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Comparative Study of Different Sewage Farming on Soil Quality

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ABSTRACT

Sewage Sludge contains high amount of nutrients in the form of wastewater. These wastewater are treated in Sewage treatment plant and separation of Sludge from wastewater is taken out using various type of technology. The sludge separated from wastewater are further treated in sludge treatment unit and removal of maximum amount of water are done using various equipment. The treated water is reused for various purposes or discharge into river bodies and the sludge after treatment are send to disposal site. This study focuses on the utilization of these sewage sludge as a fertilizer and comparison of this sludge with chemical fertilizer. The content of nutrient in sewage shows significant results on application with various plants and discussed the effect of sewage farming on soil quality.

KEYWORDS: *Sewage Sludge, Chemical fertilizers, Normal soil, Nutrients value*

1. INTRODUCTION

Sewage Sludge is one the major issue facing for any Sewage Treatment Plant for its proper disposal. The final Sludge collected from STP's required large space for disposal and space should be far away from residential community. The dry sludge is rich in nutrient and contain significant amount of mix nutrients which is useful as a fertilizer. The study focus on the use of sewage sludge as a fertilizer and a comparison between normal soil and chemical fertilizer with sewage sludge is studied. Sewage sludge is dried and taken from 6.5 MLD STP Vrindavan Yojna which is SBR based STP.

The Sludge is taken from centrifuge machine which removes the water content from sludge. The study shows by taking three plants namely Alovera, tomato and chilli and grown with sewage sludge, normal soil and chemical fertilizer. The normal soil taken is silty clay loam. The chemical fertilizer taken is Poorna 19 which contains nitrogen, present in ammonical, amide and nitrate forms, this further supplemented with zinc, iron, copper and manganese. The use of these chemical fertilizer always require a attention for proper dosage for better result. Firstly the physical test are performed and recorded which shows the sewage sludge is better compare to normal and chemical fertilizer. The rate of growth of plant with sewage sludge is much better than other two. Initially the research is performed in pot which doesn't show better effect initially. The water used for the irrigation is taken from the outlet of 6.5 MLD STP which further improves the soil quality as it also contains some parameter within the discharge limit to inland surface. The outlet water is taken before the chlorination stage. The reuse of treated water is common nowadays for small community in premises to make Zero Liquid Discharge scheme.

The sewage sludge in India is disposed far away from city which improves the soil quality of that area where it is disposed. The land where it is disposed is rich in nutrients after few years and the growth of vegetation is much better. The research also focus on the application of sewage sludge spread on near by area in plant premises which result in green grass all over where the sewage sludge spreaded. Further the application of sewage sludge is done on various plants grown in premises. The results show the significant growth of tomato over all the field. The use of sewage is cost economical, eco-friendly and doesn't require enough attention for proper dosage. The sewage sludge as a fertilizer will solve the problem for disposal of sludge and providing almost zero costlier fertilizer to farmers.

2. METHODOLOGY AND EXPERIMENTAL SETUP

The comparative amount of nutrients in various soil are shown in the table 1

	Dry Sludge	Normal Soil (%)	Chemical Fertilizer (%)
pH	8.3		
NO_3-N	38	0.9	4
NH_4-N	19.2	0.5	4.50
PO_4	40.3	0.3	19
K	4.2	2.8	19
SO_4	12.5	0.15	
Moisture Content	0.80	0.20	0.50

Table1. Amount of nutrient in Soil

The water used for the irrigation of plants contain some amount of nutrient which is shown in table 2 which contain discharge parameter of STP

Discharge Parameter	Inlet	Outlet
Ph	8.2	7.2
COD	256	40
BOD	190	12
TSS	165	10

Table2. Water quality of STP

Initially the dry sludge is mix with normal soil and group of three pot were prepared i.e one with normal soil, second with dry sludge mixture and third with chemical fertilizer.

Fig1. First day of plantation

Results were recorded every fifteen day. The growth of plant were observed for every method of plantation.

Fig2. Fifteenth day of plantation

After 15th day the growth of seed is shown in fig2

Fig3. Comparison of Sludge mixture soil with normal soil

In fig 3 the right side of pot contain normal soil plantation and left side pot contains sludge mixture soil.

Fig 4. After 30 days of plantation of chi

3. RESULTS

After 60 day of plantation the growth of plant with sewage sludge is much better than other two. From the overall analysis that had been conducted, it was found that the plant being supplied by fertilizer had dead at early stage which is on 6th week. This was the overload content of nutrients in the fertilizer. Theoretically, daily sludge application using the designed concentration will not cause any major problem to the plant but differ to the daily fertilizer application which caused harm and toxicity to the plant.

	Dry Sludge	Normal Soil (%)	Chemical Fertilizer (%)
pH	8.3	7.5	6.8
NO_3-N	38	0.9	4
NH_4-N	19.2	0.5	4.50
Total N	57.2	1.4	8.5
PO_4	14.2	0.5	19
N:P ratio	4.02:1	2.8:1	0.44:1
K	4.2	2.8	19
SO_4	7.8	0.15	
Moisture Content	0.80	0.20	0.50
N:S ratio	7.33:1	9.33:1	

Table3. Comparison of nutrients between sewage sludge and plants

Content of nutrient in plants

2 sets of data were obtained during the analysis as the plants that being fed with fertilizer were dead due to excess supply of nutrients. The nutrient content in plants receiving sewage sludge and treated water are shown in table 3 while ratio between nutrients cater by plants fed with sewage sludge and treated water of SBR plant are presented in table 3 above.

The optimum N:P ratio for most plants ranges from 5:1 to 10:1. According to table 3 the sewage sludge provides the dosage in the optimum range of plant.

Growth Development of Alovera

Initially the aloveera taken on the first day for plantation were 5.6cms, 4.8cms and 4.2cms

Aloovera height	Initial (cms)	Final (cms)
Sewage Sludge pot	4.2	35
Normal soil pot	5.6	24
Chemical fertilizer pot	4.8	18

Table4. Height of Alovera in different soil

Fig5. final growth of plant

Fig6. Growth of tomato in 6.5 MLD premises

4. CONCLUSION

Sewage sludge potentially contains nutrients which can be used as fertilizers in order to enhance the plant growth

Major nutrients contain in sewage sludge is nitrogen, phosphorous, potassium and sulfur and might contains some micro nutrients.

Though the utilization of sewage sludge will solve the problem for the disposal of STP sludge and it can be reused for developing green belts in the premises and nearby areas of STP.

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