

Need of Paper Mill Effluent in Recent Agriculture

Dhanushkodi V¹., Thanga Hemavathy A². and Sangeetha S³

^{1&2}Anbil Dharmalingam Agricultural College and Research Institute

³Horticultural College and Research Institute for Women

Tiruchirappalli -620 027, Tamil Nadu, India

*Corresponding Author: dhanushselgi@yahoo.com.au

Water is a valuable and indispensable natural resource and is an essential base for all life on earth. The paper industry is one of the top water consumers and top producers of wastewater in the world. The release of these effluents into water bodies changes the natural quality of water and other hazardous substances. However, treated wastewater includes a sizable amount of nutrients that may be helpful for plant growth. Furthermore, it has been viewed as a potential water resource and contains a rich source of plant nutrients. Hence, this effluent can be used as alternate sources for irrigation water and conventional inorganic fertilizers.

The paper industry is one of the top water consumers and top producers of wastewater in the world. In India, approximately 700 paper mills (Kumar *et al.*, 2017) are functioning and generate 8.5 million tonnes of paper/year. Typically, one tonne of paper requires 273-450 m³ of water, which consequently, generates 300 m³ of waste water

(Hazarika *et al.*, 2007). The release of these effluents into water bodies changes the natural quality of water by increasing the pH, BOD, COD, lignin, total suspended particles, colour, heavy metal ions and other hazardous substances. However, treated wastewater includes a sizable amount of nutrients that may be helpful for plant growth. Moreover, treated paper mill effluent is a rich source of plant nutrients and used as an alternate source for irrigation water and conventional inorganic fertilizers. It has properties similar to fertilizer, improves nutrients uptake and promotes the growth and yield of crops. Hence, the use of wastewater in agriculture is gaining importance rapidly.

Properties of the paper mill effluent

Wastewater originating from the paper industry, specifically from pulping, bleaching and washing operations, is frequently identified by a set of distinctive features. The treated effluent discharged from paper mills typically exhibits reduced contamination levels and, in most cases, it complies

with the standards set forth by the World Health Organization (WHO). The raw pulp and paper mill effluent typically exhibited a dark brown tint. The paper mill effluent has potential to improve agriculture due to the presence of various chemical properties (Fig.1).

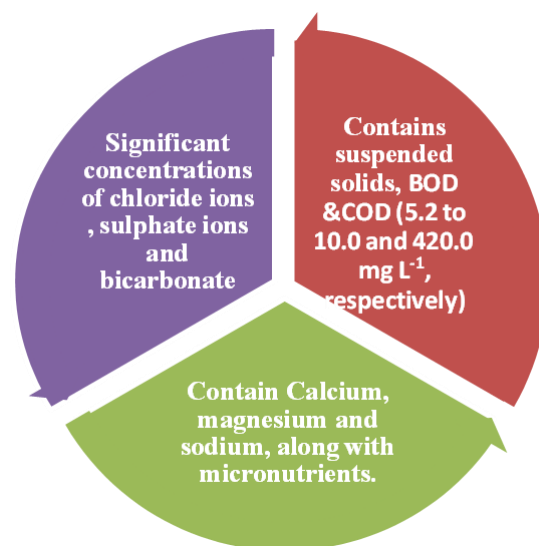


Figure 1. Compounds present in the treated paper mill effluent

Role of paper mill effluent in soil fertility status

The application of paperboard effluent on soil had several positive effects. Treated wastewater is now recognized as a potential water resource in agriculture. It contains a substantial amount of nutrients that are beneficial for plant growth. The application of treated paper mill effluent has a capacity to improving the permeability, infiltration and total porosity on soil. The levels of exchangeable basic cations, including calcium (Ca), magnesium (Mg), sodium (Na) and potassium (K) improve soils nutrient sources (Gomathy *et al.*, 2021). Continuous irrigation with effluent from the paper industry can lead to higher levels of organic matter in the soil. Soil nutrient enrichment and enzyme activity by paper mill effluent irrigation also have ability to increase the abundance of bacteria, fungi and actinomycetes.

Paper mill effluent as a water and nutrient for crops

The paper mill effluent has various impacts on the growth and yield of different crops. As

industrialization has increased at a stimulating rate the effective usage of industrial waste in agriculture supports as a new source and alternative for irrigation water and fertilizers. paper mill effluent had a positive impact on crop growth which leads to an increase in biomass and yield (Rashid *et al.* (2021). The further application of treated paperboard mills effluent irrigation in combination with the application of solid waste viz., bio-manure, vermicompost, farmyard manure and fly ash could increase the growth, yield and quality of crops.

The use of treated paper mill effluent at diluted concentrations and particularly when combined with organic manures, can be a sustainable approach for crop production without any adverse effects on either soil or yield or quality. Moreover, the paper mill effluent helps in improve soil nutrients.

References

- Hazarika, Samarendra, N. C. Talukdar, K. Borah, N. Barman, B. K. Medhi, D.Thakuria and A. K. Barooah. 2007. "Long-term effect of pulp and paper mill effluent on chemical and biological properties of a heavy textured acidic soil in Assam." *Journal of the Indian Society of Soil Science*. 55 (1):45-51.
- Rashid, R., Iqrash, S., Parveen, A., Muhammad, J.I. and Murid, H. 2021. "A state-of-the-art review on wastewater treatment techniques: the effectiveness of adsorption method." *Environmental Science and Pollution Research*. 28:9050-9066.
- Gomathy, M. K. Sabarinathan, K. Subramanian, K. Ananthi, V. Kalaiyarasi, M. Jeyshri&P. Dutta. (2021). Rhizosphere: Niche for microbial rejuvenation and biodegradation of pollutants. *Microbial Rejuvenation of Polluted Environment*. 1:1-22.
- Malathi, G. 2001. "Impact of treated pulp and paper mill effluent on vegetables-soil ecosystem." M. Sc.,(Env. Sciences) Thesis, Tamil Nadu Agric. Univ., Coimbatore.

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