

Supporting Information

Elucidating the cellular adaptive response of *Coccomyxa* sp. upon exposure to PVC-nanoplastics (PVC-NPs) for production of bioenergy molecules

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Running Title: Adaptive responses of microalga upon PVC-nanoplastics exposure

Keywords: Polyvinyl chloride nanoplastics (PVC-NPs); Phycoremediation; Hetero-aggregation; Oxidative stress; Extracellular polymeric substances (EPS); Microalgal Biorefinery

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Fig. S1 (A) Cultures of *Coccomyxa* sp. in the presence of different concentrations of PVC-NPs (0, 10, 50, and 100 ppm), **(B)** 100 ppm PVC-NPs treated culture showing pronounced hetero-aggregate formation.

(A)



(B)

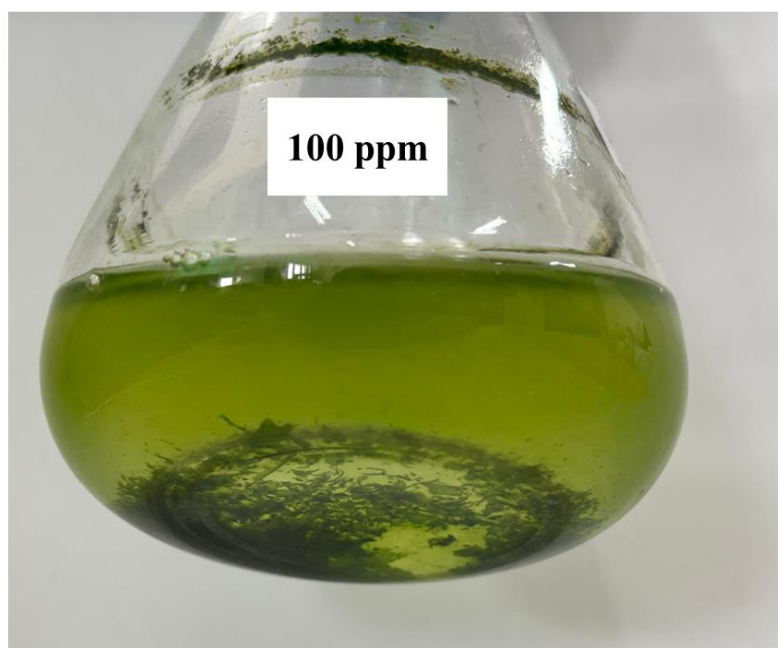


Fig. S2 Growth curve of *Coccomyxa* sp. (based on cell count) under Control (green) and different PVC-NPs concentrations- 10 ppm (pink), 50 ppm (blue), and 100 ppm (red).

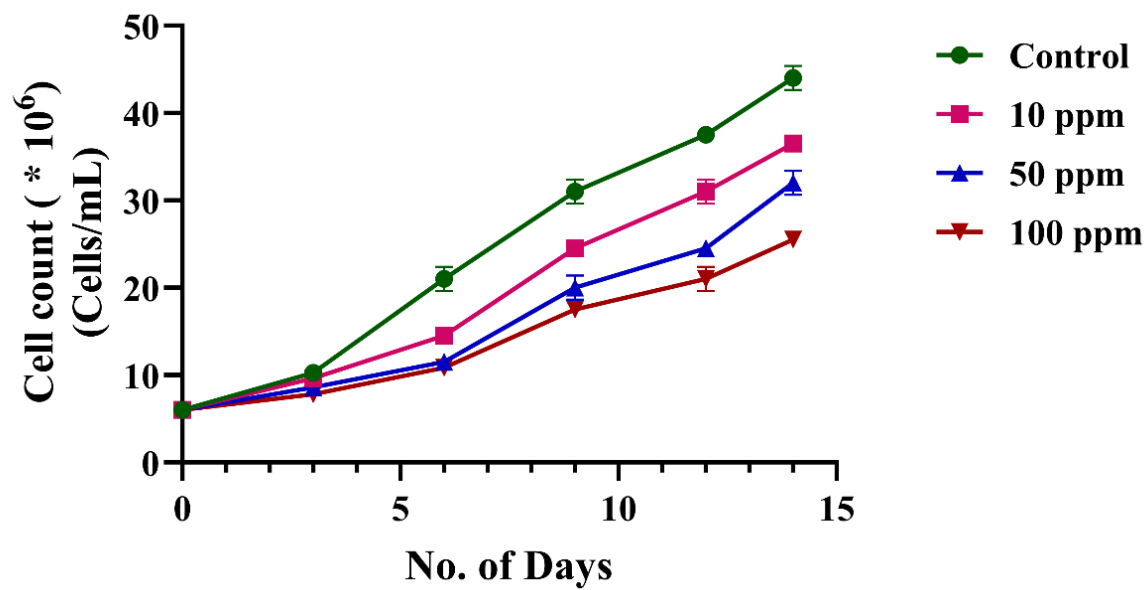


Fig. S3 EDX analysis of the cell surface of *Coccomyxa* sp. IITRSTKM4 for (A) Control, (B) 10 ppm, (C) 50 ppm, and (D) 100 ppm PVC-NPs spiked cultures, showing the presence of Chlorine (Cl) (marked with a red circle) and its weight% (marked with a yellow rectangle).

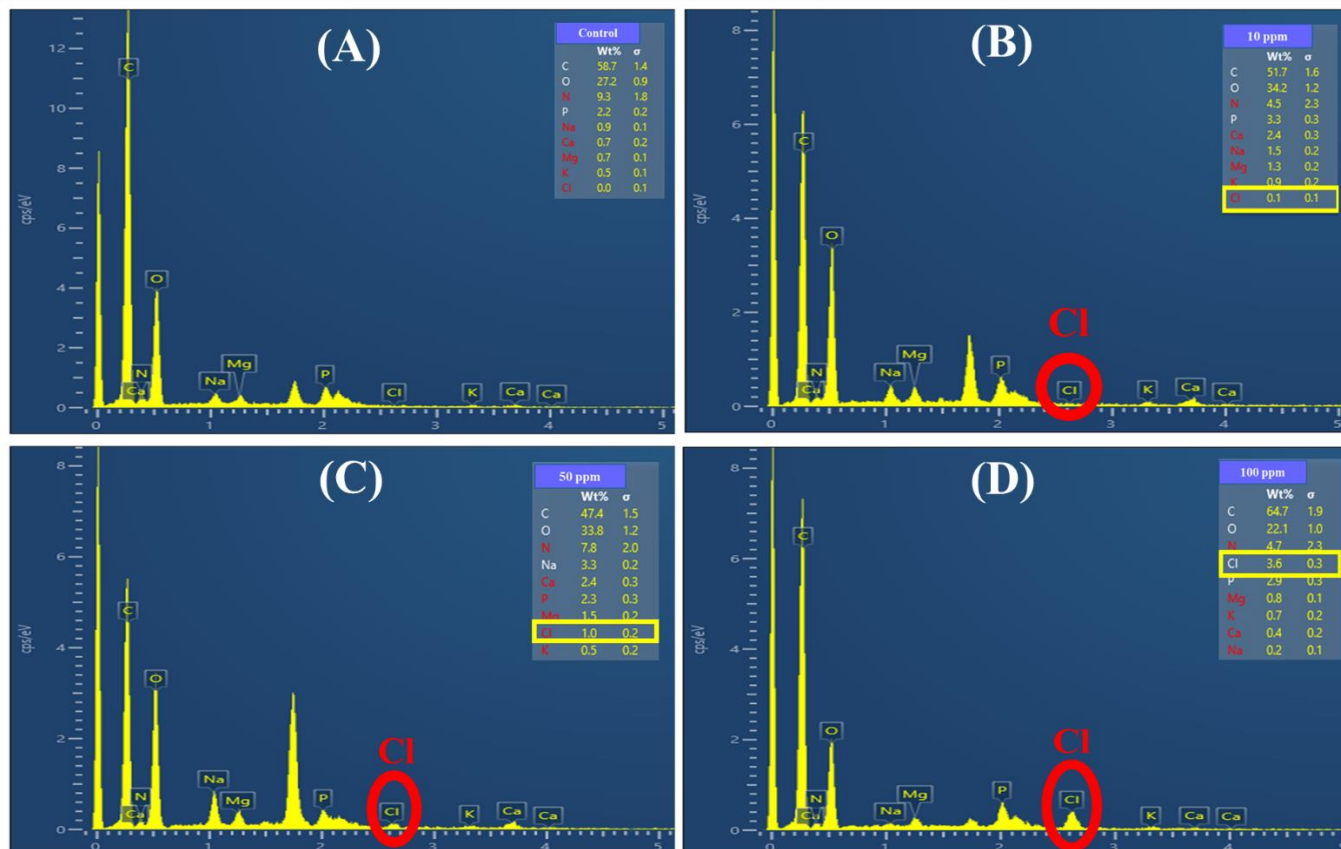


Fig. S4 Light microscopy (**Top panel**) and Nile red (**Bottom Panel**) images of *Coccomyxa* sp. IITRSTKM4 under different concentrations of PVC-NPs after 14 days of incubation, at 60X magnification, scale bar: 50 μ m. Abbreviations: Control- BBM media without PVC-NPs, BBM spiked with 10 ppm PVC-NPs (10 ppm), 50 ppm PVC-NPs (50 ppm), and 100 ppm PVC-NPs (100 ppm).

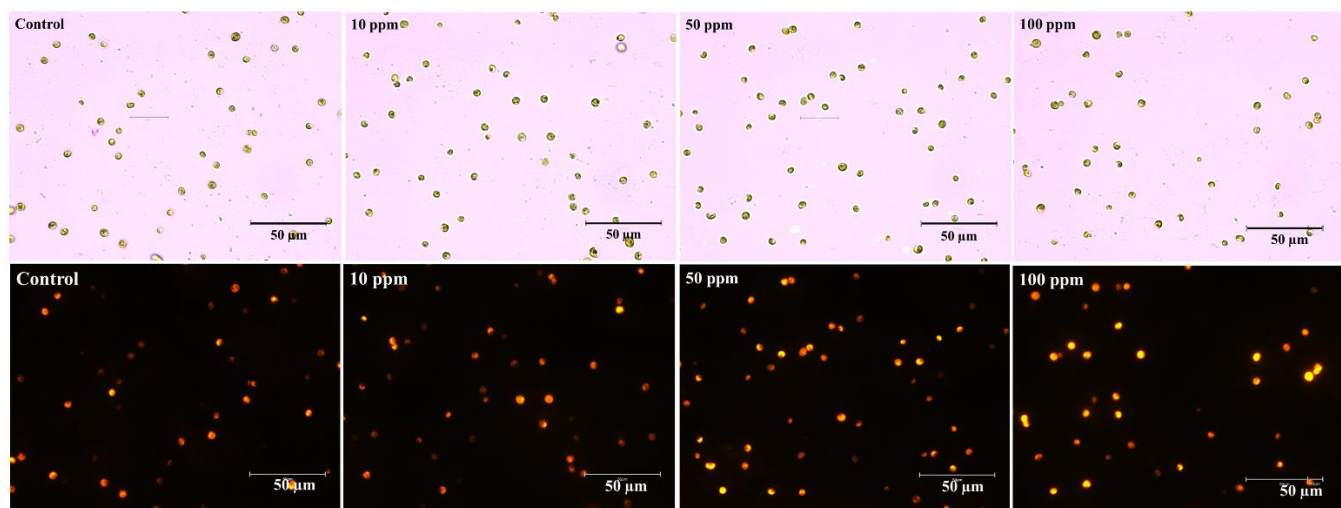


Table S1 Composition of Bold Basal Media (BBM).

Components	Quantity for 1L
Sodium nitrate (NaNO_3)	0.250 g
Potassium dihydrogen phosphate (KH_2PO_4)	0.175 g
Dipotassium hydrogen phosphate (K_2HPO_4)	0.075 g
Magnesium sulphate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$)	0.075 g
Sodium chloride (NaCl)	0.025 g
Calcium chloride ($\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$)	0.025 g
Ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$)	0.005 g
Ethylenediaminetetraacetic acid (EDTA-Na)	0.005 g
Trace metal solution	1 ml
pH	7.2-7.4

Table S2 Composition for trace metal solution used in BBM.

Components	Quantity for 1L
Boric acid (H_3BO_3)	2.860 g
Zinc sulphate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$)	0.222 g
Copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$)	0.079 g
Manganese chloride ($\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$)	1.810 g
Cobalt nitrate ($\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$)	0.041 g
Sodium molybdate ($\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$)	0.390 g

Table S3 Characterization of PVC-NPs in BBM media.

Time	Parameter	10 ppm	pdi (for size)	50 ppm	pdi (for size)	100 ppm	pdi (for size)
DAY 0	Size (nm)	158.6	0.15	168.1	0.17	174	0.15
	Zeta potential (mV)	-32.28		-33.74		-36.04	
DAY 7	Size (nm)	181.1	0.23	225.2	0.22	257.2	0.27
	Zeta Potential (mV)	-32.03		-33.62		-35.95	

Table S4 Percentage Growth Inhibition/Inhibition Ratio (IR) in different PVC-NPs concentrations (10, 50, and 100 ppm).

No. of days	Growth Inhibition % [10 ppm]	Growth Inhibition % [50 ppm]	Growth Inhibition % [100 ppm]
3	5.83 ± 1.17	16.07 ± 1.51	23.90 ± 0.13
6	30.90 ± 1.28	45.22 ± 0.32	48.27 ± 2.43
9	20.93 ± 1.32	35.52 ± 1.62	43.54 ± 0.29
12	17.35 ± 2.21	34.67 ± 0.65	44.02 ± 2.71
14	17.00 ± 1.00	27.28 ± 0.87	42.04 ± 0.20

Table S5 Impact of EPS (obtained from *Coccomyxa* sp. IITRSTKM4) exposure on PVC-NPs.

Time	Parameter	10 ppm	pdi (for size)	50 ppm	pdi (for size)	100 ppm	pdi (for size)
Initial (In BBM)	Size (nm)	158.6	0.15	168.1	0.17	174	0.15
	Zeta potential (mV)	-32.28		-33.74		-36.04	
After 4 hr (incubation with EPS)	Size (nm)	188.4	0.26	279.4	0.07	288.6	0.14
	Zeta Potential (mV)	-21.6		-27.32		-30.24	