

Land Restoration of Closed Landfill

Mohd Kamil Yusoff¹, Mohd Razi Ismail² and Nik Muhamad Nik Majid³, Azizi Muda¹, Wan Nor Azmin Sulaiman¹, Mohd Nasir Hassan¹ and Shaharin Ibrahim⁴

Faculty of Science and Environmental Studies
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor
Malaysia

E-mail of Corresponding Author: mkamil@fsas.upm.edu.my

Key words: closed landfill, leachate, water quality status, water quality index, pollutant.

Introduction

The widely used disposal method of municipal solid wastes is landfill due to its low management cost and provide a good service if properly implemented. However, the inefficiency of landfill management will cause environmental contamination. The most apparent contamination cases are surface and ground water contamination and soil pollution (Albaiges *et al.*, 1986; Husain *et al.*, 1987). Many studies showed that the composition of landfill leachate varies and contain high concentration of heavy metals and organic compounds.

Materials and Methods

The experiment was conducted to study the effect of leachate production on downstream river water quality status at the closed landfill site (field study) and the effect of the landfill leachate on the growth of vegetable crop (*Brassica chinensis*) and iron concentration in the leaf (pot study). The rehabilitation potential using fast growing forest species was studied in experimental plot.

Results and Discussion

Water quality study

The results showed that the water quality deteriorated significantly in terms of chemical oxygen demand, ammoniacal-nitrogen, dissolved oxygen, biochemical oxygen demand and total dissolved solids. The deterioration of water quality status was clearly showed by the water quality index, where the status changed from Class III to Class IV after passing through the

closed landfill site. The change in the status is mainly contributed by the leachate from the closed landfill site.

Effect of landfill leachate on vegetable crop (*B. chinensis*)

The application of landfill leachate increased the dry matter yield of *B. chinensis* in the range of 59.2% to 95.7% compared to control (treatment without leachate). The accumulation of iron in *B. chinensis* depends on the stage of growth and level of leachate application. *B. chinensis* treated with landfill leachate has accumulated iron in the range of 22.5% to 38.4% higher than the treatment without leachate during the mature stage.

Rehabilitation using fast growing forest species

Acacia mangium was selected for rehabilitation of closed landfill site. The experiment was carried out using RCBD design. The trees were monitored in terms of growth (stem size and height increment). As a control, the trees were planted on non-landfill site. From preliminary results, it showed that *A. mangium* can survive very well and has a potential to convert the degraded land such as closed landfill site into productive land in terms of softwood production.

Conclusions

The contribution of pollutants from landfill leachate affect the river water quality status significantly in the downstream end. The study shows that leachate can also be used as nutrient supplement for the vegetable crops but at certain level it will enhance iron accumulation in the leaf.

Acacia mangium has a potential to convert the degraded land (closed landfill site) into productive land in terms of softwood production.

Benefits from the study

The study reveals that improper landfill management is hazardous to environment especially in terms of surface water quality degradation. The use of leachate as in irrigation could cause iron accumulation in leafy vegetable. The study suggests that closed landfill sites can be turned into productive land especially for parks and softwood plantation.

Literature cited in the text

- Albaiges, J., Casado, F. and Ventura, F. 1986. Organic indicators of groundwater pollution by a sanitary landfill. *J. Water Res.* 22(9): 1153-1159.
- Husain, T., Hoda, A. and Khan, A. 1987. Impact of sanitary landfill on groundwater quality. *J. Water, Air and Soils Pollut.* 45:191-206.

Project Publications in Refereed Journals

None.

Project Publications in Conference Proceedings

- Mohd Kamil Yusoff. 1999. Effects of landfill sites on surface water quality. In : Proceedings of the Workshop on Landfill Sites. UPM, Serdang. 25-26 August 1999.

Graduate Research

None.