

Supporting Information For:

The Impact of Berberine Pharmaceutical Wastewater on Aerobic Granules Formation: Change of Granules' Size

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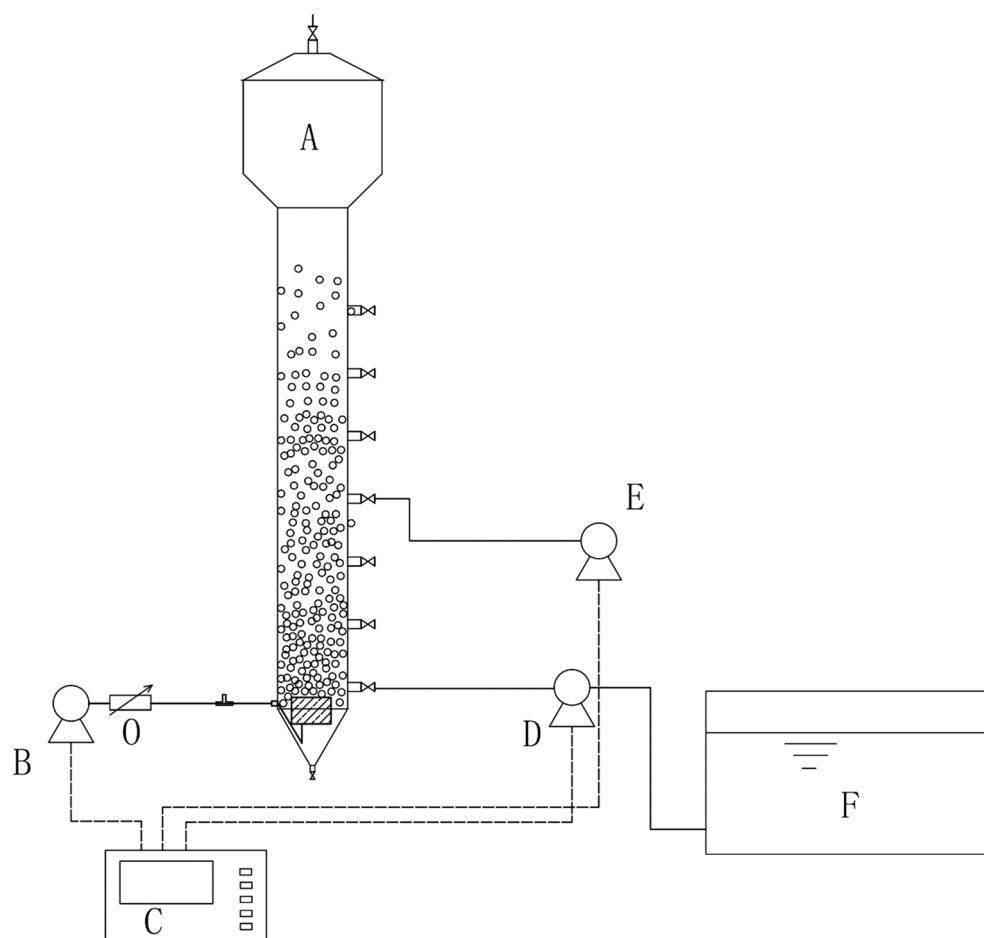


Figure S1. The image of aerobic granular system. A: SBR reactor, B: air pump, C: timer、 D: influent pump, E: effluent pump, F: influent tank.

Table S1. Physical and chemical properties of aerobic sludge as inoculum.

Reactor	Particle size (μm)	SVI (ml/g)	MLSS (mg/L)	MLVSS/MLSS (%)
R1	62.84 \pm 3.04	102.4 \pm 4.98	2147 \pm 105.7	47
R2	60.12 \pm 2.91	98.60 \pm 4.83	2363 \pm 110.2	39
R3	51.64 \pm 2.34	95.70 \pm 4.71	2350 \pm 103.4	27

Table S2. The composition of influent wastewater.

Components	Concentration(mg/L)		
	R1	R2	R3
COD	2000	2000	2000
NH ₄ Cl	200	200	-
KH ₂ PO ₄	35	35	-
CaCl ₂ ·2H ₂ O	30	30	-
MgSO ₄ ·7H ₂ O	25	25	-
FeSO ₄ ·7H ₂ O	20	20	-
Berberine	-	10-15	10-15

Table S3. The characteristics of aerobic granules' diameter in R1.

Time (day)	Settling time (min)	d (0.1) (μm)	d (0.5) (μm)	d(0.9) (μm)	D[3,2] (μm)	D[4,3] (μm)	Specific surface area (m^2/g)	Dia mete r dista nce	Consi stenc e
1	30	19.83	50.62	111.82	35.31	62.84	0.17	1.82	0.63
4	10	54.86	126.54	275.43	93.21	148.87	0.06	1.74	0.54
11	10	93.41	243.71	529.65	174.59	281.48	0.03	1.79	0.55
13	10	68.76	185.12	471.43	130.83	232.31	0.05	2.18	0.67
15	10	72.40	187.44	478.64	136.43	236.74	0.04	2.17	0.67
18	10	78.53	202.28	491.62	143.55	248.60	0.04	2.04	0.63
20	5	100.93	261.71	304.53	184.21	304.53	0.03	1.82	0.56
22	5	95.08	267.11	598.32	180.18	311.22	0.03	1.88	0.58
24	5	94.80	301.19	706.52	185.34	356.42	0.03	2.03	0.63
28	5	84.15	294.57	734.93	164.48	358.46	0.04	2.21	0.69
33	5	78.35	241.81	616.17	141.17	300.42	0.04	2.22	0.69
36	5	93.30	259.61	621.26	163.97	313.56	0.04	2.03	0.63
40	5	114.48	288.09	647.84	201.39	339.44	0.03	1.85	0.57
43	5	128.69	299.41	668.53	243.18	345.65	0.02	1.80	0.55
51	5	167.77	348.18	656.32	267.48	382.56	0.02	1.40	0.43
57	5	194.47	385.42	700.10	315.33	418.94	0.02	1.31	0.41
61	5	200.40	421.93	781.42	330.33	459.33	0.02	1.38	0.43
64	5	228.75	452.91	795.28	362.54	484.33	0.02	1.25	0.39
67	5	225.37	475.92	849.79	343.39	508.69	0.02	1.31	0.40
70	5	223.79	481.48	862.49	361.65	514.56	0.02	1.33	0.41
74	5	238.74	494.29	861.96	360.47	523.47	0.02	1.26	0.39
81	5	120.18	435.07	838.97	236.47	463.49	0.03	1.65	0.50

Table S4. The characteristics of aerobic granules' diameter in R2.

Time (day)	Settling time (min)	d (0.1) (μm)	d (0.5) (μm)	d (0.9) (μm)	D[3,2] (μm)	D[4,3] (μm)	Specific surface area (m^2/g)	Diam eter distan ce	Consist ence
1	30	20.13	50.53	107.67	35.36	60.12	0.17	1.73	0.58
4	10	50.36	119.52	272.29	87.44	145.08	0.07	1.88	0.59
6	10	69.05	168.50	382.88	123.57	200.87	0.05	1.86	0.57
11	10	72.41	212.84	532.36	139.68	263.70	0.04	2.16	0.67
13	10	58.37	188.82	572.50	115.02	259.70	0.05	2.72	0.84
15	10	59.02	180.80	525.55	109.21	242.89	0.05	2.58	0.80
18	10	55.22	158.75	552.03	99.79	238.92	0.06	3.13	0.94
20	5	73.37	223.95	609.23	139.20	289.02	0.04	2.39	0.74
22	5	65.85	199.05	572.37	120.20	264.98	0.05	2.55	0.78
24	5	74.15	214.34	603.95	132.58	283.13	0.05	2.47	0.76
28	5	91.91	256.01	649.95	163.23	319.60	0.04	2.18	0.67
33	5	108.37	284.52	691.57	192.77	348.29	0.03	2.05	0.63
36	5	101.62	261.33	638.64	180.52	321.96	0.03	2.06	0.63
40	5	96.73	235.17	550.16	161.35	285.04	0.04	1.93	0.60
43	5	118.52	274.06	623.49	206.65	328.55	0.03	1.84	0.57
51	5	212.71	371.61	635.77	338.75	400.96	0.02	1.14	0.35
57	5	193.08	390.81	679.68	310.13	414.96	0.02	1.25	0.39
61	5	204.68	460.46	829.26	328.34	491.45	0.02	1.36	0.42
64	5	238.24	482.37	832.89	374.99	510.38	0.02	1.23	0.38
67	5	276.39	519.11	873.86	404.98	547.08	0.01	1.15	0.36
70	5	171.98	496.03	890.37	289.01	520.39	0.02	1.45	0.43
74	5	231.14	553.79	968.31	323.86	579.51	0.02	1.33	0.41
81	5	130.72	451.54	878.02	243.67	483.14	0.02	1.66	0.51

Table S5. The characteristics of aerobic granules' diameter in R3.

Time (day)	Settling time (min)	d (0.1) (μm)	d (0.5) (μm)	d (0.9) (μm)	D[3,2] (μm)	D[4,3] (μm)	Specific surface area (m^2/g)	Diameter distance	Con siste nce
1	30	20.28	45.94	91.50	34.50	51.64	0.17	1.55	0.48
4	10	51.72	121.87	271.74	89.54	145.26	0.07	1.81	0.56
6	10	70.12	164.11	352.52	122.29	190.36	0.05	1.72	0.53
11	10	70.28	199.02	458.26	129.35	236.30	0.05	1.95	0.60
13	10	56.97	209.30	527.61	118.02	255.31	0.05	2.25	0.70
15	10	91.90	281.40	329.28	165.04	329.28	0.04	1.96	0.60
18	10	58.37	251.05	775.26	124.64	343.48	0.05	2.86	0.91
20	5	87.07	352.15	795.15	181.99	400.79	0.03	2.01	0.63
22	5	58.43	179.60	695.30	115.47	291.19	0.05	3.55	1.09
24	5	65.87	219.26	786.04	130.80	337.62	0.05	3.29	1.03
28	5	77.79	259.60	820.47	147.42	366.16	0.04	2.86	0.89
33	5	72.00	227.91	812.00	126.30	347.45	0.05	3.25	0.99
36	5	83.15	207.49	669.86	167.85	300.46	0.04	2.83	0.85
40	5	80.77	186.09	521.36	145.96	252.92	0.04	2.37	0.73
43	5	101.17	228.36	648.50	193.51	310.04	0.03	2.40	0.72
51	5	157.60	309.56	579.96	252.12	341.61	0.04	1.36	0.42
57	5	184.20	358.44	637.84	289.45	386.16	0.02	1.27	0.39
61	5	199.56	413.69	736.38	318.50	442.45	0.02	1.30	0.40
64	5	241.75	464.77	800.19	369.50	493.74	0.02	1.20	0.37
67	5	231.76	489.76	860.37	349.93	519.18	0.02	1.28	0.40
70	5	240.10	514.93	895.37	358.21	541.94	0.02	1.27	0.40
74	5	236.07	551.93	973.43	339.41	580.63	0.02	1.34	0.41
81	5	200.42	538.59	920.82	333.72	555.02	0.02	1.34	0.40