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Impact of Domestic Sewage for Irrigation on Properties of Soil

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Abstract: *The paper aims to investigate the impact of domestic waste water for irrigation purpose on soil fertility. Now-a-days due to the increasing the population, the demand of water has increased considerably resulting in the generation of more domestic wastewater. The use of the domestic wastewater improves the physicochemical properties of the soil as compared to the application of ground water. Domestic wastewater helps in better crop growth with increased fertility status of the soil. Application of domestic water increases total N, P, K and organic carbon content of soil & thereby increases the yield of crops compared to irrigation with ground water.*

Keywords: *Domestic sewage, soil parameters (N, P, K), irrigation, wastewater parameters (pH, B.O.D.).*

1. INTRODUCTION

The demand for water is continuously increasing in arid and semi arid Countries. Therefore, water of higher quality is preserved for drinking purposes while that of lower quality is recommended for irrigation. Domestic wastewater is less expensive and considered an attractive source of irrigation water now a day. Therefore, the interest in reusing wastewater for irrigation is rapidly growing in most countries. In addition wastewater is a valuable source for plant nutrients and organic matter needed for maintaining fertility and productivity of arid soils. Domestic wastewater contains essential plant nutrients such as N, P, K and micronutrients which are beneficial for plants growth. The objectives of this study were to evaluate the changes in soil parameters after discharging domestic wastewater on soil.

2. MATERIALS AND METHODS

Soil sample collection &analysis: - An experimental setup was made for conducting the work to investigate the impact of application of domestic wastewater on soil. For this purpose agricultural soil was collected from isasani near Y.C.C.of Engineering Nagpur. Then determine the soil parameters like N, P, K, & pH before applying wastewater.

Sampling of Domestic Wastewater& analysis: - The sewage wastewater was collected from Nag Nallah, Nagpur, and kitchen wastewater was collected from college (priyadarshini college of engineering Nagpur) Canteen.

Methods and analysis: - Discharge these two water sample into the soil separately. After 10 days, 15 days, 20 days of application of wastewater soil parameters N, P, K, & pH, of two soil sample containing sewage wastewater and kitchen wastewater was determined.

3. TEST PERFORMED

Following test was performed on soil and waste water:

1. Determining the soil parameters (N, P, K & pH) before applying waste water.
2. Determining pH &B.O.D of two sample of waste water.
3. Determining the soil parameters (N,P,K & pH) of two soil sample after 10 days of application of waste water.
4. Determining the soil parameters (N,P,K & pH) of two soil sample after 15 days of application waste water.

5. Determining the soil parameters (N, P, K & pH) of two soil sample after 20 days of application waste water.

4. Result Analysis

These tests were performed by Government of indian bureau of mines modern mineral processing laboratory and pilot plant.

Test Results:-

Table 1. *Before applying waste water (Soil parameters):-*

Name of sample	N (ppm)	P (ppm)	K (ppm	pH (5:50gm soln.)
Soil sample	2970	5.72	3240	7.00

Table 2. *Waste water parameters*

Name of sample	pH (5:50gm soln.)	B.O.D ppm
Kitchen waste water	5.7	4000
Domestic sewage water	6.3	5000

Table 3. *After 10 days applying waste water (Soil parameters):-*

Name of sample	N (ppm)	P (ppm)	K (ppm)	pH (5:50gm soln.)
Soil containing Kitchen waste water	5630	31.6	4360	7.26
Soil containing Domestic sewage water	4250	42.6	4340	7.6

Table 4. *After 15 days applying waste water (Soil parameters):-*

Name of sample	N (ppm)	P (ppm)	K (ppm)	pH (5:50gm soln.)
Soil containing Kitchen waste water	1150	5.5	3450	7.69
Soil containing Domestic sewage water	1090	5.7	3680	7.40

Table 5. *After 20 days applying waste water (Soil parameters):-*

Name of sample	N (ppm)	P (ppm)	K (ppm)	pH (5:50 gm soln.)
Soil containing Kitchen waste water	1350	14	3820	7.01
Soil containing Domestic sewage water	1150	18	4370	7

Table 6. *Standard values for following crops:-*

Crop	N (PPM)	P (PPM)	K (PPM)
Wheat	3000-4000	25-35	3500-4800
Gram	3500-5000	30-45	3000-4200
Palak	3500-4200	31-45	3300-4600

Soil sample containing kitchen waste water (B.O.D.-4000, pH-5.7)

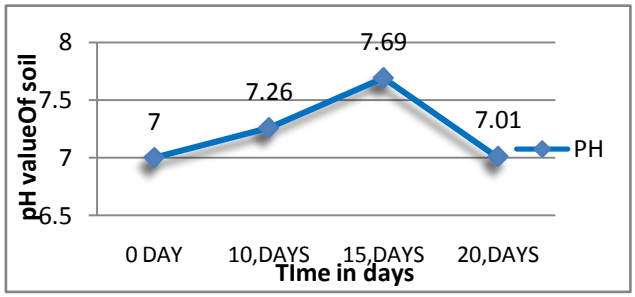

Figure 1. *variation of pH value with times (Days)*

The above graph shows that the pH value of kitchen waste water is increasing after 10 days and 15 days but gradually decreases after 20 days. This depicts that pH value again goes back to its original condition.

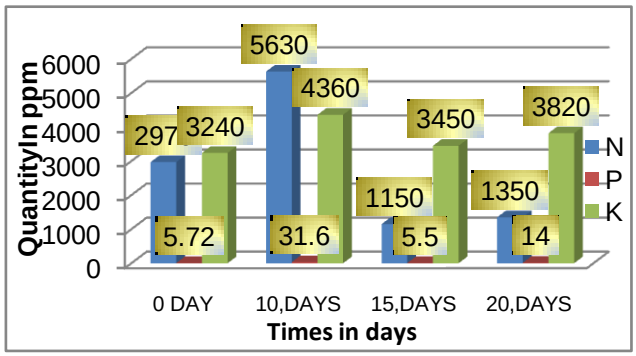

Figure 2. *Variation of soil parameters (N, P, and K) with times/ (Days)*

The above chart shows that the value N is increasing after 10 days and simultaneously P, K values are increasing, but after 15 & 20 days gradually decreases

Soil sample containing domestic sewage water (B.O.D.-5000, pH-6.3)

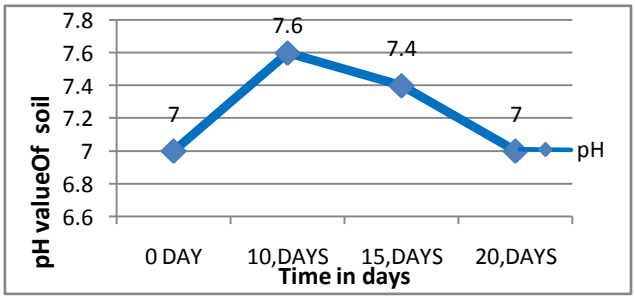

Figure 3. *Variation of pH value with times (Days)*

The above graph shows that the pH value of kitchen waste water is increasing up to 10 days but gradually decreases after 10 days. This depicts that pH value again goes back to its original condition.

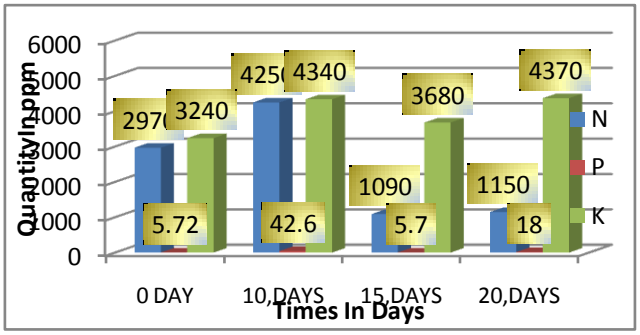

Figure 4. *Variation of soil parameters (N, P, K) with times/ (Days)*

The above chart shows that the value N, P, K is increasing after 10 days and then gradually decreases, after 15 & 20.

5. CONCLUSIONS

The value of N, P, and K is increasing till 10 days in both cases but decreasing after 10 days. The kitchen waste water proves to be beneficial for duration of 10 days as compared to domestic sewage water. So we can conclude that use of domestic wastewater for irrigation has gain importance throughout the world due to limited water sources and costly wastewater treatment for discharge. If land with suitable topography, soil characteristics and drainage is available, domestic waste water can discharge as a source of both irrigation water and plant nutrients.

Application of domestic water increased the yield of crops compared to irrigation with ground water; it also increases total N, P, K and organic carbon content of soil. In India, encountering the problems of water scarcity and high cost of fertilizers, domestic wastewater could be successfully use for irrigation. Findings indicate that, the use of domestic wastewater with physical treatment could increase water resources for irrigation may prove to be beneficial for agricultural production.

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