Effects of feeding a novel alfalfa leaf pellet (ProLEAF MAX™) and an alfalfa stem byproduct (ProFiber Plus™) on growth and conception rates of developing dairy heifers

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Introduction

Of the total cost of raising dairy heifers, feed usually accounts for 50% of costs (1). The overall goal of heifer development is to raise heifers that are efficient and profitable. Heifers should be fed a ration that targets high feed efficiency, but also minimizes the risk of over conditioning (2). Alfalfa is a commonly grown forage in the intermountain west and is often included in the rations of developing heifers. This nitrogen fixing legume is able to take nitrogen from its environment and incorporate it into plant proteins. Alfalfa is a source of protein, fiber, and energy, giving it one of the highest feeding values of forages. Advances in technology have allowed for alfalfa to be fractionated into leaves and stems, which may impact the nutrient quality and/or availability. Currently, it is not known whether including fractionated alfalfa in the ration of developing heifers impacts growth and conception rates. As such, we investigated the effects of including a novel alfalfa leaf pellet (ProLEAF MAX™; PLM) and an alfalfa stem byproduct (ProFiber Plus™; PFP) in the rations of developing dairy heifers on growth and conception rates.

Hypotheses

1. Heifers consuming PLM will have improved growth when compared to heifers consuming the control treatment or PFP.
2. Heifers consuming PLM will have improved conception rates when compared to heifers consuming the control treatment or PFP.

Specific Objectives

1. Determine whether the inclusion of PLM and/or PFP in the ration influences growth characteristics of developing dairy heifers.
2. Determine whether the inclusion of PLM and/or PFP in the ration influences conception rates of developing dairy heifers.

Methods

- Heifers were stratified by body weight and randomly allocated into one of the three treatment groups: control ration (an alfalfa hay based TMR, n=8), PLM ration (a PLM based TMR, n=8), and PFP ration (a PFP based TMR, n=8). All treatments were balanced to be isocaloric and isonitrogenous. The nutrient composition of the treatments were as follows:

	Control	PLM	PFP
Moisture, %	41.45	41.50	43.13
Dry matter (DM), %	58.55	58.50	56.87
Analysis, DM basis			
Crude protein, %	11.30	11.2	11.42
ADF (% NDF)	63.23	69.48	69.70
NFC, %	38.94	37.74	37.71
TDN, %	64.48	63.88	64.48
NE_m (Mcal/kg)	0.30	0.30	0.30
NE_g (Mcal/kg)	0.18	0.17	0.18
Ash (% DM)	8.52	9.06	7.19
Calcium (% DM)	0.77	0.92	0.59
Phosphorus (% DM)	0.25	0.23	0.23
Magnesium (% DM)	0.24	0.23	0.20
Potassium (% DM)	2.09	1.71	1.62
Sodium (% DM)	0.47	0.48	0.45
Iron (ppm)	430.00	530.17	299.83
Manganese (ppm)	56.33	54.67	47.00
Zinc (ppm)	35.17	33.83	33.50
Copper (ppm)	9.33	9.83	9.00

Table 1. Nutrient compositions of treatments.

- Animals were housed in individual pens at the USU Farm and feed was weighed daily in order to calculate individual intakes. Heifers were fed ad libitum with a goal of 0.9 kg of refusals per heifer per day.
- Heifers were fed their assigned treatment twice per day for 84 days.
- Weights, hip heights (HH), and wither heights (WH) were recorded every 14 days and blood serum samples were taken every 28 days to be analyzed for BUN.
- Once heifers reached approximately 55% of their mature body weight (approximately 374 kg), they were synchronized using a 5-day CIDR synchronization protocol and bred to sexed semen from the Holstein bull, *DIAMONDBACK*.
- Conception rates were measured by ultrasound 30 days after artificial insemination.
- The MIXED procedure of SAS was used to analyze weight, feed efficiency (FE), average dry matter intake (DMI), HH, WH, and blood urea nitrogen (BUN) over the 84 day feeding period with a repeated measures analysis where treatment, time, and their interaction were included as fixed effects and individual animal was a random effect. All other variables were analyzed by including treatment as a fixed effect and individual animal as a random effect. Differences between treatments were split out by analyzing least squares means with Tukey adjustments.

Results

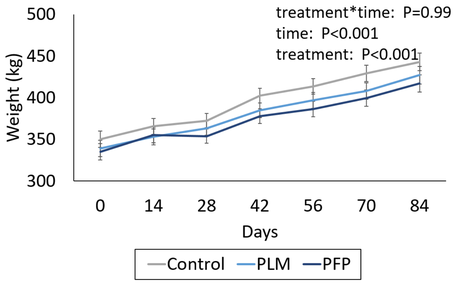

Figure 1. Weight gain of heifers from different treatments (n=8). No differences (P=0.99) from treatment*time were found relative to weight gain.

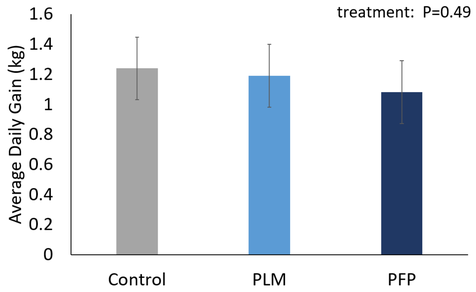

Figure 2. Average daily gains of steers from each treatment (n=8) over the 84-day period. Treatment had no impact on average daily gain (P=0.49).

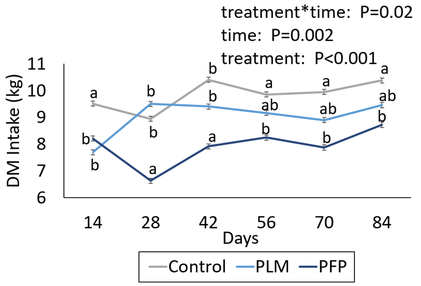

Figure 3. Dry matter intake of heifers from different treatments (n=8). Differences from treatment*time relative to dry matter intake were significant (P=0.02). Differences between treatments are indicated with a different letter.

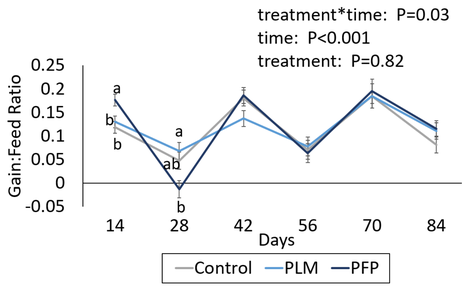

Figure 4. Feed efficiency of heifers from different treatments (n=8). Differences from treatment*time relative to feed efficiency were significant (P=0.03). Differences between treatments are indicated with a different letter.

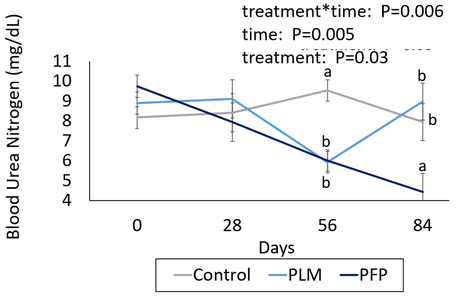

Figure 5. Blood urea nitrogen concentrations of heifers from different treatments (n=8). Differences from treatment*time relative to blood urea nitrogen concentrations were significant (P=0.006). Differences between treatments are indicated with a different letter

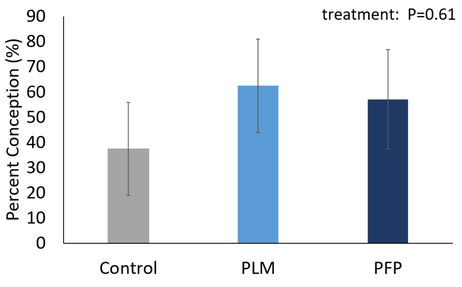

Figure 6. Conception rates of heifers from each treatment (n=8) over the 84-day period. Treatment had no impact on conception rates (P=0.61).

Conclusions

- Control heifers had the highest DMI. Dry matter intake had a significant (P=0.02) treatment*time interaction.
- On day 14, PFP heifers were the most efficient. On day 28, PLM heifers were more efficient than PFP heifers. Feed efficiency had a significant treatment*time interaction (P=0.03).
- On day 56, BUN was significantly highest in control heifers. On day 84, PFP heifers had the lowest BUN concentrations. There was a significant treatment*time interaction (P=0.006).
- **We conclude that inclusion of either PLM or PFP in a developing heifer ration will result in similar growth, development, and conception rates of developing heifers.**

References

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