PHOSPHORUS LEACHING IN A SOIL TEXTURAL GRADIENT: INJECTION VS. SURFACE APPLICATION OF CATTLE SLURRY

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"Slurry injection reduces P leaching in soils with preferential flow, whereas slurry injection has less impact on P leaching in soils with matrix dominated flow"

HYPOTHESIS

Two protecting mechanisms obtained by injection:

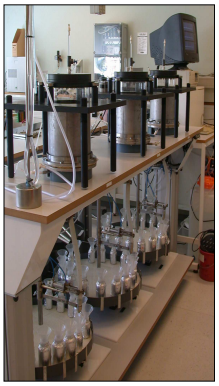
1. A physical protection of both reactive and nonreactive slurry components by dislocation of the slurry string away from the active flow paths for the infiltrating water
2. A chemical protection of reactive slurry components by optimizing the contact between slurry components and soil adsorption sites

EXPERIMENTAL DESIGN

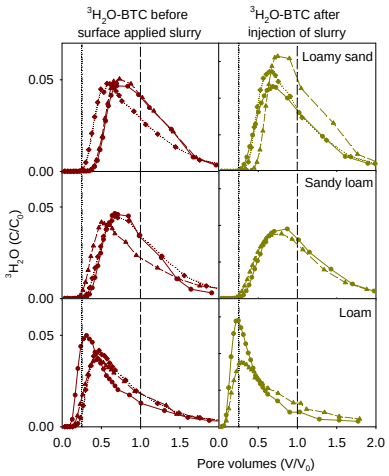
• Intact soil cores (20*20 cm)
loamy sand, sandy loam, loam

• Irrigation (2 mm h^{-1}) at near saturated conditions (-5 hPa)

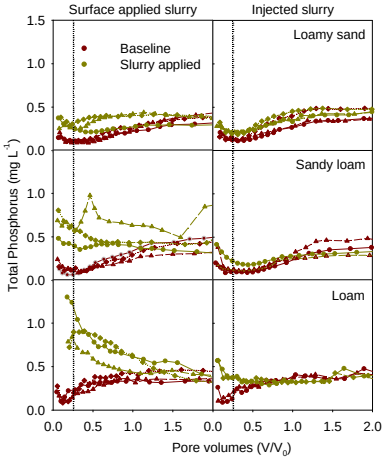
• Leaching experiments:
Baseline
Surface application
Injection



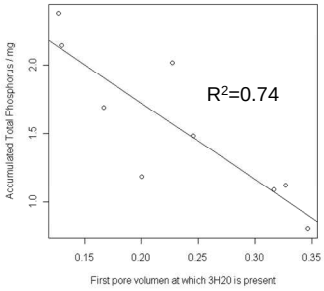
Increased preferential flow with increasing clay content



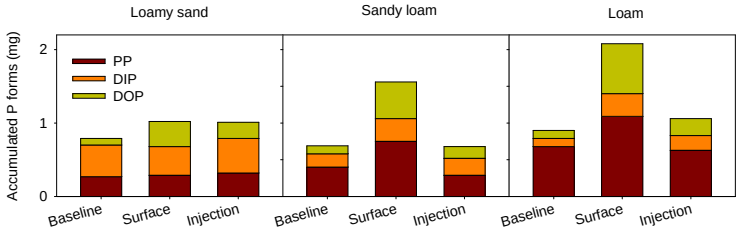
P leaching was reduced with injection in soils with increasing preferential flow



Correlation between preferential flow and P leaching



Leached P forms



PP: Particulate P, DIP: Dissolved inorganic P, DOP: Dissolved Organic P

Mass recovered P and Br

Soil	Surface applied slurry	Injected slurry	Surface applied slurry	Injected slurry
	% (P)		% (Br)	
Loamy sand	8.6	7.0	85.2	79.0
Sandy loam	27.2	-4.6†	73.6	73.7
Loam	30.2	3.6***	80.6	60.2*

† Negative values were obtained as less P was leached after injection than during the baseline study

CONCLUSIONS AND PERSPECTIVES

Slurry injection provided:

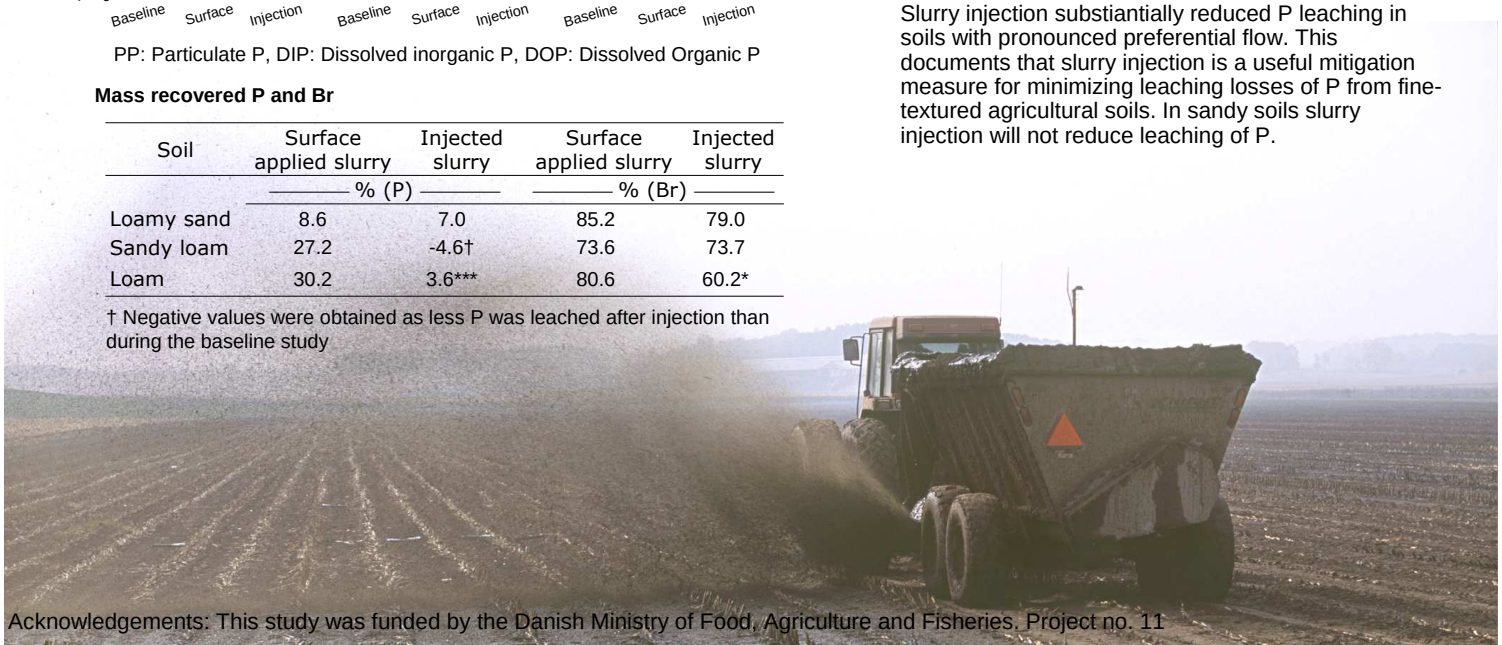
➢ Physical protection of non-reactive slurry components in loam

➢ Physical protection of particulate P in sandy loam and loam

➢ Chemical protection of dissolved P in sandy loam and loam

➢ No increased protection in loamy sand

Slurry injection substiantially reduced P leaching in soils with pronounced preferential flow. This documents that slurry injection is a useful mitigation measure for minimizing leaching losses of P from fine-textured agricultural soils. In sandy soils slurry injection will not reduce leaching of P.



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