

ALFALFA HAYLAGE

for Feedlot Cattle

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By Hugh Henderson and Terry Greathouse
Department of Animal Husbandry

Alfalfa-brome grass haylage has proven to be an excellent source of protein and a good source of energy for finishing cattle in recent research conducted at Michigan State University. Although beef produced per acre of crops fed, and feed cost per pound of gain fall short of that obtained with corn silage, haylage feeding programs have reduced protein supplement requirements by approximately 75%.

Annual silo storage requirements may also be reduced by approximately one-third if silos are filled with corn silage for October through May feeding and refilled with haylage for June through September feeding. This permits greater flexibility in planning crop rotations and spreads the silage harvest season.

Levels of Corn to Feed

To consistently produce cattle of Choice finish at 1,000 pounds with calves and 1,100 pounds with yearlings, full feed haylage and limit ground shelled corn to a minimum of 1% and a maximum of $1\frac{1}{2}\%$ of body weight daily. When feeding 1% corn, the cattle will gain more slowly, consume more haylage and less corn, require less protein supplement, and feed cost per pound of gain will be less than when feeding $1\frac{1}{2}\%$ corn. Although cattle fed 1% corn will not have as much finish as the $1\frac{1}{2}\%$ cattle, they will be in the low Choice grade when they reach slaughter weights.

To switch cattle from a corn silage feeding program to a haylage program, increase the level of corn feeding by $\frac{1}{2}\%$ of body weight daily, irrespective of the amount of corn being fed with corn silage. For example -- cattle receiving a full feed of corn silage and 1% of body weight daily in ground shelled corn would require a full feed of haylage and $1\frac{1}{2}\%$ of body weight daily in corn in order to maintain average daily gain and produce the same level of carcass finish. Likewise, cattle receiving a full feed of corn silage and no additional corn would require a full feed of haylage and $\frac{1}{2}\%$ of body weight daily in corn.

Cattle are easily switched from corn silage to haylage and back again to corn silage, if necessary, without encountering digestive problems. However, the switch should be made over a period of approximately five days.

A direct comparison of corn silage and haylage was made by Michigan State University researchers with calves in 1965 and with yearlings in 1966. Results are shown in Table 1 on page 4.

Regardless of the amount of corn being fed, haylage should always be full fed and the amount of corn regulated as a constant percent of body weight throughout the feeding period. Results of two recent experiments at M.S.U. are shown in Table 2 in which superior rates of gain, feed efficiency, and carcass quality were obtained when the cattle received a constant $1\frac{1}{2}\%$ of body weight daily in ground shelled corn from the beginning to the end of the feeding period rather than starting the cattle at $\frac{1}{2}\%$ and later raising it to 1% , $1\frac{1}{2}\%$, and 2% as the feeding period progressed. Both groups had received the same total amount of corn at the end of the feeding period.

Levels of Protein to Feed

Alfalfa haylage is an excellent source of protein. When full fed and ground shelled corn is restricted to not more than 1% of body weight daily, no added protein supplement is needed if the haylage analyzes as much as 16% crude protein on a dry matter basis. If corn is fed at higher levels than 1% of body weight daily, added protein supplement will be needed if haylage consumption drops below 13 pounds of 35% dry matter haylage or 10 pounds of 50% dry matter haylage as shown in Table 3.

Full fed cattle will normally consume up to 3% of body weight daily in air dry feed (85% DM) in the early part of the feeding period after they are on full feed. This value usually declines as the length of the feeding period progresses, or to a low of approximately 2% at the end of 150 to 200 days on feed. When corn is held at a constant level of $1\frac{1}{2}\%$ of body weight daily, all of the decline in total air dry feed consumption comes at the expense of haylage. Thus daily consumption of haylage during the last half of the feeding period usually declines to a level which is insufficient to meet the protein needs of the animal. If dry matter content, protein content, and daily consumption of haylage are known, values shown in Table 3 will serve as a guide in knowing when to start adding protein supplement as well as the amount.

Table 4 outlines minimum ratios of shelled corn to haylage that must be fed in order to meet the minimum protein requirements of finishing cattle. If the corn to haylage ratio is less than the values outlined, added protein supplement must be provided. Values shown in Table 4 are the same as those shown in Table 3 but expressed on a different basis for the convenience of cattle feeders who weigh all feed ingredients at each feeding and they serve as another check on the adequacy of protein in the ration.

To illustrate the need of providing supplemental protein during the last half of the feeding period when yearling steers are full fed haylage and $1\frac{1}{2}\%$ of body weight daily in ground shelled corn, results of an experiment conducted at M.S.U. in 1965 are shown in Table 5.

Effect of Moisture Levels and Maturity

For maximum protein content, average daily gain, feed efficiency, carcass desirability, and pounds of beef produced per acre of crops fed, haylage should be harvested and processed as follows:

- (a) Harvest in late bud stage of growth.
- (b) Mow, crimp, and windrow in one operation.
- (c) Allow material to remain in windrow until it dries down to 68% to 70% moisture (1 to 2 hours in good drying weather).
- (d) Use windrow pick-up attachment on field chopper and chop extremely fine -- no particles longer than 3/8".
- (e) Use wagons covered with 1/4" hardware cloth to eliminate leaf loss.
- (f) Store in well constructed tower silos.
- (g) Never attempt to direct chop haylage and store at moisture levels above 70%. It would result in a foul smelling, unpalatable material that results in slow gaining, inefficient and poor doing cattle. Just don't do it!

In two experiments at M.S.U. in 1965 and 1966, cattle gained faster and were more efficient utilizers of their feed when fed high moisture haylage than when fed low moisture haylage as shown in Table 6.

In both trials, percent protein on a dry matter basis (shown in Table 6) for the high moisture haylage was nearly two percentage units higher than the low moisture haylage. This can be accounted for on the basis of less leaf loss during the chopping process, although the forage wagons were covered with hardware cloth and the two haylages were made from alternate windrows.

It should also be pointed out that silos held approximately 10% more haylage dry matter when filled with the high moisture material and the ensiled high moisture haylage possessed a more desirable odor and color when fed.

Type of Silo Required

Haylage varying in moisture from 50% to 70% can be safely, efficiently and economically stored in both gas-tight and conventional tower silos. However, conventional silos must be well constructed, have tight fitting doors and preferably contain a roof. Silo requirements are considerably less demanding with 65% moisture haylage than 50% moisture haylage.

In a single trial conducted at M.S.U. in 1965, cattle performed equally well when fed haylage stored in a concrete stave or a gas tight silo. Results are shown in Table 7. In both cases, haylage was full fed and ground shelled corn fed at the rate of 1% of body weight daily.

Dry matter storage losses are estimated to vary between 8% and 12% for well constructed conventional tower silos and between 3% and 6% for gas tight silos. For a complete summary of expected storage losses in the various types of silos, see MSU Experiment State Research Report No. 7, by C. R. Hoglund.

TABLE 1: Feeding Value of Corn Silage vs Haylage

Observation	F. F. Corn Silage 1% Corn	F. F. Haylage 1 1/2% Corn
1965 -- 32 Steer Calves per Treatment (AH-BC-642)		
Average daily gain, lbs.	2.31	2.35
Feed cost per cwt. gain	\$12.11	\$12.12
Av. selling price of cattle	\$26.66	\$26.60
Av. carcass grade	Choice (10.82)	Choice (11.07)
Beef produced per acre crops fed, lbs.	1,150	887
1966 -- 32 Yearling Steers per Treatment (AH-BC-662)		
Average daily gain, lbs.	2.48	2.27
Feed cost per cwt. gain	\$14.34	\$15.17
Av. selling price of cattle	\$26.14	\$25.78
Av. carcass grade	Choice (9.88)	Choice (10.41)
Beef produced per acre crops fed, lbs.	1,000	700

Note: In each case, roughage was full fed and ground shelled corn was limited to 1% or 1 1/2% of body weight daily.

TABLE 2: Constant vs. Varying Level of Ground Shelled Corn Feeding with a Full Feed of Haylage (AH-BC-652, 662)

Observation	Constant 1 1/2% Corn	Varying 1 1/2% Corn
No. of yearling cattle	128	128
Average daily gain, lbs.	2.42	2.38
Feed cost per cwt. gain	\$16.32	\$16.94
Av. selling price of cattle	\$25.61	\$25.39
Av. carcass grade	Choice (10.4)	Choice (10.2)
Degree of marbling	Modest	Modest minus

Note: Constant group received 1 1/2% of body weight daily in ground shelled corn each day of the experiment. Varying group was started on 1/2% of body weight daily in ground shelled corn and later raised to 1%, 1 1/2% and 2% as the feeding period progressed. Both groups had received identical total amounts of corn at the end of the feeding period.

TABLE 3: Amount of Actual Supplemental Protein to Feed Per Head Daily with a Full Feed of Haylage and 1 1/2% of Body Weight Daily in Ground Shelled Corn

Percent Dry Matter of Haylage as Fed	16% Protein Haylage on DM Basis		18% Protein Haylage on DM Basis	
	Daily Haylage Cons. lbs.	Pounds Actual Protein Needed	Daily Haylage Cons. lbs.	Pounds Actual Protein Needed
35% Dry Matter	13	None	9	None
	12	.16	8	.16
	6	.32	4	.32
50% Dry Matter	10	None	6	None
	9	.16	5	.16
	4	.32	3	.32

Note: One pound of 64% protein supplement contains .64 lbs. of actual protein.

TABLE 4: Minimum Pounds of Haylage to Feed per Pound of 85% DM Ground Shelled Corn (Shelled Corn-Haylage Ratio) Fed in Order to Provide a 10.5% Crude Protein (85% DM Basis) Ration

Percent Dry Matter Of Haylage	% Crude Protein of Haylage on Dry Matter Basis					
	15%	16%	17%	18%	19%	20%
30%	2.3	1.7	1.4	1.1	.9	.8
35%	1.9	1.5	1.2	.9	.8	.7
40%	1.7	1.3	1.0	.8	.7	.6
45%	1.5	1.1	.9	.7	.6	.5
50%	1.4	1.0	.8	.6	.6	.5
55%	1.2	.9	.7	.6	.5	.4
60%	1.1	.8	.7	.5	.5	.4

TABLE 5: Value of Added Protein for Yearling Steers Full Fed Haylage and 1 1/2% of Body Weight Daily in Ground Shelled Corn (AH-BC-652)

163-Day Test	No Added Protein	.32 Pounds Added Protein
No. Yearling Steers	64	64
Average daily gain, lbs.		
First 88 days	2.69	2.64
Last 75 days	2.07	2.32
Feed cost per cwt. gain		
First 88 days	\$14.12	\$14.95 1/
Last 88 days	\$19.87	\$17.40 1/

1/ Includes cost of 1/2 pound 64% protein supplement per head daily.

TABLE 6: Low Moisture Alfalfa Haylage vs. High Moisture Alfalfa Haylage when Full Fed with 1 1/2% of Body Weight in Ground Shelled Corn

Observation	Low Moisture Haylage	High Moisture Haylage
1965 Test (AH-BC-652) 32 Yearling Steers per Treatment		
Percent moisture of haylage	38%	70%
Percent protein of haylage, DM Basis	15.8%	17.7%
Average daily gain, lbs.	2.40	2.50
Feed required per cwt. gain, lbs. 85% DM	1,082	919
Feed cost per cwt. gain	\$18.17	\$15.69
Av. selling price of cattle	\$24.83	\$24.85
Av. carcass grade	Choice (10.6)	Choice (10.6)
Beef produced per acre of crops fed, lbs.	718	759
1966 Test (AH-BC-662) 32 Yearling Steers per Treatment		
Percent moisture of haylage	45%	65%
Percent protein of haylage, DM Basis	18.0%	18.8%
Average daily gain, lbs.	2.23	2.27
Feed required per cwt. gain, lbs. 85% DM	1,026	944
Av. selling price of cattle	\$26.42	\$25.78
Av. carcass grade	Choice (9.9)	Choice (9.9)
Beef produced per acre of crops fed, lbs.	690	735

TABLE 7: Concrete Stave Silo Haylage vs. Gas Tight Silo Haylage (AH-BC-642)

16 Steer calves per treatment 203-Day test	Concrete Stave Silo	Gas Tight Silo
Percent moisture of haylage	44%	44%
Average daily gain, lbs.	2.37	2.34
85% DM consumed per cwt. gain, lbs.	729	735 1/
Feed cost per cwt. gain	\$12.14	\$12.09 1/
Av. selling price of cattle	\$26.66	\$26.54
Av. carcass grade	Choice (11.1)	Choice (11.0)
Beef produced per acre of crops fed	882	891 1/

1/ Takes into account 5% greater storage loss for concrete stave silo haylage.