

Supplementary Table S1. Standard Score Analyses Database

Parameters	Spore formation	Optimal pH growth value	Urea agar		Urea broth			CaCO ₃ formation on solid nutrient media		CaCO ₃ formation in liquid nutrient media		Standard score
			growth	color change	turbidity	color change	CaCl ₂ addition	Urea-CaCl ₂	EK-CaCl ₂	Urea-CaCl ₂	EK-CaCl ₂	
Min	0	7	0	0	0	0	0	0	0	0	0	SUM 1
Max	1	11	1	1	2	3	3	1	1	1	1	
Weights	0.05	0.45	0.001	0.014	0.001	0.014	0.02	0.075	0.075	0.15	0.15	
Polarity	+	9	+	+	+	+	+	+	+	+	+	
Bacteria												
<i>S. pasteurii</i>	1	1	1	1	1	1	1	1	0	1	0	0.77
<i>B. pseudofirmus</i>	1	1	0	0	0.5	0	0	0	1	0	1	0.73
I ₁	1	0	1	1	0	0	0	1	1	0	1	0.36
I ₂	1	1	1	0	0	0	0	0	0	0	0	0.50
I ₃	1	1	1	1	0	0	0	1	1	0	0	0.66
II ₁	1	0	1	1	0.5	0	0	1	1	1	0	0.37
II ₂	1	0	1	1	0	0	0	1	1	1	0	0.36
II ₃	1	1	1	1	0.5	0	0	0	0	0	0	0.52
II ₄	1	1	1	1	0	0	0	1	1	1	0	0.81
II ₅	1	1	1	1	0.5	0	0	0	1	1	0	0.74
II ₆	1	0	1	1	0.5	0	0	0	1	1	0	0.29
II ₇	1	1	1	1	0.5	0	0	1	1	0	1	0.82
II ₈	1	1	1	1	1	0	0	1	1	1	1	0.966
II ₉	1	1	1	1	0.5	0	0	1	0	1	1	0.891
II ₁₀	1	1	1	1	0.5	0	0	1	1	1	1	0.97
III ₁	1	0	1	1	0.5	0	0	1	1	1	1	0.52
III ₂	1	1	1	1	0.5	0	0	0	1	0	1	0.74
III ₃	1	1	1	0	0.5	0	0	0	0	0	1	0.65
III ₄	1	1	1	0	0.5	0	0	0	1	1	1	0.88
III ₅	1	1	1	0	0.5	0	0	1	1	0	1	0.80
III ₆	1	1	1	1	0.5	0	0	1	1	0	1	0.82
III ₇	1	1	1	1	0.5	0	0	1	1	0	1	0.82
III ₈	1	1	1	1	0.5	0	0	1	0	0	1	0.74
III ₉	1	1	1	1	0.5	0	0	1	1	0	1	0.82
III ₁₀	1	1	1	1	0.5	0	0	1	1	0	1	0.82
III ₁₁	1	1	1	1	0.5	0	0	1	1	1	1	0.97
III ₁₂	1	1	1	1	0.5	0	0	0	1	0	1	0.74
III ₁₃	1	0	1	0	0.5	0	0	0	0	0	1	0.20
III ₁₄	1	1	1	0	0.5	0	0	0	1	1	1	0.88
III ₁₅	1	1	1	1	0.5	0	0	1	1	1	1	0.97
III ₁₆	1	1	1	1	0.5	0.33	0	1	1	0	1	0.82
III ₁₇	1	0	1	1	0.5	0	0	1	1	0	1	0.37
III ₁₈	1	0	1	1	0.5	0	0	1	1	0	1	0.37
III ₁₉	1	0	1	1	0.5	0	0	1	1	1	1	0.52
III ₂₀	0	0	1	1	0.5	0.33	0.33	1	0	1	1	0.40
IV ₁	1	0	1	1	0.5	0	0	0	0	1	1	0.37
IV ₂	1	1	1	1	0.5	0	0	0	1	0	0	0.59
IV ₃	1	0	1	1	0.5	0	0	0	1	0	1	0.29
IV ₄	1	0	1	1	0.5	0	0	1	1	0	1	0.37
IV ₅	1	1	1	1	0.5	0	0	1	1	1	1	0.97
IV ₆	1	1	1	1	0.5	0	0	0	1	0	0	0.59
IV ₇	0	1	1	1	0.5	0.33	0	0	1	0	0	0.54
IV ₈	0	0	1	1	0.5	0.33	0	0	1	0	1	0.24

SUM
1.0

IV₉	0	0	1	0	0.5	0.08	0	0	1	1	1	0.38
IV₁₀	1	1	1	1	0.5	0.33	0.17	1	1	1	0	0.82

Supplementary Table S2. The 'goodness of fit' tests for Urea concentration, pH value and cell concentration prediction models

	χ^2	RMSE	MBE	MPE	r^2	Skew	Kurt	Mean	SD	Var.
Urea concentration										
<i>S. pasteurii</i>	0.219	0.362	0.098	28.090	0.998	-0.368	-1.110	0.098	0.368	0.135
<i>B. pseudofirmus</i>	0.003	0.045	-0.023	0.168	0.876	-0.243	-1.307	-0.023	0.040	0.002
<i>B. muralis</i>	2.282	1.170	0.056	8.739	0.955	-0.611	-0.244	0.056	1.232	1.518
<i>B. lentus</i>	1.308	0.886	0.174	4.396	0.944	-0.615	1.238	0.174	0.916	0.839
<i>B. simplex</i>	2.840	1.305	-0.067	15.697	0.963	0.783	1.236	-0.067	1.374	1.888
<i>B. firmus</i>	5.181	1.763	0.205	38.324	0.964	-0.048	-1.122	0.205	1.846	3.407
<i>B. licheniformis</i>	0.765	0.677	0.099	9.751	0.991	-0.415	1.275	0.099	0.706	0.499
pH value										
<i>S. pasteurii</i>	0.015	0.098	-0.016	0.970	0.978	0.207	-0.620	-0.016	0.101	0.010
<i>B. pseudofirmus</i>	0.001	0.024	0.004	0.229	0.821	0.408	2.083	0.004	0.025	0.001
<i>B. muralis</i>	0.022	0.119	0.024	1.076	0.974	0.540	0.177	0.024	0.122	0.015
<i>B. lentus</i>	0.017	0.103	0.021	1.058	0.929	0.341	0.500	0.021	0.106	0.011
<i>B. simplex</i>	0.022	0.120	0.010	1.316	0.978	-0.975	-0.137	0.010	0.125	0.016
<i>B. firmus</i>	0.014	0.093	-0.001	0.835	0.986	0.162	0.776	-0.001	0.097	0.009
<i>B. licheniformis</i>	0.019	0.110	0.011	1.113	0.980	-0.102	-1.110	0.011	0.115	0.013
Cell concentration										
<i>S. pasteurii</i>	0.158	0.317	0.085	2.303	0.935	1.956	5.245	0.085	0.321	0.103
<i>B. pseudofirmus</i>	0.019	0.109	-0.003	1.572	0.966	-1.364	1.589	-0.003	0.115	0.013
<i>B. muralis</i>	0.005	0.056	0.005	0.607	0.985	0.535	1.550	0.005	0.058	0.003
<i>B. lentus</i>	0.067	0.206	-0.001	2.491	0.883	-1.190	1.129	-0.001	0.216	0.047
<i>B. simplex</i>	0.062	0.199	0.013	2.606	0.964	0.132	-1.816	0.013	0.208	0.043
<i>B. firmus</i>	0.039	0.157	0.012	1.897	0.977	-0.551	-0.704	0.012	0.164	0.027
<i>B. licheniformis</i>	0.042	0.164	0.034	1.731	0.990	0.746	0.091	0.034	0.168	0.028

χ^2 – reduced chi-square; RMSE – root mean square error; MBE – mean bias error; MPE – mean percentage error; r^2 - coefficient of determination; Skew. – skewedness; Kurt. – kurtosis; SD – standard deviation; Var. – variance.

Supplementary Table S3. The 'goodness of fit' tests for amount of precipitate, pH value and reduction of Ca²⁺ ions prediction models

	χ^2	RMSE	MBE	MPE	r^2	Skew	Kurt	Mean	SD	Var.
Mass of precipitate										
<i>S. pasteurii</i>	0.000	0.001	0.000	0.388	1.000	-2.187	5.195	0.000	0.001	0.000
<i>B. pseudofirmus</i>	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
<i>B. muralis</i>	0.001	0.023	0.005	14.280	0.986	0.255	-1.065	0.005	0.024	0.001
<i>B. lentus</i>	0.001	0.016	0.006	14.039	0.980	2.638	6.968	0.006	0.016	0.000
<i>B. simplex</i>	0.000	0.014	0.001	4.022	0.993	0.321	-1.369	0.001	0.015	0.000
<i>B. firmus</i>	0.001	0.022	0.007	14.109	0.991	1.939	4.086	0.007	0.022	0.000
<i>B. licheniformis</i>	0.001	0.017	0.006	13.954	0.997	2.526	6.478	0.006	0.017	0.000
pH value										
<i>S. pasteurii</i>	0.086	0.192	0.000	1.790	0.909	1.166	0.130	0.000	0.208	0.043
<i>B. pseudofirmus</i>	0.000	0.009	0.000	0.091	0.846	1.147	2.196	0.000	0.009	0.000
<i>B. muralis</i>	0.019	0.090	-0.050	0.614	0.975	-1.723	2.205	-0.050	0.081	0.006
<i>B. lentus</i>	0.008	0.059	0.000	0.447	0.983	1.889	4.511	0.000	0.063	0.004
<i>B. simplex</i>	0.093	0.199	0.000	1.476	0.935	-2.263	5.403	0.000	0.215	0.046
<i>B. firmus</i>	0.016	0.082	0.000	0.536	0.985	0.723	2.936	0.000	0.088	0.008
<i>B. licheniformis</i>	0.001	0.020	0.000	0.140	0.999	0.517	1.989	0.000	0.021	0.000
Reduction of calcium ions										
<i>S. pasteurii</i>	6216	45.519	-12.799	166850	0.992	-0.521	2.257	-12.799	47.851	2289.754
<i>B. pseudofirmus</i>	920	17.509	0.005	1.297	0.728	0.811	-1.149	0.005	19.180	367.859
<i>B. muralis</i>	13964	68.225	-14.483	4372163	0.980	0.564	0.328	-14.483	73.033	5333.842
<i>B. lentus</i>	20593	82.851	1.667	8.703	0.836	0.810	-1.931	1.667	90.740	8233.722
<i>B. simplex</i>	26567	94.105	12.727	1402613	0.949	-1.113	0.705	12.727	102.14	10432.49
<i>B. firmus</i>	24784	90.891	-23.678	3173533	0.973	1.070	2.027	-23.678	96.128	9240.688
<i>B. licheniformis</i>	3.123	1.020	0.417	66.662	1.000	2.449	6.000	0.417	1.020	1.041

χ^2 – reduced chi-square; RMSE – root mean square error; MBE – mean bias error; MPE – mean percentage error; r^2 - coefficient of determination; Skew. – skeweness; Kurt. – kurtosis; SD – standard deviation; Var. – variance.