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Assessment of Physicochemical Parameters of Irrigation Water: A Case Study of Bathinda District

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Water quality generally refers to the biological, physical and chemical properties of water [1]. Water quality plays an important role in the development of water resources for drinking and irrigation purposes [2]. All over the world, irrigation water quality is the main concern because, irrigation water is required to maintain soil conditions, fertility of soil and quality of crops [3]. The properties of irrigation water vary depending upon the source and area. Though, Knowledge about the irrigation water quality in the area is confined and there is a lack of data on the physico-chemical parameters of irrigation water as well as, their implications for agriculture. The aim of this study is to evaluate the suitability of irrigation water for agriculture purposes in the area of the Bathinda district.

Irrigation water samples were collected from the selected site of the Bathinda district (Punjab). The villages of Bathinda District mainly obtain irrigation water from the Sirhind Canal. Sirhind Canal irrigates more than 5,200 square km of agricultural land. Irrigation water samples were during the daytime from 1 to 5 October 2020. All the irrigation water samples were collected in polyethylene bottles of 2L capacity. All the bottles were cleaned and rinsed with acid water and then washed with double distilled water. After the cleaning of bottles, bottles were title sealed and labeled with the sample name, sampling site, time and date.

According to the research study, the parameters revealed extensive variation at different-different sites. The determined values of all parameters are discussed and shown in the (Table 2).

pH

The pH value of the irrigation water sample ranged from 6.8 to 8.07. So, the water of this area is found alkaline in nature. Most of the water samples were found within the acceptable limit or permissible limit as suggested by the World health

organization (WHO) and Bureau of Indian Standards. S2 has a higher pH value whereas S4 has a lower pH value. It has been shown that the fluctuation in the pH range of all water samples may increase or decrease due to the presence of toxicity of pesticides, fertilizers and pollution.

Table 1 Water samples were collected from agricultural irrigation canal water of selected villages of Bathinda district

Sample No.	Source	Area/ location
C-1	Agricultural Irrigation Canal Water	Bibiwala
C-2	Agricultural Irrigation Canal Water	Multania
C-3	Agricultural Irrigation Canal Water	Gobindpur
C-4	Agricultural Irrigation Canal Water	Amargarh
C-5	Agricultural Irrigation Canal Water	Gill Patti
C-6	Agricultural Irrigation Canal Water	Bir Behman
C-7	Agricultural Irrigation Canal Water	Katar Singh Wala
C-8	Agricultural Irrigation Canal Water	Baho Jattri

Electrical conductivity

It is a measure of the ability of water to conduct electrical current called electrical conductivity. The value of conductivity ranged from 120-196 us/cm at selected villages irrigation water samples of the Sirhind canal of Bathinda district. According to the result, all water samples are within the desirable limit of Bureau of Indian Standard (BIS) [4] and World health organization (WHO) [5] standards. So, irrigation water from canals is safe for irrigation purposes in the agricultural field.

TDS (Total dissolved solids)

Total dissolved solids describe all dissolved solids like the presence of minerals, salts and metals in water. According Bureau of Indian Standard (BIS) value [4], the acceptable limit for total dissolved solids (TDS) is 500 mg/l. In the present study, the value of total dissolved solids (TDS) in the water varied from 145 mg/l to 197 mg/l. in sample S7, the total dissolved solids (TDS) concentration was slightly higher than other samples. Measurement of conductivity is affected by the

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presence of dissolved solids in water, as well as it gives not any sign of the corresponding quantity of other components.

Total hardness

The definition of water hardness is the amount of dissolved magnesium and calcium salts in the water. According to BIS, the desirable limit for total hardness is 200mg/l. According to the result, the total hardness value fluctuated from 102 – 119 mg/l as CaCO_3 . In samples, S7 has lower, whereas S8 has highest value of total hardness was determined. According to the result Total hardness value is within the desire limit of BIS standard value. So, irrigation water of this area is suitable for irrigation purposes [5].

Turbidity

Turbidity is defined as a reduction in the clarity and quality of water. It shows the amount of light penetrating into the water and scattered by the material present in the water or liquid. All the materials which cause turbidity in water viz. silt, clay, organic or inorganic matter, algae and other organisms are

not easily seen by naked eyes. The value of turbidity varied from 26.28 to 190 NTU and was found more than the permissible limits as prescribed by the Bureau of Indian Standard (BIS). S8 showed less turbidity value whereas other water samples showed high turbidity value [6-8]. This value is varied due to the presence of suspended solids in water which may deteriorate the water quality as well as this irrigation water quality is crucial for soil properties, plant growth and productivity.

Total alkalinity

It refers to the measure of the ability of water to neutralize bases and acids and maintain a constant pH value. It can measure the carbon dioxide, hydroxide ion, bicarbonates ion and carbonates present in the water. For alkalinity, 200- 600 mg/l is the desired standard limit or the permissible limit of BIS. The value of the water sample ranged from 75 to 87 mg/l of alkalinity in the Irrigation canal water denoting the presence of aquatic life as well as the growth of algae in the water [9-10].

Table 2 Irrigation water samples were collected from different- different villages of the Bathinda district

Sample No.	Site	Physicochemical parameters of water					
	Irrigation water of canal	pH	TDS (Mg/I)	Conductivity ($\mu\text{S}/\text{Cm}$)	Total hardness (Mg/I)	Turbidity (NTU)	Total alkalinity (Mg/I)
S-1	Bibiwala	7.9	150	129	108	85.42	80
S-2	Multania	8.07	145	118	105	91	78
S-3	Gobindpur	7.8	186	120	115	94.63	75
S-4	Amargarh	6.8	175	145	109	38	82
S-5	Gill Patti	8.01	155	186	116	55	74
S-6	Bir Behman	7.1	192	191	114	185	87
S-7	Katar Singh Wala	7.3	197	196	102	35.55	77
S-8	Baho Jattri	7.8	165	155	119	26.28	81

SUMMARY

Adequate irrigation water quality is necessary to maintain the soil property. This study was conducted to investigate various physicochemical parameters of irrigation water of selected villages of the Bathinda district. All the irrigation water samples were collected and analyzed by standard laboratory techniques. Various physico-chemical parameters like pH, Total dissolved solids (TDS), Total Hardness (TH), Turbidity, Electrical conductivity and Total alkalinity was analyzed. The observed value of irrigation water samples were compared with the Bureau of Indian Standards (BIS) and World Health Organization (WHO). According to the result, some of the irrigation water samples were not

appropriate or suitable for irrigation purposes due to the presence of a high concentration of turbidity value. The turbidity value was found to be more than the permissible limit as prescribed by BIS and WHO guidelines value. Other parameters: Electrical conductivity (EC), Total Dissolved solids (TDS), Total Hardness (TH), Total Alkalinity was in the permissible limit. However, in some villages, the turbidity value was not within safe limits, showing the need for an immediate solution to minimize this parameter in order to maintain the water quality.

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