Nano sized *Moringa oleifera* an Effective Strategy

For Pb(II) ions Removal from Aqueous Solution

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Table S1: Pb^{2+} ions Removal Efficiency and q_e at Different Initial Concentration

C_o (mg/L)	C_e (mg/L)	Pb^{2+} ions R. E %	q_e
10	0.42	95.83	1.6
20	1.13	94.36	3.15
50	4.16	91.68	7.64
100	14.58	85.42	14.24
200	49.32	75.34	25.11
300	93.24	68.92	34.46
400	172.56	56.86	37.91

Table S2: Pb^{2+} ions removal efficiency q_e at initial concentration of 20 mg/L at different pH values**.**

pH	C_o(mg/L)	C_e(mg/L)	Pb^{2+} R. E %	q_e
2	20	7.72	61.4	2.05
4	20	3.65	81.76	2.73
5	20	1.13	94.36	3.15
6	20	1.92	90.4	3.01
7	20	2.1	89.5	2.98
8	20	3.27	83.66	2.79
10	20	3.14	84.28	2.81

Table S3: Pb^{2+} ions removal efficiency and q_e at initial concentrations 20 mg/L and different biosorbent dosage

Biosorbent dosage	C_o (mg/L)	C_e(mg/L)	Pb^{2+}ionsR. E %	q_e
25	20	6.75	66.25	26.5
50	20	5.9	70.5	14.1
100	20	4.14	79.3	7.93
200	20	1.87	90.67	4.54
300	20	1.13	94.36	3.15
400	20	0.96	95.2	2.38
500	20	0.73	96.36	1.93

Table S4: Effect of contact time on Pb^{2+} ions removal efficiency and q_e at different Initial concentrations (10, 30, 50) mg/L by *Moringa oleifera*

Time (min)	Pb R. E % at C_o (10 mg/L)	Pb R. E % at C_o (30 mg/L)	Pb R. E% at C_o (50 mg/L)	q_t at C_o (10mg/L)	q_t at C_o (30mg/L)	q_t at C_o (50mg/L)	C_t at C_o (10mg/L)	C_t at C_o (30mg/L)	C_t at C_o (50mg/L)
20	78.55	73.01	69.3	1.4	4.1	6.69	1.61	5.41	9.84
40	86.3	80.88	80.79	1.52	4.3	7.20	0.9	4.1	6.74
60	95.83	90.76	91.68	1.57	4.53	7.52	0.57	2.81	4.9
80	96.15	91.19	92.2	1.58	4.59	7.54	0.52	2.5	4.75
120	96.21	91.4	92.5	1.58	4.6	7.59	0.503	2.4	4.65

Table S5: Effect of temperature on Pb^{2+} ions removal efficiency and q_e at different initial concentrations (10, 20, 50) mg/L by *Moringa oleifera*

Temp. (^oC)	Pb R. E % at C_o (10 mg/L)	Pb R. E% at C_o (20 mg/L)	Pb R. E % at C_o (50 mg/L)	q_e at C_o (10mg/L)	q_e at C_o (20mg/L)	q_e at C_o (50mg/L)	C_e at C_o (10mg/L)	C_e at C_o (20mg/L)	C_e at C_o (50mg/L)
25	95.16	94.36	91.68	1.586	3.15	7.64	0.48	1. 13	4.16
30	95.83	94.7	92.2	1.59	3.16	7.68	0.42	1.06	3.9
40	96.7	95.5	93.2	1.61	3.18	7.77	0.33	0.9	3.4
50	96.2	95.3	92.76	1.6	3.178	7.73	0.38	0.93	3.62

Table S6: Isotherm constants of Pb^{2+} ions biosorption on *Moringa oleifera* at various temperatures.

T (K)	Langmuir			Friendlich		
	q_m	b	R^2	n	Kf	R^2
298	15.65	0.23	0.9974	1.38	2.76	0.998
303	14.78	0.27	0.9843	1.43	2.98	0.9996
313	13.94	0.36	0.9748	1.484	3.4	1
323	14.34	0.32	0.9946	1.483	3.41	1

Table S7: A dimensionless constant separator factor (R_L) for Langmuir type biosorption process.

C_o(mg/L)	R_L at 25^{o}C	R_L at 30^{o}C	$R_L$at 40^{o}C	R_L at 50^{o}C
10	0.303	0.27	0.217	0.238
20	0.178	0.156	0.122	0.135
50	0.08	0.069	0.053	0.059