

Comparison of enumeration techniques for the investigation of bacterial pollution in the Berg River, Western Cape, South Africa

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Abstract

The study was aimed at assessing techniques, which would provide an accurate indication of the planktonic bacterial pollution load in the Berg River, Western Cape, South Africa. Sampling of sites started in June 2004 and continued for a period of 1 year until June 2005. The most probable number (MPN) technique was used to determine the level of faecal coliforms and *E. coli*, while the heterotrophic plate count method was used to determine the amount of culturable micro-organisms in planktonic samples. The flow cytometry (FCM) and direct acridine orange count (DAOC) (epifluorescence microscopy) techniques were employed to evaluate total bacterial counts in planktonic (water) samples. The highest MPN and heterotrophic plate counts were recorded in Week 37 at site B2 at 1.7×10^7 micro-organisms/100 mL and 1.04×10^6 micro-organisms/mL, respectively. In comparison, the viable FCM counts, were significantly higher ($p < 0.05$) for that period at 1.7×10^7 micro-organisms/mL. The highest total FCM count of 3.7×10^7 micro-organisms/mL was recorded in Week 41 at Site B2. In comparison the highest DAOC of 8.3×10^6 micro-organisms/mL was obtained in Week 29 at Site B2. Results showed that on average the heterotrophic plate count represented a fraction ($< 3.65\%$) of the total FCM counts. The total DAOC count also represented a fraction ($< 43.08\%$) of the total FCM count for most of the sampling period. Results therefore showed that the FCM proved to be more effective in evaluating microbial pollution in water samples.

Keywords: bacterial pollution, direct acridine orange count, flow cytometry, heterotrophic cell counts, planktonic organisms, river water