

SUMMARY OF FINDINGS

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Spent mushroom compost (SMC) management and options for use

Author: Siobhán N. Jordan, Laura B. Holland, S. Linnane
Lead Organisation: Dundalk Institute of Technology

A detailed study on the use of spent mushroom compost to remediate acidic mine drainage in a constructed wetlands trial was completed. The results of the small-scale greenhouse trial have shown the promising capacity of the SMC anaerobic wetland to neutralise the acidic sulphur enriched drainage, sustain the buffering capacity of the system over an extended period of time and satisfactorily remove high levels of heavy metals from the contaminated mine drainage.

Key Words

Water Framework Directive; European Communities (Good Agricultural Practice for Protection of Waters) Regulations; Spent mushroom compost, Acid Mine Drainage.

Background(5-10 lines)

Spent mushroom compost (SMC) is becoming available in increasing quantities in Ireland, a fact that poses a great environmental challenge in terms of its effective disposal. SMC possesses a number of agronomic disadvantages in relation to its possible further use in horticulture or agriculture but it can be utilised successfully in the stabilisation of disturbed and commercial sites such as abandoned coalmines, mine sites, pipeline construction sites and industrial sites. The microbial activity of SMC, particularly the presence of the dissimilatory sulphate reducing bacteria and the absorption capacity of the organic matter content within SMC, are attributed to the relevant pollutant removal properties associated with SMC.

Key points

- SMC is legislatively considered a waste in Ireland, yet it has a number of documented potential uses that would render it a valuable commercial resource. Mushroom farm environmental management plans are required in Ireland and if adhered to the suggested guidelines for normal farm operations, the correct use and disposal of all wastes from the mushroom industry would be virtually guaranteed. Based on the suggested best practice plan for Ireland, mushroom growers can opt for several best management practice scenarios to deal with waste

management, some of which do not require a waste permit, if treated in the correct manner.

- Spent mushroom compost has a good potential for use as a substrate for treating heavy metal contaminated wastewaters as it can provide an electron donor for the biological treatment of AMD and has the ability to biosorb heavy metals owing to the presence of various functional groups on the surface of the SMC.

Findings/Recommendations

- The results have shown the promising capacity of the small-scale greenhouse SMC anaerobic wetland to neutralise the acidic sulphur enriched drainage and sustain the buffering capacity of the system over an extended period of time. The results also suggest that the system is also capable of maintaining a reducing environment through the reduction of sulphates, organic substances and possibly the activity of methanogenic bacteria over a prolonged period of time.
- Spent mushroom compost has a good potential for use as a substrate for treating heavy metal contaminated wastewaters as it can provide an electron donor for the biological treatment of AMD and has the ability to biosorb heavy metals owing to the presence of various functional groups on the surface of the SMC.
- The removal of zinc and copper and to a lesser extent sulphate and iron, within the system also indicates that the system is capable of receiving a much larger volume of AMD as much of the removal took place in the first two cells of the four cell wetland trial. The results are promising and indicate that this wetlands system may indeed prove to offer a long-term waste management option for SMC in Ireland, and also present an effective alternative to treating AMD.
- However, the presence of elevated levels of organic substrates in the effluent leaving the system would suggest that the SMC wetland could possibly release nitrogen and phosphorus compounds during the treatment process and as a result, a sand filter or similar polisher may be required at the end of the wetland to remove any elevated nutrient concentrations.
- If such a system was employed to field scale, the most important parameter that should be continually logged remotely should be temperature as it had a significant impact on the ability of the system to remove particular contaminants. In the case of temperatures decreasing to less than 4°C over an extended period of time, the effluent should be re-circulated back into the system to prevent elevated contaminant concentrations entering freshwater systems in exceedance of appropriate EPA guidelines.
- The projected fate and life span of similar wetland systems should be modelled to predict their longevity and effectiveness in the field. It's recommended that a tracer dye would accurately quantify the retention time of the system which would aid in future attempts to use data modelling systems to assess the removal performance of the wetland system.

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- While most mushroom farm operations operate to stringent practices, the management of SMC and associated wastewater fall short of best practices and may become prospective pollutant sources. The introduction of regulatory best management practices in the form of mushroom farm environmental management plans (MFEMP) similar to those developed in Pennsylvania represent a simple management tool for monitoring the movement and utilisation of mushroom industry wastes throughout Ireland while complying with all aspects of S.I. No. 101 (2009). To ensure mushroom farms are operating to an appropriate environmental level, MFEMPs should be submitted to all relevant regulatory authorities.

For Further Information

Contact Dr. Siobhán Jordan (Applied Science Department, Dundalk Institute of Technology, Co. Louth, Ireland – siobhan.jordan@dkit.ie)

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Further Reading

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