

Abstract

The aim of this thesis is the utilization of phospholipid fatty acids (PLFA) analysis to determine groups of microorganisms present during the biodrying of sewage sludge and their description in relation to the temperature regime of the biodrying.

Four experimental cycles A, B, C, D were followed. Cycles A, B and C, D differed from each other in the sewage sludge collected from two waste water treatment plants. The cycles A, B, C and D were each performed in two reactors with different aeration regimes to compare the mesophilic (max. temperature ± 50 °C) and thermophilic (max. temperature ± 70 °C) regimes of biodrying. PLFA analysis was used to determine the microbial groups. Concentrations of individual PLFA were subjected to principal component analysis (PCA).

The total PLFA concentration corresponding to total microbial biomass was decreasing during both temperature regimes of cycles B, C, D, while the total PLFA concentration increased towards the end of both temperature regimes of cycle A. The total PLFA concentration reached statistically higher values at the end of the mesophilic regime of cycles B, C and D. The development of fungi to bacteria ratio showed that fungi applied more with the progression of both temperature regimes of cycles A, B and the thermophilic regime of cycle C. Based on the development of PLFA concentrations which are characteristic of actinobacteria, it was evident that their biomass did not increase towards the end of the thermophilic regimes of cycles A, B and the mesophilic regime of cycle D. The development of gram-positive (G+) and gram-negative (G-) bacterial ratio showed that in the high temperature phase of cycles B, C and D the G+ bacteria were more abundant in the thermophilic regime. Moreover, the concentrations of PLFA which are characteristic of G- bacteria decreased during both temperature regimes of cycles A, B, C, D, indicating a decrease in their biomass during biodrying. PCA showed a correlation between PLFA i16:0, i17:0, and a17:0 and samples taken at the higher temperature stage. In addition, samples taken at the end of the process correlated most frequently with methyl-substituted PLFA and cyclopropyl PLFA, however, these results differed between cycles and between temperature regimes. Based on the results of the PLFA analysis it was evident that the development of microbial groups was diverse and it was showed that the PLFA analysis provides an effective assessment of the development of microbial groups during the biodrying of sewage sludge.

Keywords: biodrying, sewage sludge, PLFA, microbial communities