

Removal of phosphorus from drainage water using an enveloped tile drain

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Why ?

In Dutch surface waters, P concentrations are often too high and eutrophication is a major problem. Leaching of P from agricultural land contributes largely to the total P load of surface waters. However, with source-oriented measures such as equilibrium fertilization, in certain parts of the rural areas the primary objective of the Water Framework Directive will not be met. Therefore, additional measures are needed that can contribute to improving the chemical surface water quality.

Iron-coated sand



How ?

Iron-coated sand is a side product of drinking water production from anaerobic groundwater. Previous laboratory experiments showed that iron coated sand is able to bind a large amount of P*. It also has a sufficiently high hydraulic conductivity, which makes it suitable for field application for filtering water. We enveloped a tile drain with iron-coated sand, and compared concentrations of P in drainage water from the enveloped drain with water from control drains.



Tile drain, enveloped with iron-coated sand, wrapped in coconut.

* Chardon, W.J. et al. 2011. Use of reactive materials to bind phosphorus. J. Environ. Qual. in press.

Does it work ?

Yes, the average concentration of P in drainage water from the enveloped drain was 94 % lower than in drainage water from the two control drains.

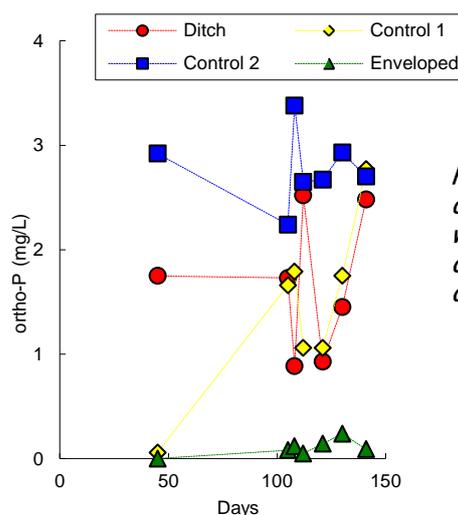


Fig. 1 Concentration of ortho-P in drainage water from enveloped drain, two control drains and ditch water

Side-effects and uncertainties ?

No indication was found of Fe being released from the enveloped drain; even less Fe was found in the drainage water (Fig. 2). Also no heavy metals were released, and redox potential of drainage water from the enveloped drain was higher than that from control drains.

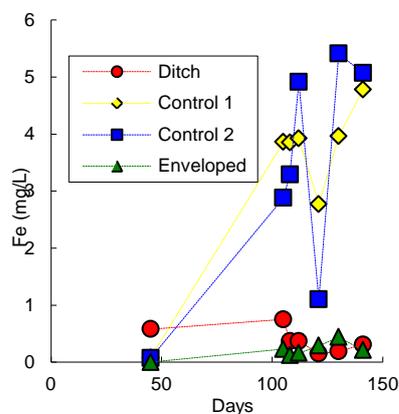


Fig. 2 Concentration of Fe in drainage water from enveloped drain, two control drains and ditch water

Although results are promising, field testing was done yet only during one winter season. Field testing has to be extended to learn more about long-term functioning of drains enveloped with iron-coated sand.