B-82: Emission of nitrous oxide, nitrogen and methane in palm oil sludge-amended soil

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Improper incorporation of organic matter on arable land, pollutes the atmosphere and reduces the potential value of fertility, specially the nitrogen value of agricultural lands due to emission of gases through the process of denitrification and methanogenesis. Nitrous oxide and CH_4 are specially responsible for the atmospheric warming and destruction of the ozone layer. Present practices to minimize the emission of these gases are scanty. Hence a study was commenced to find out the effect of pore size distribution under different organic matter amendments on the emission rates of N_2O, N_2 and CH_4, because such information will be useful in identifying contributing measures. Palm oil sludge (POS) was used as the source of organic matter. This was incorporated with sandy loam soil to make different POS-soil mixtures. The amount of N_2O, N_2 and CH_4 emitted in each POS-soil mixture was quantitatively estimated daily, using "Poropak Q" column containing flame-ionization-detector. The pore size arrangement of POS-soil mixtures was studied by scanning electron microscopy (SEM). The results revealed that lower and higher rates of POS amendments enhanced the emission rate of N_2O, N_2 and CH_4. Significant reduction ($P > 0.001$) in the emission rates of above gases was observed at the rates of 15% amendment compared to the higher and lower rates, due to proper pore size arrangement. Estimated reduction in emission rates of N_2O, N_2 and CH_4 were 73.6, 391.7 and 231.3 μg/g/day respectively at the 15% POS mixture. Scanning electron microscopic study revealed that there was considerable blocking of macro pores of sandy loam soil by POS particles giving rise to a large number of micropores. This creates anaerobic conditions due to increased moisture retention and reduced oxygen penetration, which may have resulted in the varying emission rates of gases in different POS-soil mixtures.

Financial assistance by the Malaysian Government for MSc study is acknowledged.