BIODEGRADATION OF NONWOVEN FABRICS IN SOIL

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Abstract

Biodegradation of nonwoven fabrics in aerobic surface soil may offer an alternative to landfills as a method of fabric disposal. A field study was conducted to determine the biodegradation rates of nonwoven rayon, cotton, polylactic acid, and polypropylene fabrics in a Captina silt loam soil under warm, moist conditions. Fabrics were placed in the soil at a depth of 10 cm and five replications of each fabric were excavated following 0, 7, 14, 21, and 28 days of burial to determine the amount of fabric remaining. The biodegradation of rayon and cotton was described using first-order kinetics and rate constants were determined to be 0.094 and 0.056/d, respectively. No biodegradation of polylactic acid and polypropylene was observed during 28 days. The half-life values, or time required for 50% loss of the materials, was 7.4 and 12.4 days for the nonwoven rayon and cotton, respectively. When sufficient fabric was recovered, the tearing and shear strength parameters were determined using standard methods. Data from the field study indicated that incorporation of the nonwoven rayon and cotton into surface soil may offer an effective alternative to landfills for fabric disposal.