Potential of Cold-Tolerant Microorganisms for Solid Waste Decomposition

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Abstract—*Microorganisms have been classified and identified on the basis of a variety of characteristics including morphological, growth, tolerance, metabolic, biochemical, and genetic. In this study microorganisms from the temperate regions were isolated and screened to find out the most efficient isolate with the capability for the degradation of solid wastes. The bacteria were isolated from the natural habitat and were screened for their capability of producing various enzymes like Amylase Cellulase, Cmcase, Xylanase and Protease. Three identified isolates, Brevunvimonas naejangsanensis, Alcaligenes faecalis (parafaecalis) and Alcaligenes faecalis isolated from Gulmarg, Phalagam and Drass respectively were used for the decomposition studies. The isolates with the overall best enzymatic activities were used in different effective concentrations for the degradation of the solid wastes under in vitro conditions. During in vitro decomposition of wastes using cold tolerant microbes, agricultural and municipal wastes treated with Alcaligenes faecalis at a concentration of 5 x 107 cfu ml-1 exhibited faster decomposition followed by Alcaligenes faecalis (parafaecalis) and Brevunvimonas naejangsanensis. During in vivo degradation of wastes using Alcaligenes faecalis, maturation time was decreased up to 65 and 69 days from 85 and 82 days in potential microbes treated municipal and agricultural wastes as compared to their respective controls. Likewise, volume reduction was observed 51 and 53% in treated agricultural and municipal wastes as compared to their respective controls 29 and 37% respectively. There was a significant decrease observed in the C/N ratio was also observed 16.568 and 13.963 % in agricultural and municipal treatments compared to their respective controls 20.876 and 23.837% respectively. Total Nitrogen content showed increasing trend both in vitro and in vivo treatments as 1.987%, 1.653% and 1.690%, 1.313% in agricultural and municipal treatments compared to their respective controls 1.657 and 1.453% respectively. Total phosphorus in vitro and in vivo treatments 0.727%, 0.532%, 0.567% and 0.450% in agricultural and municipal wastes with their respective controls showing 0.543 and 0.270% respectively. Total Mg2+ content ranged from 0.916 and 0.823% in in vitro and in vivo treatments with their respective controls having 1.271 and 0.513%. The total sulfur content of agricultural and municipal wastes in vitro and in vivo treatments was found 0.667 and 0.250% compared with their respective controls 0.110 and 0.090% respectively. The population of viable bacteria, fungi, phosphorus solubilizing bacteria and actinomycetes were found in treated agricultural and municipal wastes in high range in in vitro treatments 45 x 106, 21 x 106, 19 x 106, 10 x 106 g-1 as compared to their controls 16 x 106, 14 x 106, 05 x 106, 07 x 106 g-1 respectively, and in vivo treatments 35 x 106, 19 x 106, 10 x 106, 07 x 106 g-1. The treatments in vitro and in vivo showed a significant in the effective concentrations of the nutrients and were able to decompose the solid wastes at faster rates as compared to the controls.*

Key words*: Enzymes, solid wastes, efficient microorganisms and nutrients.*