CO-COMPOSTING OF TANNERY LIMING SLUDGE AND WASTE SHEEP WOOL FOR AGRICULTURAL USE

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Leather manufacturing required a combination of chemical and mechanical operations. After soaking, animal skins undergo a chemical treatment to remove wool/hair using lime (CaO) and sodium sulfide (Na_2S), which is termed as liming. The liming produces a significant amount of wastewater with high content of Biochemical Oxygen Demand, Chemical Oxygen Demand, sulfide, fat/grease, non-collagenous protein, and chlorides. For sheepskin processing, chemically wool is removed and discharged as waste. The liming wastewater and waste sheep wool create environmental pollution. This study illustrates a windrow composting method for breaking down chemically treated sheep wool and tannery hair-burning liming sludge and associated materials.

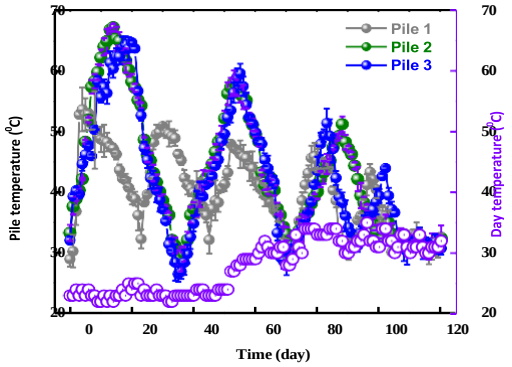

Figure 1. Temperature of each pile and day-temperature during composting

Table 1. Neutrient of the matured compost

Nutrient	Pile 1	Pile 2	Pile 3	Unit
Nitrogen (N)	2.5±0.6	1.8±0.8	3.0±0.3	%
Phosphorous (P)	0.2±0.01	0.7±0.1	0.5±0.1	%
Potassium (K)	0.5±0.1	0.7±0.02	0.8±0.1	%
Sulfur (S)	1.4±0.5	0.8±0.2	1.2±0.6	%

Three piles (Pile 1, Pile 2, and Pile 3) were constructed on a horizontal bamboo frame of mixed composting materials at different ratios to maintain carbon-to-nitrogen (C/N) 30:1. Each pile contained up to 800 kg and was kept for 120 days. Figure 1 depicts the temperature profile of the composting piles. The highest temperatures (ºC) of pile 1, pile 2, and pile 3 were observed at 52.81, 67.15, and 63.67, respectively, which ensured the completion of bacterial action. Nutrient of the final compost is demonstrated in Table 1 and they were within the Bangladesh standard. The heavy metals Cr, Zn, Fe, and Cu of the compost were analysed, and the highest amounts found among the piles were 2.03–4.03, 143.41–144.85, 20.73–21.62, and 11.94–22.89 mg/kg, correspondingly, in safe levels, and Cd, Pb, and Ni were undetectable. SEM micrograph shows the transformation of wool into compost. Cost analysis makes it affordable for field application. Germination of seed affirms the compost quality. This process determines the way to make a valuable product without having to treat waste like dehaired sheep wool and generated tannery hair-burning liming sludge. For reducing pollution in tannery, composting is a simple way that breaks down the cross-linked keratinous sheep wool.