

Enhanced biological color removal using attached media

Nagesh Vikram Singh¹, Saurabh Samuchiwal¹, Pushpender Kumar¹, Anushree Malik^{*}

¹Applied Microbiology Laboratory, CRDT IIT Delhi

Abstract

Anaerobic decolourization has proven its effectiveness in textile industry but it takes high hydraulic retention time (HRT). This makes the systems unattractive specifically to the where a tight budget is more of a problem than the increasing environmental concerns. Attached media treatment system has been chosen in this work to address the problems of anaerobic because of its flexibility to deal with almost all kinds of wastewater. More importantly, its potential to further reduce investment costs through reduction in HRT. The performances of three anaerobic reactors with different attached media Moving bed bio reactor (MBBR), Polyester beads, Nylon fiber as supporting attached media were evaluated through their ability to remove color of dye effluent.

Introduction

➤The textile industry is one of the major employment providers.
➤ Requires no special skills and plays a major role in the economy of many countries.

Textile effluent hardest to treatment due to high pH, high turbidity, poor bio-degradability, complex composition, and high chrominance, and released in large amounts, (Paz et al., 2017).

There is no single economically viable solution for colour removal

Why attached media ?

- Provide a large protected surface for bacteria
- No operational adjustments
- Stable under large load variations
- Smaller foot prints
- Low investment cost
- Flexible design that allows for increased capacity

Materials and Methods:

- **Batch feed** : Working volume: 550 mL , Moving bed bio reactor (MBBR) , Polyester beads, Nylon fiber
- Developed native microbial consortium was used as inoculum
- Flasks were fed with blue dye CP 100 PPM effluent and Carbon source along with Nitrogen source
- Nitrogen gas was sparged in flask for 10 min.
- Temperature (37°C)

Analyses : Hazen , pH

- Sample taken at HRT – 24, 48, and 72 H
- Feeding After 72 H , **Batch feed** : 80% of sample discarded and only 20% left as a source of bacteria for next feed

Conclusions

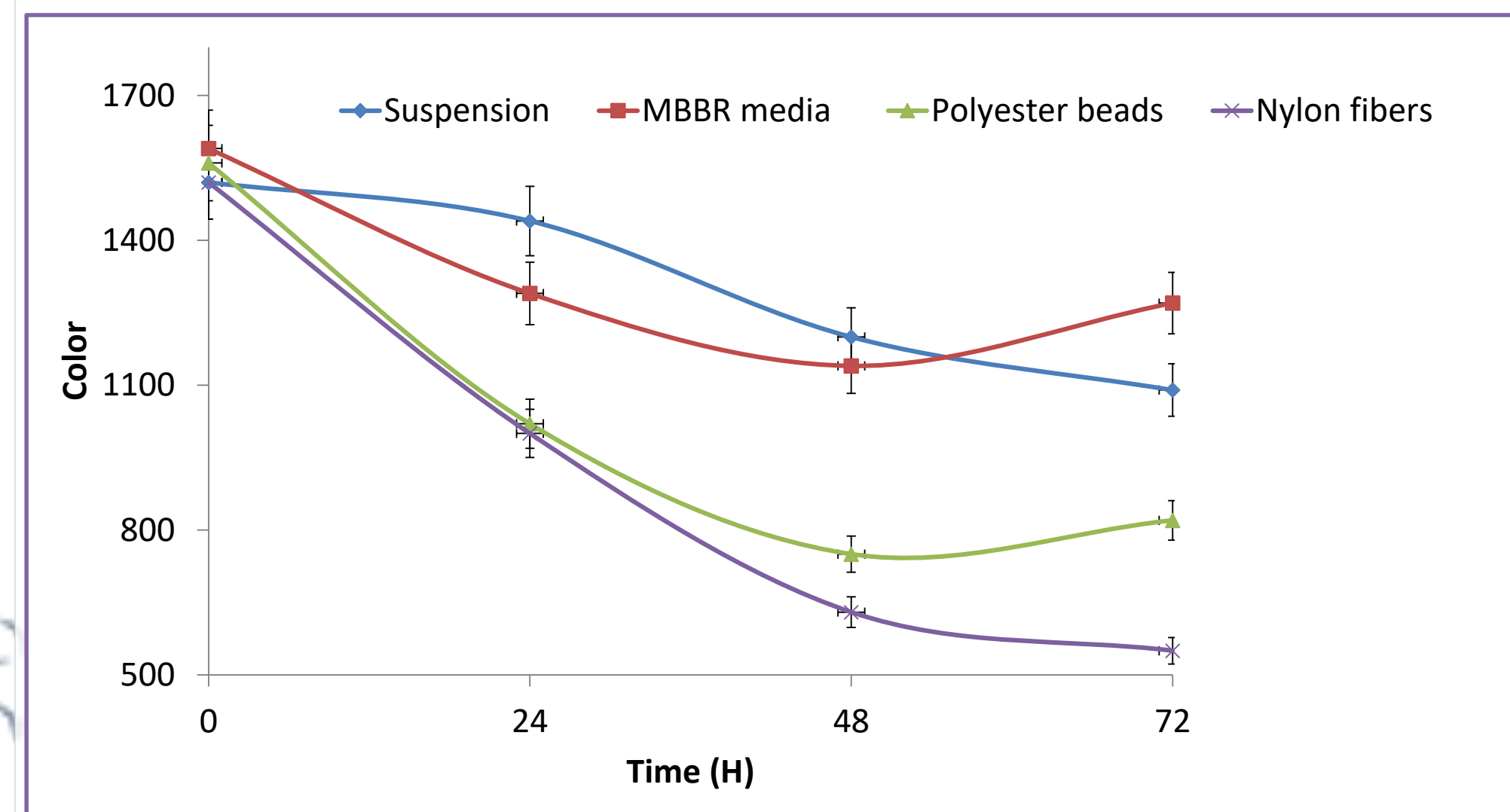
- Color removal efficiency of bacteria with Nylon fiber (63%) is higher than MBBR (20%) and polyester beads (47%)
- Nylon fiber as attached media can remove complete color of blue dye CP 100 PPM within 48 hr HRT
- Investigation on quantifying the bacterial attachment on Nylon fiber are being conducted

Industrial Significance

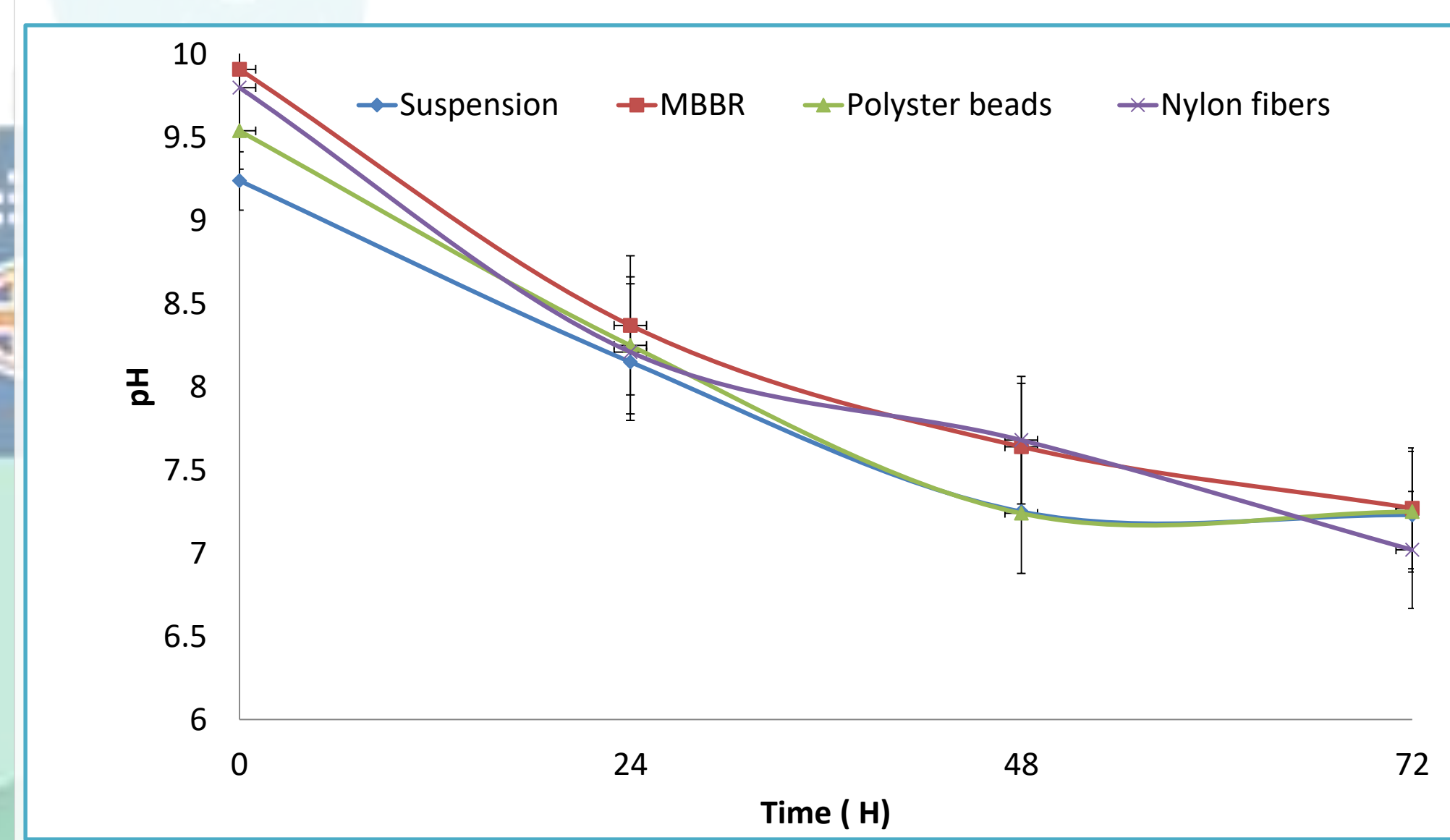
- High rate anaerobic treatment with attached media can enhance overall treatment efficiency and save operational cost

Technology Readiness Level: TRL4

Result:



61 % color removal by Nylon fibres at 72 H HRT at 37 °C



pH is coming to neutral from alkaline



HRT-0 H



HRT-24 H

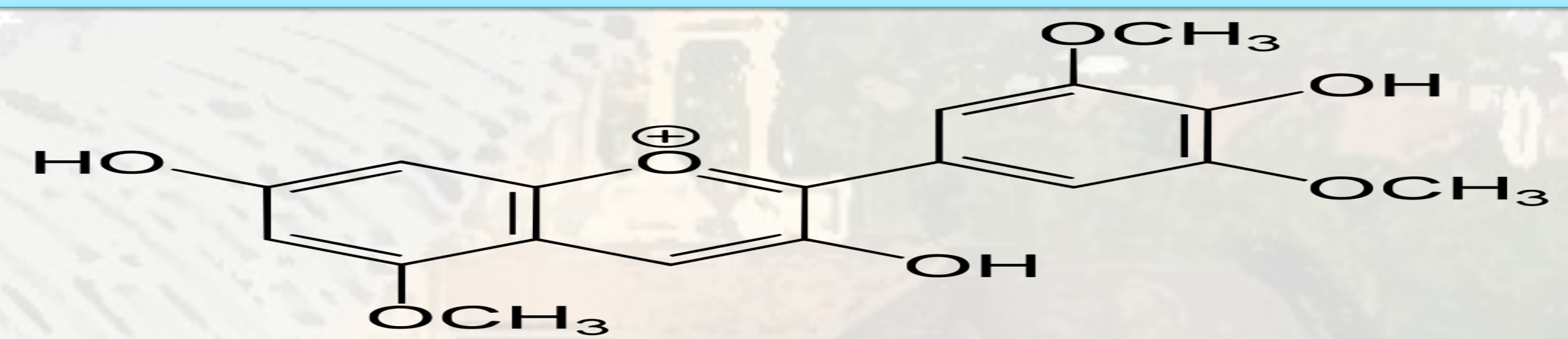


HRT- 48 H



HRT- 72 H

1- Suspension 2. MBBR 3. Polyester beads 4. Nylon fibers



Blue dye CP Structure ([Capensinidin](#))

References

- Paz, A., Carballo, J., Perez, M.J., Dominguez, J.M. 2017. Biological treatment of model dyes and textile wastewaters. *Chemosphere*, 181, 168-177.
- Chen, J., Zhang, M., Li, F., Qian, L., Lin, H., Yang, L., Wu, X., Zhou, X., He, Y., Liao, B.-Q. 2016. Membrane fouling in a membrane bioreactor: High filtration resistance of gel layer and its underlying mechanism. *Water Research*, 102, 82-89.
- Chaiprasert, P., Suvajittanont, W., Suraksa, B., Tanticharoen, M., & Bhumiratana, S. (2003). Nylon fibers as supporting media in anaerobic hybrid reactors: it's effects on system's performance and microbial distribution. *Water Research*, 37(19), 4605–4612.

Acknowledgement

FITT IIT Delhi – FT/11/82/2016
CRDT IIT Delhi.