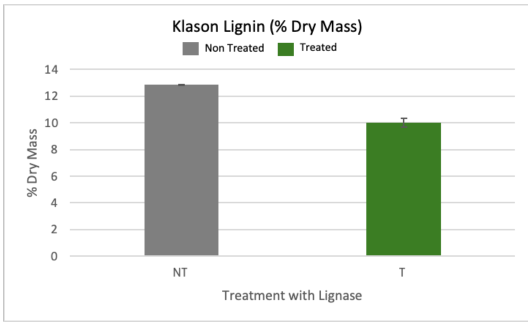
Trial of Lignase on Samples of Field Turf (Sod)

Interpretation of the CELIGNIS Lignin Analysis Results

The laboratory analysis from CELIGNIS provides a comparison between a non-treated (NT) and an enzyme-treated (T) sample of commercial field grown turf. The trial was carried out over four months, with treatments of Lignase every 28 days, total of 4no. treatments. The key focus is on how Lignase affected lignin degradation and the overall composition of the thatch material.

1. Klason Lignin Reduction

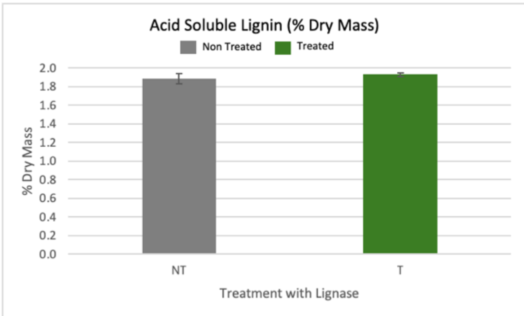
Non-Treated: 12.84%
Treated: 10.01%
Difference: Reduction of 2.83 percentage points (22.04% decrease)



Interpretation:
The enzyme treatment significantly reduced Klason Lignin, indicating that Lignase was effective at breaking down acid-insoluble lignin, which is the most recalcitrant fraction of lignin in thatch. This suggests that the enzyme formulation contains strong lignin-degrading capabilities.

2. Acid-Soluble Lignin Changes

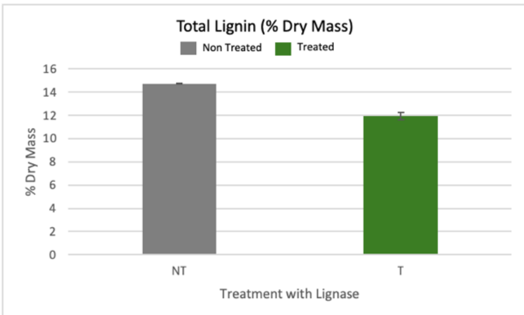
Non-Treated:: 1.88%
Treated: 1.93%
Difference: Slight increase of 0.05 percentage points (2.7% increase)



Interpretation:
The minor increase in acid-soluble lignin suggests that some lignin breakdown products became soluble in acid after treatment. This is a common result when enzymatic oxidation or cleavage of lignin bonds occurs, converting the complex polymer into smaller, more soluble fragments.

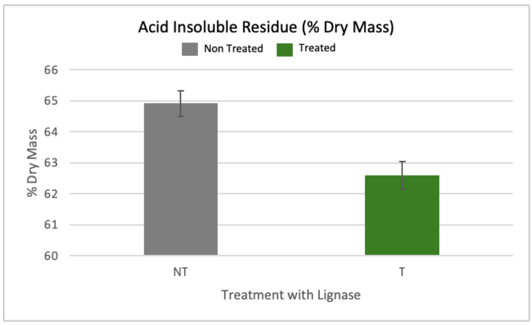
3. **Total Lignin Reduction** (Klason Lignin + Acid-Soluble Lignin)

Non-Treated: 14.72%
Treated: 11.93%
Difference: Reduction of 2.79 percentage points (19% decrease in total lignin content).



Interpretation:
A 19% total lignin reduction supports the conclusion that the enzymatic treatment successfully degraded lignin components in the sample. Since lignin is a primary structural barrier in thatch, this degradation likely improved microbial access to cellulose and hemicellulose, accelerating decomposition.

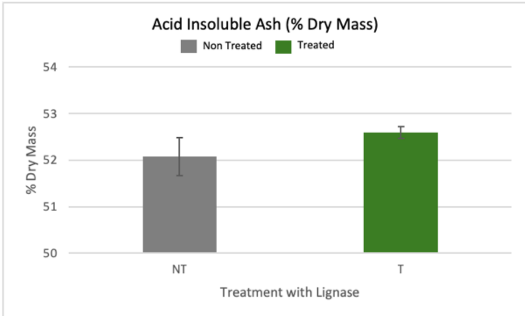
4. Acid Insoluble Residue (AIR)



Non-Treated: 64.92%
Treated: 62.60%
Difference: Decrease of 2.32 percentage points (3.6% reduction)

Interpretation:
A decrease in acid-insoluble residue suggests that the treatment partially broke down rigid structural components, allowing for more efficient degradation of organic material. This aligns with the lignin reduction observed.

5. Acid Insoluble Ash Content



Non-Treated: 52.08%
Treated: 52.59%
Difference: Slight increase of 0.51 percentage points (1% increase)

Interpretation:
The slight increase in acid-insoluble ash suggests that the enzyme treatment did not significantly affect the mineral (ash) content of the sample. The focus of degradation was likely on organic compounds, particularly lignin.

Final Interpretation

Lignase successfully degraded Klason Lignin and reduced the overall lignin content in the thatch, facilitating better decomposition. The minor increase in acid-soluble lignin suggests the breakdown of complex lignin structures into smaller, more mobile compounds. These results support the potential use of this enzyme treatment for thatch reduction, as broken down lignin increases accessibility for microbial and enzymatic degradation of cellulose and hemicellulose.

Note:
Klason Lignin is a measure of the lignin content in plant material, determined through an acid hydrolysis process. It is also referred to as "acid-insoluble lignin" because it represents the fraction of lignin that remains undissolved after treatment with strong acid, typically sulfuric acid. This method is widely used in biomass and lignocellulosic analysis to quantify the structural lignin that is resistant to degradation.

In this report, Klason Lignin is reported as part of the lignocellulosic composition of the samples. It indicates the proportion of lignin that contributes to the recalcitrant nature of the plant material, making it resistant to decomposition. Since lignin acts as a protective matrix in plant cell walls, a high Klason Lignin content suggests a material that is more resistant to microbial and enzymatic breakdown