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COMPOSTING: AN OPTION FOR ADDING VALUE TO SOLID WASTE FROM THE TANNING PROCESSES

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INTRODUCTION

Composting is the biologically driven decomposition and stabilization of organic substrates under conditions that allow the development of thermophilic temperatures, as a result of biologically produced heat, and the recovery of a stable, pathogen-free product (Haug, 1993).

184 micro-tanneries at Villapinzón and Chocontá (Colombia) annually produce a high volume of solid wastes, approximately 3.700 tons of hair and 7.200 tons of fleshings. Without an adequate handling, those wastes harmfully impact water, ground or atmosphere.

From the different alternatives, composting was selected in terms of its technical, economic and environmental characteristics.

During 2010, a pilot project was developed at Villapinzón, composting 3 tons of solid wastes: hair filtrated in dehairing, and fleshings -those are trimmings generated in defleshing, after liming-. Fleshings contain lipids and proteins. Both residues are contaminated with sodium sulfide and lime.

OBJECTIVE

To reduce pollution levels in the tanneries' zone at Villapinzón and Chocontá (Colombia), by recycling solid waste from tanning through composting.

CHALLENGE

This research needed to engage entrepreneurs in managing their wastes (hair and fleshings). It developed knowledge transfer to a community that faces educational and social barriers.

BACKGROUND

In the year 2007, as result of the CP implementation in the area, the waste of each tanning process was identified, along with applicable and available techniques for recycling it. An experimental study was conducted for composting of dehairing waste and concluded that composting is a feasible technique for recycling dehairing wastes (Cuervo, 2008).

MATERIAL & METHODS

This composting process was aerobic, in piles, with manual mixing up. Seven piles of different composition were structured with two types of dehydrated wastes: hair and fleshings. The bulking agent was a combination of wood sawdust and zeolite and the two inoculums chosen were commercial microorganisms. Another two piles were structured without inoculums and zeolite and were used as control piles.

The measurement of temperature was undertaken daily for the first 8 weeks and afterwards at weeks 10, 13, and 18. At weeks 7 and 13, moisture content was determined for all piles. At week 10 there was proof of germination index, and the top 5 results were selected. At week 13 were analyzed physicochemical and microbiological parameters.

RESULTS

Composting took 5 months. The nine piles had a typical behaviour for composting for this kind of material, piles reached the thermophilic phase between weeks 2 and 3, from week 4 to 15 was presented the cooling stage, and beyond that of maturation stage (Figure 1). According to the seed survival indexes (66 – 85%), the best results were obtained for five compost piles. Only 2 piles complied with the requirement of total coliforms (Table 1). Better organic matter decomposition and less bad odours were identified at the piles with inoculums and zeolite compared with the control piles.

Figure 1 Temperature profiles and stage length

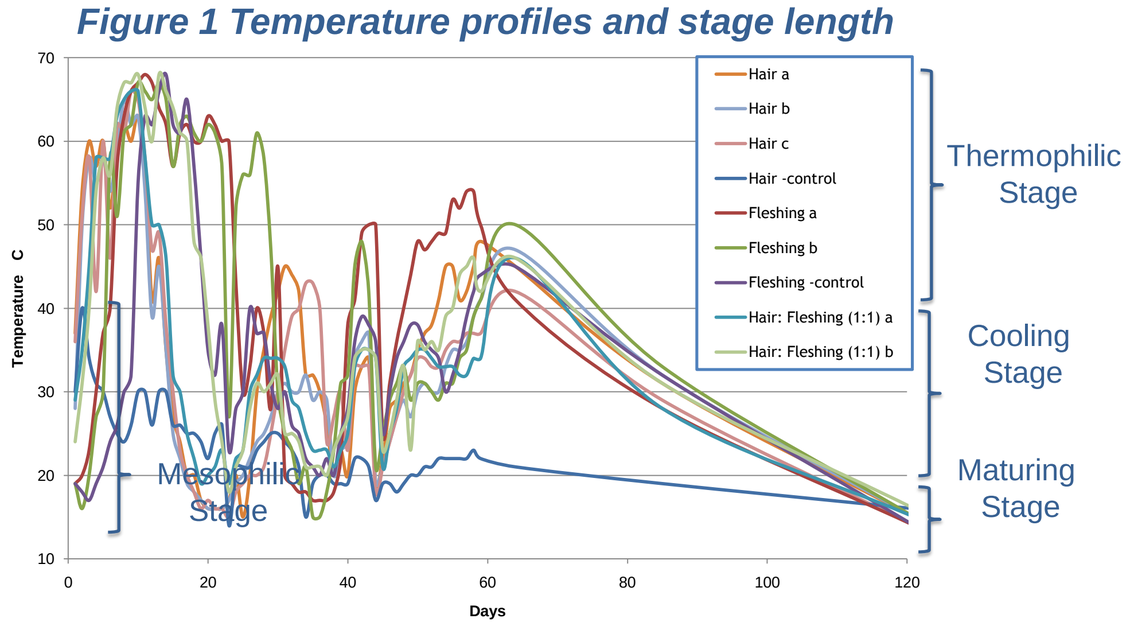

Table 1. Results at the end of the process

Parameter	Unit	Hair Pile control	Fleshing a	Fleshing b	Fleshing Pile control	Hair:Fleshing (1:1)
pH	-	7,6	7,41	7,47	7,63	7,44
Electrical conductivity	dS/m	9,85	7,31	6,86	12,08	10,11
Moisture	% w/w	61,95	41,89	55,47	62,76	57,57
Cationic Exchange Capability (CEC)	meq/100 g	24,58	60,2	16,74	25,84	25,03
Total Nitrogen	% w/w	1,27	0,79	0,14	0,45	0,92
Total Potassium	% w/w	0,03	0,052	0,14	0,041	0,04
Total Calcium	% w/w	1,75	2,48	1,6	1,43	1,91
Total phosphorus	% w/w	0,02	0,08	0,03	0,03	0,03
Total sulphur	% w/w	0,24	0,1	0,06	0,07	0,16
Total Oxidizable Organic Carbon	% w/w	14,55	18,88	16,51	13,99	16,09
Ratio C/N	-	11,46	23,90	117,93	31,09	17,49
Grasas y aceites totales	mg/kg	300	2760	2540	6960	670
Index of seed survival at 80 %w/w muestra	%	66,25	88,71	71,25	70,83	66,25
Azospirillium sp.	CFU/g	1,30E+10	1,90E+07	1,60E+08	7,50E+09	6,40E+08
Azotobacter sp.	CFU/g	4,70E+08	2,20E+07	6,30E+08	3,40E+09	3,40E+08
Phosphates dissolvers	CFU/g	4,00E+07	1,50E+07	5,50E+08	7,50E+08	3,50E+08
Salmonella sp	CFU/g	Absent	Absent	Absent	Absent	Absent
Fecal Coliforms	CFU/g	1,00E+01	1,00E+01	1,00E+01	1,00E+01	1,00E+01
Total Coliforms	CFU/g	1,00E+03	1,00E+01	4,50E+04	1,70E+07	1,50E+03

CONCLUSIONS

- The final compost obtained was a stable product, with an adequate agronomic value and degree of maturity.
- By the resulting composition of the physicochemical and microbiological analysis the product was classified as a "natural organic soil conditioner" according to the NTC norm 1927 (ICONTEC, 2001).
- Composting of hair, fleshing or a combination of both wastes has demonstrated being a feasible technical option in Villapinzón that positively impacts the environment.
- Through composting the tanners are learning to work jointly.

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