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RESEARCH ARTICLE

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Feasicbility studies of reusing of industrial waste water for irrigation

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ABSTRACT

This paper throws light on the results of experimentation carriedout to evaluate the feasibility of reusing industrial effluents and combination thereof for irrigation to grow root crop radish. The parameters namely germination percentage, leaf numbers and plant height were considered for study. The impact of sugar mill and distillery effluents and their diluted combination with sewage, along with control irrigation (water) on the parameters selected are discussed in this paper. It was observed that industrial effluent from sugar mill and distilleries and their diluted combination with sewage con be productively reused to grow radish. TDS and organic conteuts of waste water had significant influence on yield and growth.

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Key words : Industrial efflents, Germination percentage, Leaf number, Plant height, Radish

INTRODUCTION

The stringent implementation of zero discharge concepts for industrial wastewater by authorities, shortage of conventional water sources for irrigation, increase in population and thereby abnormal increase in food demand resulted in disposal of industrial effluents on land for irrigation. Many industries especially food and allied industries like sugar mill and distilleries, the wastewaters of which are rich in organic and nutrient contents were found to be amicable for use as irrigation water.

However, one has to evaluate the beneficial effects of using such wastewaters for irrigation on various components of ecosystem, before suggesting the use of such wastewater for irrigation. Many researchers to date have carriedout studies covering these aspects. Baruah and Das, 1998; Patel *et al.*,2003; Singh *et al.*, 2003; Velu *et al.*,1999; Rekha Thakre *et al.*, 2003; and many more]. However, the problems and solutions are site, crop and effluent specific and there are still many problems worthy of investigation. An attempt has been made in this paper to throw light on impact of reusing industrial wastewaters on germination percentage and growth parameters of root crop radish.

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MATERIALS AND METHODS

Effluents collected from nearby (Davangere, Karnataka) sugar mill and distillery were used for experimentation. The gravely soil (classified as per the guidelines given in SP 36 Part-II) collected from nearby agricultural fields was used for experimentation. Pot experiments were conducted circular pot made of RCC. The soil sample and effluent were analyzed as per standard methods APHA, 1991. The seeds of radish were collected from recognized agricultural outlets and ware used for study. The yield and growth parameters monitored include; plant height and leaf numbers per plant. The following wastewater combinations were tried.

Irrigation with borewell water (control) – T_1
Irrigation with sugar mill wastewater (SMWW) – T_2
Irrigation with distillery wastewater (DWW) – T_3
Irrigation with SMWW + sewage (1:1) – T_4

Irrigation with mixing DWW + sewage (1:1) – T_5

RESULTS AND ANALYSIS

The characteristics of soil and wastewater combinations used for experimentation are summarized in Table 1.Acidic nature of wastewater options T_2, T_3, T_4 and T_5 has been observed. T_3, T_4 and T_5 exhibited much higher concentrations of TDS compared to T_1 and T_2. Distillery effluent showed highest organic and nutrient content followed by wastewater option T_5.

Table1: Characteristics of soils and wastewater combinations used for experimentation

Parameters	Soil	Irrigation water source combination				
		T1	T2	T3	T4	T5
1. pH	7.2	7.23	5.58	4.37	6.39	5.79
2. TDS, mg/l	542	803	709	8236	1461	5244
3.Organic Carbon, %	0.25	--	--	--	--	--
4.BOD, mg/l	--	--	910	43520	500	21842
5.Total Nitro gen,mg/l	0.12	0.2	27	1110	19	562

Germination percentage:

The Fig 1 depicts the effect of wastewater options on germination percentage of radish. The results indicated the better germination percentage with treatment T_1 (Control) followed by T_4, T_2, T_5 and T_3. It was inferred that the pH plays an important role on germination percentage. The inverse relationship between pH and germination percentage has been observed. Further it was inferred that the complex inorganic and organic elements present in concentrated wastewater will not be easily available for plants and they may be injurious to seed germination and seedling growth. Thus, it is opined that during germination period, the pH of wastewater may be adjusted to near neutral conditions. They may reduce the wastage of seeds with better germination. Further , the authors of the opinion that, single most important parameter pH can be adjusted to neutral value at all stages of plant growth to get better results.

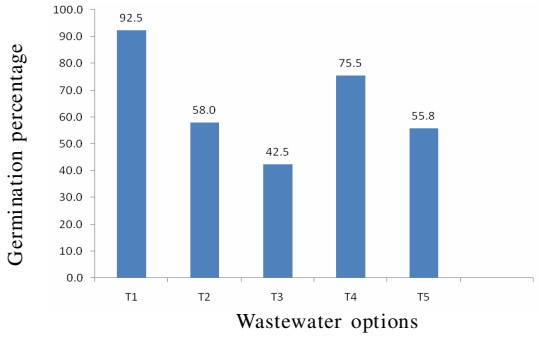

Fig. 1: Effect of wastewater options on germination percentage (Mean of three replications)

Effect on leaf numbers:

The results of experimentation are presented in Fig. 2. The highest leaf number were recorded with wastewater option T_2 followed by T_4, T_3, T_5 and T_1 .The nutrient , organic and TDS contents in wastewaters were found to have an significant influence on leaf numbers. An attempt to arrive at the influence of constituents of wastewater on leaf number revealed that the TDS and organic content (BOD)

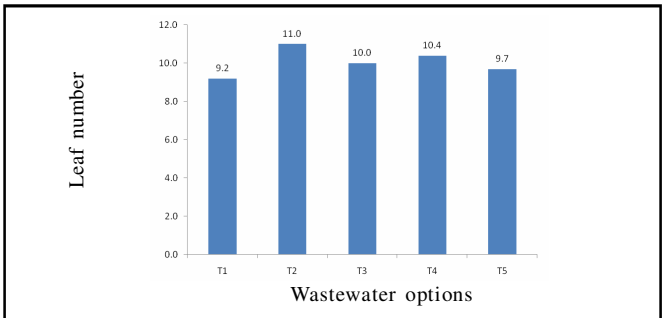

Fig. 2: Effect of wastewater options on lrsg number (Mean of three replications)

plays very important role on growth characteristics of the plant. The higher BOD concentration and lower TDS concentration in T_2 compared to T_4 were considered to be the factors responsible for better leaf numbers with T_2 compared to T_4. A very high concentration of BOD and TDS in T_3 and T_5 were considered to be the limiting attributes which hinder the growth characteristics / yield of crop.

Effect on plant height:

Another best indicator to evaluate the feasibility of reusing wastewaters for irrigation is plant height. The Fig 3 depicts the effect of wastewater application on plant height

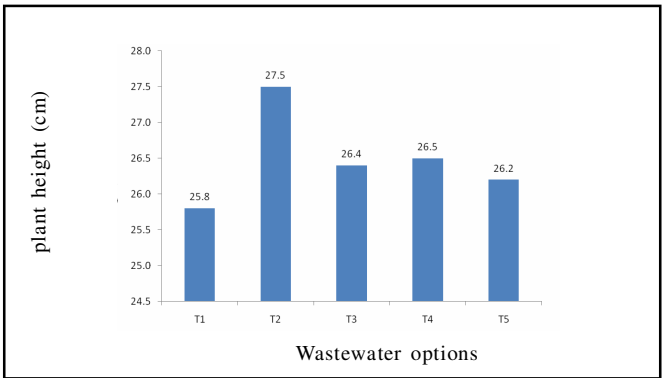

Fig. 3 : Effect of wastewater options on plant height (Mean of three replications)

of radish. The trends almost similar to leaf numbers have been observed. Thus it was inferred that the factors influencing the leaf numbers were also affecting the plant height.

Conclusion:

Based on the analysis of results of experimentation it is concluded that the industrial effluent namely from sugar mill and distilleries and their diluted combination with sewage can be productively reused to grow radish. For better germination of seeds, there is a need to adjust the pH of wastewaters near to neutral value. TDS and organic contents of wastewater had significant influence on yield/ growth characteristics of a crop.

REFERENCES

APHA. (1991). *Standard methods for the examination of water and Wastewater.18th Edition.* American Public Health Association. New York.

Baruah ,B.K. and Das, M. (1998). Study on the impact of paper mill effluent on germination behaviour and seedling growth of crop plant *Oryza sativa.* L. *Poll Res.*, **17**(1): 65 – 68.

Patel, K.P., Pandya, R.R., Maliwal, G.L., Patel, K.C. and Ramani, V.P. (2003). Suitability of industrial effluents for irrigation around Bharuch and Ankleshwar Industrial Zone in Gujarat. *Poll.* Res., **22** (2): 241 – 245.

Singh, V.K., Pandey, Rajeev and Singh, Jaswant. (2003). Impact of industrial wastewater irrigation on the soil characteristics. *J. Industrial Pollution Control.,* **19** (1): 43 – 52.

Thakre, Rekha, Deshab Ratar, P.B and Nanoti, M.V. (2003). Management of industrial effluent for crop productivity. Int. Conf. on Water Quality Management held on 13th – 15th Feb. 2003. New Delhi. India.

Velu, V., Armugam, A., and Arunachalam G. (1999). Impact of paper mill effluent irrigation on the yield, nutrient content and their uptake in rice. *Madras Agric. J.,* **86**(1- 2): 115-121.

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