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"Nutritional Status Assessment, Effects and Evaluation of Water and Wastewater on Crop"

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Abstract:

The present experimental study was effective for long term additional source of water for future and present verdure era. The effect of wastewater on soil fertility checking by adding and pouring water and wastewater by using experimental crop and also checking nutritional status (NPK) by observing growth within experimental time. Significant change occurs when we pour water and wastewater by observing crop growth. There is good growth in wastewater as compared to water. Wastewater reuse is good option for alleviation the ever increasing irrigation water scarcity.

In this study we have to check the effects of water and wastewater on soil fertility. This information will help farmers to decide the problem related to soil nutrients amount of fertilizers to be added to soil to make production economic. This research showed that the soil irrigated with wastewater has the best concentration of organic matter. The study work deals with nutritional status of the soil and assess by pouring wastewater and water on experimental crop and checking its status by applying water and wastewater by observing the growth. Study period was 37 days and checking the plant height in control and experimental sample.

Keywords: *verdure, NPK, alleviation, growth, wastewater*

Introduction:

Water is a vital resource but a severely limited in most countries. Rapid industrial developmental activities and increasing population growth had declined the

resources day to day throughout the world. The population increase has not only increased the fresh water demand but also increased the volume of wastewater generated. Therefore, there is an urgent need to conserve and protect fresh water and to use the other or recycled water of lower quality for irrigation, agriculture purpose by checking wastewater quality. This information will help farmers to decide the problem related to soil nutrients amount of fertilizers to be added to soil to make production economic (Swanti A. Jain 2014). The study work deals with nutritional status of the soil and assess quality by pouring wastewater and water on experimental crop and checking its status by observing the growth. Study period was 37 days and checking the plant height in control and experimental crop sample. The reuse of wastewater for agricultural irrigation purposes reduces the amount of fresh water that needs to be extracted from water resource. It is the potential solution to reduce the freshwater demand for zero water discharge avoiding the pollution load in the receiving sources.

The aims and objectives of the present investigation is the gainful use and utilization of wastewater collected from Nag River and to also assess its effect on the growth of crop cultivated in soil. The objective of this work is to assess the nutritional status and effects of water and wastewater. The impact of wastewater on quality of crop with respect to nutrient level i.e. NPK

Selected Site- Nag River as a source of sewage (wastewater):

The Nag River originates in Lava hills near Wadi and the confluence Point of Nag River and Pili River is near Pawangon. Nag River is part of Kanhan-Pench river system and it merges with Pili River. A Lake 'Ambazari' has been constructed at the upstream reaches of the river Nag and was the prime source of water to Nagpur city till a few years ago. The river receives fresh water only during monsoon and is a carrier of sewage and effluent throughout the year. Untreated sewage and industrial effluent of about 345 MLD are discharged directly in the river. Because of this, the river water is dark gray and emanates foul smell. Nag River flows for most of its course through the urbanized part of Nagpur city. The occupational and domestic activities in various households invariably

result in the production of liquid, solid and gaseous wastes of various types and quantities, which subsequently find their way into the river.

Disposal of domestic sewage in unlined drains and nullah, cattle farming etc. in Nagpur city slum area near and periphery of Nag River is responsible for the state of Nag River and source for the pollution. So Nag River contains the nutrients and factors which are important for the growth of plants or vegetables. Hence, Nag River wastewater is selected and used for the study of nutrients like NPK and to observe the effects of wastewater on the crop.

Map of the Sampling Location:



Materials and methods:

Sampling and Collection of wastewater - The reason for choosing Nag River wastewater is because if it is effective for giving proper growth to crop plant and it also gives plant nutrient contained in the wastewater such as Nitrogen, Phosphorous and Potassium (NPK) which are very important and essential nutrient contents for any plant to grow proper and healthy. It is also one of the sources of additional irrigation water use for recycle and also for saving of high quality fresh water i.e. for other beneficial used

and reduced water load and used in condition of water stress. This is economic way to dispose wastewater and prevent pollution and sanitary.

Plan of work - Collection of wastewater from Nag River, physico-chemical characterization in wastewater after adding in soil and make leachets then soil to assess pH and levels of nitrogen, phosphorous and potassium and experimental study on the growth performance of crop at different intervals of times (i.e. after 1 day, 7 days, 15 days, 25 days and 37 days).

Soil Sample Collection and Analysis: A laboratory setup was used for performing the work to investigate the impact after application of Nag River wastewater in soil. For this purpose, the raw soil is collected from the plant nursery which is used for the gardening purpose. Then the soil parameters like N, P, K& pH were determined before applying wastewater. All the physico-chemical parameters analyse by referring APHA 2005. Nitrogen assess by Kjeldahl's assembly method, Phosphorous by Spectrophotometer at 690 nm, and potassium by digital Flame photometer. APHA 2005, NEERI Manual.

Sampling of wastewater and Analysis: The wastewater sample is collected from the Nag River located near the Humpyard road around slum area, Nagpur shown in location map.

Preparation for the Experiment Methodology: The crop seeds are selected for the experiment, selected seed is Sardar seeds which is a good brand.

Test Performed:

First the pH, Nitrogen, Phosphorous and Potassium of the wastewater sample is assess and monitored. Then pH, Nitrogen, Phosphorous and Potassium of the soil is monitored. Then this soil and wastewater is used for practical work and changes were observed after 7 days, 15 days, 25 days and 37 days as shown in following figures A, B, C, D, E, F, G, H,I,J and K. After full growth i.e. after 37 days period then again nutrient parameters Nitrogen, Phosphorous and Potassium (NPK) were monitored.

Soil is poured in equal proportion in both trays. One tray is used for control and the other is used for experimental work. The soil was watered after sowing with experimental wastewater in one tray and tap water in other. The seeds were sown in four rows and are watered regularly. The changes and work is observed for a period of 37

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days. Then wastewater sample analysis and soil analysis was carried out (i.e. pre-assessment and post-assessment).

The observations after addition of seeds are as follows:

Day 1: (Pre-assessment)



Fig.[A] Control



Fig.[B] Experimental work

After 7 Days:



Fig.[C] Control



Fig.[D] Experimental work

After 15 Days:





Fig.[E] Control **Fig.[F] Experimental work**

After 25 Days:



Fig.[G] Control



Fig.[H] Experimental work

Day 37: (Post-Assessment)



Fig.[I] Control



Fig.[J] Experimental work

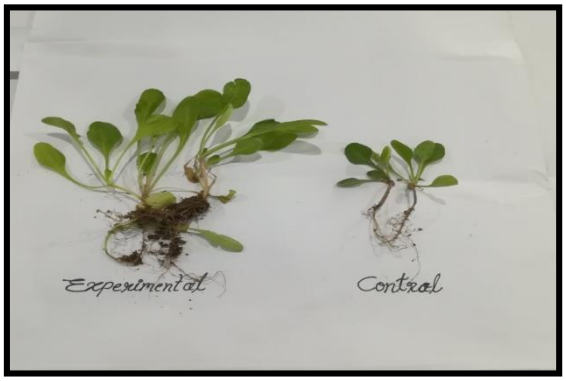
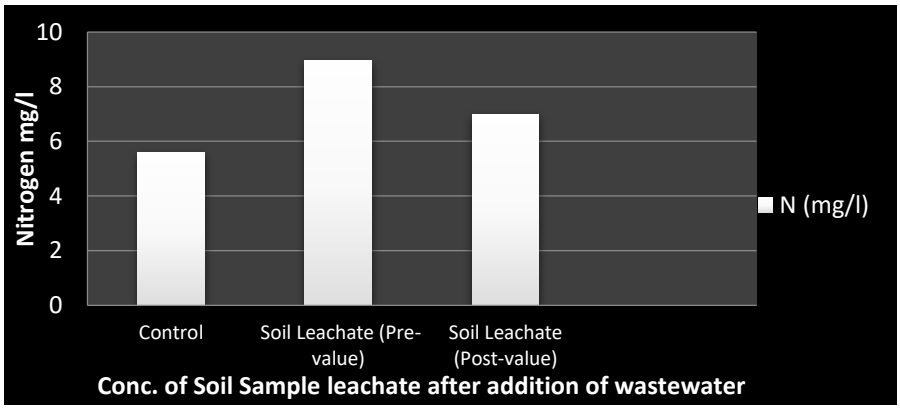
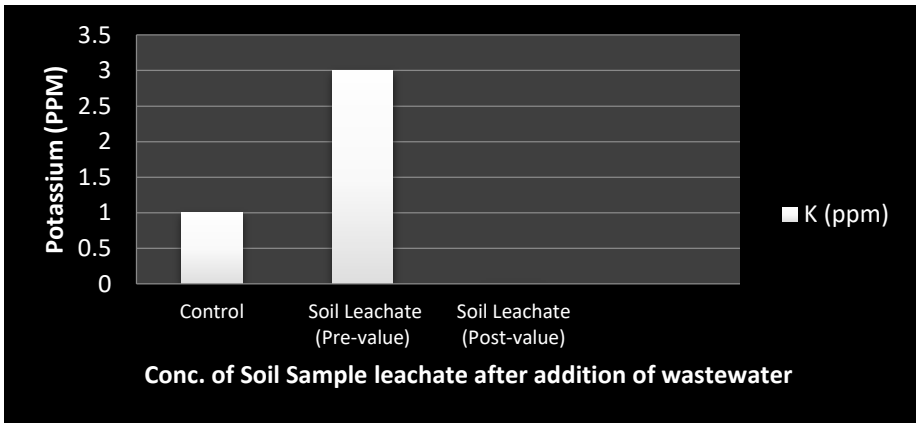


Fig [K] Crop Growth (Experimental and Control)

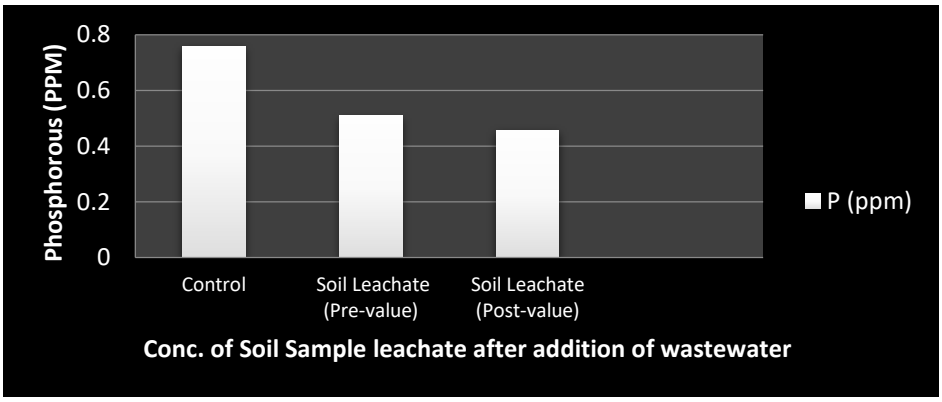
From the given status of work done above until now, hence, the present work deals with the efforts put forth in order to assess the nutritional status of the soil and effects of water and wastewater on the soil so as to determine soil fertility with experimental vegetable crop and its growth performance.



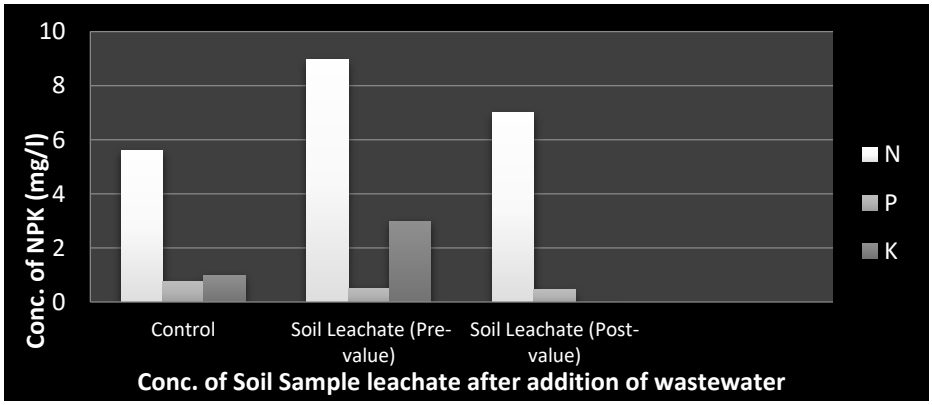
Graph 1: Different concentration of Nitrogen in soil sample leachate after addition of wastewater



Graph 2: Different concentration of Potassium in soil sample leachate after addition of wastewater



Graph 3: Different concentration of Phosphorous in soil sample leachate after addition of wastewater



Graph 4: Nutrient parameters NPK with different concentration

Result and Discussion:

In this study, "Nutritional Status Assessment, Effects and Evaluation of water and wastewater on crop" the Nag River wastewater and tap water is used to observe the nutrients present in soil. Also the present study describe the effects of water and wastewater on the crop seeds which is used as an experimental crop and observed its growth performance in fig A,B,C,D,E,F,G,H,I,J and K. by monitoring physico-chemical characteristics of Nag River (wastewater) . The Nag River wastewater was grey-yellowish in colour. The pH range of wastewater is 7.72 i.e. alkaline in nature. Nitrogen found in the wastewater sample is 13.44mg/l, Phosphate is 1.402ppm and Potassium (Kiran, 2012) is found in the range of 1ppm in the sample which indicates the presence of the nutrients (i.e. NPK) (Naveed Najam,2016) as shown in Table I. The pre-assessment of the soil sample by preparing leachate. The soil parameters were analyzed before applying wastewater. The pH of the raw soil is taken and it shows 8.68 which indicates it is alkaline in nature. The concentration of nitrogen is found to be 5.6mg/l, (Muamar AL-Jaboobi, 2014) Phosphorous is 0.760 ppm and Potassium is 1 ppm observed as shown in graph 1, 2, 3 and 4 (Yadav *et al*., 2001) (Bashir Ahmad, 2006).

After addition of wastewater in soil, the soil pH is taken. The soil is alkaline in nature i.e. the pH range is 7.40. It also shows the various concentration of Nitrogen (8.96mg/l), Phosphorous (0.510ppm) (Josef Zavadil, 2009), Potassium (3ppm) as shown in graph 1, 2 and 3 Table II. The post-assessment of the soil sample after addition of wastewater (By preparing leachate. (Rusan *et al*., 2007)

After the full growth of the crop in (Fig. K), the time period was 37 days the soil is monitored and assess for nutrient parameters like NPK observed and there was some changes in characteristics of soil (A.A.Ramteke, 2013). The pH of soil is alkaline in nature i.e. the pH range is 7.72 (A. R. Mahske and P. J. Nikam, 2017). The Nitrogen range is 7mg/l, Phosphorous is present in the range 0.458ppm (Yadav, 2001) and Potassium observed is 0ppm, it all shows the decrease in level of NPK as shown in graph 1, 2 and 3. The changes in plant height are also observed as shown in table III (Sheikh, 2012).

Table I. Observation of Nag River wastewater and soil sample leachate (Pre-assessment)

Sr. No.	Parameter	Nag River wastewater sample	Soil Sample leachate (Raw)	Soil Sample leachate after addⁿ of wastewater (Pre-analysis) 1st day
1)	pH	7.72	8.68	7.40
2)	Nitrogen (mg/l)	13.44	5.6	8.96
3)	Phosphorous (ppm)	1.402	0.760	0.510
4)	*Potassium (ppm)*	1	1	3

Table II. Observation of soil sample leachate after addition of wastewater (Post-assessment)

Sr. No.	Parameters	Soil leachate after addition of wastewater (Post-Analysis) 37th day
1)	pH	7.72
2)	Nitrogen (mg/l)	7
3)	Phosphorous (ppm)	0.458
4)	Potassium (ppm)	0

Table III. Observation of crop plant height after different intervals of days:

Days	Control	Crop height in wastewater
	Plant height (cm)	Plant height (cm)
After 7 Days	2.5	2.8
After 15 Days	4.2	8.5
After 25 Days	7.1	12.5
After 37 Days	10.5	18

Conclusion:

The study of Nitrogen, Phosphorous and Potassium (NPK) nutrients status in wastewater is favourable for crops. The results of the experiment have confirmed that application of Nag river wastewater coming from slum areas and different pollution sources increased the yield of crops compared to irrigation water and tap water. It was concluded that the effects of wastewater was better and favourable for proper crops growth or plants growth as a nutrients and also used for plantation, forest development, increasing Green Belt in industrial area, in barren area for development of forest, development of greenery in other area. It also increases total NPK content in soil. Hence, we can use Nag River wastewater for irrigation instead of using water due to limited availability of water resources and provide an alternative method of water and wastewater management. However, a certain risk exists due to contamination and pollution of the wastewater. So we can apply some methods for the treatment of this wastewater before we use it for agricultural or any other purposes.

By applying some remedies (recycling process) on large scale we can control water pollution in some percentage. This wastewater could also be used for public sector like flushing in toilets and bathrooms and for gardening, increasing green belt in industries and increases present and future verdure era. Effects of wastewater show good results on experimental crop by showing proper growth.

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