HELMINTH EGGS INACTIVATED BY ALKALINE TREATMENT IN WASTEWATER SLUDGE

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Introduction. Helminth eggs are infective agents (worm diseases). Helminth eggs infect humans through: 1) the ingestion of food crops polluted with wastewater sludge, 2) direct contact with polluted sludge, and 3) the ingestion of meat or fish polluted. Eggs are not always infectious in wastewater or sludge. To be infectious they must be viable and larval development needs to arise. These conditions frequently occur in soil or crops, where eggs are deposited when wastewater or sludge polluted are used as fertiliser. The wastewater treatment plants generate a high rate of wastewater sludge without any application.
The aim of this study was to evaluate the inactivation of helminth eggs contained in sewage sludge (class B) by alkaline stabilization.

Methods. Sewage sludge samples were obtained from wastewater treatment plant (RECICLAGUA, S.A. de C.V.) (Estado de México, México). The sewage sludge was characterized in terms of pH, water content, electrolytic conductivity and total nitrogen (Kjeldahl). Initial concentrations of helminth eggs were determined. Viability was determined by continuous washing, combined with several filtration steps, suspend, concentration and incubation in H_2SO_4 0.1 N at 26 °C for 30 days (2). One kg of wastewater sludge was placed in plastic containers of 0.30 m x 0.25 m x 0.12 m dimensions and was added 100 g CaO. The sludge was exposed by 15 days from day 0. Viable eggs quantification was performed at 0, 5 and 15 days after started treatment.

Results. Sewage sludge showed a pH of 8.2, water content, 85.4%; electrolytic conductivity, 11 dS m^{-1}, and total nitrogen content, 69 g kg^{-1}. Results were shown in Table 1.

Table 1. Viable eggs count by treatment and day (g^{-1} TS)

Day	Alkaline	Non-Alkaline	MSD [c]
	Eggs g^{-1} TS		
0	3053 A [a] a [b]	3470 A a	2077
5	1387 A a	1805 A b	2960
15	0 B a	1943 A b	773
MSD	3110	1207	

[a] Values with the same capital letter are not significant different between treatments.
[b] Values with the same letter are not significant different over time.
[c] MSD: Minimal significant difference (P<0.05).

The lime used significantly affect embryonic development of helminth eggs from the day 15, where we did not find viable eggs. The alkaline treatment increase temperature from 15 °C to 33 °C at the first day. Furthermore, lime dose used increased the pH of the sewage sludge, 12 units upon contact and remained above this value during 72 hours.

Conclusions. The treatment with lime 10% allowed the helminth eggs inactivation. However, future studies should be conducted in order to confirm the inactivation of helminth eggs in limed sewage sludge treated at large scale or under field conditions.

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