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Online measurement of dissolved oxygen in shake flask to elucidate its role on caffeine degradation by *Pseudomonas* sp.

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Abstract:

Caffeine is a plant alkaloid present in the large ratio over other emerging pollutants and it causes serious health effects on overdose. Microbial degradation of caffeine produces metabolites that can be used as a multi-functional drug. In this study, the effect of dissolved oxygen (DO) on microbial growth and degradation of caffeine in minimal media, synthetic coffee effluent treatment, and theobromine production was studied in presens flask – SFR vario installed in an orbital shaker. Induction studies showed *Pseudomonas* sp. requires oxygen for caffeine degradation. Theobromine production with induced cells of *Pseudomonas* sp. showed maximum accumulation of 35 mg/l with a higher molar yield of 80 % at higher DO of 60 % saturation when compared to experiments done with a lower oxygen level of 25 % and 20 % saturation. Effluent treatment using induced cells was the fastest caffeine degradation ever reported at 0.055g/l.h with 0.4 g/l of induced cell concentration without affecting the polyphenol content significantly. Higher DO in the medium is required for efficient conversion of caffeine to theobromine which is in agreement that the reaction is oxidative demethylation. Online monitoring of DO is very important in shake flask studies which will be useful in scaling up processes.

Keywords: dissolved oxygen, online monitoring, caffeine degradation, *Pseudomonas* sp., theobromine, oxygen uptake rate