Hypotheses

1. CH₄ flux is strongly influenced by plant functional groups:
   a. Presence of sedges will increase CH₄ flux due to aerenchyma tissues (pipe-effect) and increased labile substrates.
   b. Presence of Ericaceae will decrease CH₄ flux due to rhizosphere oxidation and the absence of aerenchyma tissues.

2. Pathways of methanogenesis are influenced by plant functional groups:
   a. Presence of sedges will increase enrichment of δ¹³C of CH₄ which leads to methanogenesis through Acetate Splitting
   b. Absence of sedges will decrease enrichment of δ¹³C of CH₄ which leads to methanogenesis through CO₂ Reduction

3. Methanotrophy (CH₄ oxidation) is influenced by plant functional groups:
   a. Presence of sedges will decrease methanotrophy
   b. Absence of sedges will increase methanotrophy

Mixed Species

Sedge
- High water table favors roots with aerenchyma
- Deep rooting & O₂ transport
- Higher nutrient demand & productivity
- Supports aerobic saprophytes
- CH₄ piping & diffuse flux

Ericaceae
- Lack aerenchyma
- Recalcitrant litter, slow decomposition
- Lower nutrient demand
- Diffuse & elevated CH₄ flux

Conceptual model of plant community interactions in peatlands. Sedges and Ericaceae have opposite effects on both CO₂ cycling and CH₄ flux, which are expected to be especially pronounced as water tables decline. Each mixed, sedges, or Ericaceae vegetation treatment include Polytrichum and Sphagnum mosses.

Hypothesis 1 – Sedge presence significantly increases CH₄ flux while Ericaceae presence results in decline

Effect on CH₄ flux (mg H₂O 24h⁻¹ dm⁻²)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CH₄ Flux (mg H₂O 24h⁻¹ dm⁻²)</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Absent</td>
<td>0.07</td>
<td></td>
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<tr>
<td>Present</td>
<td>0.13</td>
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</tbody>
</table>

Overall P = (0.001)
Sedge Effect: P (0.001)
Ericaceae Effect: P (0.003)

References


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