Denali Alfalfa as a High-Quality Forage Crop: Creating Sustainable Food Sources for Alaska Reindeer

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Background

Reindeer (*Rangifer tarandus*) are becoming common livestock in Alaska due to growing demand in the tourism and meat industries. Their diets require up to 15% protein, but many high-protein forages are reliant on importation and limited by transportation costs.

Denali alfalfa (*Medicago Sativa*) is a high-protein legume that has been successfully grown in Alaska and has the potential to provide ranchers with a local forage source with which to maintain their livestock.

Category	Relative Feed Value	ADF(%)	NDF (%)	Crude Protein
Prime	>151	<30	<40	>19
1	125-150	31-35	40-46	17-19
2	103-124	36-40	47-53	14-16
3	87-102	41-42	54-60	11-13

Source: AGR-131. Alfalfa Hay Quality Makes the Difference

Figure 1. Industry quality standards for forage products and their associated categories.

Acid Detergent Fiber (ADF) is an indicator of digestibility and can show energy uptake. Neutral Detergent Fiber (NDF) is an indicator of bulk uptake for gut fill. Both are needed to categorize the forage according to industry quality standards. Protein and micro/macro-nutrients are not included in ADF, NDF calculations but are important components of dietary needs. Low ADF, NDF values are desirable for livestock forage. Creating baselines for ADF, NDF, and nutrient profiles would allow for further research into local forage and feed production using Denali alfalfa.

Methods

Nutritional analysis results for each treatment field were obtained from Brookside Laboratories, Inc. prior to ANKOM analysis.

3 samples from each treatment field from the August 2022 UAF Denali alfalfa harvest were dried and ground through a #20 mesh screen, then packaged and labeled accordingly. The samples were sealed into filter bags to use in the ANKOM Fiber Analyzer. 2 blank filter bags were used as correction controls.

The samples were run through the analysis cycles according to ANKOM methodology, using acid reagents to strip away the organic components of the replicates.

Before beginning, and then after each step in the analysis, the replicates and blanks were weighed to the thousandth of a gram. These weights were recorded in a spreadsheet to allow for ADF, NDF percentage calculations after the process was completed.

Results

The results from the sequential analyses allowed for the percentages of ADF and NDF to be calculated within each Treatment Field and sample. Using those values, a category was assigned based on the Alfalfa Hay Industry Standards [seen in Figure 1].

High quality forages typically rank at/below Category 1 for both ADF and NDF values.

Only two samples scored Category 1 for both ADF and NDF values.

The nutritional analysis of each field showed high protein content overall and a balanced macro/micro-nutrient profile.

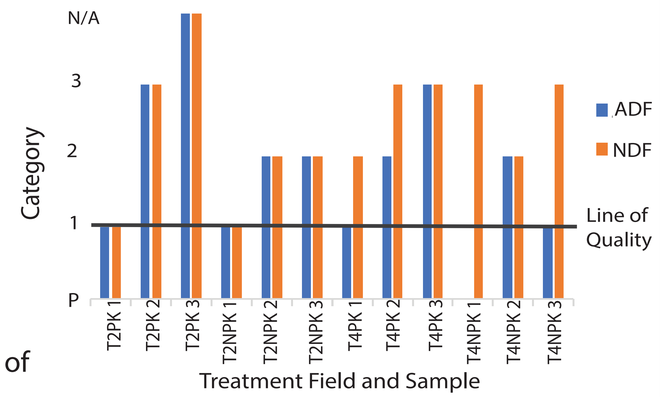

Figure 2. Results of Digestive Fiber Analysis according to sample and category. ADF/NDF values that fall below the Line of Quality are considered High Quality Forages.

Discussion

High ADF indicates that the samples are lower in digestible energy and of poorer quality.
High NDF indicates that there is a higher proportion of structural components in the samples (likely due to late harvest) and therefore has less digestible energy available.

Analyzing alfalfa harvested earlier in the season would likely show a decrease in ADF and NDF values, allowing for a higher quality rating.

In this analysis, the majority of the samples were determined to be low quality, but a high protein content and balanced nutrient profile show promise for early-harvest Denali alfalfa to become a higher quality forage for local livestock.

To create food security within Alaska, the needs of the agricultural community must be evaluated and provided for. Continuing research on Alaska-grown forage will promote collaboration between UAF and the local agriculture communities and strengthen food systems within the state.

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