

Effects of pond, Kapra Lake and Mini Tank Bund Lake waters on some biochemical studies in germinating wheat seedlings

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Abstract—The present study was initiated to examine the sensitivity of wheat seed germination in pond water, Kapra Lake and Mini tank bund Lake waters under laboratory conditions. It was observed that the content of total sugar, reducing sugar and protein was higher in wheat that were germinated in different concentrations (10, 50 and 100%) of pond water as compared to wheat germinated in Kapra Lake and Mini Tank Bund Lake water. The enzyme activity of amylase and peroxidase was higher in wheat that was germinated in 50% pond water compared to Kapra Lake and Mini Tank Bund Lake water (50 % concentration).

I. INTRODUCTION

Water is essential for all the life forms on earth. A significant problem associated throughout the world is related to the management of waste water. Three main reasons that are related to these problems include, increase in the number of people living in slum areas, steep rise in population and increase in number of industries (EPA, 1993); McCasland et al., 2008). Due to improper sewage systems (i.e., improper disposal of domestic waste and direct release of effluents from different industries in sewage systems) the load of pollution increases in natural water. This consequently leads to introduction of deposition of toxic chemicals, increase in microbial contamination (EPA, 1993, 1996; Eikelboom and Draaijer, 1999; Amir et al., 2004). Health risks associated with untreated Sewage and river pollution are provided by Katherine Baer (Health Risks of Sewage Fact Sheet) and Joshua Nizel Halder¹, M. Nazrul Islam (Joshua Nizel Halder and M. Nazrul Islam., 2015). Water pollution affects drinking water, rivers, lakes and oceans. This harms human health and the natural environment.

Keeping in view the risk problems associated with polluted water on human health, the present investigation was carried out to evaluate if polluted water had any effect on wheat germination under laboratory conditions. The contents of total sugars, reducing sugars, total protein and activities of enzymes, α amylase and peroxidase were determined in wheat that was germinated in the presence of different concentrations (10, 50 and 100%) of pond water, Kapra Lake

water and, Mini tank bund Lake water. Tap water was used as controls.

II. MATERIALS AND METHODS

A. Collection of water samples:

Water samples were collected in sterilized bottles from the pond located in Bhavan's Vivekananda College Sainikpuri, Secunderabad, Kapra Lake (Eshwaripuri Colony Sainikpuri, Secunderabad) and Mini Tank Bund Lake (Safilguda Lake Mini TankBund).

B. Seed selection and Petridish Experiment

Wheat was selected for our study since it is easily available and can be germinated in the laboratory without much difficulty. For the germination experiments, healthy and equally sized seeds of wheat (*Triticum aestivum*L.) were surface sterilized with 0.1% HgCl₂. After repeated washings with sterilized distilled water, seeds were soaked in different concentrations (10, 50 and 100%) of pond water, Kapra Lake water and, Mini tank bund lake water for 4h. After 4h, 30 seeds were arranged in sterilized petri dishes, lined with double layer of filter paper. Triplets of each concentration were taken. Plates were labelled as per type, concentration of the water samples. Tap water was used as control to compare the effect of these waters.

C. Biochemical analysis

All assays were carried out in triplicates. Estimation of total sugar was determined by method (Sadasivam. S and Manickam. A (1996), (ii) Estimation of reducing sugars was carried according to (Sadasivam. S and Manickam. A (1996) (iii) Protein estimation was carried out by the method of Lowry et al (Lowry et al., 1951) using bovine serum albumin as a standard (iv) Amylase assay was carried according to method described by Saleh A. (Saleh A et al., 2009) and (v) HRP Assay was carried according to method described by D. Sarika et al (D. Sarika et al., 2015)

III. RESULTS AND DISCUSSION

The content of total sugars, reducing sugars, proteins and enzymatic activity of HRP and amylase were determined in wheat seedlings that were germinated in the presence of different concentrations of pond, Kapra Lake and Mini tank bund Lake waters on third day of germination.

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A. Determination of total sugars reducing sugars and protein content

The contents of total sugar, reducing sugar and protein increased gradually in wheat that were germinated in different concentrations (10, 50 and 100%) (Tables I, II and III) of pond water. These concentrations were higher at all the concentrations tested when compared to control. In contrast, wheat germinated in Kapra and Mini Tank Bund Lake water showed a decrease in the contents of total sugar, reducing sugar and protein as compared to wheat that were germinated in pond water. However, the contents of total sugar, reducing sugar and protein was higher in 50% Kapra and Mini Tank Bund Lake water as compared to 10 and 100% treated seeds (tables I, II, III and Figures I, II & III).

The content of total sugars in controls was lower than that of pond water but was higher than that of kapra and Mini Tank Bund Lake waters (Table I and Figure I).

% of water	Control	Pond water	Kapra Lake water	Mini tank bund lake water
10		61.3	34.7	11.3
50		72.5	53.4	22.5
100	53.75	95.0	25.9	17.5

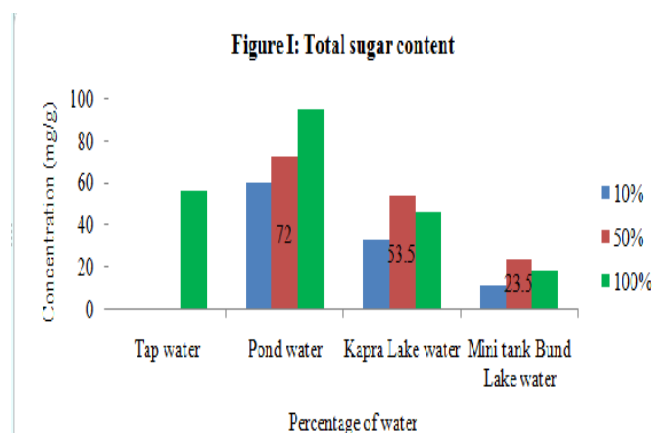


Fig 1: Total Sugar Content

% of water	Control	Pond water	Kapra Lake water	Mini tank bund lake water
10		44	14.5	12.5
50		50.5	23.5	19.0
100	37.42	68	16.5	14.0

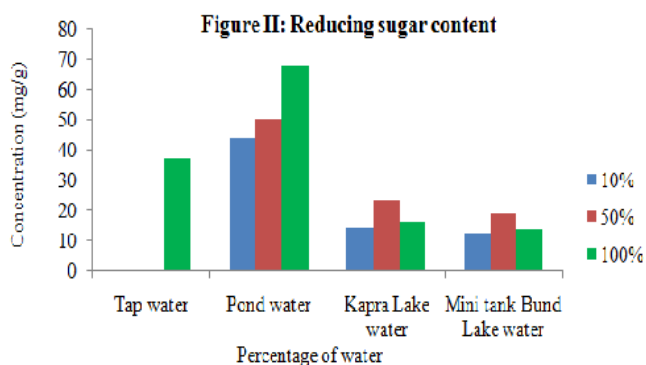


Fig 2: Reducing Sugar Content

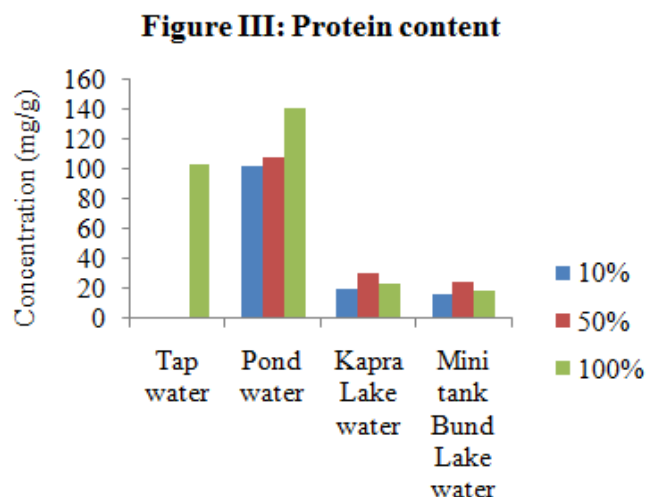
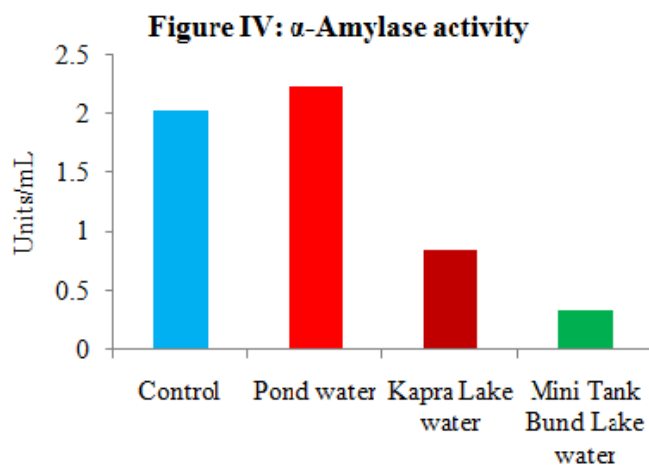


Fig 3: Protein Content

Divyapriya. S et al (Divyapriya.S et al., 2014) in their studies on biochemical effect of industrial effluence on germinating seeds of Cicer Arientum observed that the content of carbohydrate and protein was higher in 30% effluent treated seeds (10, 20, 30, 40, 50, 100 % of dilutions). They also found out the activities of enzyme amylase, protease, catalase, superoxide dismutase and glutathione reductase was higher in seeds that were treated with 30% treated effluent as compared to other percentages.

B. Determination of α amylase and peroxidase enzyme activity

The effect of 50% pond water, Kapra and Mini Tank Bund Lake water was tested on α – amylase and peroxidase enzyme activity since 50% Kapra and Mini Tank Bund Lake water treated seeds showed higher sugar and protein content. Results indicated that both the enzymes showed higher enzymatic activities in pond water as compared to Kapra and Mini Tank Bund Lake water (Figures IV & V).



Water sample
Fig 4: α- Amylase Activity

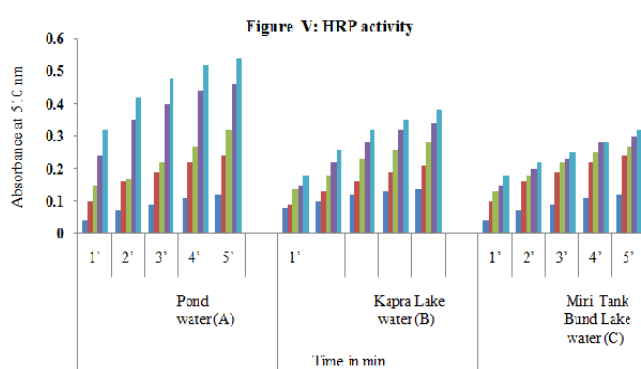


Fig 5: HRP Activity

IV. CONCLUSION

It is clear from our studies that both Kapra Lake and Mini Tank Bund Lake water had a significant effect on concentrations of total sugars, reducing sugars, protein content and enzymatic activity of α -amylase and peroxidase. This result clearly suggests that how our Lakes (which are nature's gift to mankind) are being polluted with sewage water and/or industrial pollutants. Pollution of lake water can not only become breeding ground for insects but also serve as rich sanctuary for growth of microorganism. Such polluted waters can have significant effect on human health. Therefore, concerned authorities or social organizations should come forward to protect the nature's gift since many people irrespective of their age spent time near these lake and many families reside around these Lakes.

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