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Wheat, Barley, and Oat Silages for Beef Cattle

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Wheat, barley, or oat silages can provide excellent alternatives to corn and sorghum silages for beef cattle.

After six years of research and practical experience with cereal silages, we believe the following conclusions or recommendations can be made:

1. Harvesting and feeding cereals as silage produces more beef per acre than grain.
2. For the best silage, ensile cereals at 60 to 65% moisture.
3. As cereals mature from boot to dough stages, silage yield increases but silage crude protein decreases.
4. Harvest cereals in the mid-dough stage of maturity for maximum TDN and beef production per acre.
5. Winter wheat, winter barley, and spring oats have similar dough-stage silage yields--6 to 9 tons per acre.
6. Cereal silages are usually about 2 percentage units higher in protein than corn or sorghum silages.

When fed to growing cattle in high silage rations

7. Barley and corn silages are about equal in feeding value.
8. Wheat silages support about 80% the level of performance of corn silage.
9. The higher the grain content of wheat, barley, and oat silages, the higher the silage feeding value.

When fed to finishing cattle in high grain rations

10. Wheat and corn silages support similar feedlot performance.

Feeding Value of Wheat, Barley, Oat and Corn Silages for Beef Cattle

Wheat, barley, oat, and corn silages were fed to steers in seven trials for the past five years (Prog. Rpt. 210, 230, 262, and 291, Kansas Agr. Expt. Sta.). The forages were whole plant and had been harvested in the dough stage except as indicated. Silage was made in concrete silos (10 x 50 feet). When necessary, water was added to provide a moisture content of at least 60% in the ensiled forage. Cereal silage varieties included soft red winter, awnless wheats, Blue Boy, Blue Boy II, and Arthur; hard red winter, awned wheats, Parker, Eagle and Sage; winter, awned barleys, Paoli and Kanby, and spring oats, Trio and Lodi.

Growing Rations

In the five growing trials, steers were fed to appetite twice daily a ration of 86% silage and 14% supplement (on a dry-matter basis). Rations were fed five successive falls and winters.

Trial 1, 63 Angus steers (average initial weight, 516 pounds), 1972-73.

Trial 2, 126 Hereford, Angus, and mixed breed steers (average initial weight 586 pounds), 1973-74.

Trial 3, 120 Hereford steers (average initial weight, 588 pounds), 1974-75.

Trial 4, 74 mixed breed steers (average initial weight, 666 pounds), 1975-76.

Trial 5, 108 Hereford and Angus steers (average initial weight, 640 pounds), 1976-77.

Each year the steers grazed native bluestem range for five months before being put on the silage rations. Results are summarized in Table

In all five trials, steers fed corn silage gained faster and more efficiently than steers fed any of the wheat silages. In trials 2, 3, and 5, steers receiving corn silage outperformed those receiving barley silage, but in Trial 4 gain and efficiency were slightly better for steers fed barley silage.

In Trial 1, steers fed Blue Boy wheat-head silage consumed more feed and gained faster than did steers fed Parker wheat-head silage.

In Trial 2, Paoli barley silage, Arthur wheat silage, and a mixture of equal parts corn silage and Parker wheat-head silage produced similar performances. Steers fed Parker wheat silage or Parker wheat-head silage gained the slowest, consumed the least feed, and tended to be the least efficient.

In Trials 3 and 5, steers fed barley silage outperformed steers fed any of the wheat silages. In Trial 3, steers fed Blue Boy II wheat silage gained slower and less efficiently than did steers fed either Arthur or Eagle wheat silages. In Trial 5, steers fed Arthur or Sage wheat silages performed similarly.

In Trial 5, steers fed Trio or Lodi oat silages had the lowest performance. They consumed about 10 pounds less wet silage daily and gained 1.0 to 1.5 pounds less per day than did steers fed corn, barley or wheat silages. Droughty weather in mid-June caused very low grain content of the oat silages and undoubtedly contributed to their poor showing in Trial 5.

Feeding values of cereal silages were established from the rate and efficiency of gain results presented in Table 13.1. When corn silage was given a value of 100 (Table 13.2), barley silage rated 92 to 110; wheat silage, 64 to 96, and oat silage, 46 to 50. Because of its higher grain content, higher digestibility, and greater consumption barley had superior feed value to wheat.

Wheat varieties differ in feeding value. It is not a simple difference

of hard red winter versus soft red winter or awned (bearded) versus awnless (no beards). Differences exist among hard red winter, awned varieties. For example, Eagle has a higher feeding value and is consumed in greater amounts than Parker. Likewise, in the awnless soft red winter, Arthur has a higher feeding value than Blue Boy II. One reason for the differences may be that grain to forage ratios differ among wheat silage varieties.

Finishing Rations

Two finishing trials were used to compare wheat silage and corn silage as sources of roughage in feedlot rations.

In Trial 6, 60 Angus, Hereford, and crossbred yearling steers (average initial weight, 724 pounds) were fed corn silage or Parker wheat-head silage 123 days during the winter and spring, 1973. Each silage was fed at 10 and at 20% of the ration on a dry matter basis. Grain in the rations was equal parts of dry rolled corn and steam-flaked milo.

In Trial 7, 40 yearling crossbred steers (average initial weight, 864 pounds) were fed corn silage or Eagle wheat silage during the winter and spring of 1976. Each silage was fed at 13% of the ration on a dry matter basis. The grain in the rations was either dry rolled milo or high-moisture milo.

Results are summarized in Table 13.3. In Trial 6, steers fed corn silage or wheat-head silage had similar performances. However, in Trial 7, corn silage supported a slightly faster and more efficient gain than wheat silage. In neither trial were dressing percentages, carcass qualities, or yield grades affected by silage treatment.

Tips for Making and Feeding Cereal Silage

Preserving maximum nutrients per acre from cereal silages requires careful forage and silo management. These six recommendations are based on our experiences:

1. Harvest in the dough stage.
2. Chop fine, using a recutter screen or short-length cut.
3. Ensile at about 65% moisture, adding water or a wetter forage if necessary.
4. Fill the silo rapidly.
5. Pack well to exclude air.
6. Cover and seal the surface to reduce spoilage.

Optimum silage harvest time is shorter for wheat, barley, or oats than for corn or sorghum. Harvesting at the dough stage, a critical 10 to 14 days, requires good management. It may help to start early when moisture is 65 to 70%, so harvest does not extend beyond the dough stage of maturity. As harvest draws to a close, the drier forage may require that water be added or that a wet forage, like direct-cut alfalfa, be blended with it at the silo.

Usually harvest must begin early in the dough stage or even the late milk stage to allow harvest to be completed during the optimum stage. Rain may delay harvest, which is another reason to start early and "make silage while the sun shines."

But as cereals mature, moisture decreases rapidly. Start adding water to the forage when it drops below 60% moisture, usually about the mid-dough stage. How much water to add or whether to add any depends on type and size of silo.

A 50 to 65% moisture content in the ensiled material is desirable for most silos. However, large upright, concrete silos; horizontal trench and bunker silos, or oxygen-limiting silos may permit 50 to 60% moisture cereals to be ensiled satisfactorily.

Despite their slightly lower feed values, wheat and barley silages contain more protein and require less supplementation than corn or sorghum silages. Although wheat, barley, and oat silages vary more in protein than corn or sorghum silages, under proper fertilization and a normal growing season, it would be reasonable to expect 9 to 11 percent protein in whole-plant dough cereal silages. That means much less supplemental protein in beef growing rations. For example, if a growing ration required 12.5 percent protein and the cereal silage supplied is 10.5 percent protein, supplemental protein costs at $8 per hundred-weight soybean meal and $4 per hundred-weight milo would be about 13 to 14 cents per day. Supplemental protein costs for corn or sorghum silages containing only 8 percent protein would be 17 to 18 cents per day. In any event, it is important to take a protein analysis of each silage before feeding it in growing rations.

Table 13.1. Performance of growing steers fed wheat, barley, oat, or corn silage.

Silage	Avg. daily gain, lbs.	Daily feed intake, lbs.[1]	Feed/lb. gain, lbs.[1]	Silage DM %	Silage CP% [1]	Forage harvest date
	Trial 1 (122 days) 1972-73					
Corn	1.62	15.3	8.1	33.4	8.7	----
Blue Boy wheat-head[2]	1.53	14.4	9.5	35.7	13.6	June 11
Parker wheat-head	1.43	13.4	9.5	36.6	13.2	June 9
	Trial 2 (100 days) 1973-74					
Corn	2.45	18.6	7.5	40.9	8.3	----
Barley	2.29	17.4	7.7	32.9	9.5	June 1
Arthur wheat	2.09	17.4	8.5	36.9	7.5	June 8
Parker wheat	1.93	14.7	9.6	34.6	7.4	June 6
Parker wheat-head	1.75	14.8	8.1	41.2	9.9	June 7
Corn + Parker wheat-head	2.22	18.0	8.1	----	----	----
	Trial 3 (90 days) 1974-75					
Corn	2.83	19.3	6.8	34.6	9.1	----
Barley	2.60	17.5	6.9	34.8	12.0	May 29
Arthur wheat	1.91	15.0	7.9	32.2	11.2	June 5
Blue Boy II wheat	1.53	14.3	9.5	36.9	11.2	June 5
Eagle wheat	1.91	16.3	8.5	34.3	9.6	June 5
	Trial 4 (87 days) 1975-76					
Corn	2.45	18.8	7.7	37.8	7.8	Aug. 29
Barley	2.70	18.9	7.0	35.3	11.5	June 4
Arthur wheat	2.32	18.3	7.9	36.9	10.8	June 13
Eagle wheat	2.11	16.9	8.1	37.8	8.4	June 14
Eagle wheat-milk stage	1.97	16.0	8.2	33.8	9.9	June 5
	Trial 5 (89 days) 1976-77					
Corn	2.52	19.1	7.6	37.2	8.3	Aug. 20
Barley	2.33	19.5	8.4	35.7	9.0	June 2
Arthur wheat	2.06	18.7	9.1	39.2	11.2	June 7
Sage wheat	1.96	19.2	9.9	41.2	8.3	June 9
Trio oats	1.09	14.6	13.5	30.1	12.6	June 17
Lodi oats	1.02	14.7	14.5	31.2	10.1	July 2

[1] 100% dry matter basis.
[2] Upper ½ of plant.

Table 13.2. Relative feeding values of wheat, barley, and corn silages.[a]

Silage	Relative value, corn silage = 100
Barley (dough stage)	98[b] (range: 92 to 110)
Wheat (dough stage)	81[c] (range: 64 to 96)
Oats (dough stage)	48[d] (range: 46 to 50)

[a]Feeding values established from rate and efficiency of gain data in the feeding trials.

[b]Four barley silages in four trials; [c]twelve wheat silages in five trials; [d]two oat silages in one trial.

Table 13.3. Performance of finishing steers fed corn or wheat silages.

Silage	Avg. daily gain, lbs.	Daily feed intake, lbs.[1]	Feed/lb. gain, lbs.[1]
	Trial 6 (123 days) 1973		
10% corn silage	2.40	17.4	7.02
20% corn silage	2.68	18.6	6.96
10% Parker wheat-head silage	2.54	18.2	7.32
20% Parker wheat-head silage	2.47	18.6	7.53
	Trial 7 (82 days) 1976		
Corn silage	2.60	20.5	7.99
Eagle wheat silage	2.41	20.9	8.76