


Assessment of Metalaxyl migration through vadose zone of alluvial sandy soil using column experiment and HYDRUS numerical modeling

Valutazione della migrazione di metalaxyl nella zona vadosa di un sistema sabbioso alluvionale tramite colonne sperimentali e modellazione numerica con HYDRUS

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Supplementary information

Informazioni supplementari

FIGURES

FIGURE

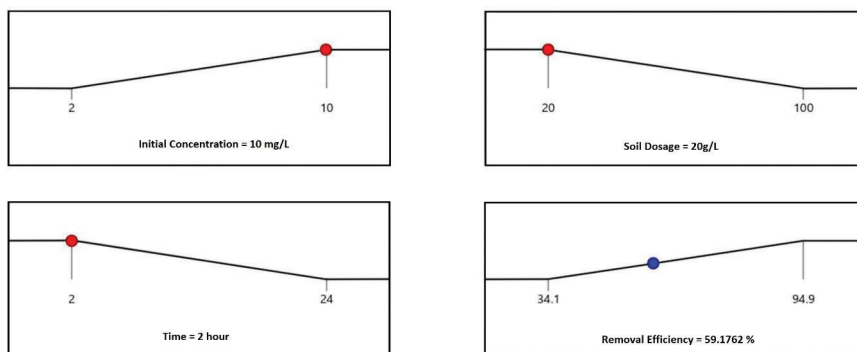


Fig. 1S - Ramp plots showing the optimization procedure.

Fig. 1S - Grafico a rampa rappresentante il processo di ottimizzazione.

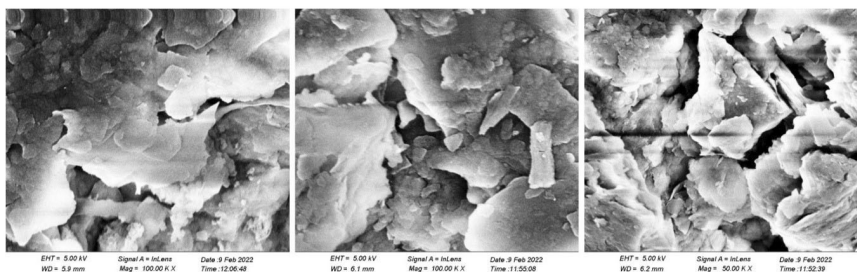


Fig. 2S - SEM images of S1, S2 and S3 before soil-column experiment.

Fig. 2S - Immagini al SEM dei campioni S1, S2 ed S3 precedenti al test in colonna.

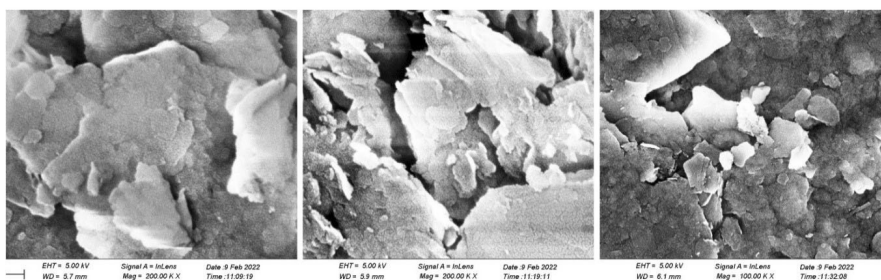


Fig. 3S - SEM images of S1, S2 and S3 after soil-column experiment.

Fig. 3S - Immagini al SEM dei campioni S1, S2 ed S3 successive al test in colonna.

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TABLE TABELLE

Tab. 1S - Pesticides used in different crops in Nadia District.

Tab. 1S - Pesticidi usati nelle diverse colture del distretto di Nadia.

Season	Crop	Pesticide Used	Solubility in water (mg/L)	GUS	References
Kharif	Rice and Jutes	Chlorpyrifos	1.05	0.58	(Saikat et al., 2016)
Pre kharif	Pointed Gourd	Azoxystorbin	6.7	2.1	(Banerjee et al., 2014)
	Okra	Cypermethrin	0.009	-1.99	(Banerjee et al., 2014)
	Blackgram	Carbendazim	8	2.21	(Abhisek, 2018)
	Maize	Imidachlorpid	610	3.69	(Kumar et al., 2013)
	Sesame	Dimethoate	25900	2.18	(Saikat et al., 2016)
Rabi	Mustard	Metalaxyl	8400	2.06	(Alagh, 1988)
	Cauliflower	Acephate and Carbendazim	790000; 8	1.14; 2.21	(Saikat et al., 2016)
	Chilli	Imidachlorpid	510	3.69	(Saikat et al., 2016)
	Brinjal	Carbendazim and Mancozeb	8; 6.2	2.21; -1.45	(Prem et al., 2009)
	Tomato	Metalaxyl- mancozeb and Cypermethrin	8400; 6.2; 0.009	2.06; -1.45; -1.99	(Prem et al., 2009)
	Potato	Metalaxyl-mancozeb and Cymoxanil- mancozeb	8400; 6.2; 780; 6.2	2.06; -1.45; 1.47; -1.45	(Saikat et al., 2016)
	Capsicum	Carbendazim	8	2.21	(Alagh, 1988)
	Cabbage	Trifloxystrobin and Tebuconazole	0.61; 36	0.15; 1.86	(Saikat et al., 2016)
Orchard crops	Groundnut	Imidachlorpid and Triazophos	510; 35	3.69; 1.38	(Alagh, 1988; Kumar et al., 2013)
	Mango	Mancozeb and Acetamiprid	6.2; 2950	-1.45; 0.904	(Abhilash et al., 2009)
	Banana	Aldrin	0.027	-0.62	(Abhilash et al., 2009)
	Guava	Triazaphos and Carbendazim	35; 8	1.38; 2.21	(Abhilash et al., 2009)

Tab. 2S - Concentration of metalaxyl in groundwater samples collected.

Tab. 2S - Concentrazione di metalaxyl nei campioni di acqua sotterranea raccolti.

Sample ID	Latitude	Longitude	Metalaxyl conc.(ppb)	SD	Sample ID	Latitude	Longitude	Metalaxyl conc. (ppb)	SD
G1	23.0359	88.494	1.34	0.045	G17	22.97498	88.59819	0.81	0.023
G2	22.96815	88.51757	0.533	0.03	G18	23.08824	88.51364	2.34	0.148
G3	22.96475	88.51859	472.9	4.45	G19	23.08925	88.51544	10.37	0.165
G4	22.98699	88.52731	5.63	0.419	G20	23.08944	88.51559	7.26	0.27
G5	22.98891	88.52377	0.13	0.051	G21	23.08907	88.51505	0.54	0.04
G6	22.99377	88.50855	2.33	0.153	G22	23.19907	88.62279	3.08	0.09
G7	23.0358	88.49398	0.33	0.035	G23	23.19927	88.62289	1.62	0.258
G8	23.03472	88.48171	2.66	0.364	G24	23.19947	88.62299	0.45	0.085
G9	23.03489	88.46695	1.09	0.098	G25	23.18521	88.6255	0.41	0.025
G10	22.96858	88.55159	11.39	0.251	G26	23.16634	88.6379	6.28	0.1
G11	22.97281	88.54636	21.68	0.305	G27	23.15997	88.66215	0.08	0.015
G12	22.97275	88.54628	2.43	0.305	G28	23.15738	88.65846	12.02	0.142
G13	22.97331	88.5979	6.43	0.214	G29	23.15379	88.65909	1.83	0.142
G14	22.97428	88.59863	3.76	0.242	G30	23.45386	88.65882	395.79	2.99
G15	22.97525	88.59802	2.03	0.16	G31	23.15361	88.65931	181.81	1.572
G16	22.97538	88.59823	0.52	0.031	G32	23.15332	88.65957	5.43	0.305

Tab. 3S - Values of unsaturated parameters used for numerical modeling.

Tab. 3S - Valori dei parametri della zona vadosa usati nel modello numerico.

S.No.	Unsaturated parameters	Soil samples		
		S1	S2	S3
1	θ_r (cm ³ /cm ³)	0.0531	0.0472	0.0441
2	θ_s (cm ³ /cm ³)	0.2325	0.24	0.254
3	α (cm ⁻¹)	0.0279	0.0309	0.0345
4	n	1.94	3.1251	3.1324

Tab. 4S - Parameters and corresponding values used for the calculation of the Groundwater Ubiquity Score (GUS score).

Tab. 4S - Parametri e valori corrispondenti usati nel calcolo del Groundwater Ubiquity Score (GUS score).

S.No.	Sample	Organic carbon (OC)	Sorption coefficient (KD)	Pesticide's organic carbon sorption coefficient (KOC)	Half life ($\tau^{1/2}$)	GUS	Average GUS
1	S1	0.791	1.746	220.73	400	4.30	
2	S2	0.79	0.42	53.16	400	5.91	4.60
3	S3	0.788	3.293	417.89	400	3.58	

Tab. 5S - Elemental composition of the soil samples S1, S2 and S3 (in weight %) before and after the soil column test.

Tab. 5S - Composizione elementare dei campioni di suolo S1, S2 ed S3 (in percentuale di peso) prima e dopo il test in colonna.

Element	S1		S2		S3	
	Before	After	Before	After	Before	After
C	0	0	0	0	0.2	0
B	3.9	4.4	0	5.4	0	3.6
O	55.8	49.6	0	49.4	55.6	54.6
Na	0.9	0.7	2	0.6	0	1.1
Mg	1.5	2.4	1.4	1.5	2.6	0.8
Al	6.2	10.9	12.4	8.3	9.2	9
Si	26.7	21	24.1	26.7	21.3	21.8
K	1.3	2.5	2.1	1.8	2.3	6.9
Ca	0.6	1.4	2.2	0.9	0.8	0.5
Fe	3.1	7.1	10	5.4	6.4	1.7
Ti	0	0	0	0	1.6	0