

Efficiency comparison between activated sludge process (ASP) and modified trickling filter (MTF) in treating sewage

Rishabh Shukla and Z. A. Shaikh*

Abstract

India is suffering from the worst water crisis in its history and around 600 million people faces a severe water shortage. As water scarcity is recognized as the most threatening problem for mankind, the world require solution for this existing problem. Wastewater collection, treatment and reuse of treated wastewater is one of the solutions that is gaining value. But traditional wastewater treatment system will not provide solutions for this problem.

To mitigate this severe crisis a new wastewater treatment technology will be required to treat wastewater generated from different sources like houses, hospitals and universities and reuse the treated wastewater for domestic and agricultural purposes.

Introduction

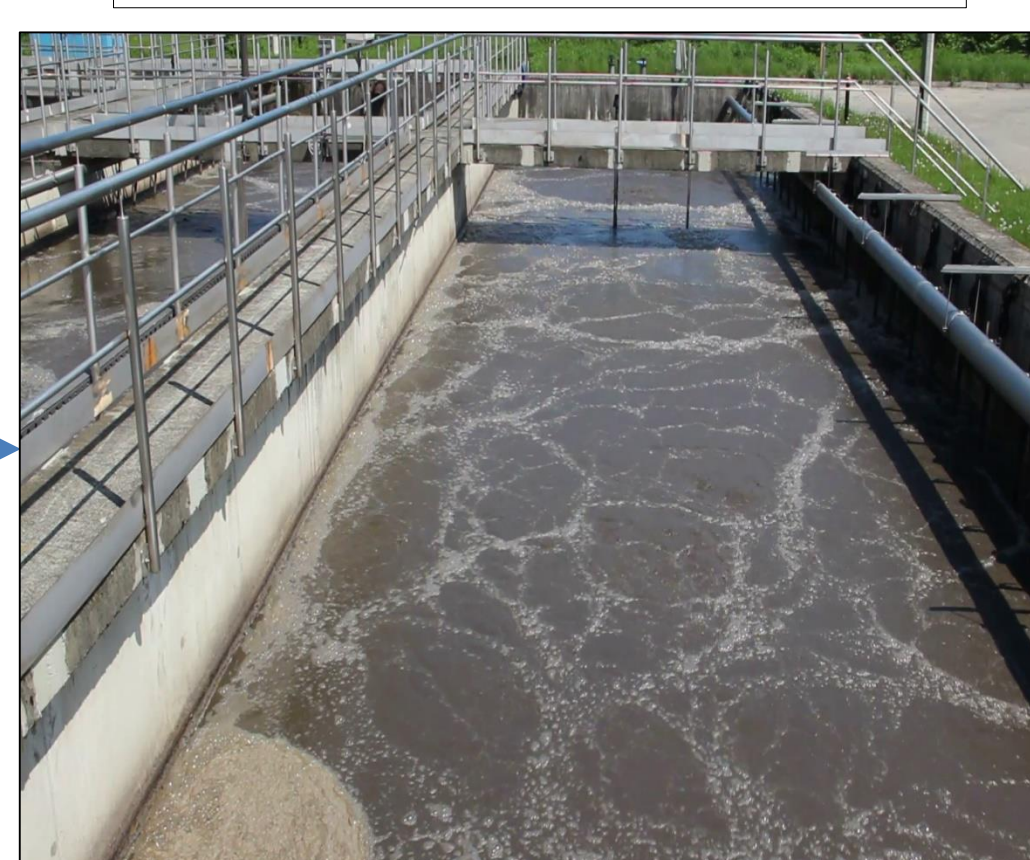
Modified Trickling Filter (MTF) is a novel hybrid reactor capable of treating high strength municipal wastewater. MTF comprised of two treatment zone in a single unit, first is aerobic zone and second is anoxic zone. These unit performs simultaneous nitrification and denitrification with complete removal of organic carbon and phosphate.



Wastewater



Modified Trickling Filter



Activated Sludge Process

Advantages of MTF over ASP

- Effluent from MTF satisfies the Indian discharge standards
- Complete removal of nitrate
- MTF is simple and cost effective
- Energy efficient
- Require less footprint
- No sludge generation
- Capability to treat low as well as high strength sewages
- Easy to fabricate and operate

Materials and Methods

- Conventional Pollutants COD, $\text{NH}_4^+\text{-N}$, $\text{NO}_3^-\text{-N}$ and phosphate are important water quality parameters that are routinely monitored to check the suitability of water for reuse.
- Abundance of different antibiotic resistant bacteria (ARB) were identified by spread plate technique.

Conclusions

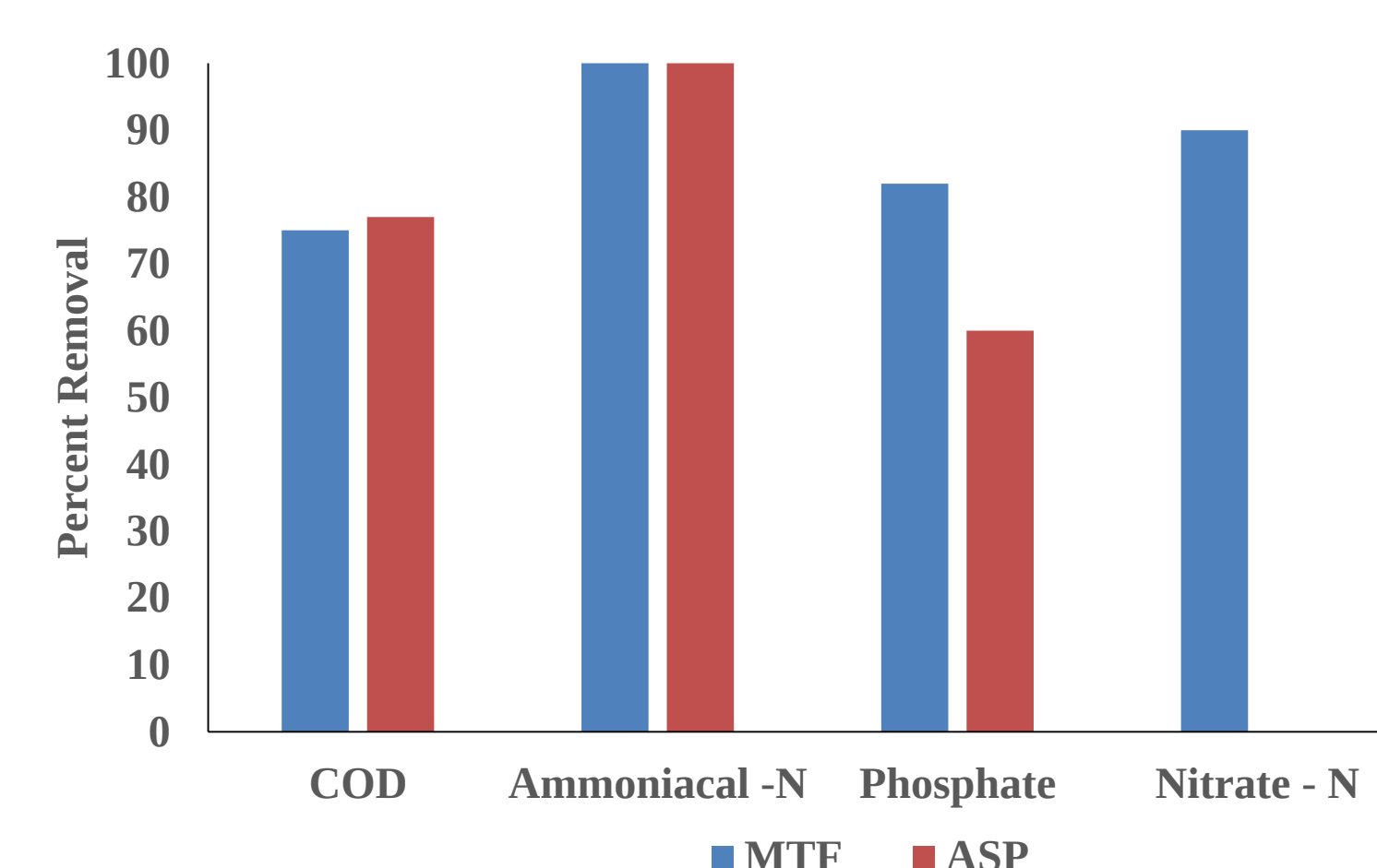
- MTF is capable in removing nitrate whereas effluent generated from ASP is high in nitrate.
- Phosphate removal efficiency of MTF is higher than ASP.
- MTF is highly energy efficient than ASP.
- Capable in treating high strength municipal wastewater.

Result

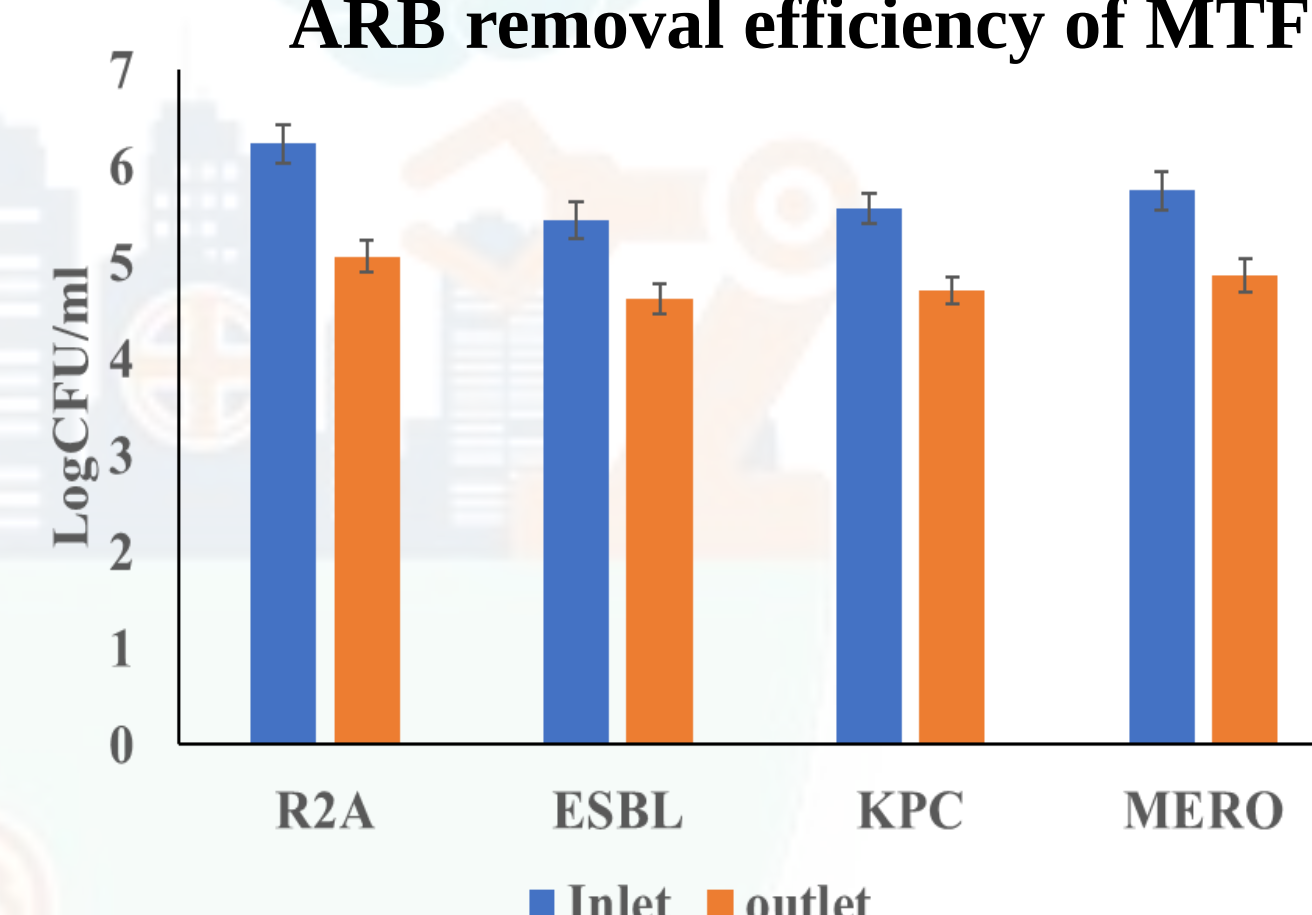
Characteristics of Barapullah drain wastewater

Parameters	Summer	Winter
SCOD	142 mg/L	172mg/L
$\text{NH}_4^+\text{-N}$	27mg/L	22mg/L
$\text{NO}_3^-\text{-N}$	ND	ND
PO_4^{3-}P	23mg/L	17mg/L
TDS	480mg/L	446mg/L
DO	0.3 mg/L	0.2 mg/L

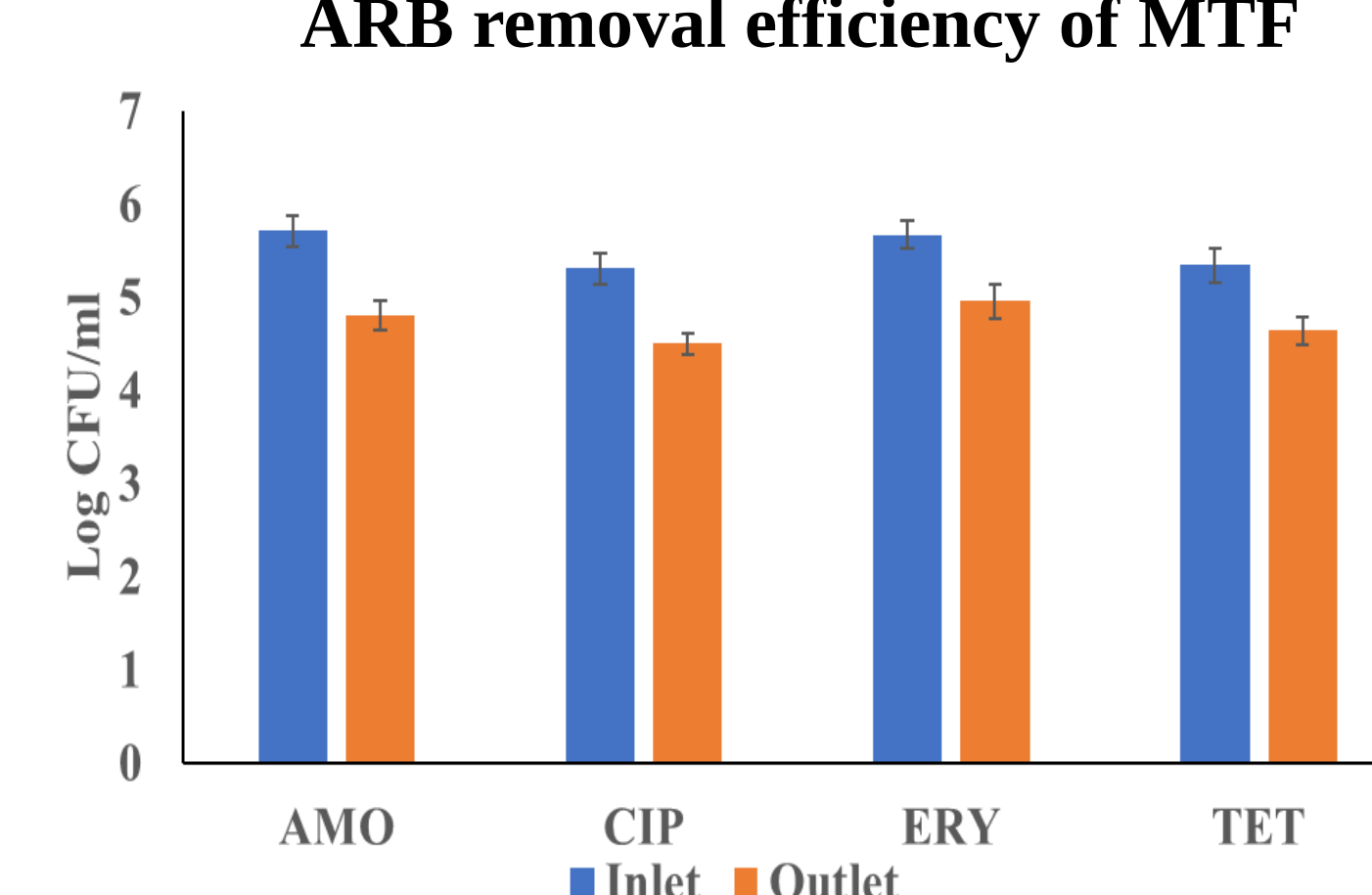
Performance comparison of MTF v/s ASP



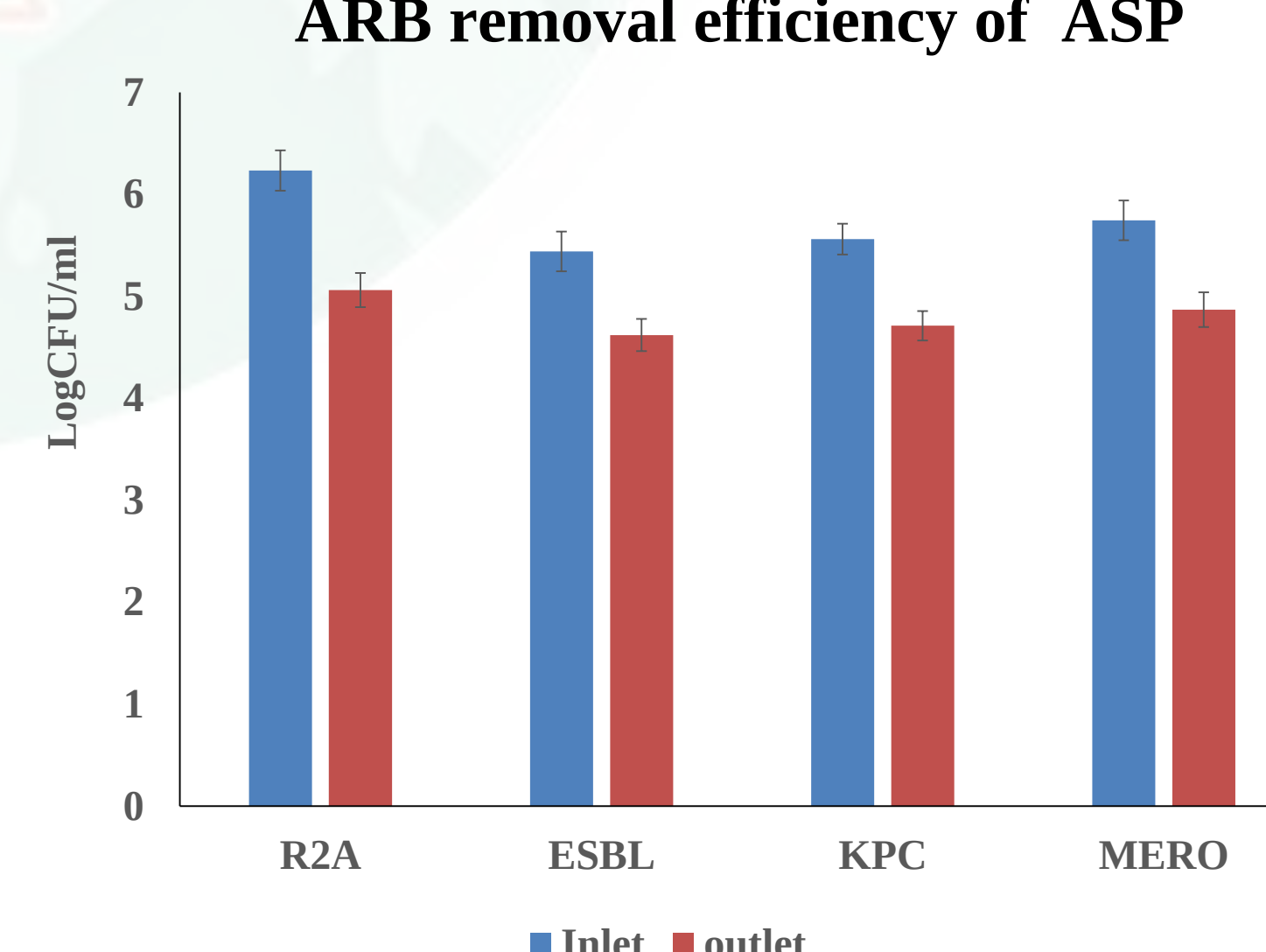
ARB removal efficiency of MTF



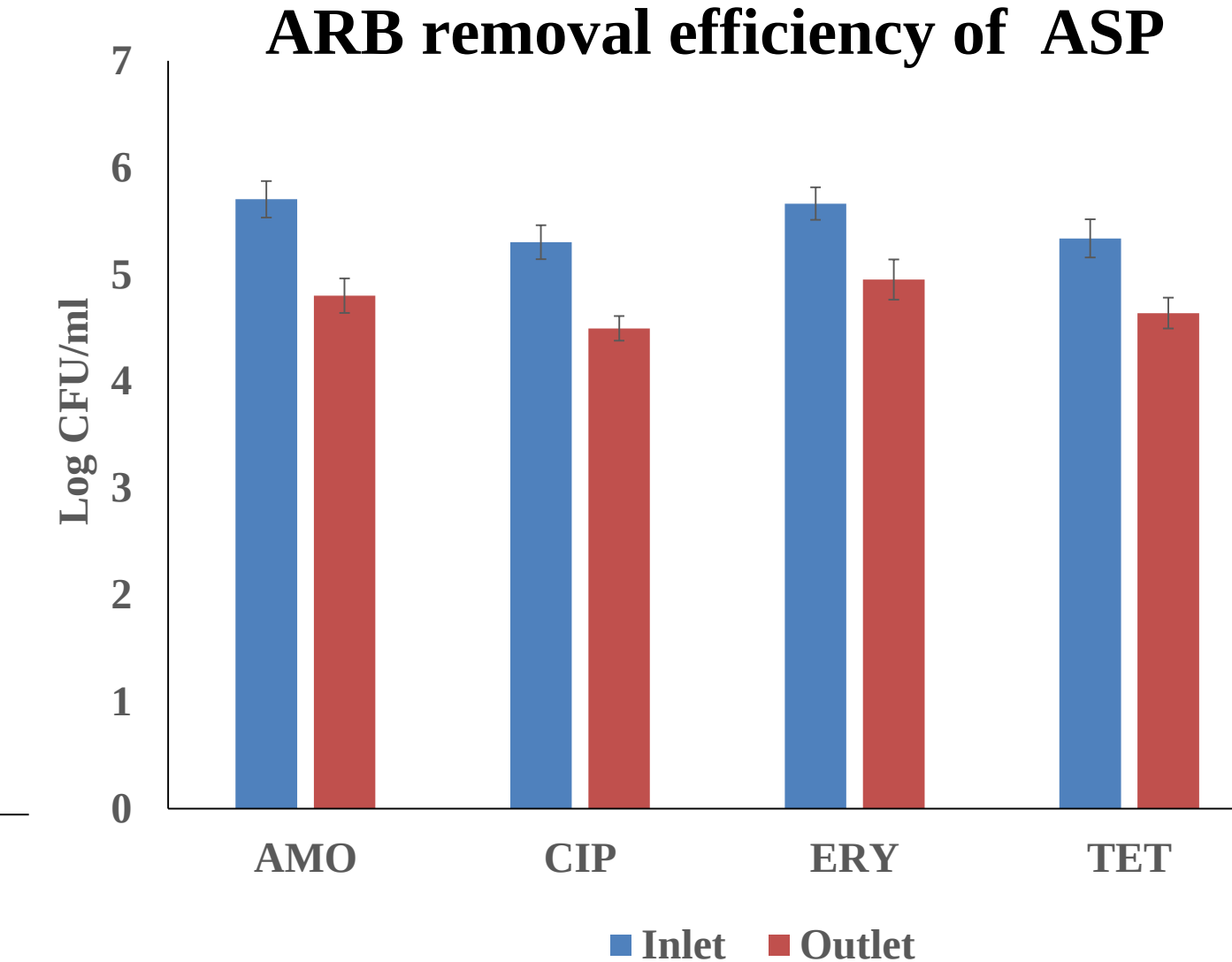
ARB removal efficiency of MTF



ARB removal efficiency of ASP



ARB removal efficiency of ASP



- Both the reactors are capable in removing COD and ammoniacal nitrogen 72% and 100%, respectively.
- One log reduction in abundance of ARB bacteria was found in both the reactors. Alone biological system is not capable in removing 100% bacteria, a tertiary treatment system is required.

Industrial Significance

- MTF can be used in industries which are generating wastewater with low carbon and high nitrogen content like fertilizer industries.
- Can be used as second stage treatment unit in paper and pulp, brewery and other food industries.

Technology Readiness Level

- Lab scale MTF was tested successfully on raw waste water.
- MTF of 2000L/day wastewater treatment capacity is installed at Barapullah drain, New Delhi.

References

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- A. Fleifle, A. Tawfik, O. Saavedra, C. Yoshimura, M. Elzeir Modeling and profile analysis of a down-flow hanging sponge system treating agricultural drainage water. Sep. Purif. Technol., 116 (2013), pp. 87-94

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