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FEDERAL UNIVERSITY OF PERNAMBUCO

DEPARTMENT OF CIVIL ENGINEERING

LABORATORY OF ENVIRONMENTAL SANITATION - LSA

Composting and solarization applied in sanitization of anaerobic sewage sludge used as substrate for *Senna siamea* Lam seedlings production

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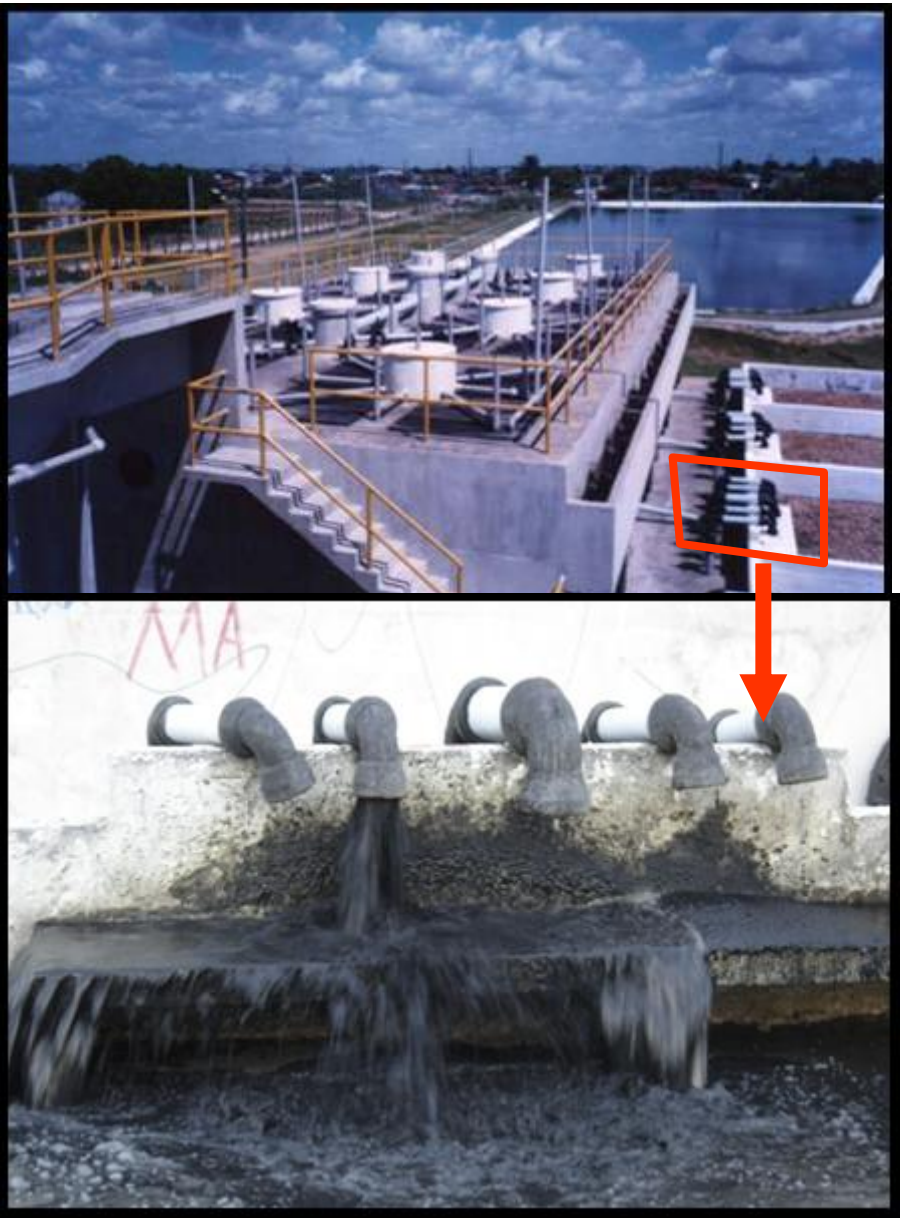
Summary

- Introduction
- Objectives
- Materials and Methods
- Results and Discussion
- Conclusions

Introduction

Wastewater Treatment Plant of Mangueira – RECIFE



LOCALIZATION:

Geographic coordinates

Latitude: 8º 05' 41" S

Longitude: 34º 55' 31“ W

POPULATION: 18,000 inhabitants in Village Mangueira

SYSTEM:

- UASB reactor (Upflow Anaerobic Sludge Blanket Reactor)

- Shallow polishing and
- Drying beds of the sludge.

FLOW: 31 L/s

Introduction

Wastewater Treatment Plant of Mangueira

Introduction

The helminth eggs were chosen as indicators of the quality of sludge, for being highly resistant to several unfavorable environmental conditions.

Temperature and required period of exposition for the destruction of some common helminths (Tchobanoglous,1993).

Organism	exposition period	Lethal temperature
Taenia saginata	few minutes	55° C
Necator americanus	Death at 50 minutes	45° C
Ascaris lumbricoides	Death < 60 minutes	> 50° C

Objectives

- **Evaluate the effect of the composting and solarization in the control of present pathogens in anaerobic sewage sludge.**

- **Evaluate the feasibility of using the sewage sludge as substrate component for seedlings production of *Senna siamea* Lam.**

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1 Sanitization by composting

Three treatments with volumetric rates were tested. A moist of 50% was kept in the natural aerated static piles of 1.80 m width, 2.00 m length and 1.20 m height, covered with black plastic film of 1.5 mm.

Three treatments with volumetric rates:

TC1- 1:1 (1 sludge volume / 1 leaves volume)
TC2- 2:1 (2 sludge volume / 1 leaves volume)
TC3- 1:2 (1 sludge volume / 2 leaves volume)

Materials and Methods

- Viability helminth eggs analysis
- Physical and chemical analysis
- Monitoring moisture and temperature

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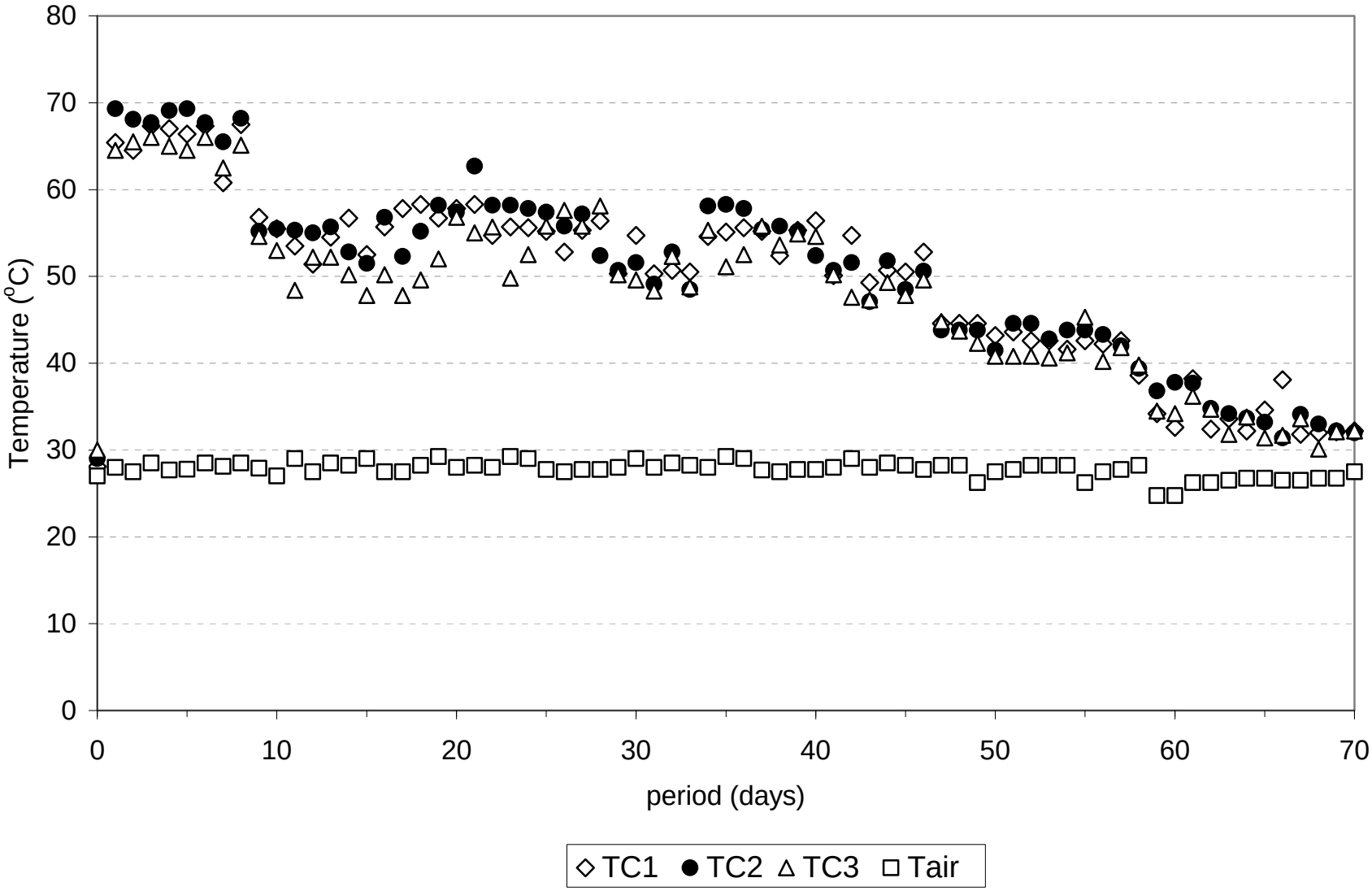
1 Sanitization by composting



1 Sanitization by composting

- **186 eggs /g ST was detected in composed samples colected in the in drying beds. Sewage sludge with 15 days of drying.**

- **The results showed that after the thermophilic stage, the viable helminth eggs decreased 0.12 eggs/ g ST, 0.03 eggs/ g ST and 0.21 eggs/ g ST.**

- **Values below the standard required in Brazil (0.25 egg/g total solids).**

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2 - Sanitization by solarization

1st Phase

The solarization period was 35 days and had three treatments and six repetitions that were the following:

TS 1 – Control
TS 2 – Transparent plastic film (0.30 mm)
TS 3 – Black plastic film (0.15 mm)

- **For the experiment, a completely randomized casual model**
- **72-m2 black surface area was used in order to absorbe sun heat;**
- **The sewage sludge was put in 18 boxes (1,0 m x 1,0 m) on the floor.**

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2 - Sanitization by solarization

1st Phase

- **152 eggs /g ST was detected in composed samples colected in the drying beds. Sewage sludge with 15 days of drying.**

- **The results showed that after the 35-day solarization period, the viable helminth eggs dropped about 4.37 eggs/ g ST(TS1), 0.22 eggs/ g ST(TS2), and 1.81 eggs/ g ST(TS3).**

- **Transparent plastic film (TS2) was the best treatment to prevent the existing helminth eggs from thriving, and the number was 0.22 eggs/ g ST.**

- **Values below the standard required in Brazil (0.25 egg/g total solids).**

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2 - Sanitization by solarization

2nd Phase: Use of the Transparent plastic film

- The temperatures evaluation was taken, completely randomized, 5 times a week, always at 2 PM in the afternoon in 25 casual points of the sewage sludge on the black surface area, coverd only with transparent plastic film (0.30 mm).

- Viability helminth eggs analyses were taken on the 0, 15th, 35th and 40th days.

2 - Sanitization by Solarization

2st stage

Parameters	Sludge Temperature ºC	Air Temperature ºC	Numbers of the helminth eggs eggs/ g ST			
			1-day	15-day	35-day	40-day
Maximum	41.3	30.58	142.18	28.89	0.28	0.005
Average	55.3	33.5	150.95	32.42	0.31	0.01

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3 - Sewage sludge as substrate for *Senna siamea* Lam seedlings production

- The sludge was sanitization by solarization, one month before sowing.
- For the experiment, a completely randomized casual model was employed, with 5 treatments and 5 repetitions, totaling 25 units with 16 seedlings per unit.

Treatment	Substrate
TP 1	soil
TP2	sludge 25% and soil 75%
TP3	sludge 50% and soil 50%
TP4	sludge 75% and soil 25%
TP5	sludge 25%, 25% of coconut powder and soil 25%

The dry matter content in the aerial portion of the seedlings was assessed, and chemical analyses of the substrates were performed three months after sowing.

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3 - Sewage sludge as substrate for *Senna siamea* Lam seedlings production

Among the treatments using sludge, the plants that grew best were those treated with the TP5 sludge concentration, followed by TP4 (75%) and TP3 (50%) concentrations.

Conclusions

- The results showed that after the thermophilic stage of composting, the viable helminth eggs were removed efficiently during the 46-day period for the three mixture tested.

- Transparent plastic film was the best treatment to prevent the existing helminth eggs from thriving, and the number was 0.22 egg/ g. ST, with value below the standard required in Brazil concerning the use of sludge for agriculture purposes (0.25 viable egg/g ST).

- Among the treatments using sludge, the plants that grew best were those treated with the TP5 (mixture of 25% of sludge, 25% of coconut powder). The use of sewage sludge for seedlings is feasible and promising.

THANK YOU VERY MUCH

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