Future Perspectives

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Present studies established that bioaugmentation of special microbial seed consortium DC5 improved nitrate removal performance and functional potential of dMBBR due to bioaugmentation of specific seed. Also, it revealed that *Thauera* spp. were most persistent and abundant as well as major contributor to nitrate removal in dMBBR. Optimization of various process parameters such as different types of carriers, filling ratio of carriers, surface modifications of carriers, HRT, C/N ratio, carbon sources, DO, temperature and pH can be used as an effective strategy to enhance MBBR performance for wastewater treatment at larger scale. Pilot studies are needed to further corroborate this.

Thauera sp.V14 could efficiently remove nitrate and COD from wastewater without accumulation of NO_2 and NH_4 and form biofilms. It can produce large amounts of EPS and has strong auto-aggregation and hydrophobicity with biofilm formation traits. Externally added DMSO and $CaCl_2$ in wastewater can increase denitrification and the biofilm forming ability of *Thauera* sp.V14. Further investigations are still needed to characterize the MBBR biofilm from macroproteomics and metagenomic approaches and in situ monitoring techniques to analyze the microbial community. There is a need to develop novel MBBR using hybridization strategies with lower energy consumption to meet the increasing requirements for nitrate removal from wastewater. More studies in this direction are essential to address this..

Existing activated sludge plants used for the treatment of nitrate containing effluents can also be converted into the MBBR by adding special microbial seed and carriers. Studies at pilot scale level are needed to confirm this.