Appraisal of Domestic Sewage and its impact of Irrigation on Soil Variability's

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Abstract - *The aim of this work is to estimate the impact on soil variability's by the use of treated liquid waste in irrigation. A study looked into the advantageous effects of treated sewage water on soil characteristics. The soil's N, P, K, OC, and pH were measured after the application of treated sewage water during the crop's 10-, 15-, and 20-day growth periods. The chemical composition and fertility condition of soil were enhanced when treated sewage water was used for irrigation. The proportion of soil organic carbon, soil electrical conductivity, and soil macronutrient content are all greatly increased when treated sewage water is applied to the ground (N, P). Growing crops in sewage results in higher agricultural yields and enhanced soil fertility. A good way to reduce the rising demand for fresh water is through sewage farming.*

Key Words: **Domestic sewage, soil variability's, nutrients, irrigation liquid waste variables.**

1. INTRODUCTION

The demand for water is continuously increasing in most of the irrigated and agricultural dependent cities. Therefore, water of more quality is stored for drinking, while that of lower quality is suggested for irrigation. Domestic liquid waste is less expensive and reflected an attractive source of irrigation water current day. Therefore, the attention in reusing liquid waste for irrigation is rapidly increasing in most states. In addition liquid waste is a respected source for floral nutrients and organic substance needed for keeping fertility and production in arid soils. Domestic liquid waste contains required floral nutrients such as N, P, K and micro-nutrients which are valuable for floral growth. The aim of this work was to appraise the changes in soil variability's after discharging domestic liquid waste into the soil

2. MATERIALS AND METHODS

2.1 Collection and Appraisal

An experimental appraisal was conducted for to estimate the impact of usage of domestic liquid waste on soil. For this purpose agricultural soil was chosen from Davangere near Avaragolla village. Then estimated the soil variability's like N, P, K and pH before usage of liquid waste as per standard procedure recommended by APHA.

2.2 Sampling of Domestic liquid waste &appraisal

The sewage waste-water was collected near Avaragolla village and kitchen liquid waste was collected from BIET Boys Hostel (BIET).

2.3 Methodology adopted

Discharge these Sewage and Kitchen liquid waste sample into the soil individually. After 10 days, 15 days, 20 days of usage of liquid waste soil variability's N, P, K, and pH, of soil sample containing sewage waste-water and kitchen liquid waste was estimated as per standard method (APHA 20th addition)

3. RESULTS AND DISCUSSION

The sewage sample and kitchen liquid waste sample were analyzed as given in table 1. The sewage and kitchen liquid waste samples exhibited almost medium range hydrogen iron content value (6.17 and 7.62), while the hydrogen content ground water sample is alkaline in reaction (7.12). The enlargement of pH is due addition of many soluble salts existing in sewage samples. Despite the increase of 7.62 %, the pH value of STP-A was within the permissible limits in respect of its use in irrigation purpose. The salinity content/EC of the STP and KLW (310mS/m and 380 mS/m) is 42.83 % and 45.72% less than that of ground water (940mS/m). The maximum salt content, the greater the flow of electrical current, the total dissolved solid in STP-A and KLW-1 (275 mg/L and 282 mg/L) was found to be 14.52 and 15.66 % less than the GWS-1 (821mg/l). The BOD of the treated sewage and kitchen liquid waste (65 mg/L and 88 mg/l)was 82.5 and 91.3 % lesser than the BOD of GWS-1 (3 mg/l), the prescribed limit of BOD for irrigation is 100 mg/l. The COD of STP-1 and KLW-1(120 mg/l and 132 mg/L) was 82.56% and 89.51 % less than the COD of GWS-1 (10 mg/l). Maximum COD represents more amount of oxidizable organic matter present in the STP-1 and KLW-1, which will decrease DO in collected sewage water. Ca and Mg content in STP-1 and KLW-1 was 2.8 mg/L, 3.1 mg/L and 3.1mg/L, 4.2 mg/L) correspondingly. Cl^- content in STP-1 and KLW-1 samples showed 24 and 36 mg/L and in GWS1 is 68 mg/l.

Table 1: Initial Quantity of Variables in Sewage treatment plant sample

Sl. No.	Variables	STP-1	FAO-1970
1.	pH	6.14	6.0-8.5
2.	EC	310 mS/m	0-3 dS/m
3.	TDS	276 mg/L	0-2000 meq/L
4.	Ca^{2+}	2.8 mg/L	0-20 meq/L
5.	Mg^{2+}	3.1 mg/L	0-5 meq/L
6.	Cl^-	24 mg/L	0-30 meq/L
7.	Na^+	22 mg/L	0-40 meq/L
8.	K^+	2.8 mg/L	-
9.	SO_4^{2-}	38 mg/L	0-20 meq/L
10.	BOD	65 mg/L	-
11.	COD	120 mg/L	-
12.	Organic Carbon	-	-
13.	Nitrogen	-	-
14.	Phosphorous	-	-
15.	SAR	8.75	0-15 meq/L

Table 2: Initial Quantity of Variables in kitchen liquid waste sample

Sl. No.	Variables	KLW-1	FAO-1970
1.	pH	7.62	6.0-8.5
2.	EC	380 mS/m	0-3 dS/m
3.	TDS	282 mg/L	0-2000 meq/L
4.	Ca^{2+}	3.1 mg/L	0-20 meq/L
5.	Mg^{2+}	4.2 mg/L	0-5 meq/L
6.	Cl^-	36 mg/L	0-30 meq/L
7.	Na^+	31 mg/L	0-40 meq/L
8.	K^+	3.1 mg/L	-
9.	SO_4^{2-}	52 mg/L	0-20 meq/L
10.	BOD	88 mg/L	-
11.	COD	132 mg/L	-
12.	Organic Carbon	-	-
13.	Nitrogen	-	-
14.	Phosphorous	-	-
15.	SAR	8.57	0-15 meq/L

Table 3: Initial Quantity of Variables in GWS

Sl. No.	Variables	GWS-1	FAO-1970
1.	pH	7.12	6.0-8.5
2.	EC	940 mS/m	0-3 dS/m
3.	TDS	821 mg/L	0-2000 meq/L
4.	Ca^{2+}	164 mg/L	0-20 meq/L
5.	Mg^{2+}	24 mg/L	0-5 meq/L
6.	Cl^-	68 mg/L	0-30 meq/L
7.	Na^+	8 mg/L	0-40 meq/L
8.	K^+	2 mg/L	-
9.	SO_4^{2-}	6 mg/L	0-20 meq/L
10.	BOD	3 mg/L	-
11.	COD	10 mg/L	-
12.	Organic Carbon	-	-
13.	Nitrogen	-	-
14.	Phosphorous	-	-
15.	SAR	12.19	0-15 meq/L

Table 4: Initial Quantity of Variables in soil

Sl. No.	Variables	Soil	FAO-1970
1.	pH	7.42	6.0-8.5
2.	EC	280 mS/m	0-3 dS/m
3.	TDS	-	0-2000 meq/L
4.	Ca^{2+}	1.96 mg/Kg	0-20 meq/L
5.	Mg^{2+}	1.52 mg/Kg	0-5 meq/L
6.	Cl^-	61 mg/kg	0-30 meq/L
7.	Na^+	92 ppm	0-40 meq/L
8.	K^+	80 mg/Kg	-
9.	SO_4^{2-}	128 mg/Kg	0-20 meq/L
10.	BOD	-	-
11.	COD	-	-
12.	Organic Carbon	2.10 %	-
13.	Nitrogen	6 %	-
14.	Phosphorous	0.38 mg/L	-
15.	SAR	-	0-15 meq/L

Effect of STP-1 and KLW-1 irrigation on soil properties Initial variabilities of the soil were given in above tables. The experimental soil was classified under the silty clay texture. Fraction of the silt and clay were found to be more that was 46% and 36% correspondingly. The pH of the pre-sowing soil was found to be 7.42. Electrical conductivity of soil was 280 mS/m. The organic carbon content in the experimental soil was 2.10 %The Nitrogen and phosphorus are primary macro-nutrients of the soil. In experimental soil the N and P were found to be 6% and 0.38 mg/L and SRA value shown 8.75meq/L, 8.57meq/L and 12.19meq/L correspondingly. The analytical values of the soil properties appraised for the soil irrigated with STP-1, KLW-1 and GSW-1 samples were given in next tables.

Table 5: Changes in variables of soil irrigated with STP-1 ,KLW-1 and GWS-1 during growth period at 10 days

Sl No	Variables	10 days		
		STP-A	KLW-1	GWS-1
1	pH	7.45	7.52	7.21
2	EC, mS/m	424.00	420.50	388.00
3	OC %	1.20	1.05	0.88
4	N, mg/kg	182.00	192.40	142.00
5	P, mg/kg	22.00	26.00	14.00

Table 6: Changes in variables of soil irrigated with STP-1 ,KLW-1 and GWS-1 during growth period at 15 days

Sl No	Variables	15 days		
		STP-A	KLW-1	GWS-1
1	pH	7.60	7.64	7.01
2	EC, mS/m	460.00	472.00	420.00
3	OC %	1.76	1.81	1.15
4	N, mg/kg	201.50	212.00	215.00
5	P, mg/kg	28.00	29.00	19.00

Table 7: Changes in variables of soil irrigated with STP-1 ,KLW-1 and GWS-1 during growth period at 20 days

Sl No	Variables	15 days		
		STP-A	KLW-1	GWS-1
1	pH	7.72	7.82	7.00
2	EC, mS/m	481.00	495.00	450.00
3	OC %	1.86	1.91	1.21
4	N, mg/kg	224.00	228.00	232.80
5	P, mg/kg	31.00	32.00	22.00

pH of soil irrigated with STP-1 and KLW1 samples was decreased from 7.45 (10 days) to 7.82 (20 days) which was greater than the pH of soil irrigated with GWS-1 during crop growth time. Irrigation with GWS-1 induces decrease of soil pH range from 7.21 (10 days) to 7.0 (20 days) (Chart 1). EC of soil irrigated with STP-1 and KLW1 samples was found to be 424 mS/m (10 days) to 472 mS/m (20 days) whereas in irrigation with GWS-1, it was noticed that 388 mS/m (10 days) to 450 mS/m (20 days) during crop growth time. Occurrence of salinity which is the most significant indicator respect to field irrigated with GSW-1 (Chart 2). The organic carbon of soil irrigated with STP-1 and KLW1 samples was increased from 1.20 % (10 days) to 1.91 % (20 days) whereas OC of soil irrigated with GWS-1 found to be 0.88 % (10 days) to 1.2 % (20 days) during crop growth time. Higher value of OC in soil irrigated with GWS-1 represents that STP-1 and KLW1 samples irrigation encourages to improve fertility condition of soil (Chart 3). Soil irrigated with STP-1 and KLW1 samples controlled to improve required nitrogen in soil which was increasingly more than the soil irrigated with STP-1 and KLW1 samples during crop growth time. Nitrogen content in soil irrigated with STP-1 and KLW1 samples was increased from 182 kg/ha (10 days) to 228 kg/ha (20 days) whereas in soil irrigated with GWS-1 it was found to be 142 kg/ha (10 days) to 232 kg/ha (20 days) during crop growth time. This indicates that the soil irrigated with STP-1 and KLW1 samples provides essential macro-nutrient to the crop (Chart 4). Soil irrigated with STP-1 and KLW1 samples led to increase the Phosphorus content from 22 kg/ha (10 days) to 32 kg/ha (20 days) whereas in soil irrigated with GWS-1 it was found to be 14 kg/ha (10 days) to 22 kg/ha (20 days) during crop growth time. Hence, it was appraised that irrigation with STP-1 and KLW1 samples gave helpful nutrients content to the soil. Phosphorus is measured one from significant nutrients that has direct outcome on growth and efficiency of flora.

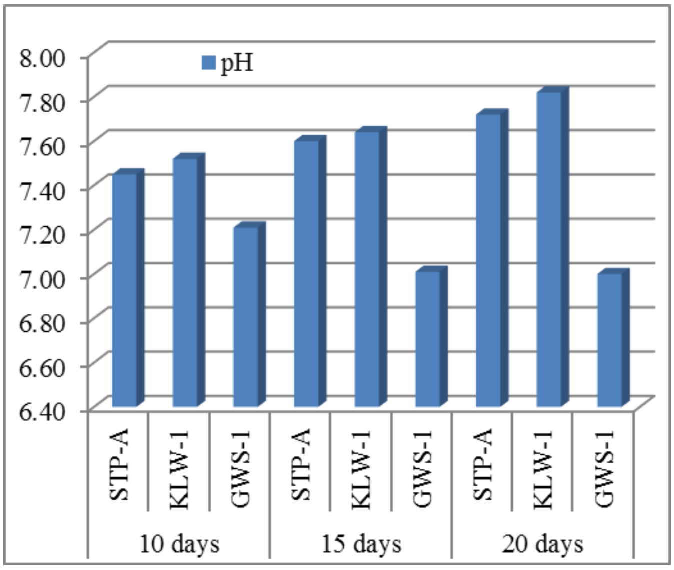

Chart-1: pH of soil irrigated with STP-1, KLW1 and GWS-1 samples during crop growth time at 10 days, 15 days and 20 days

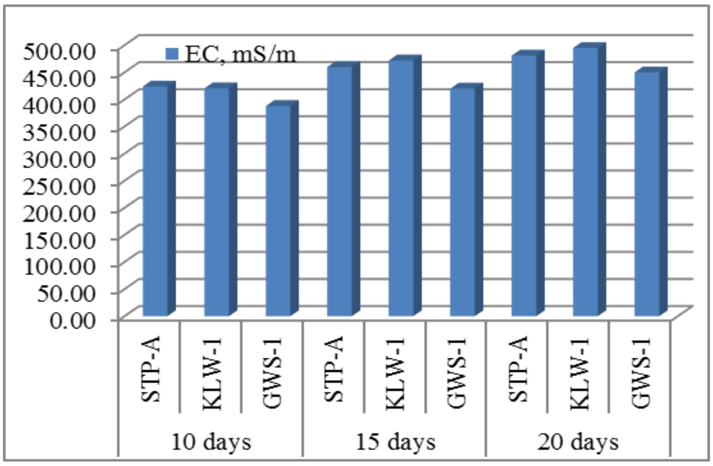

Chart- 2: Ec of soil irrigated with STP-1, KLW1 and GWS-1 samples during crop growth time at 10 days, 15 days and 20 days

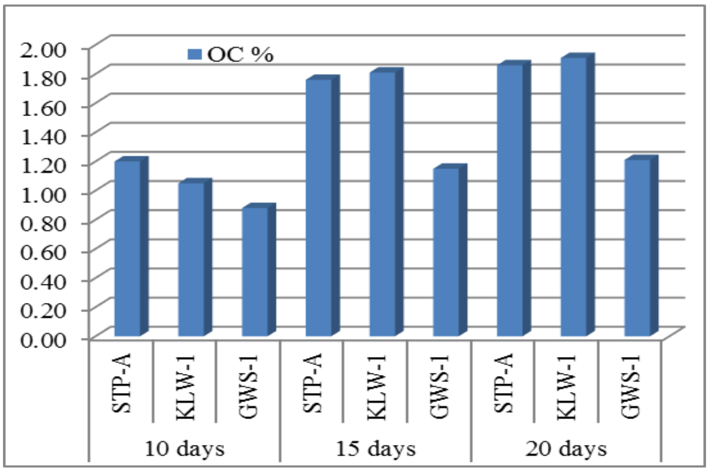

Chart- 3: OC of soil irrigated with STP-1, KLW1 and GWS-1 samples during crop growth time at 10 days, 15 days and 20 days

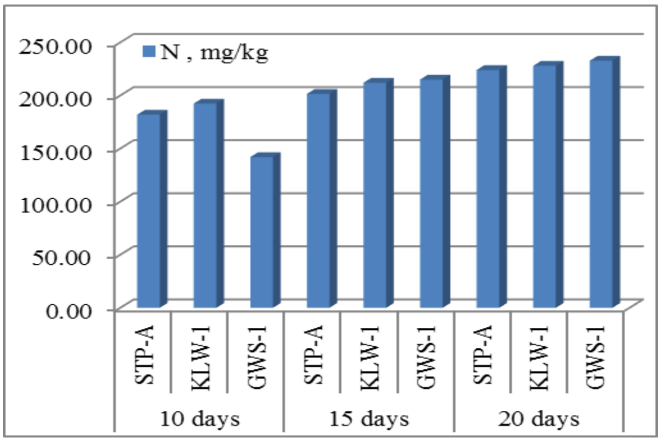

Chart- 4: N of soil irrigated with STP-1, KLW1 and GWS-1 samples during crop growth time at 10 days, 15 days and 20 days

4. CONCLUSIONS

The current analytical values are to compare the encourages on soil variables when soil irrigated with STP-1, KLW1 and GWS-1 samples during crop growth period that is 10 days, 15 days and 20 days correspondingly. From this appraisal it can be reflected that irrigation with STP-1, KLW1 and GWS-1 samples are also probable source of floral nutrient. The result indicated that the soil variables are suggestively affected by the usage of STP-1 and KLW1 samples in irrigation. Usage of STP-1 and KLW1 samples increased the yield of crops as related to irrigation with GWS-1. The current appraisal indicates that the STP-1 and KLW1 samples can be used as an alternative for irrigation, as Irrigation with STP-1 and KLW1 increased content of pH, EC, OC, P, N in soil irrigated by STP-1 and KLW1 water compared to the GWS-1 irrigation. Use of STP-1 and KLW1 has gain significance throughout the area due to lack of availability of fresh water sources

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