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PHYSICO – CHEMICAL, CORRELATION AND LINEAR REGRESSION ANALYSIS OF SMALL INDUSTRY AREA SOIL SAMPLES (SPRING SEASON)

Dr.R. Selvaraju[1] and Dr.V.Mahalakshmi[2]

Professor, Engineering Physics Section, Annamalai University,

Annamalai Nagar[1].

Assistant Professor, Department of Physics, Bharathiyar Women's Arts

& Science College, Deviyakurichi[2].

Email: mahalakshmiphd18@gmail.com, Ph: 93442 78018

1. INTRODUCTION

Soil is one of the important and valuable resources in Nature**.** All living things are directly dependent on soil for their day to day needs and 95 % of human food is derived from the earth. Planning for healthy and productive soil is critical to human survival. Soil is a natural body made up of layers (soil horizons) of mineral constituents that differ from the parent materials in their morphological, physical, chemical and mineralogical properties. Soil is made up of broken rock particles that have been altered by chemical and mechanical processes such as weathering and erosion. Sewage sludge, industrial factory residues and intensive fertilisations are the most likely sources of soil, water and plant pollution. In many parts of the world, including India, the use of industrial wastewater in suburban areas is common practice.

2. PHYSICO CHEMICAL ANALYSIS OF SOIL SAMPLES

The physico-chemical parameters were studied for soil samples, such as physical properties and chemical properties. (color, taste, odor, total dissolved solids, total alkalinity, total hardness, calcium, magnesium, sodium, potassium, chloride, fluoride, sulphate, phosphate, nitrate, and carbonate). The relationship between the concentration of chemical compounds and elements present in the soil samples could be used to study the relationship between the soil parameters according to spring season. This study reveals that it creates the platform for many chemical compounds.

Table - 2.1. Physico-chemical analysis of soil samples at spring season (SPS_1-SPS_{15})

Samples		Parameters															
		pH	EC	TDS	TA	TH	TUR	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	Cl^{-}	F^{-}	SO_4^{-}	PO_4^{-}	NO_3^{-}	CO_3- 2-
Site-1	SPS_1	8.6	1.19	797	224	122	1.2	22.08	12	50.04	5.00	258	1.5	140	4.6	2.0	166
	SPS_2	8.7	1.26	844	220	128	1.4	22.06	12	41.08	5.06	230	0.5	145	5.8	2.4	168
	SPS_3	8.4	1.24	830	226	132	1.5	22.01	12	44.07	5.09	234	1.5	180	4.8	2.8	158
Site-2	SPS_4	8.3	1.25	837	224	126	1.4	21.06	12	41.02	4.02	254	1.5	185	5.0	2.9	140
	SPS_5	8.5	1.20	804	222	136	1.6	22.05	12	50.01	4.01	232	1.0	150	4.9	2.5	130

	SPS_6	8.7	1.21	810	214	120	1.0	19.06	10	40.01	3.06	236	0.5	70	5.8	2.0	160
Site-3	**SPS_7**	8.8	1.18	790	230	128	1.1	20.04	12	40.05	2.05	268	1.0	65	5.9	3.0	152
	SPS_8	8.6	1.23	824	232	134	1.5	22.07	12	39.07	2.01	214	1.0	70	6.2	2.0	162
	SPS_9	8.0	1.05	703	238	122	1.3	20.03	13	50.05	3.03	242	1.5	60	5.0	3.1	142
Site-4	**SPS_{10}**	8.5	1.26	844	234	132	1.9	20.01	12	51.00	3.09	230	0.5	55	4.8	2.0	176
	SPS_{11}	8.4	1.22	817	232	138	1.7	21.03	11	50.06	3.07	220	1.0	70	4.6	1.5	160
	SPS_{12}	8.6	1.21	810	234	134	1.3	21.06	11	40.07	2.07	246	1.5	75	5.2	1.6	172
Site-5	**SPS_{13}**	8.7	1.22	817	236	126	1.2	21.08	11	40.04	2.06	272	1.5	160	5.8	2.4	168
	SPS_{14}	8.6	1.21	810	232	128	1.1	20.06	12	51.05	2.00	260	0.5	165	5.9	3.1	144
	SPS_{15}	8.0	1.20	804	230	122	1.0	20.01	12	51.08	2.01	256	1.0	160	4.7	2.4	148
BIS (2012)		6.5-8.5	300	500-2000	200-600	200-600	1-5	75-200	30-100	200-250	12	250-1000	1-1.5	200-400	1-5	150-350	200-600

3. The correlation matrix studies for four seasons of soil samples by Physico- chemical method

The correlation matrix for phyisco-chemical parameters of soil samples for spring season of the industrial area samples (SPS_1-SPS_{15}) are given in Table 3.1.

Table – 3.1. Correlation matrix for soil samples parameters in spring season at (SPS_1-SPS_{15})

Parameters	pH	EC	TDS	TA	TH	TUR	Ca^{2+}	Mg^{2+}	Na^+	K^+	Cl^-	F^-	SO_4^-	PO_4^-	NO_3^-	CO_3^{2-}
pH	1.000															
Electrical Conductivity	0.450	1.000														
Total dissolved Solids	0.448	0.342	1.000													
Total Alkalinity	-0.292	-0.353	-0.353	1.000												
Total Hardness	0.193	0.382	0.383	0.228	1.000											
Turbidity	-0.063	0.332	0.334	0.174	0.739	1.000										
Calcium	0.159	0.313	0.315	-0.123	0.468	0.401	1.000									
Magnesium	-0.476	-0.375	-0.373	0.338	-0.034	0.189	0.244	1.000								
Sodium	-0.539	-0.293	-0.291	0.222	0.011	0.223	-0.129	0.408	1.000							
Potassium	-0.016	0.203	0.203	-0.585	-0.025	0.311	0.554	0.206	0.103	1.000						
Chloride	0.084	-0.209	-0.211	0.171	-0.548	-0.676	-0.295	0.034	-0.047	-0.258	1.000					
Fluoride	-0.316	-0.337	-0.338	0.321	-0.047	-0.063	0.369	0.187	-0.138	0.123	0.311	1.000				
Sulphate	-0.123	0.324	0.324	-0.279	-0.160	-0.205	0.394	0.165	0.072	0.394	0.380	0.225	1.000			

Phosphate	0.620	0.107	0.105	-0.052	-0.088	-0.371	-0.123	-0.204	-0.650	-0.421	0.100	-0.370	-0.138	1.000		
Nitrate	-0.222	-0.349	-0.351	0.052	-0.359	-0.316	-0.159	0.604	0.062	0.054	0.463	0.088	0.419	0.193	1.000	
Carbonate	0.449	0.409	0.408	0.130	0.093	0.184	0.083	-0.401	-0.304	-0.005	-0.145	-0.096	-0.346	0.113	0.644	1.000

Table 3.1 shows the correlation between pairs of soil parameters in the spring season. pH with EC, TA, TH, Ca^{2+}, Mg^{2+}, Cl^-, PO_4^- and NO_3^- there is a positive correlation and with parameters like TDS, Na^+, K^+, F^-, SO_4^- and CO_3^{2-} it has negative correlation. EC has positive correlation with parameters like TA, TH, Ca^{2+}, Mg^{2+}, Cl^-, PO_4^- and NO_3^- and has negative correlation with parameters of TDS, Na^+, K^+, F^-, SO_4^-, and CO_3^{2-}. TDS with TA, TH, Ca^{2+}, Na^+, K^+, F^-, SO_4^- and CO_3^{2-} is a positive correlation, but, with Mg^{2+}, Cl^-, PO_4^- and NO_3^- it is negative. TA has positive correlation with parameters like TH, Ca^{2+}, Mg^{2+} and K^+, but it has negative correlation with Na^+, Cl^-, F^-, SO_4^-, PO_4^-, NO_3^- and CO_3^{2-}. Ca has positive correlation with K^+, SO_4^-, NO_3^- and CO_3^{2-} and has negative correlation with Mg^{2+}, Cl^- and PO_4^-. Mg^{2+} has positive correlation with Na^+, Cl^-, SO_4^- and PO_4^- and has negative correlation with K^+, F^-, NO_3^- and CO_3^{2-}. Na^+ makes positive correlation with K^+, Cl^-, F^-, SO_4^-, PO_4^- and CO_3^{2-} but, negative correlation with NO_3^-. K has positive correlation with Cl^-, PO_4^- and CO_3^{2-} and has negative correlation with F^-, SO_4^- and NO_3^-. Cl^- has positive correlation with SO_4^-, PO_4^-, and CO_3^{2-} and has negative correlation with F^- and NO_3^-. F^- has positive correlation with SO_4^-, PO_4^-, NO_3^- and CO_3^{2-}. SO_4^- has positive correlation with PO_4^- and CO_3^{2-} and has negative correlation with NO_3^-. PO_4^- has positive correlation with CO_3^{2-} and has negative correlation with NO_3^-. NO_3^- has negative correlation with CO_3^{2-}.

4. Linear Regression analysis of spring season soil samples

In linear regression for electrical conductivity and parameters composition of spring season of soil samples were analysed. We have observed that the “t” value for spring season is greater than 0.03, which indicates that there is a high relationship among the electrical conductivity and parameters composition in spring season of soil samples.

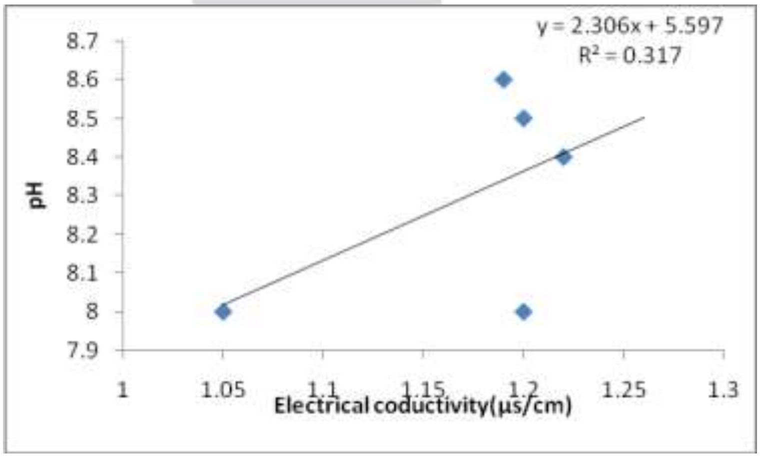

Fig 4 (i) Electrical conductivity vs pH

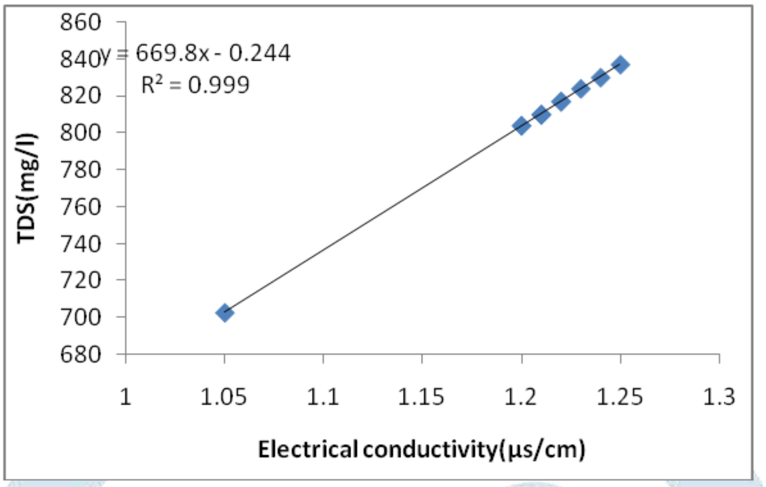

Fig 4 (ii) Electrical conductivity vs Total dissolved solids

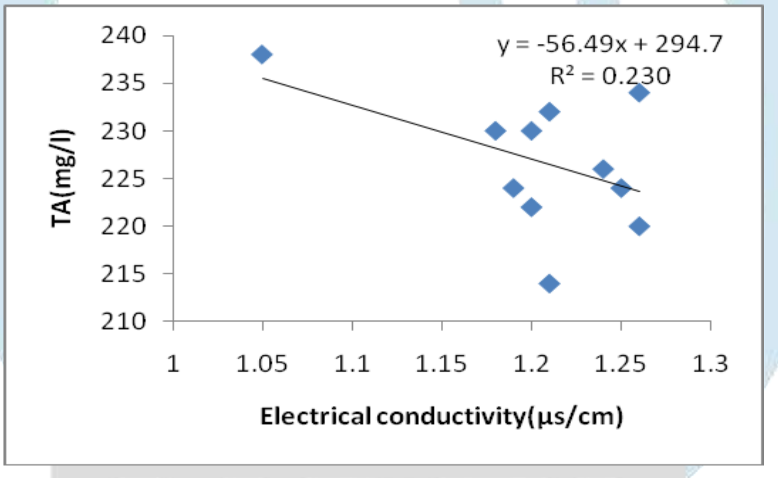

Fig 4 (iii) Electrical conductivity vs Total alkalinity

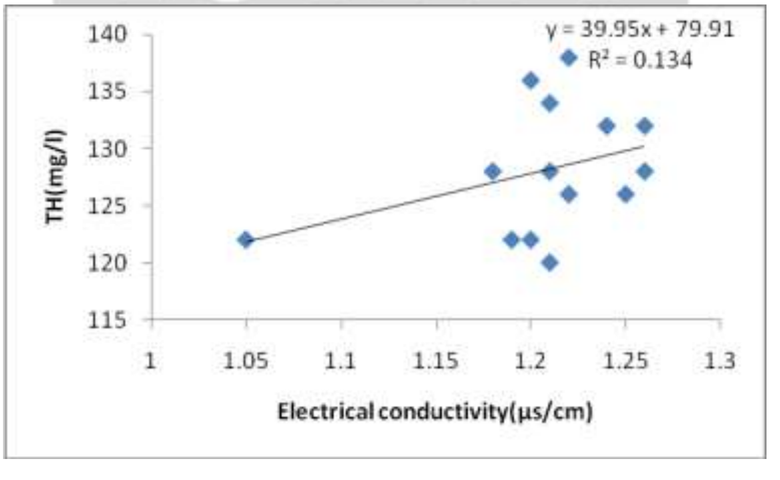

Fig 4 (iv) Electrical conductivity vs Total hardness

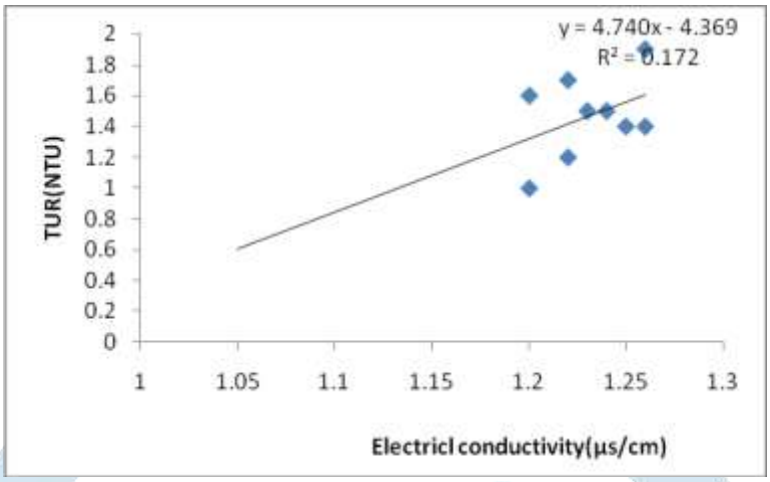

Fig 4 (v) Electrical conductivity vs Turbidity

Figure 4 (i-v) Linear regression analysis of spring season soil samples shows the X axis is Electrical conductivity with Y axis pH, Total dissolved solids, Total Alkalinity, Total Hardness and Turbidity. The linear regression values is
R^2= 0.317, 0.999, 0,230, 0.134 and 0.172. The spring season value is
R^2 = 0.999(TDS) is significant level.

4. Conclusion

Soil samples collected from spring seasons in various site. In order to investigate the Physico-chemical analysis in each sample and to correlate the results with the extent of pollutions, the following spectral and physico-chemical studies are successfully carried out. All the above mentioned parameters and the minerals are within the permissible limit. The presence of minerals is within the permissible limit, which increases cultivation.

5. References

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