

TITLE: *Chemical and microbiological attributes of the soil after pig slurry application under no-tillage system.*

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ABSTRACT

Intensive rearing of swine livestock results in a huge amount of liquid residues (pig slurry), which can be a source of contamination to the environment. This residue contains phosphorus nitrogen and other nutrients; therefore it seems appropriate to use it on cropped soils as fertilizer. This work aimed to evaluate chemical and microbiological changes in the soil profile, which had received rates of pig slurry for nine years and had been cropped under no-tillage systems. This study was carried out in a field experiment, which was established in 1997 at Experimental Station of Institute Agronomic of Paraná, Palotina, Paraná, Brazil, in clay soil (Latossolo Vermelho Distroférrico). Soil samples were collected at 0-10, 10-20 e 20-30 cm depth, in September 2005, to assess the following swine slurry application rates: 0; 30; 60; 90; and 120 m³ ha⁻¹ year⁻¹. The following parameters were determined: pH, organic matter, acidity, Ca²⁺, K⁺, Al³⁺, Mg²⁺, P (Mehlich-1), residual P, ammonification, potential nitrification, microbial activity, microbial biomass, ammonium, nitrite-oxidizing and denitrifier microorganisms. It was observed higher concentration of P, C, Ca²⁺, Mg²⁺, K⁺ e NO₃⁻ at 0-10 cm layer due to pig slurry application. At 20-30 cm depth pig slurry application had significant effect on P (Mehlich-1), but did not affect the other soil characteristics evaluated. In the soil profile it was observed higher amounts of P, C, Ca²⁺, Mg²⁺, K⁺ e NO₃⁻ at 0-10 cm depth than in the other layers. Residual P did not change in the 20-30 cm although it was observed significant increases at 0-10 cm due to application of 120 m³ ha⁻¹ year⁻¹ in relation to control treatment. Residual P at 10-20 cm in the soil profile it was higher in the plot that received 120 m³ ha⁻¹ year⁻¹ than plots with 0 e 30 m³ ha⁻¹ year⁻¹ of pig slurry rates. It was observed that pig slurry application at high rates decreased nitrite oxidant bacteria and increased denitrifiers; however, it did not change ammonifier microorganisms at the 0-10 cm depth of soil. Potential nitrification and nitrification rates were higher at 0-10 cm layer with pig slurry application. There was higher ammonification at soil surface layers with pig wastes. In contrast, pig slurry application at 120 m³ ha⁻¹ year⁻¹ rate reduced ammonification at 10-20 cm. There was an increase of microbial biomass and activity and as well in the C-mic/N-mic ratios due to pig slurry. Thus, in the long-term, consecutive

applications of pig slurry altered chemical and microbiological attributes of soil cultivated under no-tillage system.

Keywords: Ammonification; denitrifier microorganisms; FDA; microbial biomass; nitrification; residual phosphorus; swine slurry.