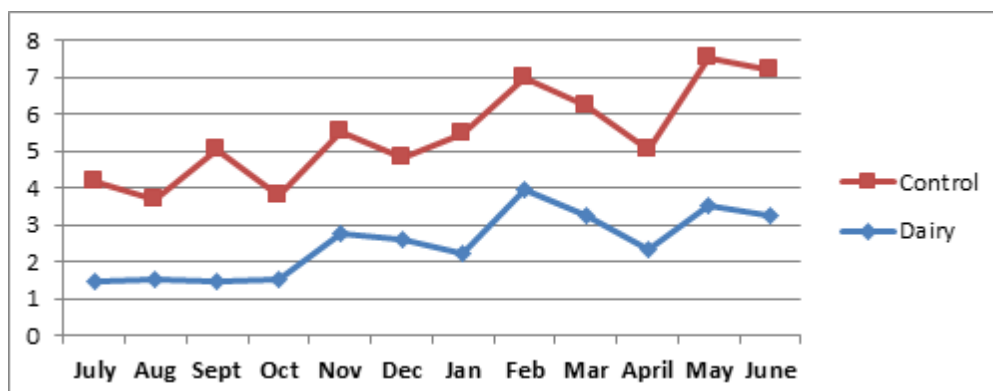
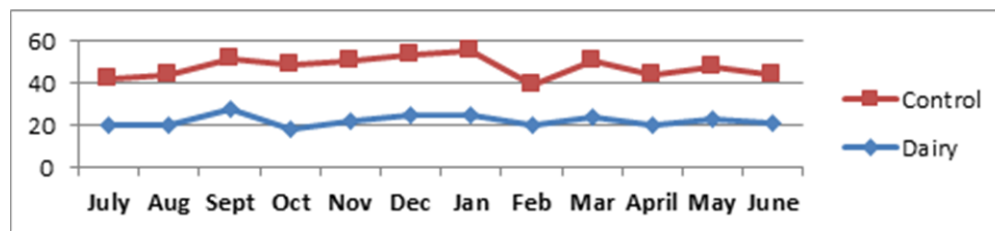
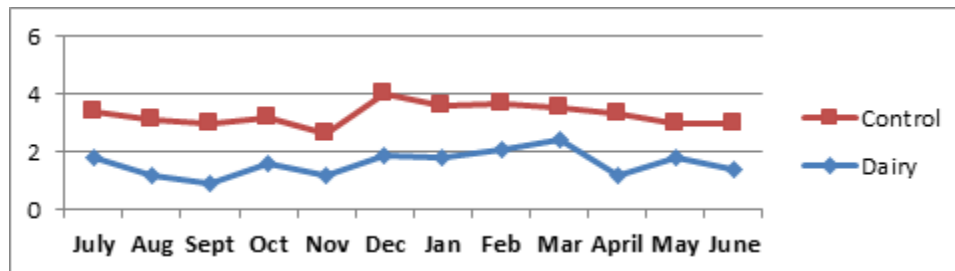


Figure-5. Magnesium concentration (mg/100) in Sewage Irrigated and control soils**Figure-6. Sulphate concentration (mg/100) in Sewage Irrigated and control soils**

Isolation and Identification of Microbes in dairy effluents. The fungal colonies were maximum in October and actinomycetes range were maximum in August.

REFERENCES

- Ajmal, M.M.A Khan and A.A Noman 1984. Effects of Industrial dairy effluents on soil and crop plants. *Environ. Pollut Ser.* 33:97-106
- Chakravarthy M. Sarma JU 2006. Impact of shifting cultivation on physico chemical properties and microbial population in soils of Nagaland, *Adv, Pl, Sci*, 190, 189-92
- Chang, A.C., Warn KC, J.E. Page, A.C. and Lund, L.T. 1984. Accumulation of Heavy Metals in sewage sludge treated soils *J. Environ Qual*, 13:87-91
- Hitochinshiga 1997. The decomposition of fresh composed organic materials in soils. *Food and fertilizer technology center extension Bulletin* 44:1-14
- Jeevan Rao, K.Y.S.S. Vimala Devi and A. Sreenivasa Raju 2003. Physical properties and elemental analysis of urban solid wastes of Hyderabad, *Indian J. Environ & Ecoplan.* 7:543-548
- Kul Karni, R.T 1992 Source and Characteristics of dairy wastes from a medium sized effluent on micro organisms plant growth and their microbial change. *Life Sci.Adv.*3:76-86
- Manivasakam, N.2002 Physico Chemical Examination of water, sewage and Industrial effluents, Pragati Prakashan.P 234
- Marwaha, S.S., Panesar, P.S and Singh, B. 1998. Studies on the Isolation of efficient yeast strain for the dairy waste water *Poli Res.* 17: 56-57
- Noorjahan, C. Dawood Sharief, S. Namsheen Dawood and Jamal Mohammad, M 2003. Isolation and Identification of Microbes an dairy effluent, National conference of Envirotech, Chennai, *Proceedings*, 161-163
- Noorjahan, C.M Dawood Sharief, S and Naurs Dawood 2004 Characterization of dairy effluents *Jr. of Indus. Pollut. Cont* 20:131-136
- Sharma, D.R and Minhas, P.S. 2004 soil properties and yield of upland crops as influenced by the long term use of waters having variation Residual, Salinity and Sodicity, *J.Indian Soc Soil.* 4:52,100
- Trivedy R.K., P.K. Goel and E.F Trisal, 1987, *Practical methods in Ecology and Environmental Sciences*, Environ Publications Karad, India.
