

Chapter 11

The Study of the Impact of Wastewater from Outfall in River Ganga, West Bengal on the Growth and Morphological Parameters of *Spinacia Oleracea* L.



Sayanti Kar, Gupinath Bhandari, Indrajit Ghosh, Amitava Ghosh and Pritam Aitch

Abstract The impact of domestic wastewater from a selected outfall of river Ganga near Dakhineswar, 24 Parganas (N) District, West Bengal, India, had been found on fifteen-days-old *Spinacia oleracea* L. season wise. An extensive analysis of physico-chemical parameters of wastewater before mixing into river showed to exceed its acceptable range in many cases. The accumulation of huge amount of Gram-positive and Gram-negative bacteria had been reported. The range of total coliform and fecal coliform was in between 1.8×10^7 to 2.9×10^7 and 2.4×10^6 to 4.7×10^6 , respectively. Mercury level was found to exceed its standard limit 0.01 mg/L. The morphological parameters like stem height, leaf length, leaf width, internodal distance, and petiole length were inhibited by wastewater treatment in comparison with tap water treatment. Along with its morphological growth, 90% reduction in total chlorophyll content and 70% reduction in protein content have also been reported in wastewater treated plants.

Keywords Physicochemical parameters · *Spinacia oleracea* L. · Wastewater

11.1 Introduction

River Ganga is one of the sacred rivers in India. Human involvement in various ways makes the river water quality very poor (Kar et al. 2017). Wastewater is used for irrigation purposes in many developing countries due to scarcity of clean water. Wastewater contains important plant growth nutrients like potassium (K), zinc (Zn), phosphorus (P), and nitrogen (N) (Gibbs et al. 2006). For many cases, sewage water irrigation also leads to the accumulation of some toxic metals on the growth of plants (Muhammad et al. 2013). Through contaminated water, soil, and air, a potential accumulation of heavy metals takes place, and it becomes a burning issue (Lokeshwari and Chandrappa 2006). The use of wastewater for agricultural purpose helps to conserve

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Impact of Wastewater from Outfalls of River Ganga on Morphological and Biochemical Parameters of Bitter Gourd (*Momordica charantia* L.) in Response to Low Molecular Weight Peptide(s) synthesis (3.00.5kDa) and Antioxidant Activity Study

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ABSTRACT

River pollution is a concerning issue for Indian people as they use river water for daily purpose. The present study aims to document about the water quality of river Ganga for its use. A series of outfalls on River Ganga between Howrah Station and Khardah, 24 PGS (N), West Bengal, a canal (situated between N22°39'08.75" and E88°21'27.60") at southern part of Dakhineswar New Jetty, carries a large of volume of untreated waste material threatens for major Ganga pollution in that area. Dakhineswar is very famous for its Kali Temple and various ritual activities takes place in this region. Again local population patch depending on river water are affected on daily basis. The average data of three consecutive years (2016-2018) showed a significant presence of total Coliform ranges up to 8.03×10^5 during pre-monsoon season. The concentration of Lead (Pb) was found alarming (0.069 mg/L). The average DO and BOD were obtained 2.26 mg/L and 8.16 mg/L respectively. The effect of waste water on Bitter Gourd (*Momordica charantia* L.) was disintegrative on its morphological as well as biochemical parameters like total chlorophyll, protein content. An approach to study the activity of low molecular weight peptides 3.0 -0.5 kDa range were extracted and purified through ion exchange resin column, ultra-filtration, TLC and HPLC analysis. The HPLC helped to differentiate the presence of peptides in comparison to control. The antioxidant activity of the peptides exhibited by DPPH reduction value and bioassay like germination percentage of the seeds of control and waste treated plants showed inhibition. Expression of peptide(s) or absence of some peptide(s) in HPLC chromatogram indicated the adverse effect of waste water on plants. Waste water effect during pre-monsoon season increases more than monsoon and post monsoon season.

Keywords: Bitter Gourd (*Momordica charantia* L.), Low molecular weight peptide(s), Waste water



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Biosorption of Methylene Blue Dye from Aqueous Solution Using Husk of *Lathyrus Sativus* and its Activated Forms

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Abstract

Water pollution due to the release of dye-containing wastewaters from textile, cosmetics, food coloring and paper industries becomes a genuine issue because the large volume of dyes has been lost from manufacturing units of dying industries and enters into ecosystems to damage biological activity (Namasivayam et al., 1996). Effluents releasing from these industries contain toxic chemicals and coloring agents that must be treated before discharge it into surrounding water bodies (Do and Chen, 1990) so that no visible color has been observed in the treated effluents (Ogugbue and Sawidis, 2011).



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The Impact of wastewater reuse from outfalls of River Ganga at Dakhineswar, West Bengal, India on the growth of *Bitter Gourd* (*Momordica charantia* L.)

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Abstract:

Water is the basic need for agriculture. The future global water security is entirely dependent on the availability of water for agriculture. According to Fedoroff et al. (2010), the scarcity of water is an important concern for the entire world (Fedoroff et al., 2010). The



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Effect of Waste Water from Outfalls of River Ganga on Morphological and Biochemical Parameters of *Bitter Gourd* (*Momordica Charantia* L.) in Response to Low Molecular Weight Peptide (s) Synthesis (3.0-0.5kDa) and Antioxidant Activity Study

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ABSTRACT: River pollution is a concerning issue for Indian people as they use river water for daily purpose. The present study aims to document about the water quality of river Ganga for its use. A series of outfalls on River Ganga between Hourah Station and Khardah, 24 PGS (N), West Bengal, a canal (situated between $N22^{\circ}39'08.75''$ and $E88^{\circ}21'27.60''$) at southern part of Dakhineswar New Jetty, carries a large of volume of untreated waste material threatens for major Ganga pollution in that area. Dakhineswar is very famous for its Kali Temple and various ritual activities takes place in this region. Again local population patch depending on river water are affected on daily basis. The average data of three consecutive years (2016-2018) showed a significant presence of total Coliform ranges up to 8.03×10^8 during pre-monsoon season. The concentration of Lead (Pb) was found alarming (0.069 mg/L). The average DO and BOD were obtained 2.26 mg/L and 8.16 mg/L respectively. The effect of waste water on Bitter Gourd (*Momordica charantia* L.) was disintegrative on its morphological as well as biochemical parameters like total chlorophyll, protein content. An approach to study the activity of low molecular weight peptides 3.0 - 0.5 kDa range were extracted and purified through ion exchange resin column, ultra-filtration, TLC and HPLC analysis. The HPLC helped to differentiate the presence of peptides in comparison to control. The antioxidant activity of the peptides exhibited by DPPH reduction value and bioassay like germination percentage of the seeds of control and waste treated plants showed inhibition. Expression of peptide(s) or absence of some peptide(s) in HPLC chromatogram indicated the adverse effect of waste water on plants. Waste water effect during pre-monsoon season increases more than monsoon and post monsoon season.

Keywords: Bitter Gourd (*Momordica Charantia* L.), HPLC, Waste water.



Water Quality Assessment of Bellandur Lake in comparison with Typical Partially Treated Sewage

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ABSTRACT: Bellandur Lake and its foaming nature has been described extensively and yet its cause(s) have not been adequately understood and neither are solutions found for the same. The Bellandur lake is known to partially treat the input sewage (along with some runoff) to intermediate levels through anaerobic, anoxic and algal aerobic stages and thus makes it a candidate for comparison with diluted sewage in order to determine components that remain undecomposed by this process. In this study, the very low DO levels are indicative of the absence of any strong aerobic oxidative processes functioning within. Absence of nitrates exemplifies this. While COD had significantly reduced, anionic detergents have remained largely undegraded is perhaps the main cause of the foam emerging when the lake water overflows and falls down the spillway. The Lake water outlet is generally devoid of most of the toxic metals and water quality other than that of COD/BOD meets water quality standards. This inability to break down the detergents needs to be examined further and is discussed in this paper.

Keywords: Water quality, Sewage treatment plant (STP), Lake.

Adsorption of Safranin Dye from Aqueous Solution Using Coconut Coir

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ABSTRACT: Coconut coir (particle size 300-850 μm) has been found as a potent low cost readily available biosorbent for removal of safranin dye from aqueous solution. Coconut coir is further treated with 1N H_2SO_4 and 1N H_3PO_4 , separately for improvement of adsorption efficiency. The batch study was conducted in the laboratory as a pilot scale to investigate potentiality of untreated and acid treated biosorbent for adsorption process that assures a management tool of water pollution from toxic safranin dye. The adsorption process was optimized by analyzing the effects of physicochemical parameters like initial pH, initial adsorbate concentration, incubation time, adsorbent doses and adsorption isotherm at different temperatures. The adsorption process is optimum at pH 4 for untreated coconut coir, whereas a wide range of pH favours the adsorption process for acid treated coconut coir. Initial dye concentration is selected as 50 mg/L for this study and more than 99% dye is removed within 60min of contact time in a thermostatic shaker with a rotation speed of 100-115 strokes/minutes at 30°C for untreated and acid treated adsorbents. Adsorption isotherm data shows that removal percentage is greater at a higher temperature which also indicates that the process becomes endothermic and spontaneous. Removal percentages, as well as adsorption capacity, are enhanced by using acid treated coconut coir than untreated coconut coir.

Keywords: Adsorption, Safranin dye, Removal, Coconut coir, Acid treatment.