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Enzyme activities in a cadmium-contaminated sewage sludge

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Soil biological activity is affected by different factors, among them urban and industrial wastes. As enzyme activity is a sensible indicator of changes in soil properties, it may be used as a tool to evaluate the effect of different materials on soil biogeochemical processes. Since cadmium is a heavy metal potentially toxic to microorganisms, plants and animals, sewage sludge is a potential fertilizer for soils and because there are little studies about the effects of Cd on the waste biochemical properties, it is very important know the effect of this heavy metal on the sewage sludge enzyme activity. The objective of this work was to evaluate the effect of different sources of Cd on sewage sludge arylsulphatase activity. Then, an experiment was carried out under greenhouse conditions (25 ± 5^{o}C) in Jaboticabal, SP, Brazil (21˚15'20" S, 48˚19'02" W) using a totally randomized 5X7 split plot design with 4 replications. The five treatments were control (without Cd addition) and four sources of Cd [$CdCl_2$, $CdSO_4$, $Cd(NO_3)_{2]}$ and metallic Cd] added to sewage sludge to get 60 mg Kg^{-1} Cd (dry basis). The six subplots were consisted of 7 periods of incubation (0, 7, 14, 21, 28, 43 and 58 days). Sewage sludge was obtained in the SABESP (Companhia de Saneamento Básico do Estado de São Paulo) in Barueri, SP, and presented the following chemical composition in a sample analyzed according to the methodology proposed by USEPA (1995), method 3050b: pH (H_2O): 6,4, moisture=78%, P=18.70; K=1.30; Ca=21.33, Mg=3.82, S=6.8 (g kg^{-1}, dry basis), Fe=37514; Mn=206; Cu=998; Zn=2475; Cd=8.7; Cr=799; Pb=170 (mg Kg^{-1}, dry basis). Sewage sludge samples (500 g air dried basis) were mixed with the different sources of Cd in a dose to get 60 mg Kg^{-1} Cd, dry basis (salt Cd + sewage sludge Cd), wet to bring the water content to 60% of the water holding capacity. Samples of the sewage sludge under incubation were taken after

incubation started, air dried and analyzed for arylsulphatase activity by the method of Tabatabai & Bremner (1970). The data were submitted to the variance analysis and to The Tukey's test at 5%, in the cases the F test was significant. All the Cd sources presented the same tendency on the arylsulphatase activity during the incubation time. Arylsulphatase activity presented pics of maximum and minimum during the incubation period and the treatment that caused the highest enzyme activity varied with the sampling time. At the 7th day incubation, the highest activity occurred in the treatment that received $CdSO_4$; at the 28th day incubation, the maximum activity was observed in the treatment that received metallic Cd; at the 58th the highest enzyme activity was caused by $Cd(NO_3)_2$. Heavy metals may cause microorganism stress, which increases its metabolism in order to mantain, the vital state. So, the different sources of Cd probably affected different groups of microorganism in diferent times, causing the pics in the arylsulphatase activity.

Reference

TABATABAI, M.A & BREMNER, J.M. Arylsulphatase activity in soils. Soil Sci. Soc. Amer. Proc., 34(2): 225-229, 1970.

USEPA (UNITED STATES ENVIRONMENTAL PROTECTION AGENCY). EPA/832-B- 93-005. A guide to the biossolids risk assessments for the EPA Part 503 rule. Fed. Reg. 1995. 143p.