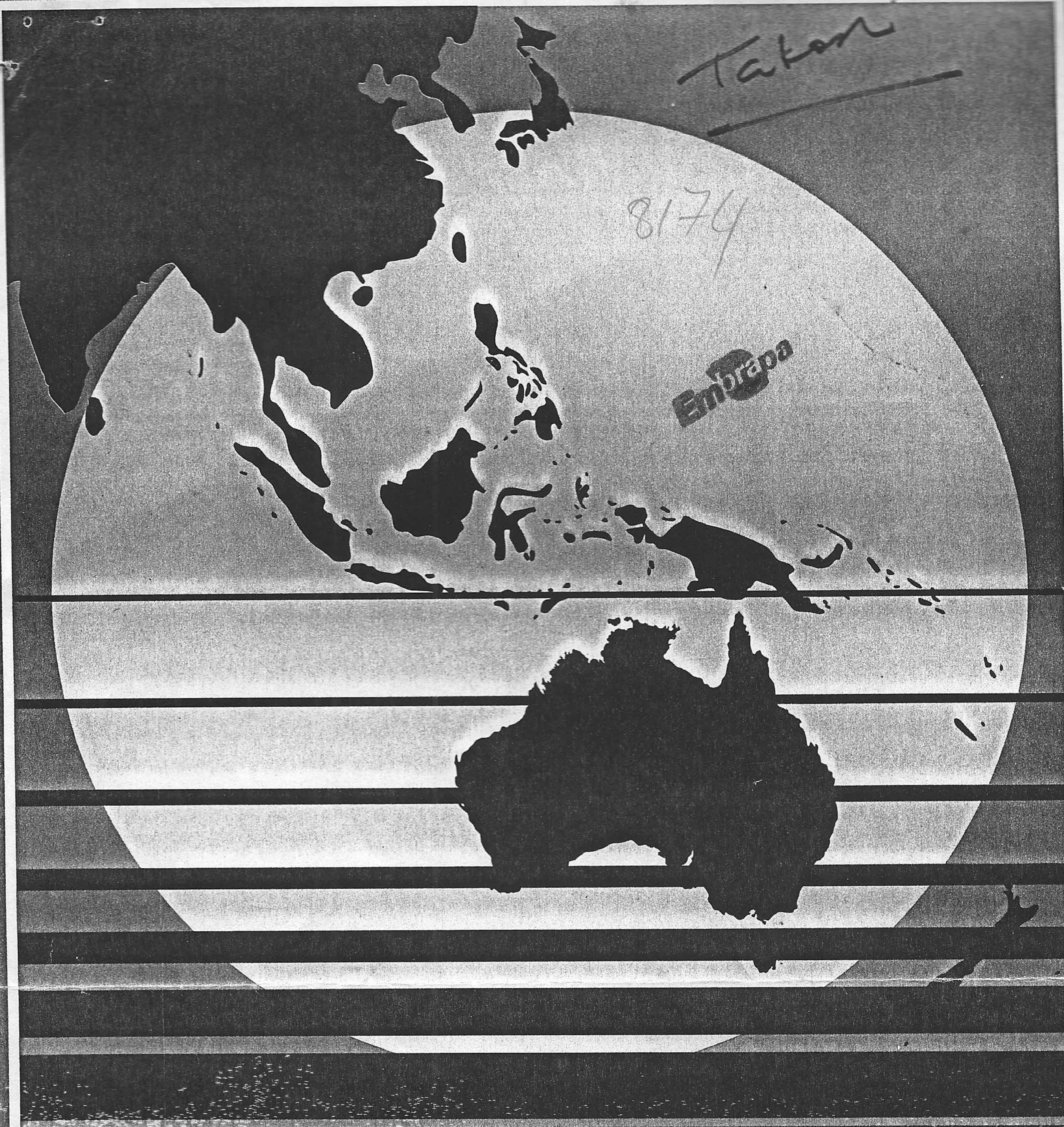

extended abstracts

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Heavy Metal Contents of Two Brazilian Oxisols Treated with Urban Waste Composts

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Introduction

The increasing world urban population has contributed decisively to the increase in generation of solid waste residues. In Brazil, where 68% of its population live in urban areas, the problem is becoming worse each day. One solution for disposing of these waste products is to transform them into composts, for agricultural use. However, there exists the possibility of the composts presenting high concentrations of some heavy metals, which, entering into trophic chain, may be harmful to human health (Xin et al., 1992). This contamination hazard by heavy metals increases with increasing applied compost rate. Although the maximum permitted compost value in Europe is 10 Mg ha^{-1} $year^{-1}$ (dry weight basis), the recomendations in Brazil for vegetable crops vary from 60 to 100 Mg ha^{-1} $year^{-1}$ (fresh weight basis). The objective of this research was to verify the effects of increasing rate of applications of two town solid waste composts to two Brazilian soils on various heavy metal contents in plant available forms.

Material and Methods

Urban waste composts from Florianópolis City, SC, Brazil (selectively collected waste) and from S. Paulo City, SP (non selectively collected) were applied to two oxisols (a, sandy, with 24% clay and b, clayey, 79% clay), contained in 3.5 L pots, at rates equivalent to 0, 10, 20, 40, 80, and 120 Mg ha^{-1}. The compost treated soils were wet and maintained at about 70% field capacity for 10 days, after which samples were taken for the extraction through Mehlich-3 method (Mehlich, 1984) of Fe, Zn, Pb, Ti, Co, Mn, Cr, Sr, Cd, Cu and Ni. The composts were also analysed for total content of these elements (Table 1).

Results and Discussion

The application of both composts increased Cd, Cu, Fe, Ni, Sr, and Zn content in one of the soils (Sandy), but with negligible alteration for the other elements, and decrease in Cr and Pb contents when treated with SC compost (Table 2).In clayey soil, there were increases in all heavy metal contents (Cu, Fe, Mn, Pb, Sr, Ti and Zn), except for Co, Ni and Cd when increasing rates of composts were applied. There was no alteration in Co and Ni, and there was a high variation for Cd content. Cr was not detected in the samples, as probably it was fixed due to the high clay content. As reported by Petruzelli, 1989 and Xin et al., 1992, the total heavy metal content of composts does not reflect exactly their availability in the soil, i.e., as determined by Mehlich 3 method, e.g., Ni, Cd, Pb, Mn, and Zn contents compared in the original materials and after applied to the soils. The increase in soil available heavy metal contents with increase in compost rate application, is of great concern when high doses of composts are used in agricullture, and this suggests the need of a redefinition of the permitted maximum rate of waste compost application, in order to avoid causing risk to human health.

Table 1. Heavy metal concentrations in waste composts utilized ($mg.kg^{-1}$)

Compost	Element										
	Fe	Zn	Pb	Ti	Co	Mn	Cr	Sr	Cd	Cu	Ni
	$mg.kg^{-1}$										
São Paulo (SP)	12782	264	203	1487	9	217	66	118	5	161	26
Florianopolis (SC)	13452	111	52	913	8	536	29	111	1	46	11

Table 2. Mehlich-3 extractable heavy metal concentrations in the soils treated with increasing rates of waste composts ($mg.kg^{-1}$ soil).

Compost Added Origin	Mg.ha^{-1}	Cd	Co	Cr	Cu	Fe	Mn	Ni	Pb	Sr	Ti	Zn
		$mg.kg^{-1}$										
		Sandy Soil										
	0	0.06	0.23	0.86	1.43	108.7	38.8	0.40	5.18	4.10	0.28	1.55
	10	0.06	0.22	0.84	1.55	110.6	39.3	0.35	5.24	4.23	0.26	2.02
	20	0.09	0.26	0.52	1.63	117.5	41.4	0.40	5.69	4.23	0.29	2.27
SP	40	0.07	0.25	0.73	1.75	116.4	40.0	0.33	5.66	4.40	0.31	2.84
	80	0.13	0.29	0.97	2.20	122.7	41.8	0.48	6.05	4.75	0.35	4.60
	120	0.13	0.27	0.90	2.53	127.0	40.8	0.48	6.14	4.88	0.39	5.86
	0	0.06	0.22	0.85	1.42	108.8	38.5	0.38	5.16	4.11	0.28	1.54
	10	0.11	0.22	0.68	1.45	118.6	43.1	0.33	4.86	3.75	0.27	1.56
	20	0.08	0.20	0.49	1.45	116.4	40.9	0.35	4.58	4.45	0.25	1.74
SC	40	0.12	0.21	0.39	1.45	113.6	39.2	0.38	4.50	4.23	0.28	1.98
	80	0.09	0.21	0.45	1.48	118.4	39.5	0.50	4.51	4.68	0.28	2.48
	120	0.12	0.21	0.41	1.50	124.1	39.3	0.48	4.63	5.13	0.31	3.02
		Clayey Soil										
	0	0.089	0.12	-	1.09	52.1	16.8	0.22	5.16	5.15	0.27	0.74
	10	0.08	0.14	-	1.28	56.8	18.2	0.30	6.10	5.43	0.33	1.20
	20	0.08	0.13	-	1.28	57.4	20.7	0.35	6.07	5.85	0.33	1.58
SP	40	0.07	0.11	-	1.30	57.9	20.4	0.38	6.11	6.13	0.32	1.95
	80	0.08	0.10	-	1.38	57.1	18.7	0.38	5.94	5.68	0.31	3.12
	120	0.11	0.13	-	1.45	63.9	20.5	0.38	6.58	6.43	0.37	3.98
	0	0.09	0.12	-	1.02	52.2	16.8	0.27	5.17	5.18	0.27	0.75
	10	0.06	0.12	-	1.13	52.4	18.7	0.28	5.58	5.60	0.32	0.95
	20	0.12	0.13	-	1.18	57.0	19.7	0.30	5.99	5.68	0.31	1.09
SC	40	0.07	0.13	-	1.15	59.0	20.2	0.30	5.89	5.85	0.31	1.27
	80	0.08	0.14	-	1.33	69.1	22.8	0.35	6.01	7.63	0.36	2.14
	120	0.07	0.13	-	1.33	71.7	23.3	0.30	6.01	7.13	0.35	2.34

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