

# Composting: An option for adding value to solid waste from the tanning processes

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## INTRODUCTION

The tanning process generates a high volume of solid wastes and thus, impacts the environment. In the towns of Villapinzon and Choconta (Colombia) -both located close to the Bogotá River's source, long-ago existing tanneries have not established appropriate technologies for handling, disposing or using solid wastes. Some 80 small industries are estimated to produce around 1,200 Ton/month of solid waste. Among these, hair (270 Ton/month) and fat (520 Ton/month.) are biodegradable and currently are dumped on adjacent land or on the river itself, together with chemicals such as sodium sulfide and lime, which, besides polluting the dumping site, prevent to some extent further use of wastes.

This project is intended to evaluate composting conditions for biologically degrading recovered hair from de-hairing operation and fat from defleshing stage in tanning process.

Between 2007 and 2008, research on composting hair-mud was conducted, and showed that this is a convenient way to add value to solid waste. Test were made at Bogotá, with an altitude (2,600 m above sea level) and weather conditions slightly different from those found in the above mentioned locations.

## METHODOLOGY

Hair, partially hydrolyzed by its own origin, was used as starting material in composting tests. Three inoculums types were employed:



1. Activated mud from an existing municipal Wastewater Treatment Plant.



2. Commercially available microbial inoculum EM® EMRO



3. Culture medium : 2.5% poultry manure, 10% cattle manure, 2.5% material from a composting pile in mesophilic stage, 2.5 % molasses and water as balance.

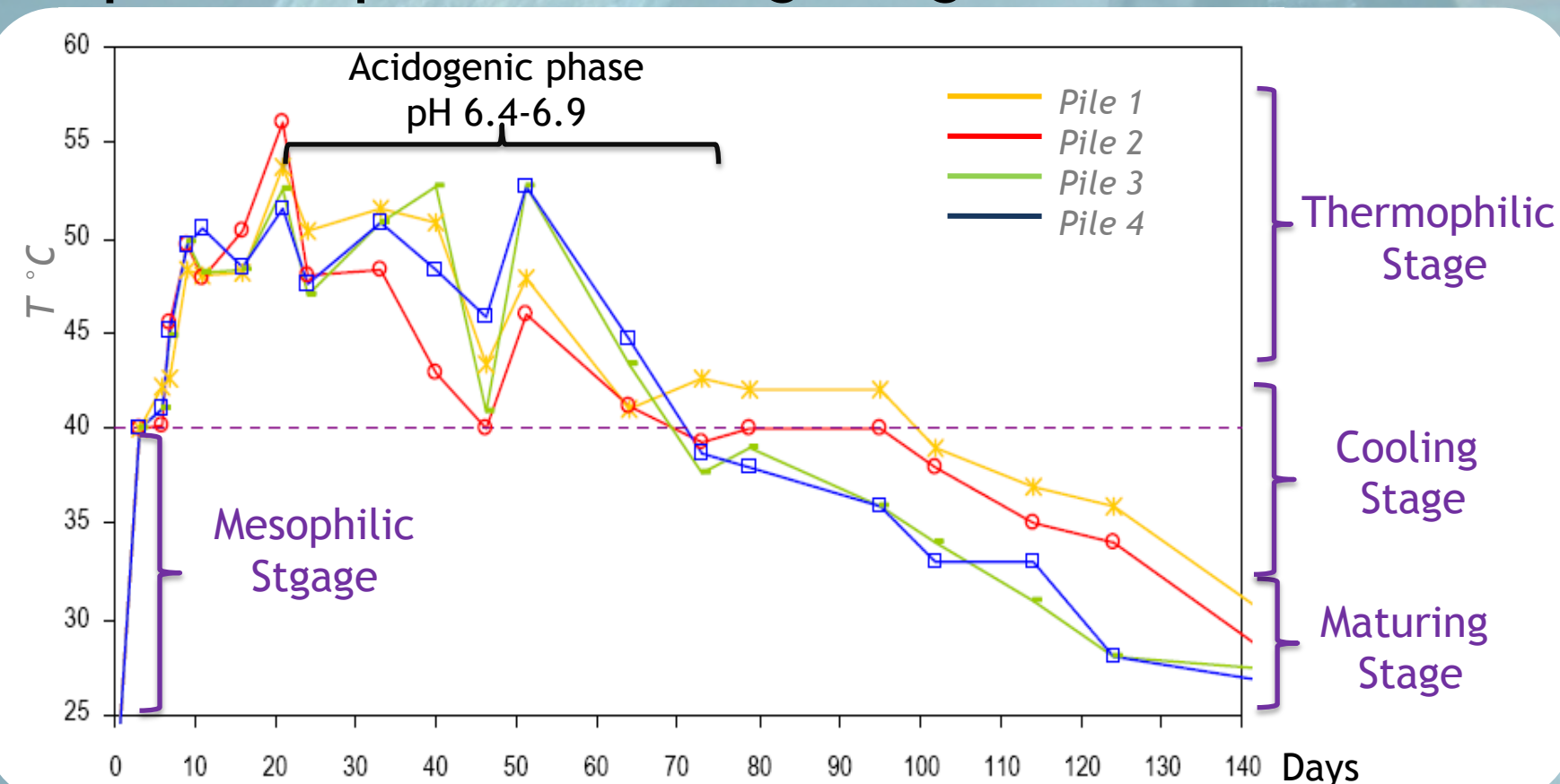
Component	Pile 1	Pile 2	Pile 3	Pile 4	Control Pile
Structural	Dried grass	Sawdust	Dried grass	Dried grass	Dried grass
Inocule	WWTP mud	WWTP mud	ME®	Culture medium	None

Composting took 5 months. From 45<sup>th</sup> day on, temperature dropped, , due to an adverse combination of low surrounding temperature and moist. At that moment, piles were moistened with water containing some amount of original inoculum.



## RESULTS

### 1. Temperature profiles and stage length



**2. Physicochemical parameters:** lowering biodegradable organic carbon and stabilizing organic matter contents. Low heavy metals contents.

Parameter	Pile 1		Pile 2		Pile 3		Pile 4	
	starting	final	starting	final	starting	final	starting	final
Moisture %	62.2	50.2	58.5	53.7	62.4	50.7	62.0	50.6
Organic Matter (% dry basis)	67.8	58.1	74.2	64.8	71.0	60.2	71.0	60.6
C Total Organic /N	4.61	5.56	5.15	6.26	4.48	5.48	4.45	5.61
C Biodegradable Organic/N	3.90	3.34	3.79	3.60	3.30	3.31	3.33	3.28
pH	8.7	7.7	8.7	7.9	8.7	7.5	8.7	7.2
Pb (mg/kg)	ND	21,0	ND	-	ND	-	ND	14,2
Cd, Cr, Ni, Hg, As (mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND

**3. Microbiological Parameters:** beneficial microbiological groups' contents were found acceptable. As for pathogen, there was no evidence of the presence of *Salmonella Sp.* in any pile and a reduction in fecal coliforms was detected.

Parameter (UFC/g)	Pile 1	Pile 2	Pile 3	Pile 4
Fungi	35 x 10 <sup>4</sup>	20 x 10 <sup>3</sup>	70 x 10 <sup>3</sup>	16 x 10 <sup>4</sup>
Heterotrophic bacteriae	11.1 x 10 <sup>6</sup>	93 x 10 <sup>5</sup>	23 x 10 <sup>5</sup>	40 x 10 <sup>4</sup>
Actinomycetus type bacteriae	<40 x 10 <sup>4</sup>	<70 x 10 <sup>4</sup>	<10 x 10 <sup>3</sup>	<12 x 10 <sup>4</sup>
Nitrogen Fixers	41.7 x 10 <sup>4</sup>	29.6 x 10 <sup>5</sup>	20.9 x 10 <sup>5</sup>	10.8 x 10 <sup>5</sup>
Phosphate solvents	40 x 10 <sup>4</sup>	29.5 x 10 <sup>4</sup>	27.3 x 10 <sup>5</sup>	17.5 x 10 <sup>5</sup>
Cellulolitics	27 x 10 <sup>5</sup>	13.5 x 10 <sup>5</sup>	14 x 10 <sup>5</sup>	23.5 x 10 <sup>5</sup>
Total coliforms (NMP/g)	46000	9300	4300	9300
Fecal coliforms (NMP/g)	610	910	300	2100
Salmonella Sp.	N.D.	N.D.	N.D.	N.D.

### Composting Pilot Project at Villapinzon

During 2010, a pilot project for composting hair, fat and chromium dust is being developed at Villapinzon, in order to adjust the process to local altitude (2,715 meters above sea level) and average temperature of 13 °C. Twelve piles of different composition were structured. Temperature monitoring shows that, after approximately two weeks of the starting point, readings in piles containing hair or fat reach 45°C. As this pilot project has no conclusive findings as of yet, this poster does not show this experiment .



## CONCLUSIONS

Pile 2 compost (in Bogotá's tests) showed best results, with high contents of organic matter and of nitrogen, being a stable product, with an adequate maturity degree and high agronomic value.

Composting has demonstrated being a viable technology, from both the technical and environmental perspectives, and for adding value to the high volumes of waste originated in dehairing operation during the tanning process.