Effect of tetracycline residues in pig manure slurry on tetracycline-resistant bacteria and resistance gene tet(M) in soil microcosms

Effects of tetracycline residues from pig manure slurry on the prevalence of tetracycline-resistant bacteria and the tetracycline resistance gene, tet(M), were studied in soil microcosms. Four types of soil microcosms were established for a period of 152 days, supplemented with combinations of pig manure slurry and a tetracycline-resistant Enterococcus faecalis, CG I 10, containing the tetracycline resistance gene tet(m) (on the conjugative transposon, Tn916). The prevalence of both tetracycline-resistant aerobic bacteria and tetracycline-resistant enterococci declined rapidly until day 45 where no significant differences in the levels of tetracycline-resistant bacteria in any of the four types of microcosms could be detected. tet(M) could be detected in microcosms supplemented with either pig manure slurry and/or E. faecalis CG 110 (tet(M)) for the whole period (152 days). tet(M) could be detected longer than tetracycline-resistant enterococci could be isolated (limit of detection 100 CFU/g soil) probably due to viable but not culturable (VBNC) bacteria with tet(M), horizontal gene transfer of tet(M) to indigenous soil bacteria or presence of "free" DNA. The concentration of chlortetracycline and oxytetracycline were almost stable throughout the experimental period, but the tetracycline concentrations had no effect on prevalence of tetracycline-resistant bacteria. The presented microcosm approach simulated natural farmland conditions well and supported results from previous field studies. (c) 2006 Elsevier Ltd. All rights reserved.