

## Supplementary Material

### Comparative analysis of the soil microbiome and carbohydrate content of *Anthoxanthum nitens* (Sweetgrass) tissues and associated soils

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#### 1 Supplementary Figures and Tables

**Table S1** Gradient conditions used for the HPLC separation of neutral and uronic acids.

| Time (min) | 100 mM NaOH | 100 mM NaOH<br>1 M NaOAc | H <sub>2</sub> O |
|------------|-------------|--------------------------|------------------|
|            | A (%)       | B (%)                    | C (%)            |
| 0          | 20          | 0                        | 80               |
| 20         | 19          | 1                        | 80               |
| 20.1       | 15          | 5                        | 0                |
| 60         | 80          | 20                       | 0                |
| 60.1       | 100         | 0                        | 0                |
| 70         | 100         | 0                        | 0                |
| 70.1       | 20          | 0                        | 80               |
| 80         | 20          | 0                        | 80               |

**Table S2** Gradient conditions used for the HPLC separation of amino sugars.

| Time<br>(min) | 100 mM<br>NaOH | 100 mM NaOH<br>1 M NaOAc | H <sub>2</sub> O |
|---------------|----------------|--------------------------|------------------|
|               | A (%)          | B (%)                    | C (%)            |
| 0             | 10             | 0                        | 90               |
| 20            | 10             | 0                        | 90               |
| 20.1          | 100            | 0                        | 0                |
| 30            | 100            | 0                        | 0                |
| 30.1          | 10             | 0                        | 90               |
| 40            | 10             | 0                        | 90               |

**Table S3** Relative abundances (Mol%) of glycosidic linkages identified from the rhizome, stems, and leaves from the cell walls of *A. nitens* (n=2) via GC-MS. Tr. = Trace (Mol % < 0.5%)

| Tissue                | Rhizome |     |     |     |     |     | Stems |     |     |     |     |     | Leaves |     |     |     |     |     |
|-----------------------|---------|-----|-----|-----|-----|-----|-------|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|
| Bio Rep               | 1       | 2   | 3   | 4   | 5   | 6   | 1     | 2   | 3   | 4   | 5   | 6   | 1      | 2   | 3   | 4   | 5   | 6   |
| t-Arap                | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| t-Araf                | 3.5     | 3.8 | 2.8 | 3.5 | 3.9 | 2.9 | 3.5   | 3.2 | 4.5 | 3.1 | 3.4 | 3.2 | 4.5    | 5   | 3.5 | 3.4 | 4.2 | 4.8 |
| 2-Araf                | 0.6     | 0.5 | 0.5 | Tr. | 0.8 | Tr. | Tr.   | Tr. | Tr. | Tr. | 0.6 | 0.5 | 0.7    | 0.6 | Tr. | 0.6 | 0.6 | 0.6 |
| 3-Araf                | 0.9     | 0.9 | 0.7 | 0.7 | 1.1 | 0.7 | 0.7   | 0.7 | 0.7 | 0.6 | 0.7 | 0.6 | 0.9    | 0.9 | 0.6 | 0.6 | 0.6 | 0.7 |
| 5-Araf                | 1       | 0.9 | 0.6 | 0.5 | 1.3 | 0.6 | 0.6   | 0.7 | 0.6 | 0.6 | 0.5 | 0.6 | 2      | 1.9 | 0.9 | 0.8 | 0.9 | 1   |
| 2,3,5-Araf            | 0.6     | Tr. | Tr. | Tr. | Tr. | 0.5 | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| t-Fucp                | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| t-Galp                | 1.6     | 1.5 | 1.1 | 1.2 | 2.4 | 1.3 | 1.1   | 1   | 1.1 | 0.9 | 1.1 | 1   | 1.5    | 1.4 | 0.9 | 0.9 | 1   | 1.2 |
| 2-Galp                | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 3-Galp                | 0.6     | 0.5 | Tr. | Tr. | 0.9 | Tr. | 0.5   | 0.5 | 0.5 | Tr. | Tr. | 0.6 | 0.9    | 0.9 | 0.5 | 0.5 | Tr. | 0.5 |
| 4-Galp                | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 6-Galp                | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 2,6-Galp              | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 3,4-Galp              | 0.5     | Tr. | Tr. | Tr. | 0.5 | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | 0.5    | 0.6 | 0.5 | 0.5 | Tr. | Tr. |
| 3,6-Galp              | Tr.     | Tr. | Tr. | Tr. | 0.8 | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | 1.1    | 0.7 | Tr. | Tr. | Tr. | Tr. |
| 4,6-Galp              | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 2,3,6-Galp            | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 2,4,6-Galp            | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 3,4,6-Galp            | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | 0.5    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 2,3,4,6-Galp          | Tr.     | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | Tr. | Tr. | Tr. | Tr. | Tr. |
| 2,4-Glcp+<br>2,4-Galp | 0.5     | 0.5 | Tr. | Tr. | Tr. | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | 0.5 | 0.5 | Tr. | Tr. | Tr. |
| t-Glcp                | 2.3     | 2   | 1.8 | 1.5 | 3.1 | 1.7 | 1.2   | 0.9 | 1   | 0.9 | 1.1 | 0.8 | 2.1    | 2.2 | 1.8 | 1.6 | 1.5 | 2.3 |
| 2-Glcp                | Tr.     | Tr. | Tr. | Tr. | 1   | Tr. | Tr.   | Tr. | Tr. | Tr. | Tr. | Tr. | Tr.    | 0.5 | 0.5 | Tr. | Tr. | Tr. |
| 3-Glcp                | 0.9     | 1.2 | 0.7 | 0.7 | 1.4 | 0.9 | 0.7   | 0.5 | 0.7 | 0.6 | 0.6 | Tr. | 0.6    | 0.5 | Tr. | Tr. | Tr. | Tr. |

## Supplementary Material

|              |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 4-Glcp       | 49  | 51.2 | 50.3 | 51.4 | 42.8 | 52.5 | 53.6 | 54.3 | 53.3 | 52.1 | 55.1 | 53.1 | 50.1 | 51.3 | 53.1 | 53.4 | 48.6 | 55.6 |
| 6-Glcp       | Tr. | Tr.  | Tr.  | Tr.  | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | 0.5  | 0.5  | Tr.  | Tr.  | Tr.  |
| 2,3-Glcp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4-Glcp     | 0.7 | 0.7  | 0.6  | 0.5  | 0.5  | 0.6  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.6  | 0.6  | 0.9  | 0.8  | 0.7  | 0.5  | 0.7  |
| 3,6-Glcp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4,6-Glcp     | 3.1 | 2.6  | 2.5  | 1.5  | 2.8  | 2.6  | 2.1  | 2    | 2.1  | 2.2  | 1.7  | 2.5  | 2.1  | 2.6  | 3    | 2.8  | 2.2  | 1.9  |
| 2,3,6-Glcp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4,6-Glcp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4,6-Glcp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,4,6-Glcp | 1.1 | 0.9  | 0.7  | Tr.  | 0.5  | 0.9  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | 0.5  | Tr.  | 0.7  | 0.7  | 0.5  | Tr.  | Tr.  |
| t-Manp       | 0.7 | 0.6  | Tr.  | Tr.  | 1    | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3-Manp       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4-Manp       | 0.6 | Tr.  | 0.5  | Tr.  | 0.7  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | 0.5  | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  |
| 6-Manp       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,6-Manp     | 0.5 | Tr.  | Tr.  | Tr.  | 1.1  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,6-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4,6-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,6-Manp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4,6-Manp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4,6-Manp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,4,6-Manp | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| t-Rhap       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2-Rhaf       | Tr. | Tr.  | Tr.  | 0.5  | Tr.  | Tr.  | 0.6  | 0.6  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4-Rhap       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3-Rhap     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4-Rhap     | Tr. | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | 0.7  | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4-Rhap     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,4-Rhap   | Tr. | Tr.  | Tr.  | Tr.  | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| t-Xylp       | 0.7 | 0.7  | 0.8  | 0.8  | 0.9  | 0.7  | 0.9  | 0.8  | 0.8  | 0.7  | 0.8  | 0.7  | 0.6  | 0.8  | 0.7  | 0.9  | 0.8  | 0.8  |

|            |      |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |      |
|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|------|------|------|------|
| 2-Xylp     | 1.3  | 1.6  | 1.8  | 1.8  | 1.5  | 1.7  | 1.7  | 1.8  | 1.5  | 1.7  | 1.7  | 1.7  | 1.2  | 1.1 | 1.3  | 1.5  | 1.4  | 1.3  |
| 4-Xylp     | 11.4 | 13.4 | 16.5 | 15.7 | 10.1 | 15.6 | 14.5 | 16.5 | 13.9 | 15.5 | 14.8 | 15.9 | 10.1 | 9.3 | 12.4 | 14.4 | 13.2 | 11.3 |
| 2,4-Xylp   | 1.3  | 1.3  | 1.4  | 1.3  | 1.4  | 1.2  | 1.8  | 1.7  | 1.4  | 1.7  | 1.6  | 1.8  | 1.4  | 1.4 | 1.5  | 1.7  | 1.5  | 1.2  |
| 3,4-Xylp   | 5.8  | 5.5  | 5.1  | 5.2  | 5.6  | 4.9  | 6.1  | 6.6  | 6.3  | 6.3  | 6.2  | 6.6  | 6.3  | 5.8 | 6.1  | 6.1  | 5.9  | 5.7  |
| 2,3,4-Xylp | 1.6  | 0.8  | 0.8  | Tr.  | 0.7  | 1.2  | 0.9  | 0.9  | 0.9  | 1.7  | 0.5  | 1.9  | 0.6  | 0.6 | 1.8  | 1.6  | 1    | Tr.  |
| t-GalAp    | Tr.  | Tr.  | 0.5  | 0.8  | 0.6  | Tr.  | 0.5  | Tr.  | Tr.  | 0.7  | 0.6  | Tr.  | 0.6  | 0.5 | Tr.  | Tr.  | 1.4  | 0.5  |
| 2-GalAp    | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  |
| 3-GalAp    | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  |
| 4-GalAp    | 1.2  | 0.9  | 1.4  | 3.7  | 2.1  | 0.5  | 1.8  | 1    | 2.5  | 3.3  | 2.8  | 0.9  | 2.4  | 1.6 | 1.7  | 0.9  | 5.5  | 1.7  |
| 3,4-GalAp  | Tr.  | Tr.  | Tr.  | 0.6  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4-GlcAp+ |      |      |      |      |      |      |      |      |      |      |      |      |      |     |      |      |      |      |
| 2,4-GalAp  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  |
| t-GlcAp    | 1.8  | 1.8  | 2.3  | 4.1  | 2.6  | 1.7  | 2    | 1.4  | 2.2  | 2    | 2.1  | 1.4  | 2.3  | 2   | 2    | 1.4  | 3.4  | 2.1  |
| 2-GlcAp    | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  |
| 3-GlcAp    | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  |

Note: Two separate experiments were conducted for each sample.

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**Table S4** Relative abundances (Mol%) of glycosidic linkages identified from the rhizome (R), stems (S), and leaves (L) from the cell walls of *E. glaucus*, *B. pumpellianus*, *S. chondrachne*, and *E. repens* via GC-MS. Tr. = Trace (Mol % < 0.5%)

| Name       | <i>E. glaucus</i> |     |     | <i>B. pumpellianus</i> |     |     | <i>S. chondrachne</i> |     |     | <i>E. repens</i> |     |     |     |     |     |     |     |     |
|------------|-------------------|-----|-----|------------------------|-----|-----|-----------------------|-----|-----|------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Tissue     | R                 | S   | L   | R                      | S   | L   | R                     | S   | L   | R                |     |     | S   |     |     | L   |     |     |
| Bio Rep    | 1                 | 1   | 1   | 1                      | 1   | 1   | 1                     | 1   | 1   | 1                | 2   | 3   | 1   | 2   | 3   | 1   | 2   | 3   |
| t-Arap     | Tr.               | Tr. | Tr. | 0.5                    | Tr. | Tr. | 0.7                   | Tr. | Tr. | 0.5              | 0.5 | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. |
| t-Araf     | 5.6               | 3.1 | 3.1 | 4.9                    | 3.5 | 3.3 | 5.1                   | 3.5 | 3.6 | 5                | 3.4 | 3.5 | 3.6 | 4.2 | 2.8 | 2.6 | 3.4 | 3.5 |
| 2-Araf     | 0.9               | 0.5 | 0.8 | 1.1                    | 0.8 | 0.6 | 1                     | 0.9 | 1   | 1.3              | 1.2 | 1.1 | 1.1 | 0.8 | 0.7 | 0.8 | 0.8 | 0.8 |
| 3-Araf     | 1.7               | 0.7 | 1.2 | 1.6                    | 1.1 | 1.1 | 1.5                   | 1.4 | 0.7 | 1.8              | 1.6 | 1.6 | 1.6 | 1.5 | 1.1 | 0.9 | 0.9 | 0.9 |
| 5-Araf     | 1.3               | 0.5 | 0.9 | 0.7                    | 0.6 | 0.6 | 0.9                   | 1.1 | 0.9 | 1.2              | 1.1 | 0.7 | 0.7 | 1.3 | 0.6 | 0.6 | 1   | 0.8 |
| 2,3,5-Araf | 2                 | 1.5 | 0.6 | Tr.                    | Tr. | Tr. | 0.8                   | Tr. | Tr. | 1                | 0.8 | Tr. | Tr. | 0.6 | Tr. | Tr. | 0.7 | Tr. |

## Supplementary Material

|                       |     |      |      |      |      |     |      |      |     |      |      |      |      |      |      |      |      |      |
|-----------------------|-----|------|------|------|------|-----|------|------|-----|------|------|------|------|------|------|------|------|------|
| t-Fucp                | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| t-Galp                | 2.5 | 0.6  | 1.2  | 1.9  | 1.3  | 1.1 | 1.6  | 1.9  | 1.3 | 2.1  | 2    | 1.3  | 1.3  | 1.4  | 0.9  | 0.8  | 0.8  | 0.9  |
| 2-Galp                | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3-Galp                | 0.9 | Tr.  | Tr.  | 0.5  | Tr.  | Tr. | Tr.  | 0.8  | 0.5 | 0.7  | 0.6  | Tr.  | Tr.  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4-Galp                | 0.6 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | 0.5  | Tr. | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 6-Galp                | Tr. | Tr.  | Tr.  | 0.5  | Tr.  | Tr. | 0.5  | Tr.  | Tr. | 0.6  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,6-Galp              | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4-Galp              | 1.2 | Tr.  | Tr.  | 0.5  | Tr.  | Tr. | 0.6  | Tr.  | Tr. | 0.9  | 0.7  | Tr.  | Tr.  | 0.5  | Tr.  | Tr.  | 0.5  | Tr.  |
| 3,6-Galp              | 0.5 | Tr.  | Tr.  | 0.6  | 0.5  | Tr. | 0.7  | 0.7  | Tr. | 0.9  | 0.9  | 0.6  | 0.7  | 0.9  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4,6-Galp              | 1.8 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,6-Galp            | 0.9 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4,6-Galp            | 1.4 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4,6-Galp            | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,4,6-Galp          | 1.2 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | 0.5  | Tr.  | Tr. | 0.8  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4-Glcp+<br>2,4-Galp | 0.5 | Tr.  | Tr.  | 0.5  | Tr.  | 0.5 | 0.5  | Tr.  | Tr. | 0.5  | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | 0.5  | Tr.  |
| t-Glcp                | 1.8 | 0.9  | 1.4  | 2    | 1.9  | 2.2 | 1.5  | 1.8  | 1.4 | 2.5  | 3    | 2.1  | 1.2  | 2.3  | 1.3  | 1.4  | 1.4  | 1.5  |
| 2-Glcp                | 0.7 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | 0.6  | 0.6  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3-Glcp                | 1.2 | 0.6  | 0.9  | 1.1  | 0.8  | 0.6 | 1    | 1.3  | 0.8 | 1.6  | 1.5  | 1.2  | 1.4  | 1.4  | 1    | Tr.  | Tr.  | 0.7  |
| 4-Glcp                | 30  | 40.4 | 43.7 | 40.2 | 50.2 | 55  | 43.8 | 35.4 | 47  | 34.9 | 38.8 | 47.4 | 49.8 | 44.2 | 51.4 | 52.7 | 44.9 | 46.6 |
| 6-Glcp                | 0.7 | Tr.  | Tr.  | 0.5  | Tr.  | Tr. | 0.5  | Tr.  | Tr. | 0.7  | 0.6  | Tr.  | Tr.  | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3-Glcp              | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4-Glcp              | 0.6 | 0.5  | 0.6  | 0.7  | 0.6  | 0.8 | 0.7  | 0.5  | 0.5 | 0.6  | 0.6  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.8  | 0.5  |
| 3,6-Glcp              | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 4,6-Glcp              | 3.7 | 3.9  | 3.4  | 2.2  | 2.5  | 2.2 | 3.4  | 1.9  | 2.2 | 3.2  | 3.1  | 2.6  | 2.3  | 2.7  | 2.2  | 1.8  | 3.8  | 2    |
| 2,3,6-Glcp            | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,4,6-Glcp            | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 3,4,6-Glcp            | 0.5 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | 0.5  | Tr.  | Tr. | 0.5  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |
| 2,3,4,6-Glcp          | 1.7 | 1.1  | 0.5  | 0.7  | 0.6  | 0.7 | 1.2  | Tr.  | Tr. | 1.3  | 1.1  | 0.5  | Tr.  | 0.9  | Tr.  | Tr.  | 0.6  | Tr.  |
| t-Manp                | 1.6 | Tr.  | Tr.  | 0.8  | Tr.  | Tr. | 0.6  | 0.5  | Tr. | 1.4  | 1.4  | 0.6  | Tr.  | 1    | Tr.  | Tr.  | Tr.  | Tr.  |
| 3-Manp                | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  |

|              |     |      |      |      |      |     |      |      |      |      |      |      |     |      |      |     |      |      |
|--------------|-----|------|------|------|------|-----|------|------|------|------|------|------|-----|------|------|-----|------|------|
| 4-Manp       | 0.8 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | 0.5  | Tr.  | Tr.  | 0.7  | 0.7  | Tr.  | Tr. | 0.6  | Tr.  | Tr. | Tr.  | Tr.  |
| 6-Manp       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,4-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,6-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | 0.5  | Tr.  | Tr.  | Tr.  | 0.5  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 3,4-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 3,6-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 4,6-Manp     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,3,6-Manp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,4,6-Manp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 3,4,6-Manp   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,3,4,6-Manp | 0.9 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | 0.5  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| t-Rhap       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2-Rhaf       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 4-Rhap       | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,3-Rhap     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,4-Rhap     | 0.5 | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | 0.6  | 0.6  | Tr.  | 0.5 | 0.6  | Tr.  | Tr. | Tr.  | Tr.  |
| 3,4-Rhap     | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 2,3,4-Rhap   | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| t-Xylp       | 1.8 | 0.9  | 0.9  | 1.5  | 1    | 0.7 | 1.2  | 0.7  | 1    | 1.7  | 1.1  | 1.2  | 1.2 | 0.9  | 0.9  | 0.9 | 1    | 1.1  |
| 2-Xylp       | 1.3 | 2    | 1.8  | 2.2  | 1.8  | 1.5 | 1.6  | 1.2  | 1.7  | 1.8  | 1.8  | 1.9  | 1.9 | 1.5  | 1.9  | 2.1 | 1.9  | 1.9  |
| 4-Xylp       | 7.9 | 19.2 | 15.3 | 16.8 | 15.9 | 14  | 11.9 | 10.1 | 15.8 | 10.3 | 11.3 | 13.9 | 15  | 12.3 | 17.2 | 20  | 17.3 | 17.8 |
| 2,4-Xylp     | 1.1 | 1.9  | 1.9  | 1.4  | 1.5  | 1.2 | 1.3  | 1    | 1.3  | 1.6  | 1.6  | 1.7  | 1.6 | 1.3  | 1.6  | 1.4 | 2    | 1.6  |
| 3,4-Xylp     | 6.8 | 6.3  | 7.2  | 6.1  | 6.2  | 5.9 | 6    | 5.4  | 6.8  | 7.1  | 6.3  | 6.3  | 6.6 | 6    | 6.1  | 6.1 | 7.6  | 6.8  |
| 2,3,4-Xylp   | 2.9 | 9.4  | 3.5  | 1    | 1.2  | 0.8 | 2.5  | 1.2  | 1.2  | 1.9  | 2    | 1.3  | 1.1 | 1.4  | 1.3  | 0.5 | 3.3  | 0.9  |
| t-GalAp      | 0.7 | Tr.  | 0.5  | 0.5  | Tr.  | Tr. | Tr.  | 1.7  | 0.9  | 0.6  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | 0.9  |
| 2-GalAp      | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 3-GalAp      | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |
| 4-GalAp      | 2.2 | Tr.  | 2.3  | 0.6  | 0.7  | 0.6 | 0.6  | 13.4 | 4.9  | 0.9  | 1    | Tr.  | 1.1 | 1.9  | 0.8  | 0.6 | 0.7  | 3.5  |
| 3,4-GalAp    | Tr. | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | 0.7  | Tr.  | Tr.  | Tr.  | Tr.  | Tr. | Tr.  | Tr.  | Tr. | Tr.  | Tr.  |

# Supplementary Material

|                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2,4-GlcAp+<br>2,4-GalAp | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. |
| t-GlcAp                 | 1.8 | 1.3 | 1.9 | 2.2 | 1.8 | 1.8 | 1.8 | 6   | 2.5 | 2.2 | 2   | 1.8 | 1.6 | 2   | 1.9 | 1.5 | 1.3 | 2.2 |
| 2-GlcAp                 | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. |
| 3-GlcAp                 | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. | Tr. |

Note: Two separate experiments were conducted for each sample.

**Table S5** Total carbohydrate quantification of soil obtained from greenhouse (GH) and field (F) through colorimetric analysis.

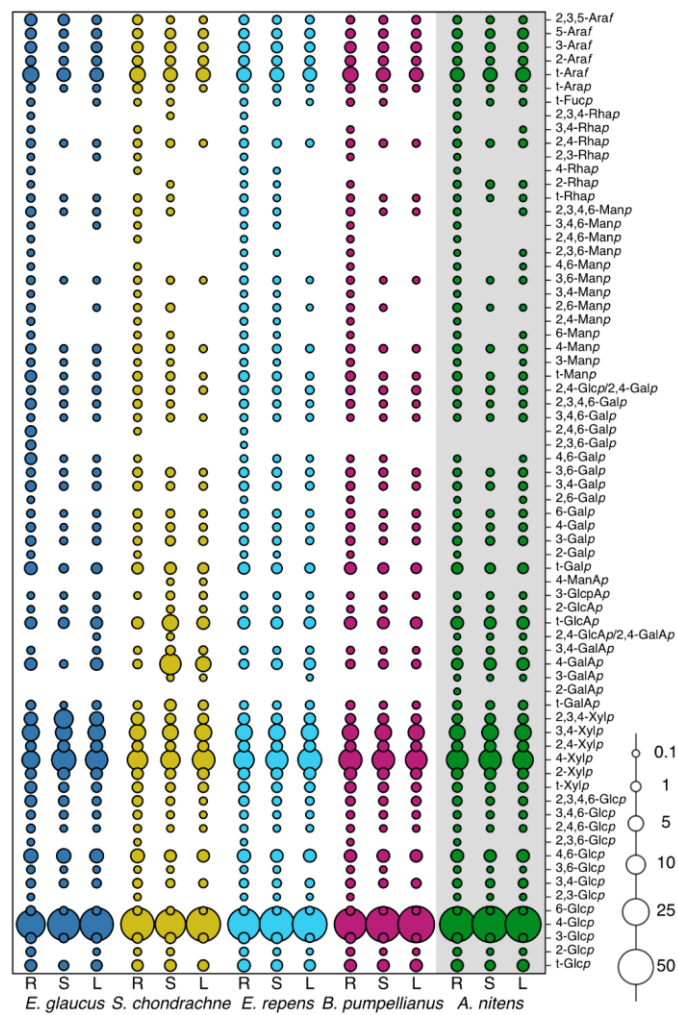
| Sample | Bio Rep | Tech Rep | mg of carbohydrate/<br>100 mg of soil | St. Dev |
|--------|---------|----------|---------------------------------------|---------|
| GH     | G1      | 1/2      | 11.6                                  | 0.1     |
|        |         | 2/2      | 11.0                                  | 0.1     |
|        | G2      | 1/2      | 8.6                                   | 0.2     |
|        |         | 2/2      | 10.1                                  | 1.9     |
|        | G3      | 1/2      | 12.5                                  | 0.6     |
|        |         | 2/2      | 12.5                                  | 0.9     |
|        | G4      | 1/2      | 8.5                                   | 0.4     |
|        |         | 2/2      | 11.4                                  | 0.1     |
|        | G5      | 1/2      | 10.0                                  | 1.3     |
|        |         | 2/2      | 8.5                                   | 0.2     |
| F      | G6      | 1/2      | 9.0                                   | 0.4     |
|        |         | 2/2      | 6.9                                   | 1.9     |
|        | F1      | 1/2      | 9.2                                   | 3.1     |
|        |         | 2/2      | 7.2                                   | 0.4     |
|        | F2      | 1/2      | 5.1                                   | 0.7     |
|        |         | 2/2      | 4.1                                   | 1.3     |
|        | F3      | 1/2      | 9.6                                   | 2.3     |
|        |         | 2/2      | 8.9                                   | 1.9     |
|        | F4      | 1/2      | 6.2                                   | 0.4     |
|        |         | 2/2      | 5.9                                   | 0.1     |
|        | F5      | 1/2      | 4.3                                   | 1.1     |
|        |         | 2/2      | 5.1                                   | 1.0     |
|        | F6      | 1/2      | 8.4                                   | 3.2     |
|        |         | 2/2      | 6.9                                   | 3.5     |

Note: Two separate experiments were conducted for each sample.

**Table S6** Daily precipitation recorded at the nearest weather station (Pincher Creek) to our sampling location for 40 days prior to collection in 2022. Amount of total rainfall was 18.4 mm indicating limited soil moisture availability prior to sample collection.

| Date   | Precipitation (mm) | Date         | Precipitation (mm) |
|--------|--------------------|--------------|--------------------|
| 01-Aug | 0                  | 23-Aug       |                    |
| 02-Aug | 0                  | 24-Aug       | 5.3                |
| 03-Aug | 0                  | 25-Aug       | 2.2                |
| 04-Aug | 0                  | 26-Aug       | 0                  |
| 05-Aug | 0                  | 27-Aug       | 0.9                |
| 06-Aug | 0                  | 28-Aug       | 0                  |
| 07-Aug | 0                  | 29-Aug       | 0                  |
| 08-Aug | 0                  | 30-Aug       | 0                  |
| 09-Aug | 0                  | 31-Aug       | 0                  |
| 10-Aug | 0.6                | 01-Sep       | 0                  |
| 11-Aug | 0                  | 02-Sep       | 0                  |
| 12-Aug | 0                  | 03-Sep       |                    |
| 13-Aug | 0                  | 04-Sep       | 0                  |
| 14-Aug | 0                  | 05-Sep       | 0                  |
| 15-Aug | 0                  | 06-Sep       | 0                  |
| 16-Aug | 0                  | 07-Sep       | 0                  |
| 17-Aug | 0                  | 08-Sep       | 1                  |
| 18-Aug | 0                  | 09-Sep       | 8.4                |
| 19-Aug | 0                  |              |                    |
| 20-Aug | 0                  | <b>Total</b> | <b>18.4</b>        |

1.1 Supplementary Figures



**Figure S1** Bubble plot of the different glycosidic linkages (relative abundance) present within the rhizome, stem, and leaf sections of greenhouse-grown Sweetgrass and other Poaceae grass species. Analyzed grass species include *Elymus glaucus* (dark blue), *Setaria chondrachne* (yellow), *Elymus repens* (light blue), and *Bromus pumpellianus* (fuchsia) collected from the field sampling site, and *Anthoxanthum nitens* (Sweetgrass; green) collected from the greenhouse.