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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



APPENDIX

ศูนย์วิทยทรัพยากร
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Table A1 The results of control of biomass concentration in a continuous fermentation with cell recycling.

	Time (hrs.)	Glucose conc. (g/l)	Substrate Cons. (g/l-hr)	Spec. cons. (1/hr)	Cell conc. (g/l)	Spec. growth (1/hr)	Cell Prod. (g/l-hr)	Butanol (g/l)	Acetone (g/l)	Ethanol (g/l)	Acetic acid (g/l)	Butyric (g/l)	Total Solvent (g/l)	BuOH Prod. (g/l-hr)	Acetone Prod. (g/l-hr)	Solvent Prod. (g/l-hr)	Prod. form. (g/l-hr)	Spec. P (1/hr)	Spec. Bu. (1/hr)	Spec. Acc. (1/hr)	Yp/s
	0	46	0	0	0	0	0.00	0.000	0.000	0.000	0.000	0.000	0.00	0	0	0	0	0.000	0	0.000	0.000
Batch 1 L	6	41	1.50	1.982	0.757	0.167	0.126	0.203	0.090	0.083	2.517	0.000	0.38	0.03	0.02	0.063	0.063	0.083	0.045	0.020	0.042
	12	37	2.17	0.512	4.23	0.137	0.579	0.776	0.264	0.174	2.812	0.580	1.21	0.10	0.03	0.140	0.140	0.033	0.023	0.007	0.093
	18	34	2.67	0.452	5.9	0.047	0.278	1.106	0.663	0.204	2.237	0.213	1.97	0.06	0.07	0.127	0.127	0.021	0.009	0.011	0.123
	24	19	5.17	0.573	9.01	0.058	0.518	1.736	1.335	0.184	1.719	0.060	3.26	0.11	0.11	0.214	0.214	0.024	0.012	0.012	0.105
	30	23	4.50	1.807	2.49	-0.436	-1.087	1.340	0.645	0.174	1.754	0.132	2.16	-0.07	-0.12	-0.183	-0.183	-0.073	-0.027	-0.046	0.080
	36	22	4.67	1.520	3.07	0.031	0.097	1.800	0.751	0.203	1.625	0.270	2.75	0.08	0.02	0.099	0.099	0.032	0.025	0.006	0.098
Batch 3.175 L	42	19	5.17	0.764	6.76	0.091	0.615	2.200	0.992	0.138	1.437	0.170	3.33	0.07	0.04	0.096	0.096	0.014	0.010	0.006	0.107
	48	14	6.00	0.648	9.26	0.045	0.417	2.519	1.254	0.190	1.720	0.145	3.96	0.05	0.04	0.106	0.106	0.011	0.006	0.005	0.110
	54	9	6.83	0.596	11.47	0.032	0.368	2.540	1.369	0.176	1.342	0.210	4.09	0.00	0.02	0.020	0.020	0.002	0.000	0.002	0.100
	60	14	3.6	0.157	22.96		2.30	5.100	3.534	0.261	2.210	0.000	8.90	0.51	0.35	0.89	0.039	0.00169	0.00097	0.00067	0.2471
Bleed ratio =	66	10	4	0.156	25.71		2.57	4.880	3.358	0.235	1.319	0.000	8.47	0.49	0.34	0.85	0.033	0.00128	0.00074	0.00051	0.2118
0.5	72	7	4.3	0.173	24.82		2.48	5.109	3.908	0.346	0.856	0.040	9.36	0.51	0.39	0.94	0.038	0.00152	0.00083	0.00063	0.2177
D =	78	7	4.3	0.177	24.23		2.42	5.339	4.045	0.224	0.843	0.000	9.61	0.53	0.40	0.96	0.040	0.00164	0.00091	0.00069	0.2234
0.1	84	7	4.3	0.176	24.45	0.0500	2.45	5.237	4.001	0.386	0.905	0.046	9.62	0.52	0.40	0.96	0.039	0.00161	0.00088	0.00067	0.2238
	90	19	4.03	0.168	24.00		3.12	3.414	2.279	0.186	2.058	0.053	5.88	0.44	0.30	0.76	0.032	0.00133	0.00077	0.00051	0.1896
Bleed ratio =	96	18	4.16	0.172	24.23		3.15	3.565	2.631	0.141	2.249	0.134	6.34	0.46	0.34	0.82	0.034	0.00140	0.00079	0.00058	0.1980
0.4	102	15	4.55	0.191	23.78		3.09	4.398	3.198	0.200	1.644	0.000	7.80	0.57	0.42	1.01	0.043	0.00179	0.00101	0.00074	0.2227
D =	108	15	4.55	0.196	23.19		3.01	4.550	3.304	0.239	2.919	0.202	8.09	0.59	0.43	1.05	0.045	0.00196	0.00110	0.00080	0.2312
0.13	114	15	4.55	0.191	23.78	0.0520	3.09	4.309	3.243	0.221	1.574	0.000	7.77	0.56	0.42	1.01	0.042	0.00179	0.00099	0.00075	0.2221
	120	23	5.13	0.192	26.75		5.08	4.632	3.433	0.225	1.828	0.051	8.29	0.88	0.65	1.58	0.059	0.00220	0.00084	0.00062	0.3070
Bleed ratio =	126	21	5.51	0.209	26.31		5.00	4.609	3.559	0.207	1.893	0.039	8.38	0.88	0.68	1.59	0.060	0.00230	0.00087	0.00067	0.2888
0.286	132	18	6.08	0.252	24.15		4.59	4.267	2.971	0.212	1.798	0.000	7.45	0.81	0.56	1.42	0.059	0.00243	0.00095	0.00066	0.2328
D =	138	18	6.08	0.252	24.08		4.58	4.297	2.445	0.214	1.772	0.000	6.96	0.82	0.46	1.32	0.055	0.00228	0.00096	0.00055	0.2174
0.19	144	18	6.08	0.251	24.23	0.0543	4.60	4.305	2.924	0.229	2.069	0.081	7.46	0.82	0.56	1.42	0.058	0.00241	0.00095	0.00065	0.2331
	150	21	8.7	0.304	28.61		8.58	3.670	1.904	0.091	2.103	0.120	5.67	1.10	0.57	1.70	0.059	0.00208	0.00135	0.00070	0.1953
	156	19	9.3	0.347	26.79		8.04	3.110	1.815	0.146	2.358	0.073	5.07	0.93	0.54	1.52	0.057	0.00212	0.00130	0.00076	0.1636
	162	17	9.9	0.359	27.57		8.27	3.608	2.483	0.228	2.091	0.106	6.32	1.08	0.74	1.90	0.069	0.00249	0.00142	0.00098	0.1915
	168	12	11.4	0.288	39.57		11.87	4.907	3.250	0.223	2.061	0.072	8.38	1.47	0.98	2.51	0.064	0.00161	0.00094	0.00062	0.2205
Bleed ratio =	174	10	12	0.291	41.24		12.37	4.930	3.139	0.161	1.006	0.000	8.23	1.48	0.94	2.47	0.060	0.00145	0.00087	0.00055	0.2058
0.182	180	8	12.6	0.303	41.58		12.47	5.180	3.423	0.265	1.585	0.000	8.87	1.55	1.03	2.66	0.064	0.00154	0.00090	0.00059	0.2111
D =	186	8	12.6	0.306	41.13		12.34	5.298	3.714	0.288	2.137	0.032	9.30	1.59	1.11	2.79	0.068	0.00165	0.00094	0.00066	0.2214
0.3	192	8	12.6	0.301	41.8	0.0545	12.54	5.248	3.466	0.248	1.619	0.364	8.96	1.57	1.04	2.69	0.064	0.00154	0.00090	0.00060	0.2134
	198	13	18.5	0.432	42.8		21.40	4.750	2.040	0.204	2.567	0.155	6.99	2.38	1.02	3.50	0.082	0.00191	0.00130	0.00056	0.1890
Bleed ratio =	204	15	17.5	0.392	44.69		22.35	4.602	3.394	0.177	1.538	0.032	8.17	2.30	1.70	4.09	0.091	0.00205	0.00115	0.00085	0.2335
0.1176	210	17	16.5	0.398	41.48		20.71	3.602	2.571	0.247	1.985	0.129	6.42	1.80	1.29	3.21	0.077	0.00187	0.00105	0.00075	0.1945
D =	216	17	16.5	0.389	42.37		21.19	3.692	2.636	0.273	2.457	0.140	6.60	1.85	1.32	3.30	0.078	0.00184	0.00103	0.00073	0.2000
0.5	222	17	16.5	0.393	41.98	0.0588	20.99	3.574	2.442	0.251	2.105	0.197	6.27	1.79	1.22	3.13	0.075	0.00178	0.00101	0.00069	0.1899
	228	15	17.5	0.369	47.37		23.69	3.509	2.620	0.287	1.640	0.113	6.42	1.75	1.31	3.21	0.068	0.00143	0.00078	0.00058	0.1833
	234	13	18.5	0.343	53.9		26.95	4.715	3.016	0.242	2.435	0.201	7.97	2.36	1.51	3.99	0.074	0.00137	0.00081	0.00052	0.2155
Bleed ratio =	240	9	20.5	0.324	63.3		31.65	5.548	4.026	0.283	2.085	0.043	9.86	2.77	2.01	4.93	0.078	0.00123	0.00069	0.00050	0.2404
0.1176	246	11	19.5	0.318	61.32		30.66	5.116	3.652	0.484	2.244	0.227	9.25	2.56	1.83	4.63	0.075	0.00123	0.00068	0.00049	0.2372
D =	252	11	19.5	0.320	60.95		30.48	4.942	3.618	0.471	2.065	0.155	9.03	2.47	1.81	4.52	0.074	0.00122	0.00067	0.00049	0.2316
0.5	258	11	19.5	0.317	61.5	0.0588	30.75	5.262	3.658	0.493	2.362	0.226	9.41	2.63	1.83	4.71	0.077	0.00124	0.00070	0.00048	0.2414
	264	11	19.5	0.302	64.47		32.24	5.200	3.051	0.294	1.981	0.156	8.55	2.60	1.53	4.27	0.066	0.00103	0.00063	0.00037	0.2191
Bleed ratio =	270	8	21	0.318	66.14		33.07	5.537	3.898	0.301	1.816	0.226	9.74	2.77	1.95	4.87	0.074	0.00111	0.00063	0.00045	0.2318
0.1176	276	7	21.5	0.325	66.14		33.07	5.599	3.786	0.285	1.243	0.104	9.67	2.80	1.89	4.84	0.073	0.00111	0.00064	0.00043	0.2249
D =	282	5	22.5	0.304	74.12		37.06	5.874	4.109	0.309	2.140	0.114	10.29	2.94	2.05	5.15	0.069	0.00094	0.00053	0.00037	0.2287
0.5	288	2	24	0.303	79.32		39.66	6.961	4.858	0.343	1.063	0.081	12.16	3.48	2.43	6.08	0.077	0.00097	0.00055	0.00039	0.2534
	294	2	24	0.304	78.95		39.48	6.761	4.649	0.307	0.964	0.061	11.72	3.38	2.32	5.86	0.074	0.00094	0.00054	0.00037	0.2441
	300	2	24	0.307	78.2	0.0588	39.10	6.644	4.560	0.310	1.051	0.060	11.51	3.32	2.28	5.76	0.074	0.00094	0.00054	0.00037	0.2399

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