Mobility of Fluopyram in soils under saturated flow conditions

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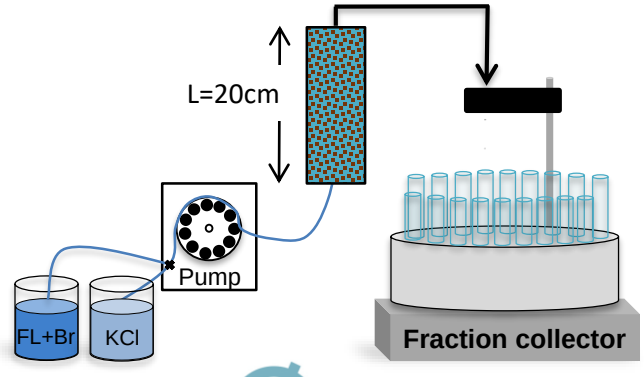
Objective

Quantify the adsorption and transport of the nematicide Fluopyram (FL) in 3 soils with different texture under increasing water flows

Material and Methods

- Equilibrium adsorption isotherm by batch method
- Flowthrough experiments under saturated water flow
- Chemical analysis by HPLC

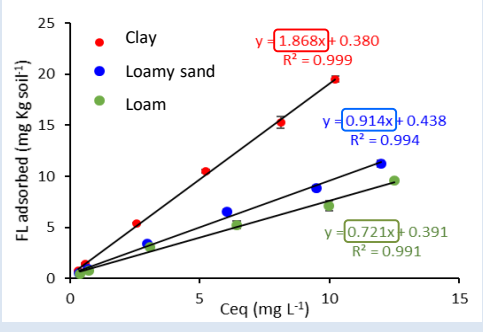


Soils

Soil	Sand	Silt	Clay	ρ_b [a]	$pH_{w1:1}$ [b]	$EC_{w1:1}$ [b]	OM
		(%)		g cm^{-3}	-	dS m^{-1}	%
Loamy sand (30°46' N; 35°16'E)	**82**	14	4	1.52	7.8	3.5	0.7
Loam (31°18' N; 34°31' E)	48	**40**	12	1.26	7.6	0.67	1.7
Clay (32°23′ N; 35°2′ E)	27	34	**39**	1.16	7.5	0.89	4.1

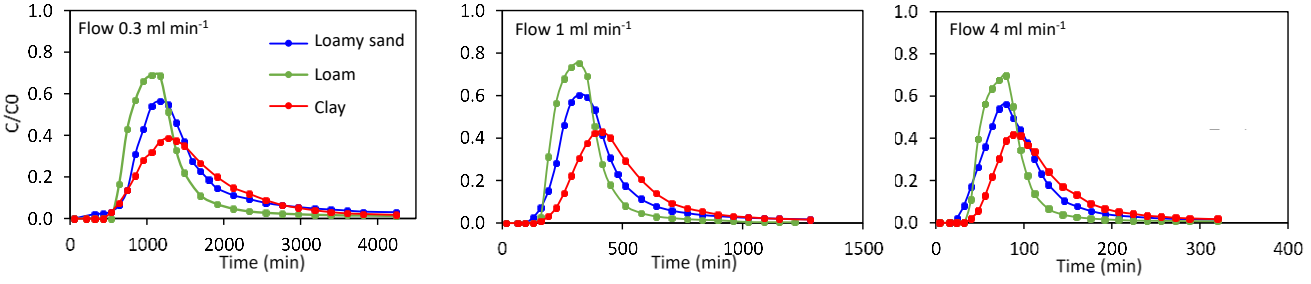
Results and Discussion

Equilibrium adsorption isotherms



Soils	K_d	K_{OM}
	L Kg^{-1}	L kg^{-1}
Loamy sand	0.914	129.1
Loam	0.721	41.7
Clay	1.868	45.9

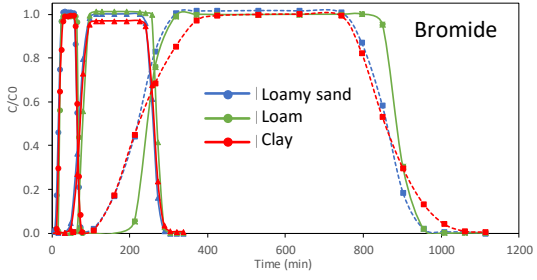
Fluopyram mobility



Soils	Q	Pulse duration	Applied Mass	FL recovery	Bromide recovery
	ml min^{-1}	min	mg	%	%
Loamy sand	0.3	53	1.5	89	102
	1	16	1.5	92	100
	4	4	1.6	91	101
Loam	0.3	53	1.6	87	101
	1	16	1.5	88	101
	4	4	1.6	81	99
Clay	0.3	53	1.5	80	100
	1	16	1.7	78	97
	4	4	1.4	78	97

FL-BTCs:

- In agreement with the adsorption isotherm.
- Larger retention time in clay.
- Sharp increase in concentration after pulse input and long tailing during leaching phase



Physical equilibrium:

- Bromide, used as a conservative tracer, exhibited symmetrical curves in all fluxes, with an average of 100% Br recovered

Results and Discussion

Sorption models

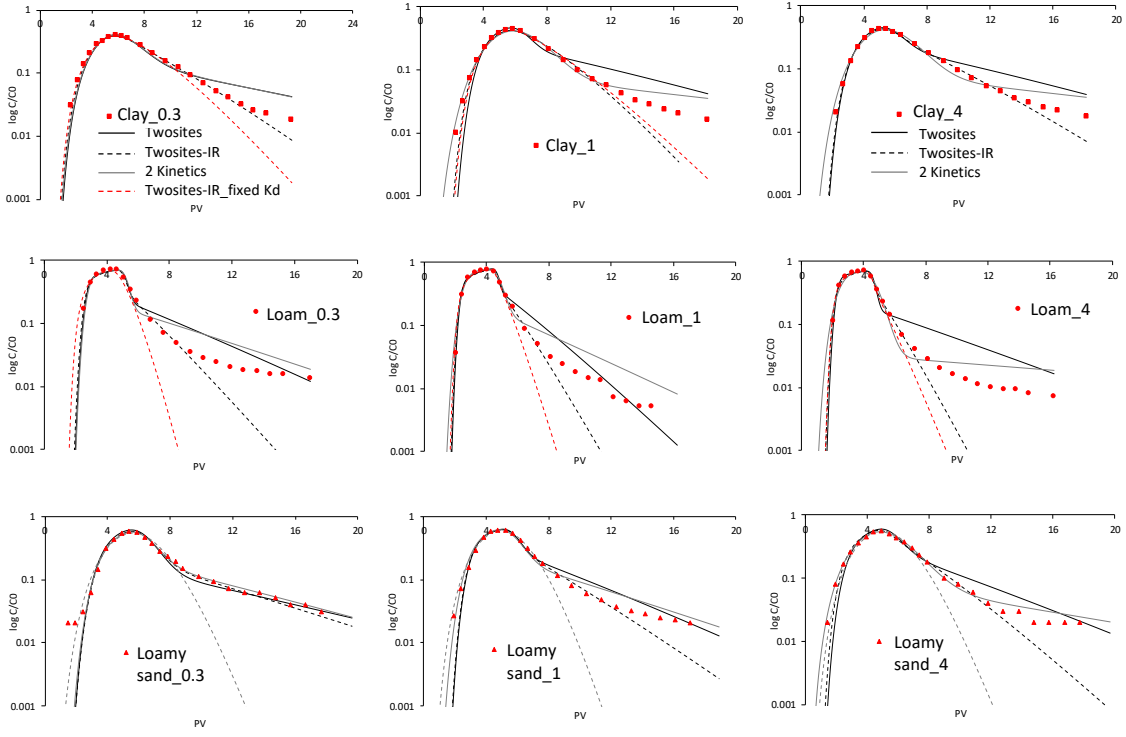
2 models evaluated:

- Two-sites model (TSM)
- Two-kinetic sites model

- When irreversibility (IR) is assumed, both models underestimated the tailing of BTCs; showing that instead of irreversible desorption, the long-term leaching behavior is due to a very slow desorption kinetics.

The results and models implied on:

- Rapid adsorption
- Slow kinetic release



Conclusions:

- Transport of FL is influenced by soil texture and slightly affected by flow rate
- FL has higher adsorption on clay, followed by loamy sand and loam soil
- Both models, TSM and 2 kinetic sites, using 2 adsorption sites can adequately describe the measured FL-BTCs