Choosing forage sources to feed the post-weaned heifer

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One question commonly asked by dairy producers is: Which forage sources should I use when beginning to feed calves a total mixed ration (TMR) after weaning?

In general, when feeding forages to heifers, it is best to avoid extremes and a single source. For instance, feeding only grass hay, corn silage or alfalfa haylage requires more nutrient balancing and supplementation. This is because grass hay is often lower in protein and may be lower in digestibility and energy value; corn silage is high in energy but low in protein; and alfalfa haylage may vary considerably in protein content and digestibility/energy value. A blend of forage may better balance nutrient content and yield a composite which needs less nutrient balancing and supplementation. Also, with better forage raised, harvested, stored and fed to dairy cows, those same better-quality forages may no longer be fed to heifers free choice without fattening. In those cases, poorer-quality forage or roughage may need to be added to the TMR so that TMR can be fed free choice without fattening the heifers.

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A Penn State study was a reasonable step to evaluate different sources of forage for post-weaned calves. Forty-five post-weaned Holstein calves (36 female and nine male), beginning at 7 to 16 weeks old, were used in the growth phase. Another 12 male calves were used in a separate digestibility trial with these same dietary treatments. All calves had been previously weaned after 6 weeks old.

Diets consisted of a texturized grower and either 20% alfalfa haylage, 24.5% corn silage or 11.3% coarse-chopped grass hay with the balance coming from the grower. The TMR was formulated to contain equal amounts of forage neutral detergent fiber (NDF) (8 ± 0.5%) on a dry matter basis. Alfalfa haylage analyzed 39.6% dry matter, and on a dry basis: 23.5% protein, 35.2% acid detergent fiber (ADF), 42.8% NDF, 0.4% starch and 10.5% ash. Corn silage averaged 42.3% dry matter, and on a dry basis: 7.8% protein, 17.5% ADF, 32.2% NDF, 39.8% starch. and 3.5% ash. Grass hay analyzed 89.5% dry matter, and on a dry basis: 10% protein, 40.3% ADF, 67.3% NDF, 1.5% starch and 5.7% ash. There was also a yeast source added to each of these TMRs in a 2X3 study design, but yeast essentially had no effects, so I will ignore that treatment category.

A texturized starter continued to be fed free choice along with the assigned forage fed separately for weeks seven to nine before going on TMR treatments from 9 to 16 weeks of age. Grower intake was limited to 5.5 pounds daily but with forage available free choice. All calves had been housed in separate calf hutches until 9 weeks of age when they were moved into a mechanically ventilated barn from 9 to 16 weeks of age and bedded with shavings as needed. For digestion trials, calves were moved into another barn for total fecal collection at 11 and 15 weeks of age for four days and rumen sampling over the last 24 hours of each sample period. Empty bodyweight gain (EWBG) was estimated using a Virginia Tech classic study equation.

Average daily gain (ADG in **Table 1**) was significantly lower for the grass hay treatment, but it was still OK for the desirable range of 1.8 to 2 pounds for Holstein dairy heifers. The same pattern was also evident for EBWG projections. Hip width increase did not vary by treatment. Dry matter intake (DMI) decreased significantly for the grass hay treatment. Since grower was fed in a TMR for all treatments, this difference is a bit puzzling. Authors suggest this may have been due to NDF characteristics of grass hay passing more slowly through the rumen. The grass hay TMR did have the greatest NDF and ADF digestibilities among treatments, and its starch digestibility was greater than the alfalfa hay TMR.

TABLE 1

Treatments	Alfalfa haylage	Corn silage	Grass hay
Initial weight, lb	144.0	143.9	141.7
ADG, lb	2.10	2.21	1.95
EBWG, lb	1.83	1.98	1.70
Initial hip width, inch	7.91	7.93	7.39
Hip growth, inch	2.38	2.42	2.39
DMI, lb/day	6.45	6.39	5.90
Forage	1.92	1.71	1.17
Grower	4.58	4.65	4.72
Feed efficiency	0.35	0.37	0.36
Digestibility %			
Dry matter	69.9	74.1	73.0
NDF	55.2	46.6	59.9
ADF	55.4	41.1	57.2
Starch	88.2	94.2	93.3
Rumen Samples			
pH	6.19	6.25	6.32
Total VFA, mM	113.1	92.1	92.7
Acetate, %	57.5	49.7	56.5
Propionate, %	23.7	25.0	26.8
Butyrate, %	12.8	8.5	10.4
Acetate:propionate	2.72	1.48	2.49

Rumen pH did not differ among treatments, but it also was quite variable. Total volatile fatty acids (VFA) were greatest among TMRs for alfalfa haylage, acetate percent was lowest for the corn silage TMR, propionic percent was lowest for alfalfa haylage TMR, and butyrate percent and the acetate-to-propionate ratio was highest for alfalfa and lowest for corn silage TMRs.

In a subsequent study, Holstein calves of similar size and age were fed TMRs with increasing grass hay at 10%, 17.5% or 25%. DMI decreased linearly while daily gains were 2.27, 2.03, and 1.76 pounds with increasing grass hay. NDF and ADF percent digestibilities tended to be greater with 25% grass hay TMR, most especially compared to 10% grass hay TMR. The lowest ADG of 1.76 pounds with 25% grass hay indicates this level of grass hay may be too high for calves under 16 weeks of age. This would especially be true when grass hay would be lower in quality than the (dry matter basis) 16% crude protein, 66% NDF and 34.7% ADF in this study. Unfortunately, grass hay fed to heifers is often poorer in quality than that.

At one time, heifers were the forgotten animals on a dairy farm and were often literally relegated to the "back 40 acres." That variable and often poor pasture resulted in poorly grown heifers. Then the other extreme occurred when corn silage became prevalent. It was often fed free choice to heifers, which led to low protein and too much energy in diets. The result was fat heifers that experienced "fat-cow syndrome" and associated calving and metabolic problems.

Among alfalfa haylage, corn silage and grass hay forages evaluated in TMRs balanced for equal forage NDF contribution for Holstein heifers from 9 to 16 weeks of age, all were suitable. In fact, the grass hay TMR resulted in a daily gain within the desirable range of 1.8 to 2 pounds, while the other two TMRS resulted in 2.1 to 2.2 pounds daily gains. Heifer TMRs need to be as balanced with forage/roughage sources and for nutrient content as they are for milking cows.

References omitted but are available upon request. Click here to email an editor.

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