**SUPPLEMENTARY MATERIAL**

Table S1. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the total carbon content in *Monostroma hariotii*, *Adenocystis utricularis* and *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |  |   | ***Total Carbon*** |
|  |  | ***df*** | ***MS*** | ***F*** | ***P*** |
| *M. hariotii* | *Time (T)* | 1 | 3589.4 | 12.669 | \*\* |
| *temperature (t)* | 1 | 1750.2 | 6.177 | \*\* |
| *T\*t* | 1 | 7.0 | 0.025 |  |
| *Res* | 8 | 283.3 |  |  |
| *A. utricularis* | *Time (T)* | 1 | 94 | 0.391 |  |
| *temperature (t)* | 1 | 11160 | 46.339 | \*\* |
| *T\*t* | 1 | 166 | 0.689 |  |
| *Res* | 8 | 241 |  |  |
| *P. endiviifolia* | *Time (T)* | 1 | 115 | 2.31 |  |
| *temperature (t)* | 1 | 100 | 2.01 |  |
| *T\*t* | 1 | 222 | 4.45 |  |
| *Res* | 8 | 50 |  |  |

 *Res: Residual*

Table S2. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the total nitrogen content in *Monostroma hariotii*, *Adenocystis utricularis* and *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |  |   | ***Total Nitrogen*** |
|  |  | ***df*** | ***MS*** | ***F*** | ***P*** |
| *M. hariotii* | *Time (T)* | 1 | 55.10 | 29.831 | \*\* |
| *temperature (t)* | 1 | 70.65 | 38.255 | \*\* |
| *T\*t* | 1 | 27.68 | 14.987 | \*\* |
| *Res* | 8 | 1.85 |  |  |
| *A. utricularis* | *Time (T)* | 1 | 0.209 | 0.159 |  |
| *temperature (t)* | 1 | 285.929 | 217.478 | \*\* |
| *T\*t* | 1 | 5.088 | 3.870 |  |
| *Res* | 8 | 1.315 |  |  |
| *P. endiviifolia* | *Time (T)* | 1 | 34.80 | 5.343 | \*\* |
| *temperature (t)* | 1 | 44.33 | 6.805 | \*\* |
| *T\*t* | 1 | 64.64 | 9.923 | \*\* |
| *Res* | 8 | 6.51 |  |  |

 *Res: Residual*

Table S3. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the ratio C:N in *Monostroma hariotii*, *Adenocystis utricularis* and *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |   |   | ***Ratio C:N***  |
|   |   | ***df*** | ***MS*** | ***F*** | ***P*** |
| *M. hariotii* | *Time (T)* | 1 | 0.168 | 0.524 |   |
| *temperature (t)* | 1 | 13.235 | 41.193 | \*\* |
| *T\*t* | 1 | 2.533 | 7.884 | \*\* |
| *Res* | 8 | 0.321 |   |   |
| *A. utricularis* | *Time (T)* | 1 | 0.107 | 0.177 |  |
| *temperature (t)* | 1 | 9.399 | 15.456 | \*\* |
| *T\*t* | 1 | 0.232 | 0.381 |  |
| *Res* | 8 | 0.608 |   |   |
| *P. endiviifolia* | *Time (T)* | 1 | 0.428 | 1.940 |  |
| *temperature (t)* | 1 | 0.621 | 2.814 |  |
| *T\*t* | 1 | 0.837 | 3.795 |  |
| *Res* | 8 | 0.221 |   |   |

 *Res: Residual*

Table S4. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the chlorophyll *a* content in *Monostroma hariotii*, *Adenocystis utricularis* and *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |   |   | ***Chlorophyll a*** |
|   |   | ***df*** | ***MS*** | ***F*** | ***P*** |
| *M. hariotii* | *Time (T)* | 1 | 173.27 | 14.719 | \*\* |
| *temperature (t)* | 1 | 2.51 | 0.213 |  |
| *T\*t* | 1 | 138.01 | 11.723 | \*\* |
| *Res* | 8 | 11.77 |   |   |
| *A. utricularis* | *Time (T)* | 1 | 83.52 | 4.253 |  |
| *temperature (t)* | 1 | 397.62 | 20.247 | \*\* |
| *T\*t* | 1 | 3.50 | 0.178 |  |
| *Res* | 8 | 19.64 |   |   |
| *P. endiviifolia* | *Time (T)* | 1 | 15.353 | 9.3868 | \*\* |
| *temperature (t)* | 1 | 128.832 | 78.7700 | \*\* |
| *T\*t* | 1 | 6.247 | 3.8194 |  |
| *Res* | 8 | 1.636 |   |   |

 *Res: Residual*

Table S5. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the phenolic compounds in *Monostroma hariotii*, *Adenocystis utricularis* and *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |  |   | ***Phenolic compounds*** |
|  |  | ***df*** | ***MS*** | ***F*** | ***P*** |
| *M. hariotii* | *Time (T)* | 1 | 0.8469 | 2.461 |  |
| *temperature (t)* | 1 | 0.0021 | 0.006 |  |
| *T\*t* | 1 | 1.9514 | 5.67 | \*\* |
| *Res* | 8 | 0.3442 |  |  |
| *A. utricularis* | *Time (T)* | 1 | 98.215 | 54.127 | \*\* |
| *temperature (t)* | 1 | 433.345 | 238.821 | \*\* |
| *T\*t* | 1 | 175.922 | 96.953 | \*\* |
| *Res* | 8 | 1.815 |  |  |
| *P. endiviifolia* | *Time (T)* | 1 | 0.121 | 0.678 |  |
| *temperature (t)* | 1 | 3.445 | 19.233 | \*\* |
| *T\*t* | 1 | 0.220 | 1.226 |  |
| *Res* | 8 | 0.179 |  |  |

 *Res: Residual*

Table S6. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the DPPH in *Monostroma hariotii*, *Adenocystis utricularis* and *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |  |   | ***DPPH*** |
|  |  | ***df*** | ***MS*** | ***F*** | ***P*** |
| *M. hariotii* | *Time (T)* | 1 | 16.8482 | 22.0221 | \*\* |
| *temperature (t)* | 1 | 5.7271 | 7.4858 | \*\* |
| *T\*t* | 1 | 9.8756 | 12.9083 | \*\* |
| *Res* | 8 | 0.7651 |  |  |
| *A. utricularis* | *Time (T)* | 1 | 0.0298 | 0.097 |  |
| *temperature (t)* | 1 | 0.0641 | 0.209 |  |
| *T\*t* | 1 | 0.4069 | 1.325 |  |
| *Res* | 8 | 0.3071 |  |  |
| *P. endiviifolia* | *Time (T)* | 1 | 1.3189 | 1.9856 |  |
| *temperature (t)* | 1 | 0.4725 | 0.7112 |  |
| *T\*t* | 1 | 0.0003 | 0.0005 |  |
| *Res* | 8 | 0.6643 |  |  |

 *Res: Residual*

Figure S1. Spectral sweep from 250 to 500 nm to detect single phenolic compounds in A) *Monostroma hariotii,* B) *Adenocystis utricularis* and C) *Pyropia endiviifolia,* exposed to 2 °C and 8 °C, at days 3 and 5 of experiments.



Figure S2. The UV visible spectrum of phenolic compounds standards, A) p-coumaric acid, B) Rutin, C) 3, 4 – Dihydroxy benzaldehyde, D) 4 - Hydroxybenzoic acid, E) Esculetin, F) Trans - Cinnamic acid, G) Protocatechuic acid and H) Phloroglucinol.



Table S7. ANOVA results after experiments at different temperatures (2°C and 8°C) and time (3 and 5-day) over the Total MAAs in *Pyropia endiviifolia* *p* < 0.05\*\*

|  |  |  |  |
| --- | --- | --- | --- |
|   |  |   | ***Total MAAs*** |
|  |  | ***df*** | ***MS*** | ***F*** | ***P*** |
| *P. endiviifolia* | *Time (T)* | 1 | 0.7586 | 22.078 | \*\* |
| *temperature (t)* | 1 | 1.5197 | 44.224 | \*\* |
| *T\*t* | 1 | 0.0737 | 2.146 |  |
| *Res* | 8 | 0.0344 |  |  |

 *Res: Residual*