Chapter 7
Valorization of Tannery Solid Waste Materials Using Microbial Techniques: Microbes in Tannery Solid Waste Management

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ABSTRACT
This chapter describes how environmental pollution is the major problem associated with rapid industrialization, due to which the quantity of solid waste generated from the industries is increasing substantially. Solid wastes generated in leather industries are briefly classified into pre-tanned and post-tanned wastes. Although landfills, composting, anaerobic digestion and thermal incineration are available for disposal of these solid wastes, they do again pose severe environmental and financial burdens to the tanners. Microbe-mediated tannery solid waste management points to the recovery of value-added products from these wastes. Microbial valorization of tannery solid wastes for the production of saleable products would be a convincing, challenging and eco-friendly opening for its utilization when compared to that of chemical and thermal hydrolysis. Exploitation of traditional chemicals could be reduced and innovative products could be recovered, enabling sustainable solid waste management. This would ultimately alleviate the solid waste disposal problems and financial crisis faced by the tanners.

DOI: 10.4018/978-1-5225-3540-9.ch007
INTRODUCTION

Globally, leather is one of the most widely traded products. Leather products are the greatest export earners. The drastic transformation of leather industries over years from a mere supplier of raw and tanned leather into a leading exporter of finished leather goods is due to the demand driven by several other industries for fashion and commercial purposes. Leather industries mark a prominent place in India’s economy. Tanning process is highly complicated and could be briefly classified into beam house and tanyard operations that involve various steps such as curing, soaking, dehairing, fleshing, deliming, pickling, tanning, wringing, splitting, shaving, re-tanning, fat-liquoring, buffing and finishing. Raw hides undergo these step-wise processes to transform into final leather product (Kanagaraj et al., 2006).

Leather processing industries are also well known for their disagreeable odor emanating from the effluents and solid wastes, causing severe environmental pollution. The drastic growth of tanneries is coupled with issues in discharging and dumping of tannery effluents and solid wastes respectively, enriched with organic, inorganic and chemical load. Protein and fat are the major components of these wastes. Due to the lack of proper waste management facilities and inferior infrastructure technologies, tanneries aggravate pollution problems day by day (Ahamed & Kashif, 2014).

Common effluent treatment plants and effluent treatment plants regularly monitor and help in safe discharge of treated tannery effluents into the disposal sites. Major problem of the industry that dominates wastewater/effluent treatment is the unhealthy disposal of solid wastes emanating from the tanning processes. These wastes remain unutilized or underutilized. They are found stagnated at a particular area within the industry, undergoing decomposition with a familiar putrefying smell of sulfide and ammonia gases. Available methods to dispose these wastes create secondary environmental pollution in terms of soil, water and air contamination. Eco-friendly strategies to minimize the tannery solid wastes and maximize their recycling are scarce. With this perspective, the objective of this chapter lies at featuring the role of microbes and related techniques in tannery solid waste management. Products acquired from microbial waste management and their possible utilization as a feed for several other industries has also being discussed (Thazeem et al., 2017b).

BACKGROUND

Leather industries aim at the transformation of putrescible (liable to decompose) animal raw hides and skins into a stable non-putrescible material (leather), ultimately resulting in the generation of solid as well as liquid wastes. An average of 250 kg non-tanned waste and 50,000 kg waste water is produced during one metric ton of raw hide processing (Sundar et al., 2011). Tanneries in India alone produce 150,000 tonnes of unutilized solid wastes out of the whole tanning process, which result in severe environmental threat (Rai et al., 2010). Many biological methods have been implemented to reduce environmental pollution emerging through tannery effluents (Bhaskar et al., 2007). Although numerous cleaner technologies and effluent treatment plants support in the alleviation of liquid waste generation, there remains inadequacy in the healthy disposal of solid waste among the tanners. One of the major issues faced by the leather industry lies at the improper disposal of solid waste generated during leather processing, with maximum waste emerging at the pre-tanning operations. From 1000 kg of raw hide, nearly 850 kg of solid wastes are generated which infers that only 150 kg of raw material is converted into finished leather. Tannery solid wastes consist of: fleshing waste (56-60%); skin trimmings (5-7%); chrome shaving, splits and
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