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Comparison Study on Effect of Groundwater, Influent and Effluent of STP on Irrigation Land in Bhudihal Area, Davanagere Taluk

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Abstract

Groundwater is important for irrigation because it supplies essential for irrigation. The incoming flow of water to STP refers to influent and effluent. This study investigates the effect of groundwater (GW), effluent, and influent on soil properties and plant growth which focuses on fenugreek cultivation Results showed that most changes observed insoil irrigated with influent with increase of soil pH, electrical conductivity (EC), and nutrient levels N, P, K of 7.91, 1.01,241, 41.89, 96.73.The Plant height measurement indicates the superior growth with influent andeffluent irrigation compared to GW, with influent irrigation resulting in the highest plant growth.

Keywords: Groundwater, Irrigation, Effluent, Influent and Fenugreek

1. Introduction

1.1 Overview

Groundwater is important for irrigation because it supplies essential for irrigation. The incoming flow of water to Sewage Treatment Plant (STP) refers to influent and effluent. Water is among the essential resources, in many countries there is an insufficient supply of it.Daily resource depletion on Earth is the result of rapidly expanding industrialization and population. higher-quality water is used for drinking, while lower-quality water is increasingly being recommended for irrigation. Moreover, wastewater is an essentialsource of organic matter and plant nutrients for dry soil fertility. Now a day's domestic wastewater is more important and economical source for irrigation, and leads to the critical situations. The majority of nations are interested in reusing wastewater to provide micronutrients, Nitrogen, Phosphorus, and Potassium (NPK) essential for growth of the plant. Recycled sewage utilized for resource and a good way to reduce the expense of commercial fertilizer additionally environmental issues, when used for agricultural irrigation. As it reduces environmental damage and helps to prevent the loss of scarce resources, recycling wastewateris considered as an environmentally beneficial disposal option.

1.2 About STP and Effluent

Effluent is treated wastewater that flows from a treatment facility, like a reservoiror basin. After treatment, this water is often used for various purposes, such as irrigation. Since treated effluent is available all year round and isn't affected by weather changes, it providesa reliable water source. Influent water can provide a reliable source of water for plants whenother sources are limited. Soil Improvement: It adds nutrients to the soil, improving its fertility and composition, which helps plants grow better. Soil is the top layer of the Earth'ssurface that supports plant growth. It's a complex mix of organic material, minerals, water,air, and living organisms. The properties of soil determine how well it supports plants andinteract with the environment. Davanagere is a city which is situated in the center of Karnataka and is developing under Smart City scheme by Central government. . The Municipal Sewage Treatment Plants are well designed to treat the wastes comes from the city. One of the STP is located at the Shivanagara, Davanagere of having capacity 20MLD. The treated effluent from this STP is released to canal which flows along the Doddabudihal,Chikkabudihal and other villages which joins to theThunga Bhadra river.

1.3 Objectives

- To analyze the characteristics of influent, effluent and GW this is used for irrigation.
- To analyze the agricultural properties of the soil.
- Physical monitoring of crop growth which is irrigated by different sources of water.
- Comparison of soil quality before and after crop harvesting.

2. Materials and Methodology

The methodology involves selecting a study area, gathering samples, and using various laboratory techniques to analyse the various parameters of soil and water samples from the STP.

Study area and description

Davanagere is the city in Karnataka's heartland. Davanagere city developing under the Central government's Smart City initiative. It is the state's seventh-biggest city. As to the census conducted in 2022, Davanagere city has approximately 530,000 people. TheTreatment facilities for Municipal Waste include made to handle waste that originates in cities. One STP, with a 20MLD capacity, is situated in Shivanagara, Davanagere. This STPreleases its treated wastewater into a canal that passes next to the villages of Doddabudihal, Chikkabudihal, and others before joining the Thunga Bhadra River. Sample collection Groundwater and soil collected from our village Holalu vijayanagara district Hoovinahadagali Taluk. Effluent and Influent water samples are collected from the sewage treatment plant (STP) for irrigation of plant Fenugreek.

Materials

Glassware: Bottles of reagents, pipette, Burette, conical flask, funnel, and measuring jar, pipette.
Chemical reagents: H_2SO_4, $AgNO_3$, $MnSO_4$, $K_2Cr_2O_7$, $MnSO_4$, FAS, $Na_2S_2O_3$, $MgCL_3$.

Instrument used: What's man filter paper, silica dish, pH meter, TDS meter, open reflux COD digester, and BOD incubator

2.2 Methodology

In this methodology how the procedure is taken please is below according to the researchwork and my project.

Collection of effluent and influent and groundwater samples Analysis of initial parameters of effluent, groundwater and influent samples then Collection of soil and cultivation of Fenugreek plant seeds Irrigation of plants using effluent and influent till harvesting period with different places. Monitoring and recording the height of plants till harvesting period. Collection and analysis of soil samples after harvesting period which is used for irrigation. Comparison of soil characteristics before and after harvesting Comparison of plant height, irrigation effluent, influent.

3. RESULTS & DISCUSSIONS:

3.1 Physicochemical Parameters Analyzed Results.

This study investigates the effects of groundwater, effluent and influent on soil properties and plant growth which focuses on fenugreek cultivation. Collected samples are tested in the laboratory below table 3 includes pH, electrical conductivity(EC), Nitrogen, Phosphorous, Potassium. The parameters of soil are tested before and after irrigation with water samples. Thisstudy was done by 50 days and tested the growth of plant weekly.Theplant growth was good inthe influent water sample as compare to the other watersamples.

3.1.1 pH:

After irrigation, soil pH can rise because of the type of fertilizers and water used. Some fertilizers can make the soil more alkaline (less acidic), raising the pH. When you add these fertilizers during irrigation, they can increase the soil pH.

3.1.2 Electrical conductivity:

Electrical conductivity (EC) goes up after irrigation because irrigation water can dissolve saltsin the soil. These salts, which can come from the water or fertilizers, increase the ion concentration and thus raise the EC.

3.1.3 Nitrogen:

Nitrogen levels can rise after irrigation for several reasons. Fertilizers add nitrogen directly, and irrigation helps break down organic materials, releasing morenitrogen in forms like ammonium and nitrate. More water also boosts the microbes that convert ammonium into nitrate, raising nitrogen levels.

3.1.4 Phosphorus:

Phosphorus levels can increase after irrigation because of several factors, including fertilizerapplication, runoff, and soil conditions. Fertilizers containing phosphorus can make the soil or runoff richer in phosphorus. Irrigation helps decompose organic matter, which can also release more phosphorus.

3.1.5 Potassium:

Potassium levels in the soil can rise after irrigation due to the use of potassium-rich fertilizers. Water helps dissolve these fertilizers, increasing potassium in the soil. Also, irrigation can boost microbial

activity, which helps release potassium from soil minerals and organic matter into the soil solution.

Table 3.1: Analysis of water samples parameters and methods

Sl No	Parameters	Methods
1	pH	pH meter
2	Alkalinity	Using sulphuric acid with a digital titration
3	Hardness	with a standard solution of ethylenediamine tetra acetic acid
4	TDS	TDS meter
5	Chloride	Mohr's approach
6	BOD	BOD incubator
7	Electrical conductivity	EC meter

Analysis of soil samples

Table 3.2: Analysis of soil samples parameters and methods

Sl No	Parameters	Methods
1	pH	Calibrated pH meter
2	Electrical conductivity	Conductivity meter
3	Nitrogen	Kjeldahl technique
4	Phosphorous	Olsen's conduct
5	Potassium	Flame photometer

Effects of GW, Effluent and Influent Irrigation on Soil Properties

Table 3.3: Effects of irrigation on soil properties

Slno	Parameters	Units	Initial	Results		
				Ground water	Effluent	Influent
1	pH	-	6.03	6.91	7.42	7.91
2	EC	ms/cm	0.46	0.83	0.93	1.01
3	N	kg/ha	210	230	231.73	241
4	P	kg/ha	34.18	37.79	39.34	41.89
5	K	kg/ha	78.76	84.86	89.36	96.73

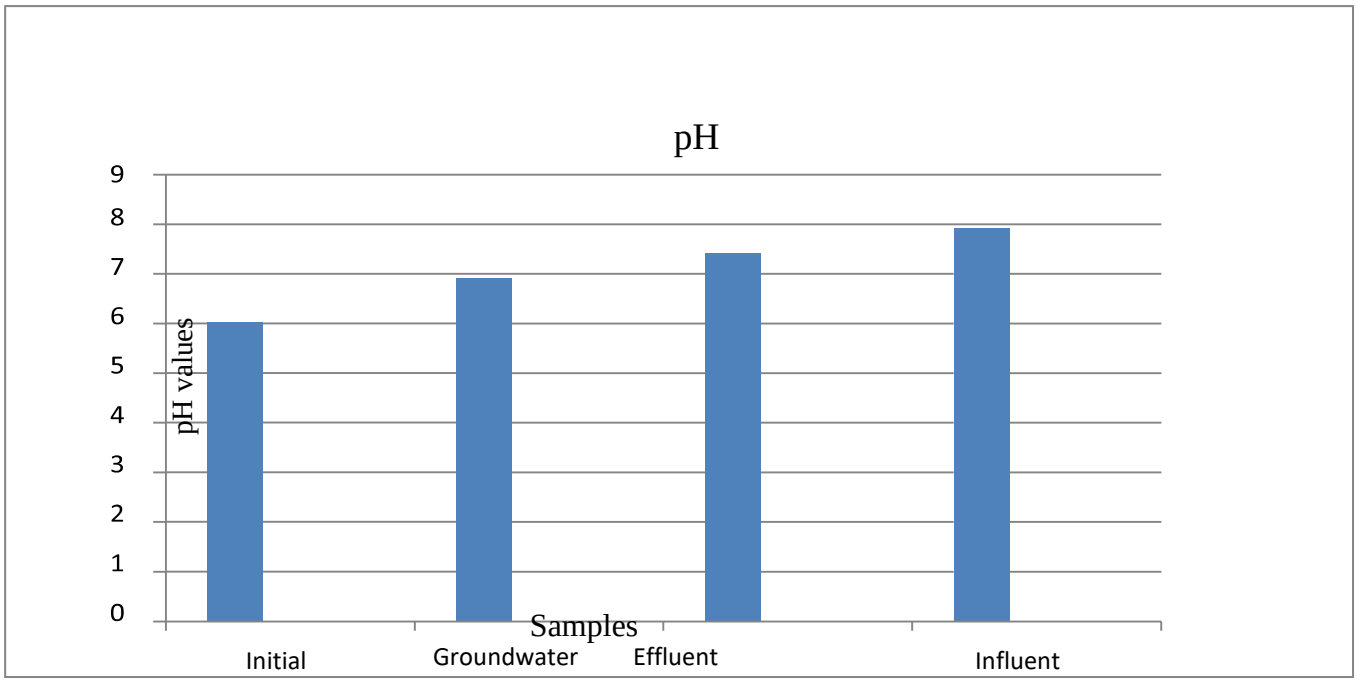

Fig 3.1: Representation of pH value for plant growth

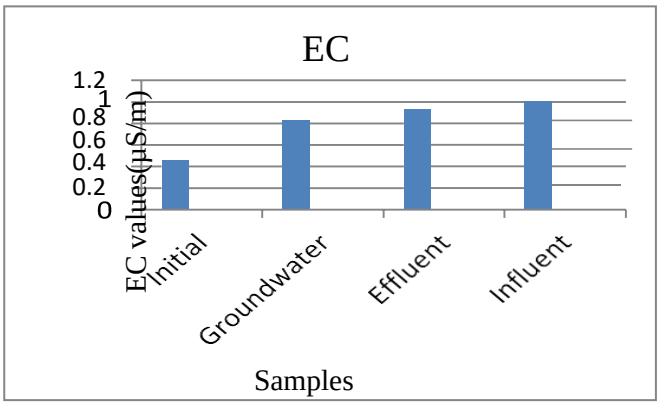

Fig 3.2 : Representation of EC of plant growth

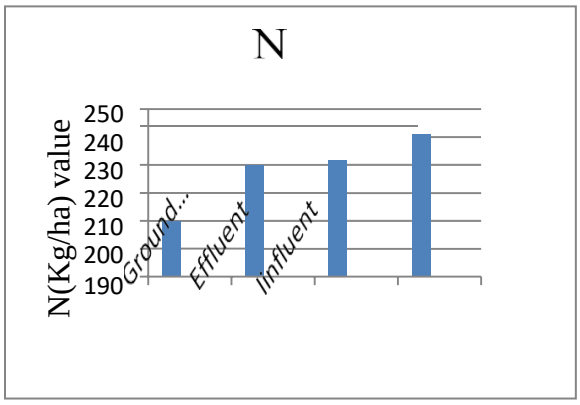

Fig 3.3: Representation of graph for N

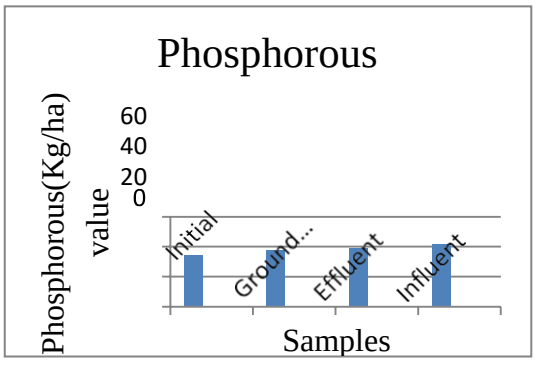

Fig 3.4 : Representation of P of plant growth

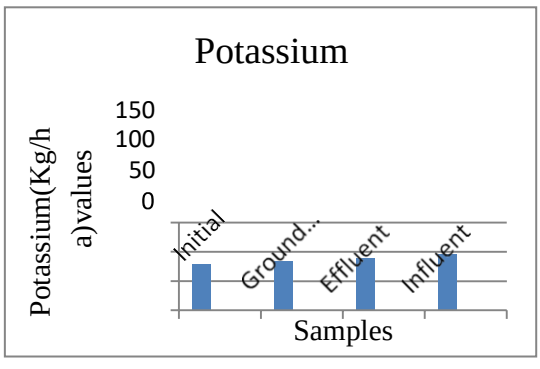

Fig 3.5 : Representation of K of plant growth

Conclusions:

This study investigates the effects of groundwater, effluent and influent on soil properties and plant growthwhich focuses on fenugreek cultivation. The conclusion of this study is as follows. Initial water quality assessments, water which we used for irrigation purposes revealed that GW had q neutral pH with moderate turbidity and high TDS, while effluent exhibited alkaline characteristics with low turbidity andelevated BOD and COD. After cultivation of fenugreek with these water samples, results showed that most changes observed in soil irrigated with influent with increase of soil pH, electrical conductivity and nutrient levels N, P, K of 7.91, 1.01, 241, 41.89, and 96.73 respectively. The soil irrigated with influent, initial plant growth was observed 3.3 after 50 days plant growth raised up to 20.2. The study reveals that, the highest rate of plant growth was observed in influent irrigation, when compared to effluentand groundwater irrigation. It is due to presence of the high level of phosphorous, potassium and nitrogenin the influent which makes the soil is rich in nutrients.

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