

Production Performance of Cows Fed Whole Plant Faba Bean Silage in Comparison to Barley and Corn Silage

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Why is this important?

In western Canada, dairy producers often use barley or corn silage in their dairy cattle rations. However, these are known to be low in protein compared to legume silages like soybean and alfalfa. Alfalfa silage is also common in Canada and is well recognized as having a higher yield and quality than grass silages. The disadvantage to alfalfa silage is its high price (at times) and almost null starch content. Legumes such as pea and faba bean are also grown extensively in Canada. These crops are high in protein and starch and are beneficial when included in dairy rations as silage. Of note, the protein in faba bean silage is higher than barley silage, yet the starch content is comparable. Therefore, ensiled whole plant faba bean is a promising source for extra protein and starch compared to barley silage. This may be particularly beneficial to cattle in early lactation, during which they show low feed intake and have high energy and protein demands. Including faba bean silage may help to meet these requirements.



The objective of this project was to develop a whole plant faba bean silage feeding strategy in dairy cows for better production performance than the already established barley or barley/corn silage-based diets.

What did we do?

Faba bean cv. Snowbird (low tannin variety) was harvested at late pod stage (97 days old) in Melfort, SK. Harvest time was chosen based on previous studies comparing faba bean silage at different stages of cutting. Fresh material was wilted to 45% DM and then chopped to 1-inch length (around 226 tonnes). A silage pile was constructed, packed and covered with plastic. The fermentation process lasted 150 days until the silage pile was opened.

Eight early lactating Holstein cows were used in this study. For different diets were formulated for early lactating cows at 60 DIM. Formulations included:

- 1) a control diet (T0) with 18.37% corn silage + 12.23% barley silage
- 2) partial replacement (T50) with 9.18% corn silage, 6.12% barley silage, 15.30% faba bean silage
- 3) partial replacement (T75) with 4.59% corn silage, 3.06% barley silage, 22.95% faba bean silage
- 4) complete replacement (T100) of barley and corn silages with 30.60% faba bean silage.

Cows were milked 3x/d and samples were collected for further analysis. Urine, feces, and rumen fluid were also collected for further analyses.

What did we find?

Dry matter intake was not significantly different between groups. However, the intake of crude protein was higher in T100 groups compared to T0 and T50 groups. Feed efficiency was increasingly higher the more faba bean silage was included in the diet.

Milk yield and composition profiles are presented in Table 1. Milk yield tended to increase with increasing level of faba bean silage and the yield of fat corrected milk (3.5% FCM) and energy corrected milk (ECM) increased with increasing level of faba bean silage. Fat yield also increased with increasing levels of faba bean silage.

Table 1. Milk yield and composition of cows fed TMR with different levels of inclusion of faba bean silage.

	T0	T50	T75	T100
Yield (kg/cow/d)				
Milk ¹	49.06	50.64	51.81	51.15
3.5% FCM ²	51.98	55.90	56.95	56.34
ECM ³	50.77	53.84	54.98	54.35
Milk composition				
Fat (%) ⁴	3.86	4.20	4.11	4.02
Protein (%) ⁵	3.04	2.95	2.97	2.96
Lactose (%) ⁶	4.45	4.51	4.49	4.50

¹ P=0.06; ^{2,3} P=0.01; ⁴ P=0.11; ⁵ P=0.08; ⁶ P=0.07

Overall digestibility of the faba bean silage was found to be similar to the digestibility of the corn silage diet. However, the starch digestibility was lower (90.1%) for faba bean silage compared to barley silage (93%) and corn silage (98%). Including faba bean silage in the diet also resulted in a linear increase in urinary, fecal, and manure nitrogen. Rumen pH was not affected by the diets.

What does it mean?

The ability to diversify crop rotations on-farm provides a variety of benefits to the soil and helps to prevent disease and pest issues in crops. Additionally, including legumes such as faba bean in the rotations provides additional benefit to the soil due to its ability to fix nitrogen. Producers are passionate about environmental stewardship, and including faba bean in rotations is a great new tool!

This study demonstrated that whole plant faba bean can be ensiled and included in dairy cattle rations successfully, with no negative impact to intake, production, or rumen health.

Increasing the potential variety of crop types allows producers to take advantage of varying prices. For instance, if faba bean seed (or silage) is available at reduced cost in comparison to barley, corn, or alfalfa seed or silage, producers can take advantage of this price reduction. This has the potential to positively impact the bottom line of their operation.



Summary Points

- Producers in western Canada typically use barley, corn, and/or alfalfa silage in their dairy cattle rations.
- Whole plant faba bean silage offers an alternative to these other silages with excellent protein and starch levels.
- Inclusion of faba bean silage in dairy cattle diets resulted in no negative impact on feed intake, milk production or composition, or rumen health.
- Introducing faba bean into crop rotations allows producers to take advantage of attractive pricing and the nitrogen-fixing capability of legumes to improve soil and crop health.