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Sequential Remediation Processes for a Low Level Pesticide Wastewater

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ABSTRACT

The aim of this study was to develop a remediation system for the treatment of a low-level pesticide wastewater that uses available onfarm organic matter as an absorption media, is capable of reducing the concentration of the pesticide to a safe level and is economically viable for implementation by farmers. The absorption capacity of chopped hay and soybean to the fungicide captan was evaluated under batch conditions and the effectiveness of the composting process in depredating captan in contaminated organic materials was evaluated. The results showed that both hay and soybean plant residues were very effective in absorbing 99.2% and 98.5% of captan form the wastewater after 4 hours, respectively. Because of its availability, hay can be used in an onfarm pesticide immobilization system that consists of shallow reinforced concrete pit (filled with hay) with steel bars across the top for machinery to roll onto and be washed. The wastewater can be retained for 24 hours which is a sufficient time for hay to absorb the captan. The contaminated hay can then be composted. The addition of used cooking oil raised the temperature of the composting mixture to 63?C. Small reductions in moisture content (from 60% to 58.9 %) and C:N ratio (from 30:1 to 28:1) were observed while reductions of 18.92%, 15.56% and 4.8% in the volatile solids, total carbon total Kjeldahl nitrogen were achieved after 10 d of composting, respectively. About 92.4% of the captan was degraded in the first 4 days of composting. Most of captan (92.4%) was degraded during the mesophilic stage (first 3 days). The degradation rate constant for the mesophilic stage (0.724 d^{-1}) was 2.74 times the degradation rate constant for the thermophilic stage (0.264 d^{-1}). An onfarm windrow composting process would be very effective in degrading captan contaminated hay. The captan contaminated hay could be mixed with equal amount poultry manure or dairy manure to provide the required bioavailable carbon and nutrients for the composting process. Some used cooking oil could also be added to maintain higher temperature within the compost matrix. The windrows should be mixed on a daily basis to provide sufficient oxygen for the composting microorganisms.

KEYWORDS

Pesticide; Captan; Soybeans; Hay; Absorption; Immobilization; Degradation; Composting

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