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SOIL CONTAMINATION: A PHYCO-CHEMICAL ANALYSIS NEARBY RIVERS AT BALOTRA AND PALI WESTREN RAJASTHAN, INDIA.

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Abstract:

Soil parameter of the present sites was also evaluated because the effluent not only affects the water but also it can also impact on soil quality. Some of the general soil parameters are also examined. The water holding capacities (WHC) of the both the sites are calculated seasonally and it is found that the maximum values in winter and rainy season and minimum in summer.

Key Words: *Soil, River, Pali, Balotra*

Introduction:

Irrigation often involves application of moisture in excess of the storage capacity of the soil. This excess water flows along the surface of the irrigated areas and some of it percolates into the subsoil towards the low-lying areas. If the drainage of this excess water is not taken care of, problems of water logging, salinity and alkalinity of the irrigated land arise leading to heavy loss of agricultural production. This soil survey deals with the nature of this problem and the step that must be taken to keep it under control. Broadly speaking, these steps are as follows:-

1) A soil survey of the command under irrigation project is conducted to study the nature of the soil from the view point of water logging, salinity and alkalinity. Based on this survey the cropping pattern which helps to avoid such ill-effects is suggested and areas which are more vulnerable to such are also demarcated. Joshi *et al.*, (2009), Onojake *et al.*, (2012), Raut *et al.*, (2012) studied physico-chemical parameters of soil ranged between clay to clay loams with slightly alkaline in nature.
2) The soil survey of the above type is conducted at the project formulation stage. At the stage of commencement of irrigation after the completion of the project, further detailed check is applied by working out for each outlet command a limit on the area under perennials. For such intensive cultivation has in the past given rise to the water logging Salinity. Bharamal *et al.*, (2014) studied Physico-Chemical parameters of water, and also concluded the water was observed better quality and by Rathore *et al.*, (2014) observed the water get polluted in Ayad River.
3) Along with these preventive measures a continuous watch kept on the state of the command by annually demarcating of the logging, saline and alkaline areas, studying the trend of the rise and fall of groundwater, and formulation subsoil drainage schemes as remedial measures against the damage that has actually occurred or is about to occur. Coulibaly *et al.*, (2016) studied the high utilization of autonomous systems of sanitation and faucal sludge management, which are typical in larger and secondary cities of developing countries. They also show that improper wastewater management in Dimbokro constitutes a serious hazard to humans as well as the environment.

Materials and Method:

Sampling Site:

Soil samples are collected at the rate of one for each depth 10-20 cm from every fourth bore on the alternate cross section. The samples from three consecutive auger-bores close to the river on alternate cross section are also collected. The soil from each layer is mixed thoroughly taking care that the extraneous material from the ground or from other layer is not mixed up with it, and the sample is representative of the layer from which it is taken. One kilogram soil for each representative samples is collected in a cloth bag of size 20 cm. x 30 cm. The location of the sample such as village, survey number, cross section number, and pit number and the depth must invariably be given on a label and kept with the sample. The same information is also written on the bag. Proper labeling is very important so that the identity of sample is not lost. The bags containing samples from the same pit are tied together to facilitate the sorting work and are transported to laboratory for testing as soon as possible.

 Soil sample Pali	 Soil sample Balotra

Results and Discussion:

Textile Industrial effluents Effects on Soil

Due to irrigation of soil, Heavy metals are observed in ground water which is affected by textile industrial effluents. Dyes use by textile industries for coloration and due to use many chemicals in Dyeing and Printing observed by Meena *et al.,* (2016). These were found to be very high from ground water to agriculture soil due to the natural shale value of heavy metals in soil system. Thus, untreated industrial effluents can cause an environmental threat to ground water resources and affects soil quality and agricultural plant productivity studied by Bharti *et al.,* (2013).

Soil Analysis:

pH

Seasonal variation in Mean pH of Soil during Rainy season on sampling site Pali was 7.43±0.19, winter it was 7.34±0.26 and summer it was 7.4±0.14. In Balotra during Rainy season observed mean pH was 7.33±0.16, during winter 7.13±0.16 and summer 7.4±2.08. Ahmad *et al.,* (2012) studied effect of pH on soil due to industrial effluent; the pH of soil was ranges from 7.76 to 8.7 in contaminated soil while in uncontaminated it was less and ranges from 6.90 to 7.31. pH of the soil samples was typical of arid area soil (slightly alkaline), with non-significant differences among various sites studied by Faryal *et al.,* (2007). Prasad *et al.,* (2011), Patel *et al.,* (2008), Jaishree *et al.,* (2014) also studied the soil pH ranges from 7.8 to 9.4 which was highly alkaline in nature and higher than that of the slandered values.

Bicarbonates

Seasonal variation in both sampling site, Bicarbonate of Soil during Rainy season on Pali was 187±42.1 mg/l, winter it was 270±40.3 mg/l and summer it was 339±51.6mg/l. In Balotra during Rainy season observed mean

Bicarbonate was 237.3±42.1mg/l, during winter 295.5±59.75mg/l and summer 315±32.9mg/l. Ahmad *et al.*, (2012) studied bicarbonate ranges from 440 to 540mg/kg. **Table No. 85 and Graph Plate No. 85.**

Total Hardness

Seasonal variation in both sampling site, Total Hardness of Soil during Rainy season on Pali was 254.4±24.92 mg/l, winter it was 191.25±45.6 mg/l and summer it was 170±50.20mg/l. In Balotra during Rainy season observed mean Total Hardness was 243.75±24.04mg/l, during winter 194.87±23.15mg/l and summer 161.125±24.21mg/l. Reddy *et al.*, (2013) also studied discharge of effluents from paper industry altered the physic chemical biological properties of soil.

Chloride

Seasonal variation in both sampling site, Chloride of Soil during Rainy season on Pali was 373.75±53.38 mg/l, winter it was 484.25±46.31 mg/l and summer it was 564.87±24.572mg/l. In Balotra during Rainy season observed mean Chloride was 314.375±21.74mg/l, during winter 455.375±27.75mg/l and summer 518.87±23.51mg/l. Reddy *et al.*, (2013) also studied discharge of effluents from paper industry altered the physic chemical biological properties of soil.

Salinity

Seasonal variation in both sampling site, Salinity of Soil during Rainy season on Pali was 674.65±96.36 mg/l, winter it was 874.1±83.6 mg/l and summer it was 1019.6±44.35mg/l. In Balotra during Rainy season observed mean Salinity was 567.47±39.24mg/l, during winter 821.98±50.09mg/l and summer 936.6±42.43mg/l. Tandale and Dabhade (2016) also studied the salinity of Lonar water was much and more higher as compared to fresh water bodies. Reddy *et al.*, (2013) also studied discharge of effluents from paper industry altered the physic chemical biological properties of soil.

Nitrate

Seasonal variation in both sampling site, Nitrate of Soil during Rainy season on Pali was 2.45±0.232 mg/l, winter it was 2.79±0.38 mg/l and summer it was 2.12±0.28mg/l. In Balotra during Rainy season observed mean Nitrate was 2.3±0.40mg/l, during winter 2.67±0.63mg/l and summer 2.22±0.373mg/l. Faryal *et al.*, (2007) studied Significant differences were also present in all the soil samples with regard to Nitrates-N, P and K level.

Phosphate

Seasonal variation in both sampling site, Phosphate of Soil during Rainy season on Pali was 8.5±1.33 mg/l, winter it was 8.08±0.16 mg/l and summer it was 11.55±1.4mg/l. In Balotra during Rainy season observed mean Phosphate was 8.4mg/l, during winter 10.935mg/l and summer 11.995mg/l. Soil irrigated with waste water

contains high amount of available phosphorus which play significant role in plant growth. The available phosphorus content ranged from 8.0 to 10.1 Kg/ha which was low in range by Prasad *et al.,* (2011).

Fluoride

Seasonal variation in both sampling sites, Fluoride of Soil during Rainy season on Pali was 1.465±0.205 mg/l, winter it was 2.01±0.403 mg/l and summer it was 2.39±0.414mg/l. In Balotra during Rainy season observed mean Fluoride was 1.52±0.28mg/l, during winter 0.60±0.43mg/l and summer 2.02±0.54mg/l. The textile effluents are highly toxic in nature and effects on these River water as well as soil parameters Meena *et al.,* (2017).

Soil Texture

During the study periods mean percentage of Soil texture observed Jul 13 to Jun 14 on Pali site was Sand 45%, Silt 25% and Clay 32% while on same year Balotra site had 45% sand, 26% Silt and 25% Clay, Faryal *et al.,* (2007) studied soil sample which was collected from the factory areas was observed loamy class of soil texture. Raut *et al.,* (2012) studied the soil texture is concerned with the relative proportions of mineral particles of various sizes in a given soil.

Water Holding Capacity (WHC)

Seasonal variation in Mean Water Holding Capacity of Soil during Jul 13 to Oct 13 on sampling site Pali was 45.75±3.18%, Nov 13 to Feb14 it was 44.75±3.53% and Mar 14 to Jun 14 it was 39.75±2.12%. In Balotra during Rainy season observed mean percentage of WHC was 45.13±1.23%, during winter 42.13±0.53% and summer 39.25±0.7071%. Water Holding Capacity of soil was also studied by Ahmad *et al.,* (2012) according to it more water holding capacity shows the good physical condition of soil, which was ranges from 53% to 65% in uncontaminated and contaminated soil that is contaminated soil have more water holding capacity than uncontaminated.

Electrical Conductivity (EC)

Seasonal variation in both sampling site, EC of Soil during Rainy season on Pali was 0.57mg/l, winter it was 0.585±0.021 mg/l and summer it was 0.815±0.13mg/l. In Balotra during Rainy season observed mean EC was 0.78mg/l, during winter 0.685mg/l and summer 0.68mg/l. EC ranges from 0.09-0.34mS/cm studied by Addis *et al.,* (2014) from that they concluded that such EC value indicate that soil was non-saline. Soil EC was increases with the application of effluent as irrigation water having high concentration of salts, particularly Na^+ and Cl^- has significantly increased the salinity studied by Ahmad *et al.,* (2012). Faryal *et al.,* (2007) studied Lower EC of all the soil samples; as compared to the reference soil was observed. Similar pattern of total soluble salt concentration (10.73±0.12 to 35.53±0.80 meq/L) was seen with respect to the reference soil

(112.80±2.04 meq/L). The values of electrical conductivity ranged from 0.75 to 1.15 mmhos/cm and was quite high. Such high value of electrical conductivity might be due to the presence of high concentration of ions and dyes contributed by numerous printing houses located near the drain by Jaishree *et al.,* (2014), Prasad *et al.,* (2011).

Sodium (Na)

Seasonal variation in both sampling site, Sodium of Soil during Rainy season on Pali was 1.435±0.2616 mg/l, winter it was 1.28±1.28 mg/l and summer it was 1.16±1.16mg/l. In Balotra during Rainy season observed mean Sodium was 1.25±0.057mg/l, during winter 1.34±0.113mg/l and summer 1.11±1.11mg/l. High Sodium value are recorded near about 845-1014mg/kg by Addis *et al.,* (2014). Ahmad *et al.,* (2012) observed the sodium and potassium in waste water led to an increase in EC, they also recorded high values of sodium which was ranges from 70.3 to 79.7 ppm in contaminated soil. Chhonkar *et al.,* (2000) also studied the Na, Total dissolved solids BOD, COD which adversely affect soil as well as plant growth.

Potassium (K)

Seasonal variation in both sampling site, Potassium of Soil during Rainy season on Pali was 119.4675±24.14 mg/l, winter it was 192.688±46.26 mg/l and summer it was 99.411±19.41mg/l. In Balotra during Rainy season observed mean Potassium was 141.75±30.39mg/l, during winter 100.2±12.64mg/l and summer 97.25mg/l. 1980-6065 mg/kg Potassium was recorded by Addis *et al.,* (2014). Ahmad *et al.,* (2012) also studied the potassium ranges from 30.7 to 33.8 ppm. Garg *et al.,* (2007) studied the potassium content was negligible in soil sample. Prasad *et al.,* (2011) studied the available potassium ranged from 295 to 355 Kg/ha which was in high range.

Conclusion:

Although most of the bioremediation studies for surface water and soil contamination were proven to be effective in removing or reducing contaminant, such studies were done at lab scale. Thus, there is a need to investigate on large scale to better understand the suitable condition for optimization remediation process. It is also found that the amount of pollutant in both the soil and water has increasing and affects on the human health. The various parameters signify that the immediate action should be taken to prevent the pollution of the water soil. The textile dyeing industry is under considerable pressure to reduce the color of process waters directly discharged to municipal water treatment facilities.

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