TITLE: DIFFUSE POLLUTION BY VETERINARY ANTIBIOTICS IN SOIL WITH SWINE WASTEWATER APPLICATION IN WESTERN PARANÁ, BRAZIL.

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ABSTRACT:

The release of veterinary antibiotics (VA) from the application of animal effluents to soil (agricultural reuse technique) can negatively impact aquatic and terrestrial organisms and, in particular, increase the resistance of microorganisms to antibiotics. Rhodic Hapludox samples were collected in an area with a 7-year history of swine wastewater application (SW) in 3 doses (100, 200 and 300 m^3 ha^{-1}), with and without mineral fertilization (MF) (NPK 0:20:20, at 250 kg ha^{-1}), during soybean crop cultivation, in Cascavel, PR, Brazil. The SW was collected before the biodigester, in a pig farm with complete life cycle (from farrow to finish), and was applied in a single dose on the day of sowing. Soil samples (0-20 cm) were collected after 3 days of SW application. SW and soil were submitted to 24 VA analysis of β-lactam, aminoglycoside, macrolide, quinolone, tetracycline and sulfonamides classes and trimethoprim and florfenicol by ultra-efficient liquid chromatography with mass spectrometry (UPLC - MS/MS). The design was completely randomized, in a 4 x 2 factorial scheme (4 doses of SW and 2 levels of MF - with or without MF), with 3 replications, totaling 24 plots. The following AV were detected in SW: chlorprotracycline (35 µg/L), doxycycline (40.9 µg/L), enrofloxacin (23.4 µg/L), lincomycin (9.1 µg/L), norfloxacin 6 µg/L), penicillin (17.0 µg/L), sulfamethazine (50.9 µg/L) and tetracycline (14.9 µg/L). In the soil, AV were identified in only two treatments: with 100 m^3 ha^{-1} and presence of MF (100MF) and with 200 m^3 ha^{-1} and absence of MF (200). The mean AV concentrations in 100MF were: spiramycin (17.7 µg/L), lincomycin (6.03 µg/L), sulfadiazine (3.3 µg/L), tylosin (3.8 µg/L) and trimethoprim (4.7 µg/L). In treatment 200 the mean concentration of 3.5 µg/L of spiramycin was found. The application of SW in the soil was effective in eliminating most of the AV, which were probably degraded or retained in SW organic matter. Although found in soil, spiramycin, sulfadiazine and tylosin were not detected in the effluent. Other studies have indicated that iron-rich soils may have a low ability to carry macrolide and sulfamethazine VA groups, emphasizing the importance of assessing the risk of these VA in the environment. This study suggests that such VA may have arisen from SW applications from previous cultivation cycles and that more studies should be carried out regarding the VA release from reuse techiniques.

Keywords: liquid chromatography, bacterial resistance, effluent reuse.

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