Additive-treated Corn Silage for Growing Cattle[1]

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Summary

The response of corn silage to the additive, Silo-Best Soluble®, was not consistent for the farm silo criteria measured. Ensiling temperatures and chemical compositions were similar for control and treated silages, except for ethanol, which was lower in the treated silage. Dry matter recovery favored the treated silage in both the top and bottom halves of the silos and in buried bags. Although daily gains were similar for calves fed control and treated silages, feed conversion was slightly better for those fed control silage.

Introduction

The objective of this trial was to determine the efficacy of a microbial inoculant additive, Silo-Best Soluble®, for whole-plant corn silage using farm silo evalution techniques. The effect of the additive on the rate and efficiency of fermentation of wheat, alfalfa, and forage sorghum silages using laboratory silos is reported on page 110 of this report.

Experimental Procedures

Two whole-plant corn silages were compared: (1) control (no additive) and (2) with Silo-Best Soluble® applied at the blower, at the manufacturer's recommended rate. The silages were made in the 10 x 50 ft concrete stave silos on August 24, 25, and 27, 1984. The irrigated corn (Pioneer 3183) was in the early-dent stage and contained about 67% whole-plant moisture at the time of harvest.

The silos were filled by the alternate load method on each of the 3 filling days. Each silo was partitioned vertically into halves as it was filled, with approximately 34 tons per half. The partitions were separated by plastic mesh fencing. Four thermocouple wires and 12 nylon bags filled with 4.5 to 5.5 lb of fresh crop, were placed in the vertical center of each half. The silos were opened on November 15, 1984 and emptied at a uniform rate over a 13-week period. Silage samples were taken twice weekly.

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[1]Silo-Best Soluble® contains Streptococcus faecium, Lactobacillus acidophilus, Lactobacillus plantarum, and Pediococcus sp. fermentation products and is marketed by Cadco, Inc., Des Moines, Iowa, which provided partial financial assistance.

The silages were fed to steer and heifer calves (four pens of four calves per silage) in an 84-day growing trial, which began on November 16. Silages were full-fed and all calves received 2.0 lb of supplement daily (as-fed basis). Rations were formulated to provide 12.25% crude protein (DM basis), 200 mg of Rumensin® per calf daily, and equal amounts of calcium, phosphorus, and vitamins A, D, and E. Supplements were top-dressed and partially mixed with the silages in the bunk. Feed offered was recorded daily for each of the pens and the quantity of silage fed was adjusted daily to assure that feed was always available. Feed not consumed was removed, weighed, and discarded every 7 days or as necessary.

All calves were weighed individually on two consecutive days at the start and at the end of the trial. Intermediate weights were taken before the a.m. feeding at 28 and 56 days.

Results and Discussion

Actual and adjusted ensiling temperatures are shown in Table 38.1. Both silages reached maximum temperature on day 4 post-filling. Although the average temperatures were nearly identical for the two silages, control silage had the greatest temperature rise in the bottom half of the silo (83.0 to 97.7 F) and Silo-Best Soluble® silage in the top half (90.0 to 105.2 F).

Chemical analyses are shown in Table 38.2. Both silages had very low pH values, high total fermentation acids (predominantly lactic acid), and low ammonia-nitrogen contents, all characteristics of well preserved, high moisture corn silage. The Silo-Best Soluble® silage had approximately one-half as much ethanol as the control, an indication of slightly better preservation of the treated silage.

Silage recovery and loss data are shown in Table 38.3. In the concrete stave silos, DM lost during fermentation, storage, and feedout was 24.6% less for the Silo-Best Soluble® silage (10.1%) than for the control silage (13.4%). The data from the buried nylon bags were similar—treated bags had 12.2% less DM loss than control bags (6.5 vs. 7.4%). Results of five previous trials have shown consistent improvements in DM recovery for Silo-Best silages (Report of Progress 448).

Performance by calves fed the two corn silages is shown in Table 38.4. Throughout the 84-day trial, calves fed Silo-Best silage consistently consumed more feed than those fed control silage. Since daily gains were the same for calves fed the two silages, feed efficiency was slightly in favor of the control silage.

Also shown in Table 38.4 are calf gains per ton of crop ensiled. These data combine silage recovery (Table 38.3) and calf performance. The two silages were similar (only a .7 lb advantage for Silo-Best Soluble®). In four of five previous trials, gains produced per ton of whole-plant corn, sorghum, or high-moisture corn ensiled with Silo-Best were increased by an average of over 6.0 lb when compared with control silages (Reports of Progress 377, 413, and 448).

Table 38.1. Ensiling Temperatures for the Two Corn Silages[1,2]

Days Post-filling	Location in the Silo	Control		Silo-Best Soluble®	
		Actual °F			
Initial:	Top	91.0		90.0	
	Bottom	83.0		83.0	
	Avg.	87.0		86.5	
Day 4:	Top	102.7		105.2	
	Bottom	97.7		96.0	
	Avg.	100.2	(+13.2)	100.6	(+14.1)
Day 7:	Top	101.2		102.3	
	Bottom	97.0		94.5	
	Avg.	99.1	(+12.1)	98.4	(+11.9)
Day 14:	Top	99.25		100.5	
	Bottom	96.0		92.3	
	Avg.	97.6	(+10.6)	96.4	(+9.9)
Day 21:	Top	95.2		97.0	
	Bottom	93.0		89.0	
	Avg.	94.1	(+7.1)	93.0	(+6.5)
Day 35:	Top	85.5		86.5	
	Bottom	84.7		82.4	
	Avg.	85.1	(-1.9)	84.5	(-2.0)

[1] Top and bottom values are the mean of four thermocouple wires. Bottom wires were buried in the crop at about 8 p.m. on August 24th and top wires, at about 4 p.m. on August 25th.

[2] In parenthesis are the changes from the initial crop temperature for each silage.

Table 38.2. Chemical Analyses for the Two Corn Silages

Item	Concrete Stave Silos		Buried Bags	
	Control	Silo-Best Soluble®	Control	Silo-Best Soluble®
Dry Matter:				
Pre-ensiled	33.3	33.0	32.6	32.5
Silage	32.0	31.5	32.6	32.5
pH	3.73	3.67	3.69	3.61
	% of the Silage DM			
Lactic Acid	6.54	6.33	6.21	7.50
Acetic Acid	2.89	2.83	3.73	3.09
Propionic Acid	.06	.03	.11	.06
Butyric Acid	.23	.12	.23	.16
Total Fermentation Acids	9.86	10.15	10.39	11.32
Ethanol	2.53	.93	1.34	.92
Ammonia-nitrogen	.105	.103	.083	.088
Ratio (Lactic:Acetic)	2.26	2.24	1 .66	2.43

Table 38.3. Dry Matter Recoveries and Losses From the Concrete Stave Silos and Buried Bags for the Two Corn Silages

Item		DM Recovery		DM Lost During Fermentation, Storage, and Feedout
		Feedable	Non-feedable (Spoilage)	
		% of the DM Ensiled		
Concrete Stave Silos:				
Control:	Top	85.9	2.1	12.0
	Bottom	85.1	—	14.9
	Avg.	85.5	1.1	13.4
Silo-Best Soluble®:	Top	88.9	2.4	8.7
	Bottom	88.2	—	11.8
	Avg.	88.6	1.3	10.1
Buried Bags:				
Control:	Top	93.2	—	6.8
	Bottom	92.1	—	8.0
	Avg.	92.6	—	7.4
Silo-Best Soluble®:	Top	93.3	—	6.7
	Bottom	93.8	—	6.2
	Avg.	93.5	—	6.5

Table 38.4. Performance by Calves Fed the Two Corn Silages and Calf Gain per Ton of Crop Ensiled

Item	Control	Silo-Best Soluble®
No. of Calves	16	16
Initial Wt., lb	472	474
Final Wt., lb	664	667
Avg. Daily Gain, lb	2.29	2.30
Daily Feed Intake, lb[1]	14.67	15.11
Feed/lb. of Gain, lb[1]	6.43	6.53
Silage Fed, lb/Ton Ensiled[2]	1710	1772
Silage/lb of Gain, lb[2]	16.06	16.53
Calf Gain/Ton of Crop Ensiled, lb[2]	106.5	107.2

[1]100% dry matter basis.

[2]Values are adjusted to the same silage DM content, 35 percent.