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Research Article

ANALYSIS OF SEWAGE IRRIGATED SOIL FOR PHYSICO-CHEMICAL PROPERTIES FROM OUTSKIRT OF AURANGABAD, MAHARASHTRA INDIA

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A R T I C L E I N F O

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A B S T R A C T

Soil serves as natural growth medium for plant as it has integral system of continuous recycling mechanism of organic and inorganic matter. Aurangabad is very fast developing and densely populated area, this factor is accelerating the rate of sewage discharge. Hence water bodies are contaminating by domestic as well as industrial discharge. The same water was utilized by some farmers for irrigation. In the present study 14 different locations of agricultural land which are irrigated by sewage water were compared with one controlled agricultural land irrigated by dug well for physico-chemical parameters such as Bulk density, Electrical conductivity, Water holding capacity, percentage of pore space, pH, Calcium, Magnesium, Sulphate, Chloride, Organic matter and Total Alkalanity. Values obtained in the present study were recorded more of less than ideal values set by FAO. This implies that sewage water was polluting agricultural land and changing its physico-chemical values.

INTRODUCTION

Soil plays crucial role in earth's ecosystem without soil human life would be very difficult. It serves as natural growth medium for plant as it has integral system of continuous recycling mechanism of organic and inorganic matter. It also serves as habitat for variety of microbes, insects and animals. Besides store and maintenance of atmospheric gases it filters surface water and various gases. Soil is most important abiotic factor of natural ecosystem. For better yield of crop plants water is also as much important which in turn depends on Water holding capacity of soil and many other physico-chemical properties of soil. Aurangabad is a very fast developing and densely populated area. Many industries are also concentrating around the city due to various favorable geological condition and availability of natural resources. These factors are accelerating the rate of sewage discharge of Aurangabad. Hence, water bodies are contaminating by domestic as well as industrial discharge. The same water was utilized by some farmers for irrigation.

It is very necessary that soil should be in healthy condition, means it's all physico-chemical parameters should be balanced. Polluted or disturbed physico-chemicals parameters of soil would be a great hazard to plants and animals (Smita tale 2015). At primary stage of pollution soil decreases its fertility. The present study deals with the investigation of deflected physico-chemical properties of soil due to sewage irrigated 14 agricultural outskirt land of Aurangabad (MS) city.

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MATERIAL AND METHODS

Collection of sample: For the present investigation soil samples from 14 different location of agricultural land which were irrigated by sewage water were collected from Aurangabad outskirt. One agricultural land physically same and irrigated by dug well water selected as control. While collecting soil samples the upper layer of litter, stone stubble were removed carefully. Experimental area is located in Maharashtra having geological coordinates 19.8762° N, 75.3433° E.

Physico-Chemical Properties

Bulk density was estimated by field moist core sampling method of Kulte (1986). Water holding capacity was estimated by oven drying method. Electrical conductivity and pH of soil samples was determined by Jackson (1967) method. Magnesium estimation was carried out by Lindsay and Norvell (1978). Organic Percentage of soil was estimated by using Walkley-Black (1934). Other chemical properties such as total alkalinity, chloride, calcium, sulphate of content of soil were analysed by standard procedures of Jackson (1973) Analytical grade chemicals and double distilled water were used for the present study.

Statistical analysis: All the experiments were performed in triplicate and mean and Standard Deviation have been calculated. (Panse and Sukhatme, 1976).

Table 1 Physical Characteristics of Sewage Irrigated Paddy and control soils.

Site	BD		EC		WHC		PS	
1	1.37	±0.0577	1.13	±0.0666	28.57	±0.153	29.50	±0.2646
2	1.36	±0.0153	1.07	±0.0153	29.43	±0.252	31.70	±0.1000
3	1.28	±0.0115	1.03	±0.3215	27.90	±0.200	30.57	±0.2082
4	1.20	±0.1000	1.02	±0.0100	29.93	±0.153	35.97	±1.1547
5	1.32	±0.0764	0.84	±0.0306	27.73	±0.153	32.13	±0.2517
6	1.24	±0.1442	0.18	±0.0115	**31.53**	±0.306	48.43	±1.1015
7	1.07	±0.0436	0.34	±0.0200	28.80	±0.100	32.60	±0.1000
8	1.26	±0.0416	0.36	±0.0208	27.40	±0.100	31.93	±0.1528
9	1.15	±0.0404	0.35	±0.0361	29.40	±0.300	38.30	±0.7000
10	1.17	±0.0153	**0.24**	±0.0265	30.53	±0.153	37.33	±0.3215
11	1.23	±0.0346	1.35	±0.0361	**26.43**	±0.351	29.30	±0.2646
12	1.06	±0.0551	0.36	±0.0252	30.70	±0.100	45.80	±0.1000
13	1.28	±0.0100	0.46	±0.0416	27.50	±0.100	49.67	±0.1528
14	1.26	±0.0153	1.04	±0.0306	30.80	±0.100	40.30	±0.2646
15C	1.48	±0.0153	1.14	±0.0265	27.53	±0.115	47.57	±0.1528

± Standard Deviation.
*BD: bulk density (gm/cm^3), EC: **Electrical** conductivity(m mhos), **WHC:** Water holding capacity Percentage, **PS:** Percentage of pore space.*

2018). Electrical conductivity ranges between 0.24 to 1.35 m mhos. While in control it was 1.14 m mhos. Electrical conductivity increases as the ions increases in soil.
It is used to estimate the soluble salt concentration in soil salinity (Vanderlinden K, Juan *et al*, 2005). Soil having low WHC progressively dried out and retard plant growth. In present study WHC ranges from 26.43 to 31.53 %. Site 06 has maximum WHC and PS i.e. 31.53% and 48.43 % respectively and site 11 has lowest WHC and PS i.e. 26.43% and 29.30%. It was found that WHC and PS are positively correlated. pH of soil is important physico-chemical parameter as it affects mineral nutrient soil quality and activity of microorganisms. The site 5th was slightly acidic with pH 6.10 and site 6th was moderately alkaline with 7.80 pH, while

Neutral soil has 6.51 to 7.30 pH. Different pH might be due to different content of sewage.(Auwal sarkinnoma *et al,* 2013.). Calcium values recorded in this study were ranges from 22.2 mg/100gm to 40.3 mg/100gm. Calcium content has been associated with carbohydrates and various organic acids (Mahajan and Billore, 2014.). Magnesium is water soluble cation and required for the formation of Chlorophyll pigment.

Table 2 Chemical Characteristics of Sewage irrigated agricultural soil

Sr. No.	pH		Calcium (mg/100g)		Magnesium (mg/100g)		Sulphate (mg/100g)		Chloride (mg/100g)		organic matter %		Total Alkalanity	
1	6.83	±0.0577	22.2	±0.0082	10.73	±0.0436	0.53	±0.1155	37.01	±0.0833	3.04	±0.0723	51	±1
2	7.00	±0.1000	42.2	±0.0125	21.05	±0.0208	0.80	±0.1000	34.22	±0.1274	2.96	±0.0361	55.67	±0.5774
3	7.07	±0.1528	38.2	±0.1424	18.05	±0.0115	1.13	±0.0577	38.66	±0.2757	2.69	±0.3724	62.33	±0.5774
4	7.60	±0.1000	25.4	±0.2007	22.30	±0.3464	1.83	±0.0577	35.50	±0.4000	2.58	±0.0954	71.67	±0.5774
5	6.10	±0.1000	28.2	±0.0386	21.50	±0.2000	0.57	±0.0577	38.57	±0.1528	3.12	±0.1250	88.33	±0.5774
6	7.80	±0.1000	40.3	±0.0125	20.73	±0.2887	0.47	±0.0577	31.53	±0.3512	3.18	±0.1528	75.67	±0.5774
7	6.97	±0.0577	22.5	±0.1247	23.57	±0.1528	1.00	±0.1000	31.97	±0.1155	3.40	±0.1401	61	±1.0000
8	7.53	±0.0577	23.4	±0.2055	24.47	±0.2517	1.30	±0.1000	38.90	±0.2000	3.05	±0.1127	70.67	±1.1547
9	6.87	±0.0577	24.0	±0.7846	26.53	±0.3215	1.63	±0.0577	58.40	0.2000	3.11	±0.1044	53.67	±0.5774
10	7.13	±0.0577	32.4	±0.2494	28.30	±0.1732	1.80	±0.1000	48.40	±0.4359	2.57	±0.1387	64.33	±2.0817
11	7.20	±0.1000	29.2	±0.4028	16.57	±0.4041	0.90	±0.1000	51.44	±0.4461	3.13	±0.1311	65	±1.0000
12	6.83	±0.0577	33.8	±0.2625	20.47	±0.2082	1.10	±0.1000	39.43	±0.3215	3.56	±0.1795	57.33	±1.5275
13	7.13	±0.0577	38.5	±0.3300	22.70	±0.2000	1.04	±0.0493	36.47	±0.3055	3.10	±0.0624	64	±1
14	7.03	±0.0577	36.4	±0.2449	24.53	±0.3512	1.02	±0.0058	38.50	±0.4000	2.96	±0.0814	62	±0
15C	7.00	±0.1000	34.5	±0.2867	24.60	±0.1000	1.00	±0.1000	30.60	±0.2000	2.31	±0.2211	61	±1

±SD:- Standard Deviation.

Table 3 Correlation among Chemical parameters of 14 sewage irrigated agricultural soil.

	pH	Calcium	Magnesium	Sulphate	Chloride	Organic matter	Alkalanity
pH	1						
Calcium	0.151695	1					
Magnesium	0.100093	0.067646	1				
Sulphate	0.26586	-0.26218	0.60995	1			
Chloride	-0.15891	-0.29836	0.173523	0.461558	1		
Organic matter	-0.18891	-0.15636	-0.22934	-0.38395	0.086319	1	
Alkalanity	0.002929	0.011866	0.169529	-0.14422	-0.19593	-0.0326	1

RESULTS AND DISCUSSIONS

Findings of the present study are represented in Tables 1 and 2. The characterization of the polluted soil and control soils were same in their texture were analyzed for physical and chemical parameters.Bulk Density of Control was 1.48 gm/cm3 and in all the sewage irrigated sites shows decreased Bulk density. The bulk density varies according to compaction and consolidation of soil. Bulk density predicts the swelling and shrinking ability of soil due to moisture content. It has been reported that volume changes nearly 60% when dry vertisol was saturated by water (Rao *et al*. 1978). As the bulk density increases organic matter decreases (Arshi Iram and TI Khan

In case of magnesium there were varied levels of concentrations ranging from 10.73 to 28.30 mg/100gm. Sulphate content fluctuated from 0.53 mg/100gm to 1.83 mg/ 100gm while in control soil it was 1.00 mg/100gm. The alkalinity was high in sewage irrigated maize soils and 1.4 mg/10_g and low in 0.4mg/ 10_g in control soils. Chloride and Organic matter were found increased in all sewage irrigated soil than control. (Malik *et al* (2007), khai *et al* (2008). Soils irrigated with sewage water and other effluents recorded direct correlation between crop productivity and loads of chemical contaminants.

Correlation: The relationship between the concentrations of different physio-chemical parameters were analyzed Pearson's correlation coefficient and results are shown in table 3.

CONCLUSION

Values obtained in the present study were recorded more of less than ideal values set by FAO. This implies that sewage water was polluting agricultural land and changing its physico-chemical values. This might not be unconnected to the fact that domestic and industrial waste water find their ways into the drainage channel and increasing soil pollution.

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