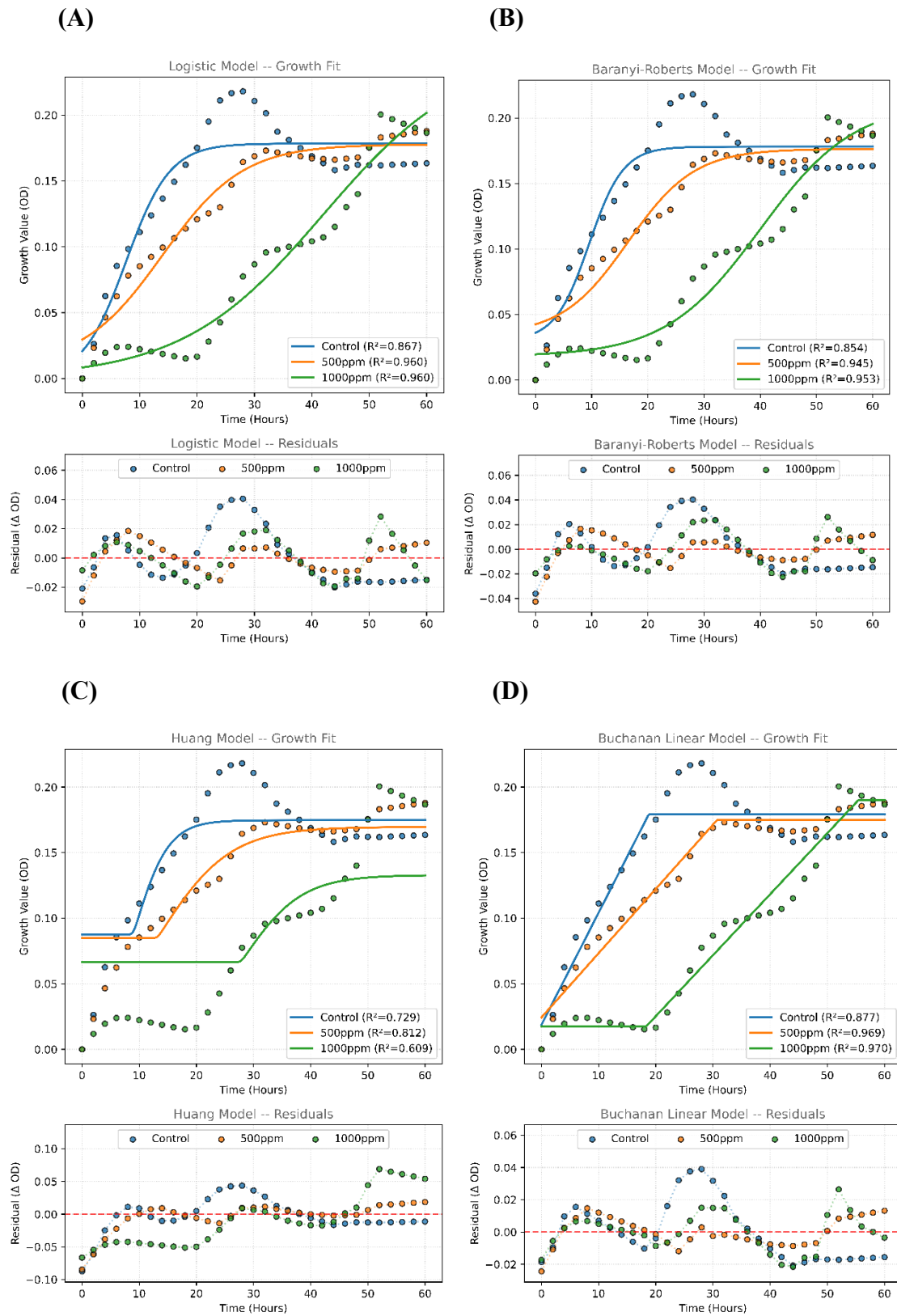


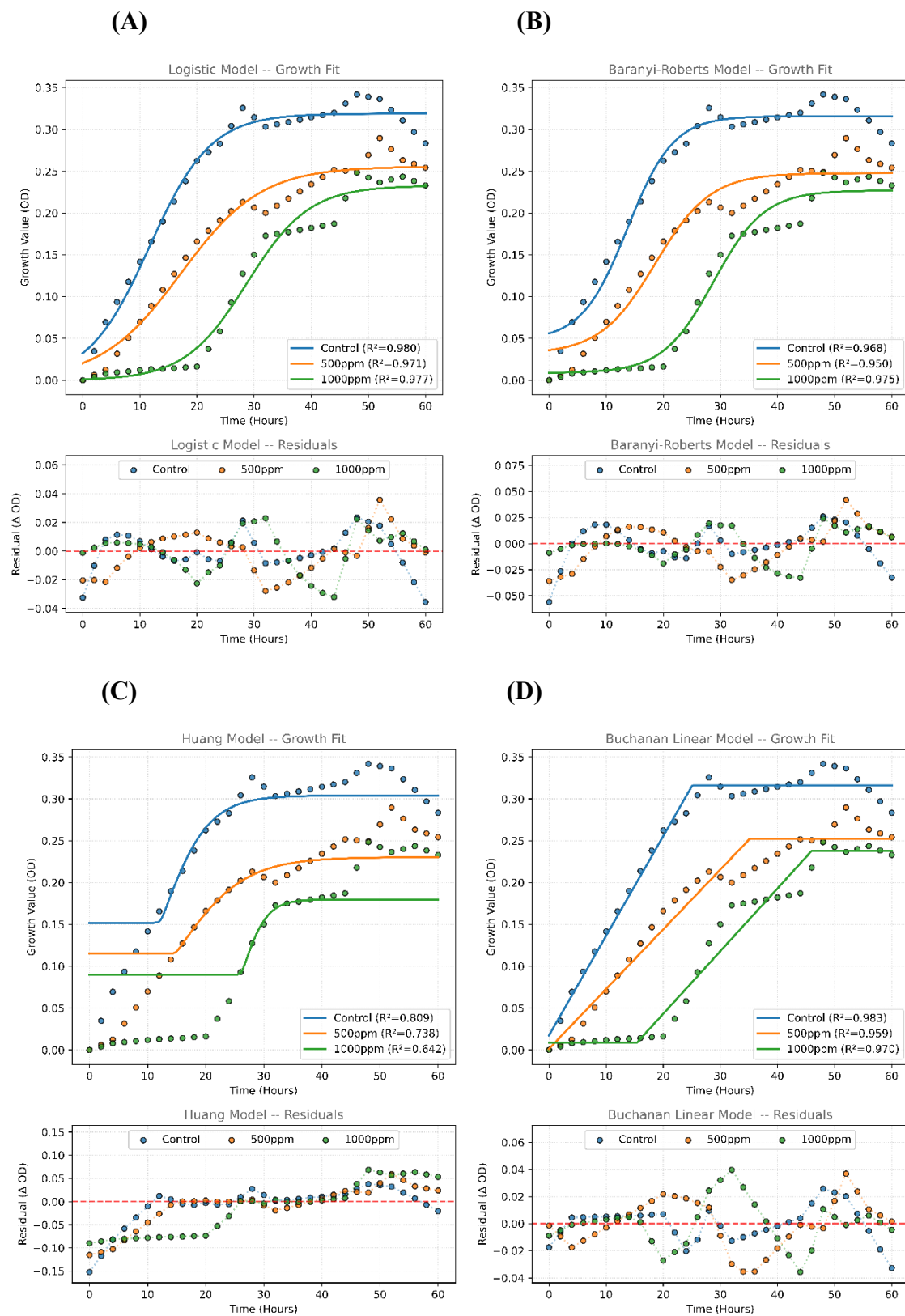
Supplementary Information

Figure S1:



Supplementary Figure S1: Alternative bacterial growth models fitted to the growth kinetics of My2 under arsenite stress. Comparison of four alternative bacterial growth models fitted to the growth kinetics of arsenic-resistant isolates My2 under control, 500 ppm, and 1000 ppm arsenite treatments. **(A)** Logistic model, **(B)** Baranyi-Roberts model, **(C)** Huang model, and **(D)** Buchanan Linear model. For each model, the upper panels show the observed growth data and the corresponding fitted growth curves for My2, while the lower panels present the residual plots used to evaluate model performance. Growth values were measured as optical density at 600 nm (OD₆₀₀) over a 60-hour incubation period.

Figure S2:

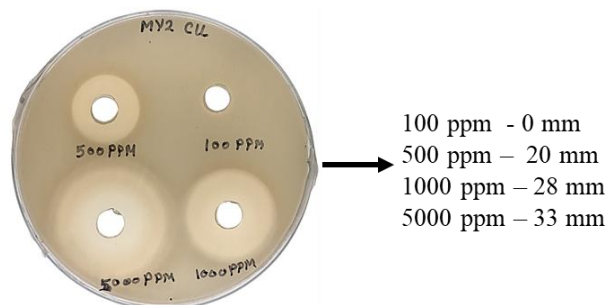
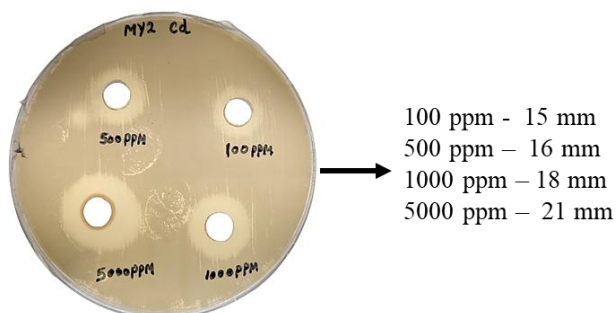
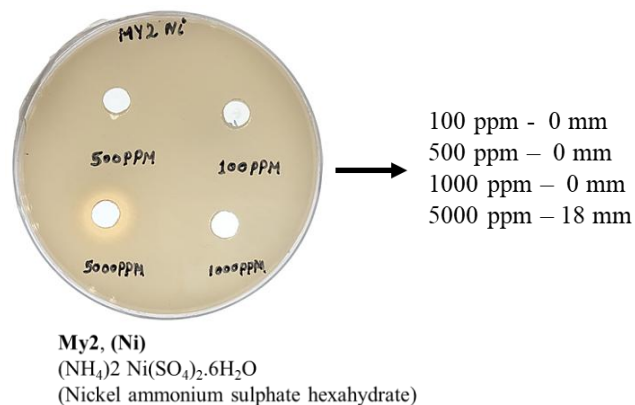
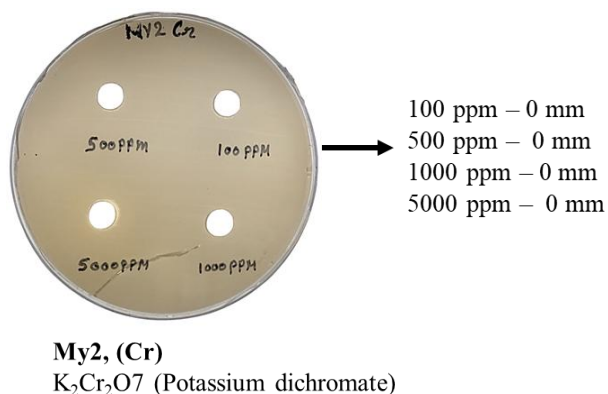
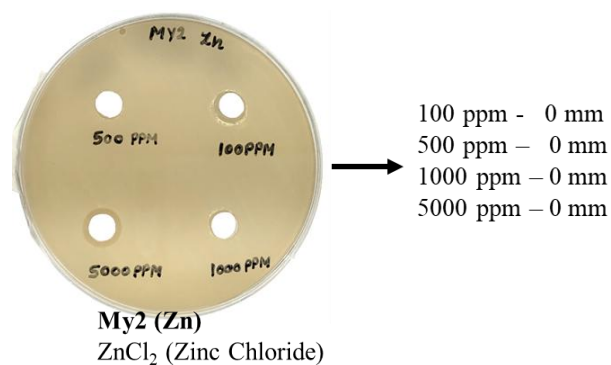
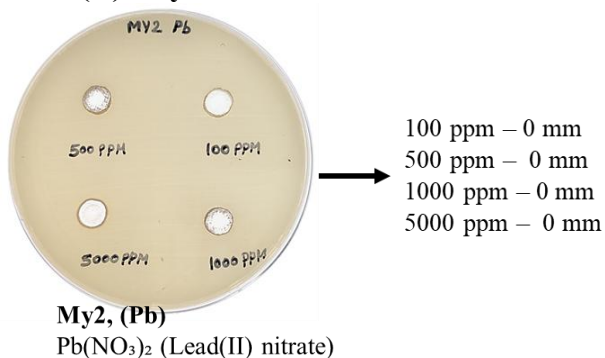


Supplementary Figure S2: Alternative bacterial growth models fitted to the growth kinetics of My6 under arsenite stress. Comparison of four alternative bacterial growth models fitted to the growth kinetics of arsenic-resistant isolates My6 under control, 500 ppm, and 1000 ppm

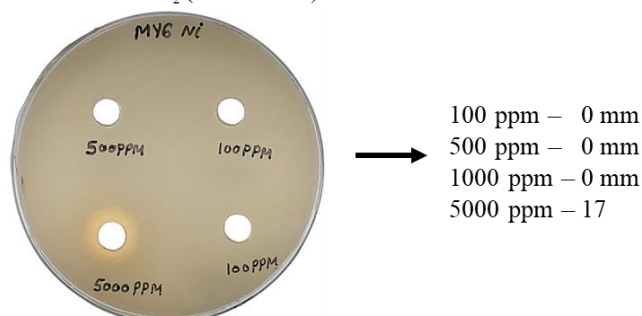
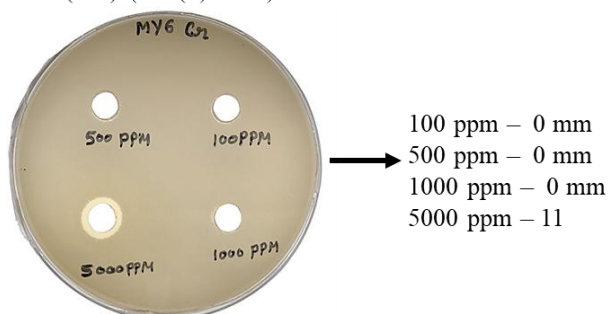
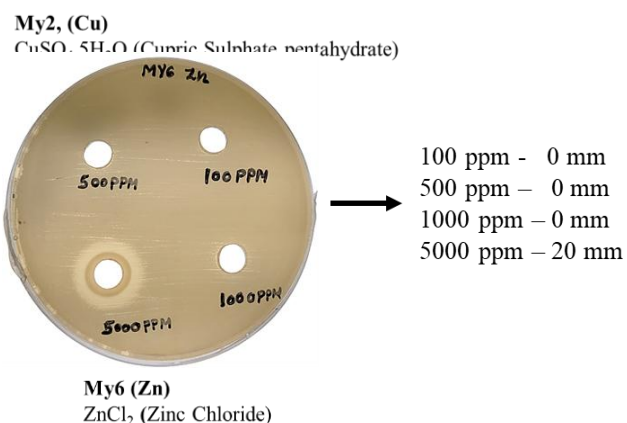
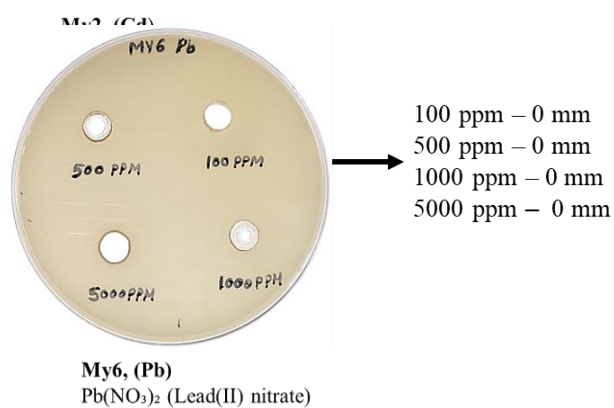
arsenite treatments. **(A)** Logistic model, **(B)** Baranyi-Roberts model, **(C)** Huang model, and **(D)** Buchanan Linear model. For each model, the upper panels show the observed growth data and the corresponding fitted growth curves for My6, while the lower panels present the residual plots used to evaluate model performance. Growth values were measured as optical density at 600 nm (OD_{600}) over a 60-hour incubation period.

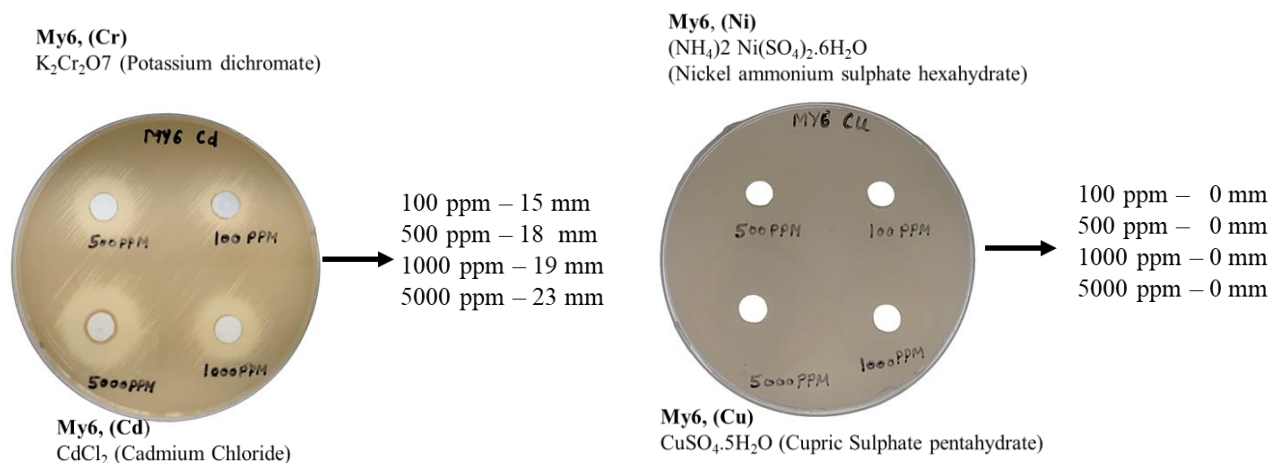
Figure S3:

(A) My2



(B) My6





Supplementary Figure S3: Representative agar well diffusion assays showing the cross-heavy metal resistance of arsenic-resistant bacterial isolates My2 (*Staphylococcus kloosii*) and My6 (*Bacillus albus*) against different heavy metals. (A) My2 and (B) My6 exposed to zinc chloride ($ZnCl_2$), cadmium chloride ($CdCl_2$), nickel ammonium sulfate hexahydrate $[(NH_4)_2Ni(SO_4)_2 \cdot 6H_2O]$, potassium dichromate ($K_2Cr_2O_7$), cupric sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$), and lead nitrate $[Pb(NO_3)_2]$. Agar wells (8 mm diameter) were loaded with 50 μ L of heavy metal solutions at concentrations of 100, 500, 1000, and 5000 ppm. The diameter of the inhibition zone (mm) was measured after incubation to evaluate bacterial tolerance. The inhibition zone values corresponding to each heavy metal concentration are indicated adjacent to the representative plates.

Figure S4:

(A) My2

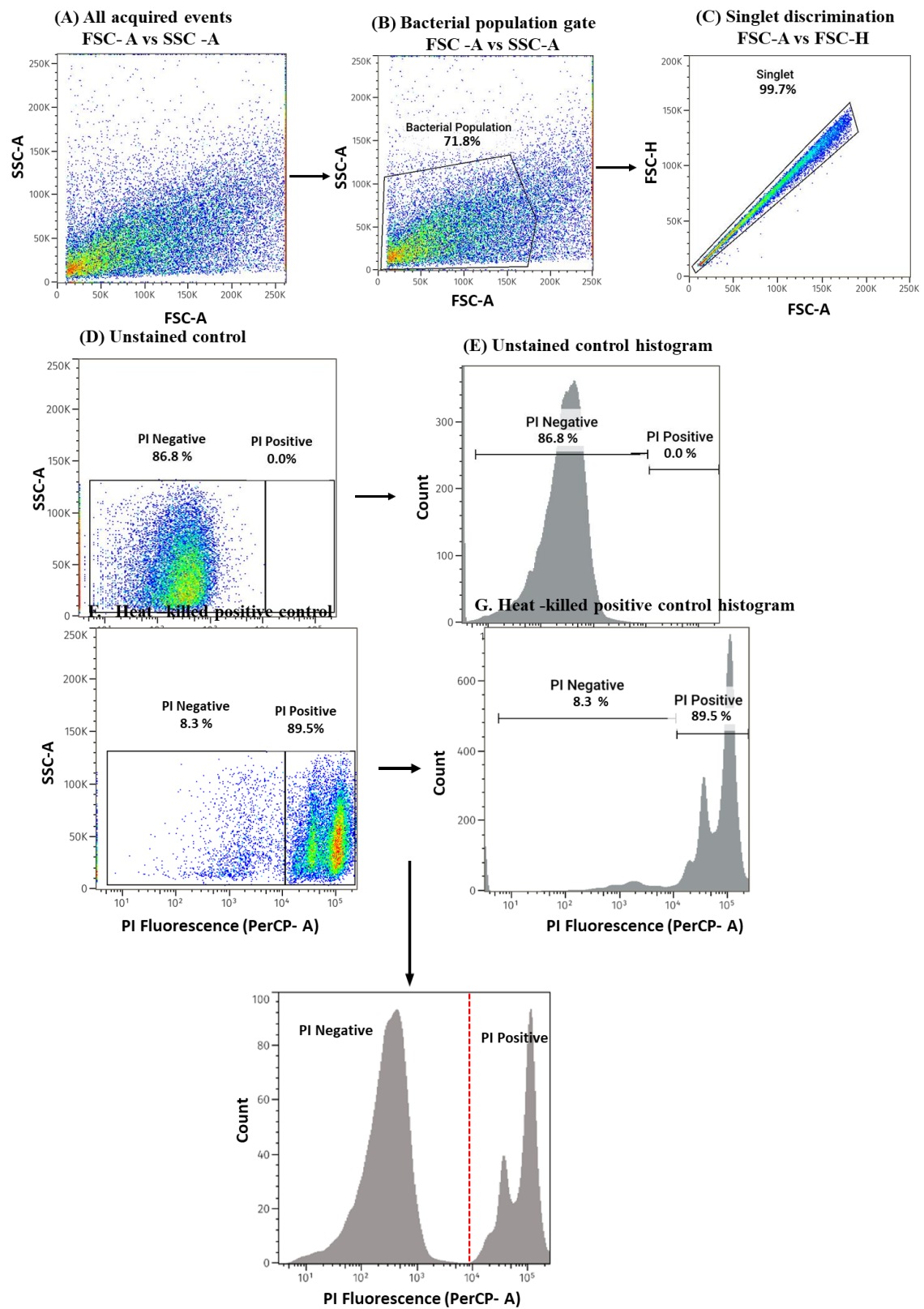


(B) My6



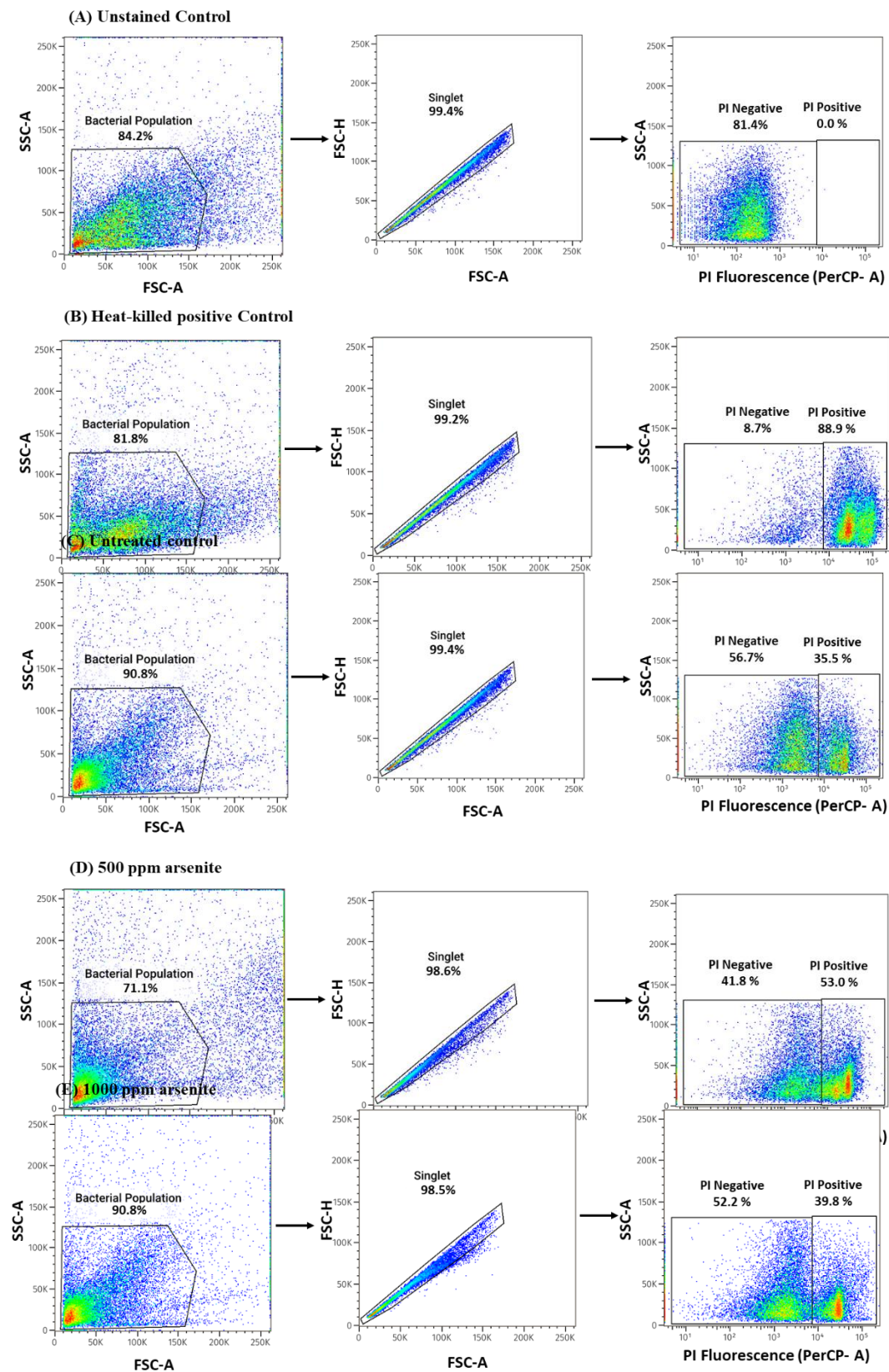
Supplementary Figure S4: Antibiotic susceptibility profiles of arsenic-resistant bacterial isolates My2 and My6. Representative agar plates showing antibiotic susceptibility of My2 (upper panel) and My6 (lower panel) determined by the disc diffusion method using commercial Hexadiscs HX083, HX002, and HX022, along with representative individual antibiotic discs. Clear zones surrounding the discs indicate inhibition of bacterial growth. The complete list of antibiotics, disc potencies ($\mu\text{g}/\text{disc}$ or units/disc, as applicable), and measured inhibition-zone diameters (mm) is provided in Supplementary Table S4.

Figure S5:



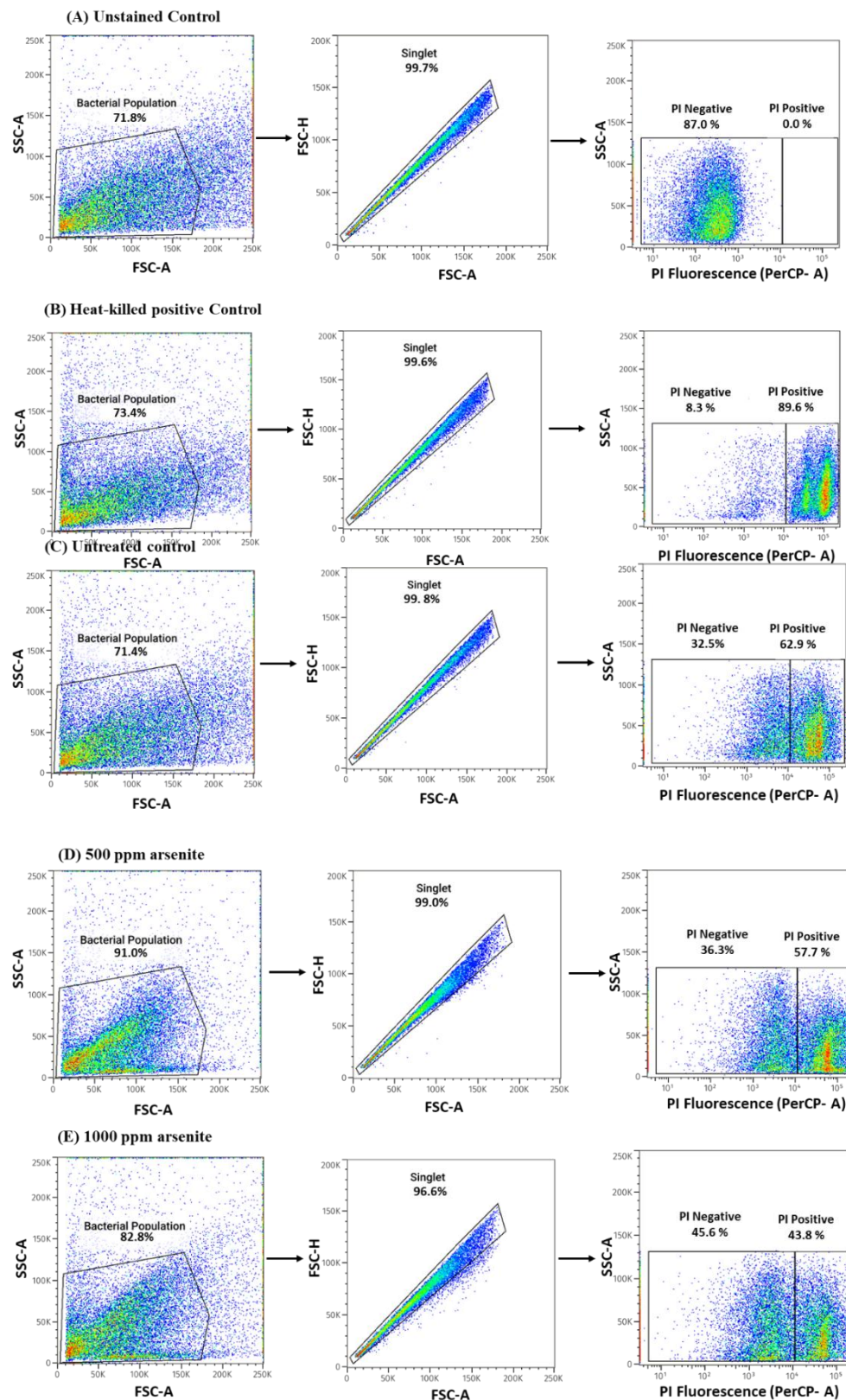
Supplementary Figure S5: Flow cytometric gating strategy used for the analysis of membrane integrity in arsenic-resistant bacterial isolates stained with propidium iodide (PI). **(A)** All acquired events displayed on an FSC-A versus SSC-A dot plot. **(B)** Gating of the bacterial population to exclude debris based on forward scatter (FSC-A) and side scatter (SSC-A). **(C)** Singlet discrimination using FSC-A versus FSC-H to exclude doublets and cell aggregates. **(D)** Representative unstained control showing the PI-negative population and background fluorescence. **(E)** Histogram of the unstained control used to establish the PI-negative fluorescence distribution. **(F)** Representative heat-killed positive control demonstrating PI uptake by membrane-compromised cells. **(G)** Histogram of the heat-killed control showing separation of PI-negative and PI-positive populations. **(H)** PI fluorescence histogram illustrating the gate used to distinguish PI-negative (viable) and PI-positive (membrane-compromised) bacterial cells. The PI-positive threshold (red dashed line) was established using the unstained and heat-killed controls and subsequently applied uniformly to all experimental samples for quantitative analysis.

Figure S6: My2



Supplementary Figure S6: Flow cytometric gating strategy and representative PI fluorescence analysis of the arsenic-resistant isolate My2 **(A)** Unstained control, **(B)** heat-killed positive control, **(C)** untreated control, **(D)** 500 ppm arsenite-treated cells, and **(E)** 1000 ppm arsenite-treated cells. For each treatment, the left panel shows gating of the bacterial population based on forward scatter area (FSC-A) and side scatter area (SSC-A), the middle panel shows singlet discrimination using FSC-A versus FSC-H, and the right panel shows PI fluorescence analysis used to distinguish PI-negative (viable) and PI-positive (membrane-compromised) bacterial cells. The same bacterial population gate, singlet gate, and PI-positive threshold were applied uniformly to all samples. Percentages of gated bacterial populations, singlets, PI-negative cells, and PI-positive cells are indicated within each plot.

Figure S7: My6



Supplementary Figure S7. Flow cytometric gating strategy and representative propidium iodide (PI) fluorescence analysis of the arsenic-resistant isolate My6. **(A)** Unstained control, **(B)** heat-killed positive control, **(C)** untreated control, **(D)** 500 ppm arsenite-treated cells, and

(E) 1000 ppm arsenite-treated cells. For each treatment, the left panel shows the bacterial population gate based on forward scatter area (FSC-A) and side scatter area (SSC-A), the middle panel shows singlet discrimination using FSC-A versus FSC-H, and the right panel shows PI fluorescence analysis used to distinguish PI-negative (viable) and PI-positive (membrane-compromised) bacterial cells. The same bacterial population gate, singlet gate, and PI-positive threshold were applied consistently to all samples. The percentages of gated bacterial populations, singlets, PI-negative cells, and PI-positive cells are indicated in each plot.

Table S1. Cultural, Morphological, and Microscopic Characteristics of the Bacterial Isolates (My1-My6).

Characteristics of the strain	MY1	My2	My3	My4	My5	My6
Colony colour	Cream	Cream	Cream	Cream	Cream	Cream
Colony shape	Circular	Circular	Irregular	Circular	Irregular	Circular
Surface	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
Elevation	Raised	Raised	Raised	Raised	Raised	Raised
Margin	Entire	Entire	Undulated	Entire	Entire	Entire
Opacity	Opaque	Opaque	Opaque	Opaque	Opaque	Opaque
Motility	Motile	Non-Motile	Non-Motile	Non-Motile	Motile	Motile
Gram Staining	Gram positive rods	Gram positive cocci	Gram positive cocci	Gram positive cocci	Gram positive rods	Gram positive rods

Table S2:. Biochemical Characterization Isolated bacterial strains.

Biochemical tests	My 1	My 2	My 3	My 4	My 5	My 6
Spore staining	+	–	–	–	+	+
Motility	+	–	–	–	+	+
Catalase	+	+	+	+	+	+
Mannitol fermentation	–	+	+	+	–	–
Nitrate reduction	–	–	–	–	–	–
Citrate	–	–	–	–	–	–
Voges proskeur	–	–	–	–	–	–
Starch hydrolysis	NA	–	–	–	NA	NA

(+),Positive reaction; (–),Negative reaction; NA, Not applicable)

Table S3: Carbohydrate Fermentation Profile of the Arsenic-Resistant Bacterial Isolates My2 and My6.

Sugar Fermentation	My 2	My 6
Lactose	–	+
Xylose	–	+
Maltose	+	+
Fructose	+	+
Dextrose	+	+
Galactose	+	+
Raffinose	–	+
Trehalose	+	+
Melibiose	–	+
Sucrose	+	+
L- Arabinose	+	–
Mannose	+	–
Inulin	+	+
Sodium gluconate	–	+
Glycerol	+	+
Salicin	+	–
Dulcitol	–	–
Inositol	–	–
Sorbitol	–	–
Mannitol	+	–
Adonitol	–	–
Arabitol	–	+
Erythriol	–	–
Alpha Methyl D Glucoside	–	–
Rhamnose	–	–
Cellobiose	+	+
Melezitose	–	+
Alpha Methyl D Mannoside	–	–
Xylitol	–	–
ONPG	–	+
Esculin	+	+
D Arabinose	–	+
Citrate	+	–
Melonate	–	–
Sorbose	–	–
Control	–	–

Table S4: Antibiotic susceptibility profiles of arsenic-resistant bacterial isolates My2 and My6. Antibiotic susceptibility was evaluated by the disc diffusion method using commercial Hexadiscs HX022, HX002, and HX083. The table presents the antibiotics tested, their respective disc potencies ($\mu\text{g}/\text{disc}$ or units/disc, as applicable), and the corresponding zones of inhibition (mm) recorded for My2 and My6. Values represent the measured inhibition-zone diameters; 0 mm indicates no detectable zone of inhibition.

S.no.	Antibiotics	Disc potency (mcg)	My2	My6
1.	Erythromycin	15	30	30
2.	Clindamycin	2	30	30
3.	Streptomycin	10	29	28
4.	Ciprofloxacin	5	28	22
5.	Chloremphenicol	25	25	25
6.	Sulphatriad	300	25	25
7.	Dioxycycline Hydro.	30	24	24
8.	Tetracycline	25	23	21
9.	Vancomycin	30	20	20
10.	Co- Trimoxazole	25	20	20
11.	Amphicillin/ Subactam	10/10	17	14
12.	Amphicillin	10	15	10
13.	Nitrofurantoin	300	12	12
14.	Penicillin G	1 unit	11	9
15.	Norfloxacin	10	3	28
16.	Fosfomycin	200	0	0

Table S5 : Growth kinetic parameters of the arsenic-resistant bacterial isolates My2 and My6 under control, 500 ppm, and 1000 ppm arsenite treatments estimated using the Logistic model, Baranyi-Roberts model, Huang model and Buchanan Linear model models. Model performance was evaluated using the coefficient of determination (R^2) and residual root mean square error (RMSE). Growth parameters include the maximum growth value (Y_{max}), maximum specific growth rate (μ_{max}), lag phase duration (λ), and area under the growth curve (AUC).

Bacterial Isolate	Model	Treatment	Y_{max}	μ_{max}	Lag Time (λ)	AUC	R^2	Residual RMSE
My2	Logistic	Control	0.1784	0.0118	0.08 h	9.27	0.867	0.0187
		500 ppm	0.1778	0.0060	0.0 h	8.19	0.960	0.0102
		1000 ppm	0.2482	0.0050	17.34 h	5.06	0.960	0.0130
	Baranyi-Roberts	Control	0.1781	0.3299	4.84 h	9.27	0.854	0.0196
		500 ppm	0.1764	0.1692	8.41 h	8.19	0.945	0.012
		1000 ppm	0.2119	0.1189	20.02 h	5.06	0.953	0.0141
	Huang	Control	0.1747	0.3308	8.96 h	9.27	0.730	0.0266
		500 ppm	0.1696	0.1595	13.19 h	8.19	0.81	0.0222
		1000 ppm	0.1329	0.1909	27.8 h	5.06	0.61	0.0407
	Buchanan Linear	Control	0.1791	0.0085	0 h	9.27	0.877	0.018
		500 ppm	0.1748	0.0049	0 h	8.19	0.969	0.009
		1000 ppm	0.1901	0.0046	18.29 h	5.06	0.97	0.0114
My6	Logistic	Control	0.3188	0.0149	0.95 h	15.26	0.981	0.0135
		500 ppm	0.2556	0.0091	3.12 h	10.73	0.971	0.0148
		1000 ppm	0.2326	0.0107	17.88 h	7.25	0.977	0.0144
	Baranyi-Roberts	Control	0.3159	0.2499	6.92 h	15.26	0.969	0.0173
		500 ppm	0.2477	0.2066	9.34 h	10.73	0.95	0.0195
		1000 ppm	0.227	0.2248	14.4 h	7.25	0.974	0.0151
	Huang	Control	0.3039	0.2481	12.22 h	15.26	0.809	0.0424
		500 ppm	0.2303	0.173	14.84 h	10.73	0.739	0.0446
		1000 ppm	0.1798	0.4672	26.15 h	7.25	0.641	0.0569
	Buchanan Linear	Control	0.316	0.0119	0 h	15.26	0.982	0.0127
		500 ppm	0.2526	0.0071	0 h	10.73	0.959	0.0177
		1000 ppm	0.2375	0.0075	15.41 h	7.25	0.97	0.0165