# Mechanism Underlying Flow Velocity and its Corresponding Influence on the Growth of *Euglena gracilis*, a Dominant Bloom Species in Reservoirs

## Supplementary material

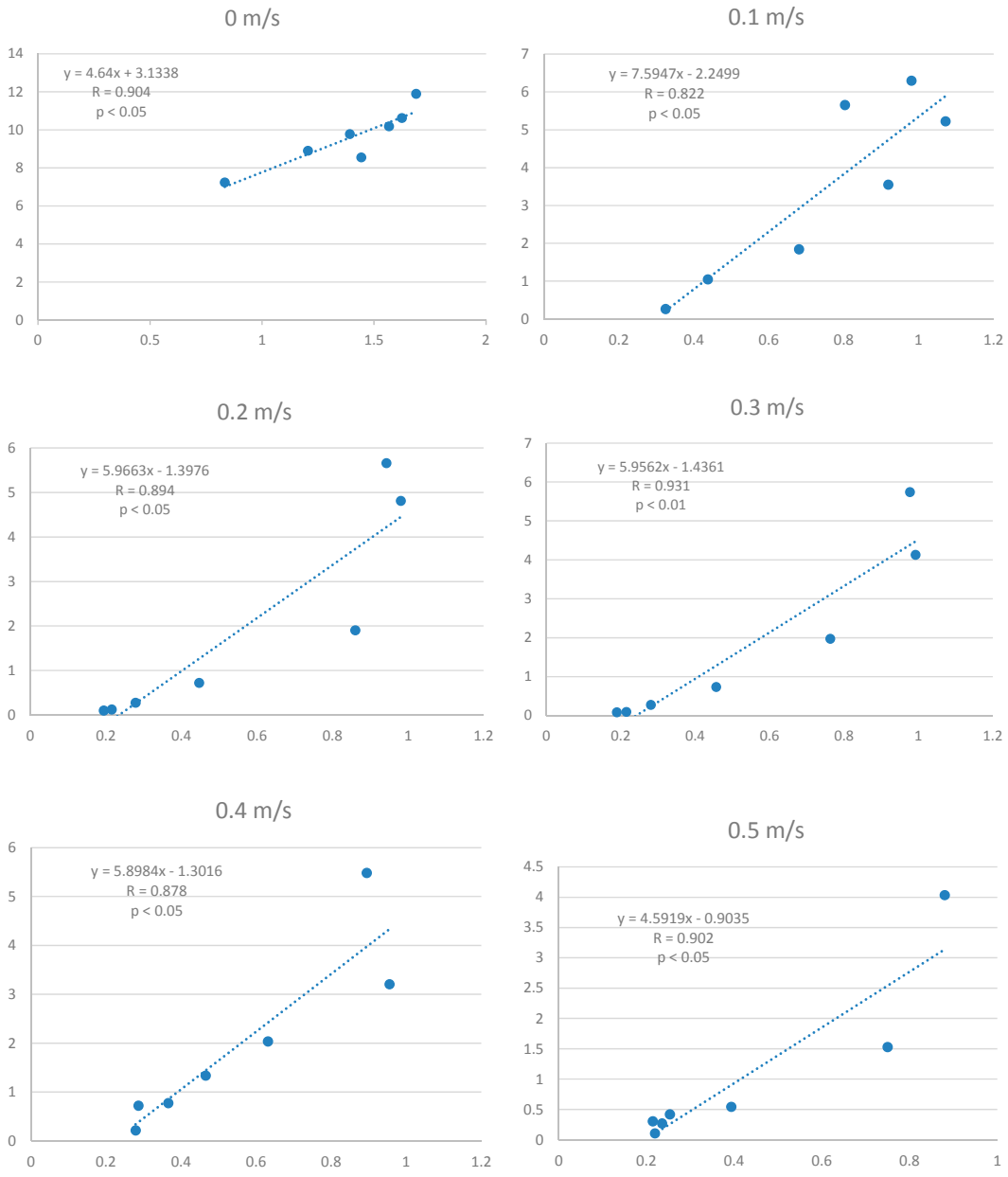


**Figure S1.** The correlation between biomass and Chla at different flow velocities.

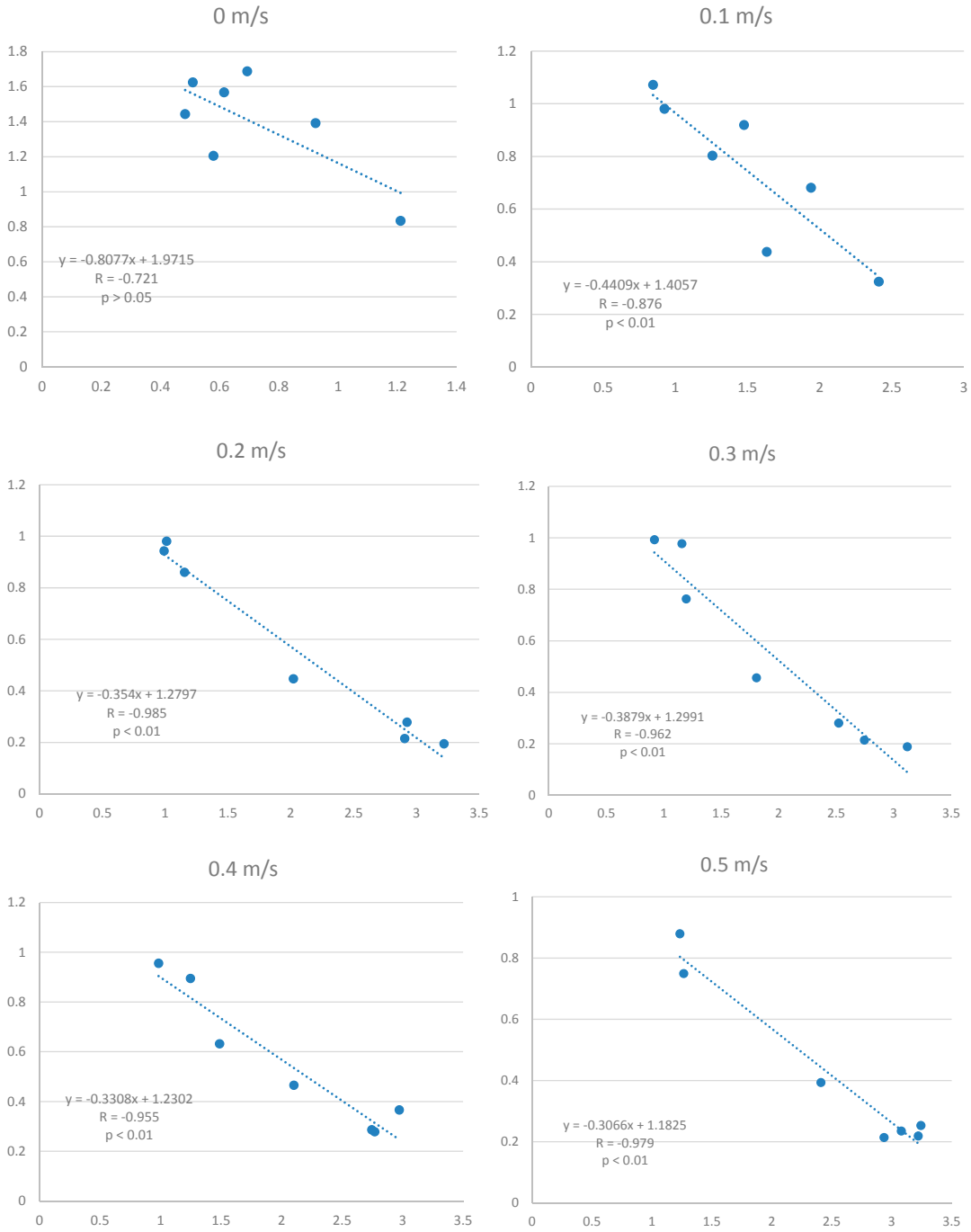


**Figure S2.** The correlation between MDA and biomass at different flow velocities.

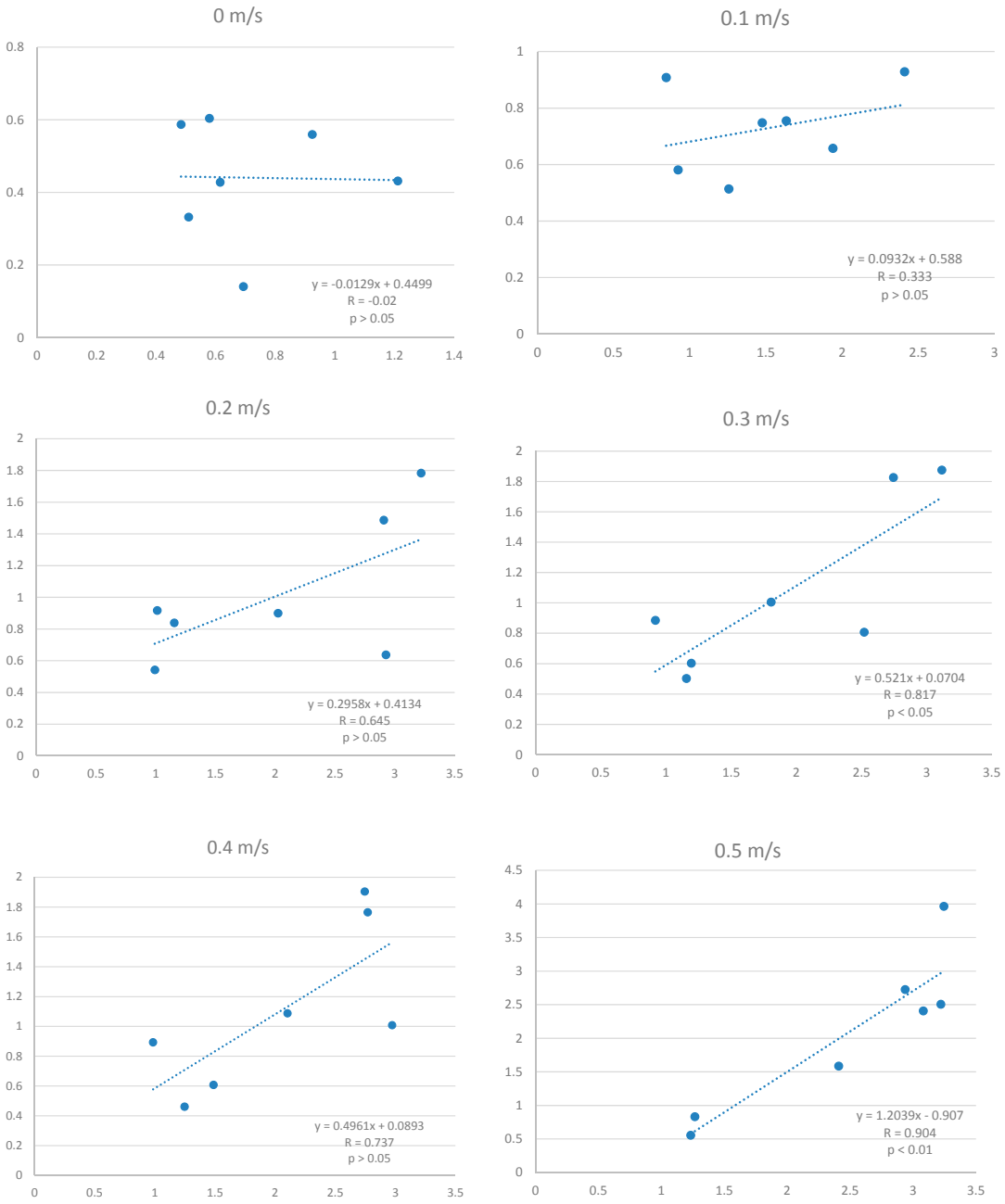


**Figure S3.** The correlation between MDA and SOD at different flow velocities. MDA: malondialdehyde; SOD: superoxide dismutase.

**Table S1.** Effects of different flow velocities on biomass.

| Flow Velocity (m/s) | Biomass ($10^8$ cells/L) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 0.83±0.023ab | 1.2±0.072a | 1.44±0.172a | 1.39±0.141a | 1.57±0.184a | 1.62±0.031a | 1.69±0.128a |
| 0.1 | 0.8±0.066b | 0.98±0.097b | 1.07±0.093b | 0.92±0.087b | 0.68±0.077b | 0.44±0.026b | 0.32±0.028b |
| 0.2 | 0.94±0.061ab | 0.98±0.086b | 0.86±0.077c | 0.45±0.042c | 0.28±0.026c | 0.21±0.005d | 0.19±0.017c |
| 0.3 | 0.98±0.055a | 0.99±0.075b | 0.76±0.061cd | 0.46±0.03c | 0.28±0.03c | 0.21±0.012c | 0.19±0.002c |
| 0.4 | 0.89±0.101ab | 0.96±0.121b | 0.63±0.022d | 0.47±0.039c | 0.37±0.043c | 0.29±0.025d | 0.28±0.02bc |
| 0.5 | 0.88±0.082ab | 0.75±0.055c | 0.39±0.036e | 0.25±0.021d | 0.24±0.028c | 0.21±0.015d | 0.22±0.008bc |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S2.** Effects of different flow velocities on MDA.

| Flow Velocity (m/s) | MDA (nmol/$10^8$ cells) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 1.21±0.047ab | 0.58±0.029c | 0.48±0.062e | 0.92±0.019d | 0.61±0.05d | 0.51±0.027c | 0.69±0.044c |
| 0.1 | 1.26±0.1a | 0.92±0.022b | 0.85±0.043d | 1.48±0.124c | 1.94±0.17c | 1.63±0.085b | 2.41±0.176b |
| 0.2 | 0.99±0.083b | 1.01±0.061b | 1.15±0.082c | 2.02±0.267b | 2.93±0.322ab | 2.91±0.171a | 3.22±0.301a |
| 0.3 | 1.16±0.114ab | 0.92±0.085b | 1.19±0.065c | 1.81±0.226bc | 2.52±0.25b | 2.74±0.336a | 3.12±0.268a |
| 0.4 | 1.25±0.126a | 0.98±0.09b | 1.49±0.066b | 2.1±0.155b | 2.97±0.15ab | 2.75±0.273a | 2.77±0.195ab |
| 0.5 | 1.23±0.125ab | 1.26±0.043a | 2.41±0.162a | 3.24±0.348a | 3.08±0.302a | 2.94±0.163a | 3.22±0.202a |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S3.** Effects of different flow velocities on SOD.

| Flow Velocity (m/s) | SOD activity (units/$10^8$ cells) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 0.43±0.035b | 0.6±0.038b | 0.59±0.067c | 0.56±0.04d | 0.43±0.037d | 0.33±0.024e | 0.14±0.004d |
| 0.1 | 0.51±0.048ab | 0.58±0.048b | 0.91±0.099b | 0.75±0.059cd | 0.66±0.035cd | 0.75±0.094d | 0.93±0.015c |
| 0.2 | 0.54±0.031ab | 0.92±0.074a | 0.84±0.045b | 0.9±0.069bc | 0.64±0.037cd | 1.49±0.126c | 1.78±0.185b |
| 0.3 | 0.5±0.047ab | 0.88±0.082a | 0.6±0.026c | 1.01±0.016bc | 0.81±0.021bc | 1.83±0.189bc | 1.88±0.077b |
| 0.4 | 0.46±0.062ab | 0.89±0.12a | 0.61±0.054c | 1.09±0.082b | 1.01±0.084b | 1.9±0.122b | 1.76±0.137b |
| 0.5 | 0.56±0.057a | 0.83±0.036a | 1.59±0.077a | 3.97±0.283a | 2.41±0.255a | 3.24±0.296a | 2.34±0.215a |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S4.** Effects of different flow velocities on POD.

| Flow Velocity (m/s) | POD activity (units/$10^8$ cells) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 377.79±10.849c | 132.8±7.188d | 44.15±1.528c | 23.51±1.281e | 36.92±3.84c | 32.02±2.63d | 80±5.628d |
| 0.1 | 449.21±34.768ab | 256.95±18.092c | 21.48±1.375c | 391.7±26.55b | 40.65±1.163c | 93.68±5.106c | 138.56±7.538ab |
| 0.2 | 435.16±27.574bc | 296.54±7.916bc | 72.46±4.96c | 553.79±49.912a | 75.53±4.135c | 100.12±1.126c | 111.12±13.206c |
| 0.3 | 464.86±49.723ab | 293.36±24.142bc | 59.64±2.829c | 497.17±41.897a | 320.8±8.101b | 144.12±10.233b | 120.16±2.7bc |
| 0.4 | 511.23±28.149a | 318.21±8.935b | 554.7±65.37b | 193.39±17.253d | 488.66±50.105a | 157.33±9.954b | 161.49±16.414a |
| 0.5 | 454.69±10.376ab | 480.2±42.654a | 1257.49±41.161a | 266.34±23.769c | 497.17±33.314a | 189.47±9.559a | 148.6±12.592a |

All values are the means of triplicates ± SD (n = 3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S5.** Effects of different flow velocities on CAT.

| Flow Velocity (m/s) | CAT activity (units/$10^8$ cells) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 114.29±14.75b | 139.44±14.109c | 99.8±6.329e | 22.04±1.222d | 86.16±4.349d | 81±5.742c | 90±10.461c |
| 0.1 | 280.1±11.797a | 195.01±18.041c | 223.91±13.264b | 85.68±1.274cd | 238.45±26.963c | 184±4.475b | 149.22±10.617b |
| 0.2 | 111.36±15.027b | 133.09±13.545c | 136.07±3.904d | 50.34±2.938cd | 583.45±17.009b | 55.82±3.599c | 187.29±11.838a |
| 0.3 | 92.09±7.432b | 453.37±44.903b | 141.55±8.453d | 131.44±10.681c | 174.98±4.577cd | 77.57±7.849c | 95.11±12.171c |
| 0.4 | 76.94±3.216b | 499.36±38.749b | 199.45±4.676c | 595.04±31.377b | 191.39±16.15c | 209.78±21.067ab | 63.11±1.077d |
| 0.5 | 288.22±32.339a | 740.31±77.3a | 469.3±16.893a | 710.25±90.58a | 1813.89±99.53a | 218.89±19.3a | 136.75±10.398b |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S6.** Effects of different flow velocities on TN.

| Flow Velocity (m/s) | TN (mg/L) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 446.63±34.845a | 190.65±13.506a | 172.26±9.903b | 153.86±16.636b | 90.72±10.82b | 56.06±2.698c | 21.4±2.517d |
| 0.1 | 416.63±36.936a | 210.8±11.643a | 215.35±23.102a | 219.9±13.381a | 68.71±6.025c | 21.4±2.303d | 53.95±2.851c |
| 0.2 | 426.63±30.464a | 190.65±8.274a | 160.38±9.441b | 130.11±11.433bc | 200.21±15.673a | 132.41±10.734b | 64.62±7.613bc |
| 0.3 | 406.63±32.466a | 192.12±10.481a | 126.73±4.49c | 61.33±4.343e | 51.33±5.583c | 207.09±18.682a | 51.33±4.961c |
| 0.4 | 436.63±35.078a | 198.99±11.74a | 158.18±7.654b | 117.37±11.937c | 22.36±1.622e | 66.97±4.216c | 111.58±6.319a |
| 0.5 | 406.61±29.511a | 204.5±10.697a | 146.16±14.116bc | 87.82±2.292d | 60.02±7.188c | 46.48±3.526c | 73.69±8.477b |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S7.** Effects of different flow velocities on TP.

| Flow Velocity (m/s) | TP (mg/L) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 8.86±0.74a | 3.06±0.21a | 4.79±0.487a | 3.49±0.281b | 3.12±0.159c | 5.11±0.445c | 6.06±0.675b |
| 0.1 | 9.11±0.667a | 1.92±0.089bc | 2.59±0.18d | 3.09±0.206b | 4.46±0.295b | 6.19±0.703bc | 6.65±0.381b |
| 0.2 | 8.86±0.969a | 1.97±0.178b | 3.48±0.109c | 4.66±0.394a | 5.95±0.604a | 6.62±0.687ab | 7.29±0.45b |
| 0.3 | 8.59±0.336a | 1.99±0.146b | 3.31±0.103c | 5.13±0.068a | 6.37±0.585a | 7.16±0.611ab | 7.23±0.49b |
| 0.4 | 7.92±1.043a | 2.26±0.152b | 3.78±0.253bc | 4.96±0.407a | 6.15±0.579a | 7.7±0.568a | 7.16±0.629b |
| 0.5 | 8.65±0.704a | 1.6±0.096c | 4.35±0.483ab | 5.37±0.712a | 6.44±0.893a | 7.83±0.191a | 11.6±1.199a |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S8.** Effects of different flow velocities on AKP

| Flow Velocity (m/s) | AKP synthase (units/$10^8$ cells) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 0.05±0.005a | 0.05±0.004a | 0.05±0.001e | 0.04±0.003e | 0.04±0.002d | 0.04±0.005d | 0.04±0.001d |
| 0.1 | 0.05±0.006a | 0.05±0.004a | 0.09±0.009d | 0.09±0.006d | 0.11±0.004c | 0.19±0.01c | 0.25±0.029c |
| 0.2 | 0.05±0.003a | 0.05±0.001a | 0.11±0.008cd | 0.21±0.026c | 0.31±0.009b | 0.42±0.032b | 0.45±0.036b |
| 0.3 | 0.05±0.004a | 0.05±0.006a | 0.12±0.005c | 0.22±0.019c | 0.31±0.02b | 0.41±0.033b | 0.44±0.015b |
| 0.4 | 0.05±0.003a | 0.05±0.005a | 0.19±0.012b | 0.28±0.024b | 0.34±0.026b | 0.49±0.028b | 0.49±0.058b |
| 0.5 | 0.05±0.002a | 0.05±0.003a | 0.4±0.02a | 0.55±0.039a | 0.62±0.059a | 0.74±0.071a | 0.58±0.018a |

All values are the means of triplicates ± SD (n=3). ANOVA was significant at $p < 0.05$. Different letters indicate significantly different values for a particular treatment group (DMRT, $p < 0.05$).

**Table S9.** Effects of different flow velocities on pH.

| Flow Velocity (m/s) | pH | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0 | 7.44±0.3 | 8.22±0.27 | 8.22±0.26 | 8.26±0.28 | 8.3±0.31 | 8.33±0.4 | 8.37±0.23 |
| 0.1 | 7.3±0.46 | 8.27±0.32 | 8.47±0.29 | 8.54±0.23 | 8.62±0.19 | 8.69±0.17 | 8.76±0.36 |
| 0.2 | 7.43±0.3 | 8.28±0.14 | 8.55±0.21 | 8.61±0.38 | 8.66±0.37 | 8.72±0.46 | 8.77±0.44 |
| 0.3 | 7.47±0.47 | 8.28±0.38 | 8.56±0.51 | 8.64±0.53 | 8.72±0.3 | 8.79±0.33 | 8.87±0.43 |
| 0.4 | 7.43±0.47 | 8.51±0.34 | 8.71±0.12 | 8.75±0.36 | 8.8±0.12 | 8.84±0.21 | 8.88±0.3 |
| 0.5 | 7.81±0.38 | 8.65±0.23 | 8.72±0.23 | 8.77±0.28 | 8.82±0.5 | 8.86±0.09 | 8.91±0.33 |

All values are the means of triplicates ± SD (n=3).