

## Effects of heavy metals on Antarctic bacterial cell growth kinetics and degradation of waste canola oil

### ABSTRACT

**Aim:** The aim of the present study was to study the effect of heavy metals on growth kinetics of Antarctic bacterial in degradation of waste canola oil. **Methodology:** The BS14 Antarctic bacterial community was introduced in the minimal salt media containing 1 ppm of heavy metals (Cd, Cr, Al, Zn, Ni, As and Co) with 1% waste canola oil, and the effects of heavy metals on biodegradation of waste canola oil was analysed by gravimetric analysis. The turbidity of bacteria was obtained through UV-visible spectroscopy at 600 nm of wavelength for every 24 hr within seven days of incubation period, and the data were regressed with linear and non-linear kinetic equations. **Results:** The results demonstrated that Co was the most active metal that led to 4.217% increase in waste canola oil and the least active metal in biodegradation of oil was zinc, as it degraded the waste canola oil only to 29.26%. Overall, the bacterial growth was inhibited in increasing order of Al > Cd > As > Zn > Ni > Cr > Co whereas the waste canola oil biodegradation was inhibited in the order of Zn > Cr > Ni > Al > Cd > As > Co. The best fitted regression model was determined by comparing the kinetic parameters  $k_2$  estimated between linear and non-linear model equations, where the R value for non-linear regression was highest at 0.8421, and low  $sy.x$  at 0.324 for Ni  $^{-1}$  with a maximum growth rate (0.01131 hr<sup>-1</sup>) of the Antarctic bacterial in degrading waste canola oil, meantime best-fitted in the linear regression  $k_2$  - model was Zn with high R and growth constant values (0.9082 and 0.2075 hr<sup>-1</sup>, respectively) as well as low value of statistical error, which was 0.2075. **Interpretation:** The presence of heavy metals in Antarctic bacterial community could suppress the ability of bacteria to degrade waste canola oil, and this can slower the rate of bacterial growth in the kinetics studies. Hence, this work would be helpful in actual bioremediation operations by understanding and manipulating the process of the kinetics parameters.

**Keyword:** Antarctic; Canola oil; Degradation; Heavy metal; Kinetic growth