

Microbial removal of chlorinated phenols during aerobic treatment of effluents from radiata pine kraft pulps bleached with chlorine-based chemicals, with or without hemicellulases

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Abstract

The removal of chlorophenolic compounds from kraft mill effluents bleached with chlorine (cBKME) or chlorine plus hemicellulases (bBKME) was studied in reactors of aerobic treatment lagoons. In these laboratory models, a stable microbial population removed biochemical oxygen demand at similar rates of the mill lagoon. Complete removal of nine chlorophenols and chloroguaiacols during microbial treatment of these effluents was detected by gas chromatography. Abiotic removal was only observed with 2,4-dichlorophenol and 2,4,5-trichlorophenol. There were no significant differences in degradative ability between microorganisms acclimated to grow in reactors fed with cBKME or bBKME. The latter had a lower content of adsorbable organic halogen and chlorophenols than cBKME. Microorganisms acclimated to cBKME or bBKME were only able to grow on phenol or guaiacol as sole carbon source. However, these microorganisms removed (0.1–0.5 mM) 4-chlorophenol, 2,4-dichlorophenol and 2,4-dichlorophenoxyacetate with BKME as primary carbon source. Under these conditions, 2,4,6- and 2,4,5-trichlorophenol, 4,5-dichloroguaiacol, 4,5,6-trichloroguaiacol and tetrachloroguaiacol were not removed. These results suggest that the microbial removal of bleaching chlorophenols and chloroguaiacols during aerobic treatment, probably takes place only because of their very low concentration (1–200 ppb) in BKME.