

# CLOGGING AND FLOW REDUCTION IN SOIL MATERIALS BY PONDED HOG MANURE

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## Introduction

Earthen manure storages offer an economically viable means of storing manure as compared to concrete or steel tanks. Ground water contamination is a concern if improper soil materials are used or if improper construction techniques are used. Previous research done in Quebec has shown that liquid manure can cause clogging and a great reduction in seepage rates. We conducted a laboratory and field study to confirm these findings for Saskatchewan soil materials and conditions. Within this summary we present some of our laboratory findings.

## Experimental Procedure

We packed three replicates of seven different sub soil materials into a total of 21 clear plexiglass columns. The columns were first ponded and measured with water for 30 days, then with manure for 630 days, then with a 'chemical' manure that had a similar ionic composition as hog manure but without the organics. The columns were stored in a room at 6°C, so as to minimize biological effects. Over the period of 630 days two sets of replicates were taken apart for chemical and physical analysis. The soils were 20 cm thick with 60 cm of liquid ponded on them.

## Findings

Almost immediately after the soils were ponded with manure, flow was reduced by 100 to 1000 times with little effect by texture (see graph). A one mm black layer was observed at the manure/soil interface (photo). This layer grew (into the soil) to about 8 mm thick over the 630 days. The flow remained at these low values during the 630 days except twice when the cooling system had a 24 hr failure and the flow rates increased by five to 10 fold. After 630 days the manure and the black layer were carefully removed. A chemical solution similar to the manure, but having no solids, was then ponded on the soil columns. The flow rates increased to almost exactly what they were as measured with water, before the manure had been put on (see graph).

## Implications

Liquid hog manure can effectively clog soil pores, however the clogging can be easily disturbed and appears to be a surface effect. Warmer temperatures and biological activity might also disrupt this clogging effect. The presence of clogging should not be used as a substitute for properly chosen and well engineered earthen materials in manure storages.

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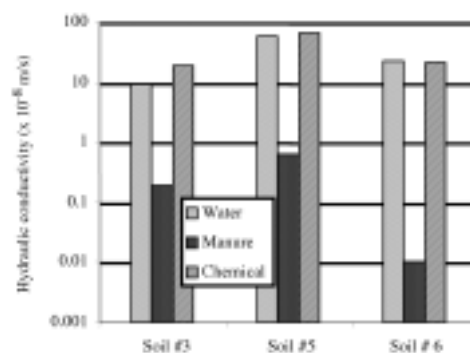
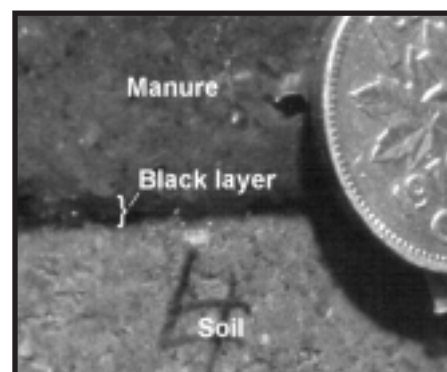


Figure 1. Effect of soil and ponded solution on hydraulic conductivity



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*Liquid manure can clog soil pores, but the effect is easily disturbed and can't substitute for proper earthen storage design.*