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ABSTRACT

Emission of methane has become a problem in the past decades worldwide. It is believed to have adverse effects on climate change as it is said to be 21 times more potent than carbon dioxide. The main source of methane emission is landfills, which are thus far, the cheapest and most commonly used method of waste disposal. Methane is produced anaerobically by methanogenic bacteria in the landfills and is supposed to be oxidised by soil bacteria in the aerobic region. However, some is lost in the atmosphere.

In this study, we observed the effect of different soils that can be used as landfill cover soil, on the compaction and methane oxidation. Three soil types namely garden soil, sandy soil and uncultivated (veld) soil while landfill soil was a control. At the start of the experiment in a simulated laboratory scale, the soils had bacterial counts of 7.5 log cfu/ml, 5.0 log cfu/ml and 7.0 log cfu/ml respectively. Methane production was at 6% and the reduction levels per soil were 0%, 1% and 0% respectively. Due to less methane production, the waste composition was changed to increase putrecibles, and methane production was increased to approximately 8% on average. The oxidation was not improved, however, addition of compost in the soil at 10% showed better methane oxidation. The soils were further inoculated with isolated cultures from soils and that had little effect on methane oxidation. From this, we concluded that the bacterial numbers had little effect on methane oxidation but addition of organic matter improved oxidation rate. The soil properties showed that garden soil was porous and could not hold together. Sandy soil on the other hand, had little clay and loses water quickly which is one of the parameters for methane oxidation. These two factors may cause soil land shift and expose waste. Veld soil in comparison with the two above, had enough clay and could be compacted better. Although garden soil oxidized methane better that the other soils, the veld soil is recommended as it is more workable than the rest of the soils.

Waste on the other hand, showed that increased putrecibles increased production of methane. However, like in soil experiment, addition of cow dung as extra inoculum had no effect on methane production. The counts were at 5 log cfu/ml at start and ended at 8 log cfu/ml with addition of sewage and cowdung.

The leachate varied with the age of he experiment that is, from straw yellow in week one to blackish-brown in week six. From scanning electron microscope, thee was yeast presence in leachate and resulted in fermentation.

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