ONLINE ISSN : 1349-1008
PRINT ISSN : 1343-943X

Plant Production Science
Vol. 8 (2005) , No. 4 475-481

Effects of Soil Moisture and Temperature on Decomposition Rates of Some Waste Materials from Agriculture and Agro-industry

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(Received: April 7, 2004)

Abstract: The effect of soil moisture and temperature on decomposition of waste materials, bagasse, coir dust, rice chaff and rice straw, in soil were examined by measuring the decrease in weight of and CO_2 generation from each waste material. The rate of the decrease in weight increased as temperature rose, and was highest in rice straw followed by bagasse, rice chaff and coir dust in this order, irrespective of soil moisture and temperature level. In all waste materials, the rate of decrease in weight was highest in the soil holding the water equivalent to field capacity (saturated soil) followed by submerged soil and dry soil in this order. CO_2 generation rate was also highest in rice straw followed by bagasse, rice chaff and coir dust. It was highest in saturated soil followed by half-saturated or submerged soil and dry soil in this order. The rate of CO_2 generation from rice straw in saturated soil was highest at the initial period of incubation and it decreased thereafter, but the rate in submerged soil was highest at 40 and 20 days after the start of incubation at 20 and 35°C, respectively. The rate of CO_2 generation from coir dust and rice chaff was very low at all soil moisture levels at either 20 or 35°C. The content of total N in the waste materials was positively and significantly correlated with the rate of decrease in weight in saturated and submerged soils at a moderate temperature (Oct.—Dec.), and in submerged soil at a high temperature (Aug.—Oct.). It was also significantly correlated with CO_2 generation rate in submerged soil at 20°C. Holocellulose and hemicellulose contents were negatively and significantly correlated with CO_2 generation rate in dry soil at 20°C. Lignin content was also

significantly and negatively correlated with CO_2 generation in dry soil at 35°C.

Keywords: CO_2 generation, Decomposition rate, Soil moisture, Soil temperature, Waste materials

To cite this article:

Chaisit Thongjoo, Shuichi Miyagawa and Nobumitsu Kawakubo: “Effects of Soil Moisture and Temperature on Decomposition Rates of Some Waste Materials from Agriculture and Agro-industry”. Plant Production Science, Vol. **8**, pp.475-481 (2005) .

doi:10.1626/pps.8.475
JOI JST.JSTAGE/pps/8.475