ANALYSIS OF PHYSICO-CHEMICAL PARAMETERS OF IRRIGATION WATER OF SIKAR DISTRICT, WITH ITS EFFECT ON QUALITY OF SOIL

Narendra Singh[1], Ashok Babaji Sable[2], Shradha Binani[3], Umesh Kumar Sharma[4], Hari Ram[5], Bhawna Walia[6], Manmohan Singh Chauhan[7], Narendra Pal Lamba[8*]

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Abstract

Present study is related with Sikar, Lacchmangarh and Fatehpur tehsil of Sikar District area of Rajasthan which uses Irrigation water of various industries and ground water for irrigation purpose. 98samples were taken from Sikar, Lacchmangarh, and Fatehpur tehsils. In the study take a look at the usage of diverse parameters like pH, EC, T.D.S, ALK, T.H, Fluoride, Nitrate, Sulfate, Sodium, Potassium, Calcium and we've used diverse strategies which include Sodium absorption ration (SAR), and based that a number of the parameters are based extra than the ideal limit.

Keywords: Irrigation water pollution; agricultural activity; irrigation water quality; soil quality, variation of physico-chemical parameter impact on Soils; Sikar District area;

[1,5,7,6,8*]ASAS, Dept. of Chemistry, Amity University Rajasthan, Jaipur, India – 303002
[2]Department of Chemistry, JECRC University, Jaipur, India - 303905
[3]Department of Chemistry, Hyderabad institute of technology and management, Hyderabad, Medchal, India – 501401
[4]Bhaskaracharya College of Applied Sciences, University of Delhi, Delhi, India – 110075

Email: [8*]Budania1947@gmail.com

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1. Introduction

Most human endeavours, whether household, industrial, or agricultural, have an effect on the environment's water resources and ecosystems. A significant environmental problem on a worldwide scale, water contamination now poses a severe danger to India's ability to grow sustainably. According to data from the World Health Organization, water-related diseases account for 50% of morbidity in India. Due to improper management of the discharge of industrial effluents, household waste, and agricultural pollutants, around 70% of India's surface water resources and an increasing portion of its groundwater reserves are polluted by biological, toxic, organic, and inorganic pollutants [1]. These sources have often become unfit for use in irrigation and other industrial applications as well as for human consumption. When dangerous compounds are discharged into the water in significant amounts and endanger animals, humans, or habitats, water pollution results. In addition, natural events like earthquakes, algae blooms, hurricanes, and volcanoes have a significant impact on the biological state of water. Pollutant sources are divided into point and nonpoint sources according to the kind of source[2]. Contaminants that enter a river from a single, recognizable source, such as a pipe or ditch, are referred to as point source water pollution. Nonpoint source pollution is the term used to describe diffuse contamination that does not come from a single discrete source. It often results from the accumulation of tiny quantities of pollutants across a wide region. In addition to highlighting the current and proposed policy framework for water pollution control, this chapter evaluates the level of water pollution in India, the connection between water pollution and agriculture, technologies to control agricultural water pollution, and technologies for safe use of polluted water in agriculture[3]. In the prevailing observe, Sikar District, Tehsils Lachhmangarh and Fatehpur Sekhawati turned into selected. There are nine Tehsils with inside the Sikar district and all of the Tehsils have their specific geological, historic and cultural features. Lachhmangarh and Fatehpur(shekhawati) Tehsil are simple land having extremely good agricultural and irrigation dependence on floor water. Fatehpur Tehsil is definitely barren region with saline floor water and no irrigation. Also, Tehsils relying soils on floor water however the floor water potentials in those Tehsils could be very low. The Sikar District is a maze of all of the above and feature huge spectrum of irrigation water and soil first-rate issues. The vicinity is meager in rail-falls and has many water first-rate issues. If the irrigation water and soils of this vicinity is characterized and issues recognized remedial measures can be exercised for shield of life[4]. Various human beings are interested by agriculture and that they use this tube nicely and bore nicely water in irrigating fields. five The plant life and vegetables developing right here suggests early maturity, however have many problems like harmful, chlorosis, stunting boom and leaf die returned etc. There is a robust possibility of aggregation of critical metals in plant life/crops, a huge quantity of populace is reliant on their for his or her comestible purposes, so it'll be have an effect on human populace and lead them to diseased with all this scene, the present day observe is purposed[5].

1. Experimental

The last two decades witnessed an existing phase in the development of analytical chemistry in terms of new and improved analytical techniques which permit detection and quantification of much lower levels of chemical species, multielement analysis and a vastly increased data output in unit time[6]. Various people are engaged in farming and they use this pollutant water for irrigating fields. No other means like tube-well is present for irrigation purposes. The plant's /crops growing here shows early maturity, but have many disorders like Necrosis, chlorosis, stunting growth, leaf die back etc[7]. ; which might be due the use of this pollutant water. Irrigation water and soil samples were collected from Sikar District areas consisting of Sikar, Lachhmangarh and Fatehpur(shekhawati). We took 98 samples of irrigation soil and irrigation water respectively. After collecting samples, they were brought to laboratory. Samples under investigation which were clean and free from turbidity & organic materials were not required any type of processing and they were analyzed as such, but those samples which were turbid required filteration through whatman filter paper before analysis. And following Physico-chemical and Soil samples test shall be conducted.

pH by pH meter method, EC by conductometry method, TDS formula Ec x 640 = TDS (in ppm), total hardness, total alkalinity, chloride by titrimetric methodsulphate by turbidimetry method, Nitrate by spectrophotometrically method, fluoride by Ion selective method. We also used method that is used to determine the physicochemical parameters. Sodium absorption ratio (SAR)[8].

2. Result and Discussion

Sampling and analysis:- Investigation area, of Sikar district, at each 98 samples of irrigation water and soil were collected at different distance from the villege of the main Sikar, Lacchmangarh and Fatehpur tehsil. In each of the distance, soil

samples were collected by using of 0.5-15 cm diameter in all cases; grampanchayt soil samples were place in clean plastic bags and transported to the laboratory.

1. Physico-Chemical Characteristics Of Irrigationwater: -

Table-1 :- Physico- chemical parameter in irrigation water samples of Sikar District, tehsils (ppm), (Low and High range irrigation water)

Sr No.	Tehsils	Source	PH	EC	TDS	ALK	TH	SO_4^{2-}	CL^-	NO_3^-	F^-
1	Sikar	Tube-well	7.2-8.5	1080-4760	350-3380	190-1090	130-670	11-66	20-510	31-180	0.3-3.3
2	Lachhmangarh	Tube-well	7.4-9.4	1250-4800	955-4270	270-1340	140-740	22-310	130-180	36-112	1.2-7.8
3	Fatehpur	Tube-well	7.2-9.2	1450-4150	110-3470	130-1610	130-850	20-350	120-1200	46-375	1.2-8.2

1. PH: pH range for irrigation water is 6.5-8.5, according to ISI or WHO. In irrigation water samples. in sikar its varying from 7.2-8.5, in lacchmangarh its 7.4-9.4 and in Fatehpur it is 7.6-9.2 in (table-1), is considered each area. Sikar distrct tehsils, Lachhmangarh, Fatehpur, highly pH range irrigation water.

2. Electrical Conductivity (Ec): The capability of water to hold electric powered cutting-edge is decided through its electric conductivity. Water's electrical conductivity is directly and oddly inversely related to the amount of disintegrated minerals present[9]. The irrigation water samples in Sikar, Lachhmangarh, and Fatehpur range from 1080 to 4760, 1250 to 4800, and 1450 to 4150 ms/mohs, respectively (table 1). High electrical conductivity range irrigation water at Lachhmangarh and Fatehpur. In every place, it is not ideal for plant development.

3. Total dissolved solids (TDS): are an indicator of the salinity behaviour of water (TDS). Total dissolved solids adjust the traits and shade of water. The waft of water into and out of an organism's cells was governed by the density of the water, which might be hazardous owing to a rise in TDS concentrations125. TDS levels for irrigation water should be approximately 2000 ppm, according WHO and Indian Guidelines. Investigation area limit of irrigation water range for Sikar, Lachhmangarh and Fatehpur the irrigation water samples are varying from 350-3380, 955-4270 and 1110-3470mg/l in (table-1).

4. Alkalinity: Bicarbonates, carbonates and hydroxides make a contribution basically to the alkalinity or acid neutralizing energy of water. Other constituents, namely, borates, phosphates, silicates and anionic matter, contribute alkalinity but these are usually of little significance. Alkalinity is required limit in irrigation water 250ppm to 600ppm. Alkalinity is required in plant growth. In Sikar, Lachhmangarh and Fatehpur the irrigation water samples are varying from 190-1090, 270-1340 and 350-1601ppm, in (table-1), respectively. . Investigation area high concentration of Alkalinity does not suitable irrigation field for irrigation purpose.

5. Total Hardness:- The contemporary awareness of calcium and magnesium ions in water. And is expressed the awareness of calcium and magnesium carbonate water hardness does now no longer immediately effect plants. The permissible limit for irrigation water total hardness is 1300ppm most in plant growth[10]. In Sikar, Lachhmangarh and Fatehpur the irrigation water samples are varying from 130-670, 140-740 and 130-850 in (Table-1) respectively. Total hardness is very low irrigation water under investigation area.

6. Sulphate (So_4^{-2}): - The BIS set the desirable stage as four hundred mg/l (12 meq/l) restriction of sulphate ion in irrigation water withinside the absence of opportunity source.In Sikar, Lachhmangarh and Fatehpur the irrigation water samples are varying from 11-60, 22-310 and 20 and in soil samples its varying from 105-196, 80-206 and 85-245, in (Table-1) respectively. The effect of its on plants is characterized by similarly chlorosis in plant and stunted growth.

7. Chloride: - IS specifies a tolerance limit of 600 mg/L for irrigation water. (17 Meq/l). In Sikar, Lachhmangarh and Fatehpur the irrigation water samples are varying from 20-510, 130-180 and 170-1200 in (Table-1) respectively. It is found that chloride ion affects for plants growth in irrigation water. Through osmotic association along with turgor pressure, leaf water possibly and osmotic possibly's.

8. **Nitrates**: - Nitrates occur naturally in certain water supplies and may also found access directly or indirectly through discharges likes, irrigation water. According W.H.O nitrate permissible limit for irrigation water is 45ppm. Investigation area Sikar, Lachhmangarh and Fatehpur the irrigation water samples range 31ppm to 375ppm in (Table-1) respectively. Because of it the plants become yellowed. With stunted growth and produces smaller fruits and flowers.

9. **Fluoride (F^-)**: Fluoride is an crucial hint detail nutrient in human metabolism. It is a bone sticking detail. Trace amount of fluoride intake is reported to be beneficial for human health as it is required for formation of resistant dental enamel and mineralization of hard tissues. Fluoride tolerance limit for irrigation water is 1.0 to 1.5 mg/l. In Sikar, Lachhmangarh and Fatehpur the irrigation water samples are varying from 0.3-3.3 which is high in17 samples 1.2-7.8 which is high in 28 samples and 1.2-8.2mg/l. in (table-1), which is high in 31 samples respectively. Fluoride is an critical nutrient for plant growth.

10.

2. Physico-Chemical Characteristics Of Irrigation Soil: -

Table-2. :- Physico - chemical parameters of soil samples in Sikar District,, tehsils (Meq/L) (Low and High range irrigation Soil)

Sr No.	Tehsils	Source	pH	E.C	ALK.	Na^+	SAR	K^+	Ca^{2+}	Mg^{2+}	SO_4^{2-}
1	Sikar	Tube-well	6.6-8.2	690-1365	130-310	6.0-30.10	2.1-9.0	3.0-17.00	8.00-11.10	2.20-20.40	105-196
2	Lachhmangarh	Tube-well	6.7-8.5	1000-1480	120-330	12-30.20	2.3-6.8	3.60-26.20	8.20-12.70	2.10-12.30	80-206
3	Fatehpur	Tube-well	6.5-8.5	1250-2050	290-510	7.50-26	2.7-9.4	10.60-30.00	7.30-15.60	7.30-26.60	85-245

1. **PH** The acidity or alkalinity of a solution is determined by the amount of hydrogen and hydroxyl ions present. The pH of a soil water suspension, which indicates soil reactivity, is a crucial sign of the health of the soil. Thus, Mo deficiency rather than Al toxicity in acid soil has a greater impact on the development and nodulation of leguminous plants. The soil pH is an important factor for plant nutrition. The pH tolerance limit for soil is 6.00 to 8.00 in most favourable condition of plant growth. In Sikar, Lachhmangarh, Fatehpur tehsil agricultural soil, , have pH range from 6.5 to 8.5 in (table-2). It is not suitable range for plant growth.

2. **EC (Electrical Conductivity of soil):** Soil An essential sign of healthy soil is electrical conductivity, which provides an indirect assessment of salinity, or the amount of salt in the soil solution. Electrical conductivity is measured in milli-siemens per metre and is defined as the capacity of soil suspension to conduct (transmit) an electrical current. (mS m1)$_2$. Ec is suitable range for irrigation soil upto 2100 ppm[11]. In Sikar, Lachhmangarh, Fatehpur tehsil agricultural soil, study area, has 690-2050 ppm in (table-2). The availability of vitamins to plants, crop yields, and the interest of soil microorganisms that have an effect on Key soil processes, consisting of the emission of greenhouse gases like nitrogen oxides, methane, and carbon dioxide, are all impacted via way of means of excessive soil salinity.

3. **Alkalinity of Soil:**- It means The capacity or capability of water to face up to acidification, additionally referred to as the buffering capability of water. Alkalinity is required limit in irrigation water 250 to 600ppm. Alkalinity is required in plant growth[12]. In Sikar, Lachhmangarh and Fatehpur is in limit 320-710ppm in (table-2). This is not suitable irrigation field for irrigation purpose.

4. **Sodium of soil:** - The sodium permissible limit is 11.50 to 24.50 Meq/L for irrigation soils. In Sikar, Lachhmangarh and Fatehpur Tehsils 6.00 to 30.20Meq/l in (table-3). Sodium toxicity isn't always identified pretty effortlessly as chloride toxicity.

5. **SAR (Sodium Absorption Ratio):** - It is a diploma of the suitability of water for use in agricultural irrigation, as determined with the useful resource of the use of the concentrations of solids dissolved withinside the water. It is also a diploma of the sodicity of soil, as determined from assessment of water extracted from the soil. SAR of soil has been in range 8.50 to 15.00 meq/L which suitable for plant growth.In Sikar, Lachhmangarh and Fatehpur tehsil the irrigation water samples are varying from 2.1-9.0, 2.3-6.8 and 2.7-9.4 meq/L in (table-2), respectively.

6. **Potassium of soil**: - Potassium is a necessary component for plant development. It is crucial for food crops. For the optimum growth plant, requires 2.81 to 5.12 meq/l[13]. Investigation area of Sikar, Lachhmangarh and Fatehpur tehsil

agricultural soil region from 3.00 - 31.10Meq/l. in (table-2). High Potassium range Lachhmangarh, Fatehpur tehsils, it is not suitable plants growth.

7. Calcium of soil: - Calcium is essential element for plant and being a constituent of plant cell walls in form of Calcium apectate and of bones in man and animals, calcium deficiency is often a problem and causes to curl or roll and leaves and become chlorotic. The calcium concentration for optimal growth for plant is 5.00 to 10.00Meq/l. in (table-2), concentration of calcium in soil sample In Sikar, Lachhmangarh and Fatehpur Tehsils the irrigation water samples are varying from 8.00-17.10, 8.20-12.70 and 7.30-15.60 Meq/l. respectively. Role of calcium in manufacturing plant tissues and permits it to grow higher. Calcium is liable for holding along the cell walls of plants.

8. Magnesium of soil:- Mg has to be 2.5 for the best plant development to 12.0 meq/L in vegetative parts. In Sikar, Lachhmangarh and Fatehpur Tehsils it is varying 2.10 – 26.60 meq/L in (table-2), which is low and its deficiency causes symptom of interveinal iron deficiency anaemia 1st seems in older leaves. Leaf tissue between the roots is also chromatic, Bronze, or reddish, in which due to the fact the leaf veins stay inexperienced. Corn leaves seem yellow striped with inexperienced veins, whilst plants like soybeans, tomatoes, potatoes, and cabbage display orange-yellow shadeation with green veins[14].

9. Sulphate if Soil: - The prescribed limit by BIS is 400ppm in irrigation water. The result of its on plants is characterized by uniformly iron deficiency anemia plant and scrawny growth[15]. In Sikar, Lachhmangarh, and Fatehpur tehsils it is varying from 80-245ppm in (table-2), which are low values in irrigation water and soils investigation area. Sulfate deficiency The effect of its on plants is characterized by similarly chlorosis plant and diarises plant growth

3. Conclusion

The current study that we are studying is focused on the Physico-Chemical parameters of irrigationSoil and irrigation water in Sikar district, Lacchmangarh and Fatehpur tehsils, with its impact on quality of soil and for this purpose we took samples of irrigation groundwater and irrigation soil and by the help of various parameters as like pH, EC, T.D.S, ALK, T.H, Calcium, Magnesium ,Chloride, SO_4^{2-}, NO_3^-, F^-, Na^+, K^+ and SAR we founded that in the irrigation groundwater samples as like pH, EC, ALK, F^- in Lacchmangarh, Fatehpur high range. T.D.S, Chloride is normal in Lacchmangarh but high in Fatehpur and some parameters such as Nitrate and Sulphate are lower limit.

Now in the irrigation soil samples some parameters as like pH, EC, TDS and Potassium is higher range, but some parameters as like Sodium and SAR, is in normal limit. Calcium, Magnesium and Sulphate are lower in Lacchmangarh and Fatehpur tehsils, Sikar District. Alls parametars irrigation water and soil, higher range in Lacchmangarh and Fatehpur tehsils, Sikar District. It is not suitable irrigation field in future.

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