AgriChem, Inc.
15760 Lincoln St. NE
Ham Lake, MN 55304

763-434-6755
info@agricheminc.com
www.grainprep.com

Grain Prep® Processing Aid Research Report

Grain Processing and Cattle Feeding Trial
Northeast Nebraska Experiment Station
Concord, Nebraska
Summer, 1991

Objective

The primary objective was to generate quality research data to support product development and marketing efforts for Grain Prep Processing Aid and Grain Prep Auto Delivery System®

Introduction

While grain conditioning has become widely practiced in cattle feedlot feed manufacturing, there is very little good data documenting a benefit either in the manufacturing of feed or the subsequent feeding of the conditioned grain to feedlot cattle.

The first phase objective was to determine the effect grain conditioning has on dry rolling corn. The second phase was to conduct a cattle feeding trial where grain conditioned with Grain Prep Processing Aid was fed versus untreated grain as the control ration.

Results and Discussion

Phase 1

Table 1 contains processing data from Phase 1. In part 1, two percent moisture was added to corn having approximately thirteen percent moisture content. Then both the conditioned and control corn were processed. In part 2, four percent were added and the corn was then processed. Mill operating data and rolled corn particle size distributions are recorded.

It is widely believed conditioning grain before rolling results in a power saving. These data show quite clearly a power and time penalty for adding moisture to grain. The roller motor ammeter did generally show a lower amp draw for the treated grain. However grain flow was also significantly reduced. Informal discussions with roller equipment manufacturers confirmed the validity of this observation and its order-of-magnitude. Production rates and roll power costs are shown in Figure 1. For the purpose of estimating costs of observed production changes, calculations were based on 6 cents per kwh.

Table 1: Conditioning Effect on Rolled Corn

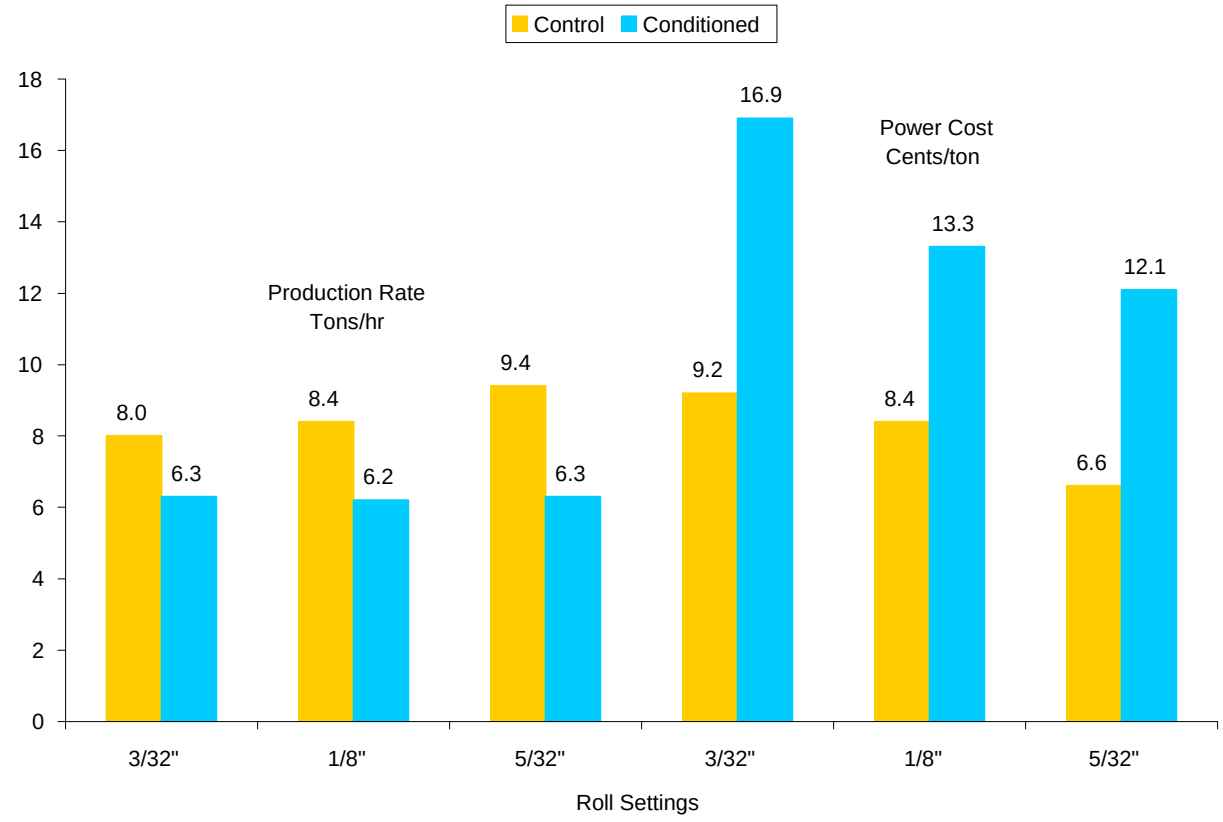
Part 1	Untreated			Conditioned		
Roll Setting	3/32"	1/8"	5/32"	3/32"	1/8"	5/32"
% Moisture		12.8		14.9	14.9	14.5
KW/CWT		9.1^{a}		13.8^{b}	11.6^{c}	9.8^{a}
Time (Sec./CWT)		25.7		27.6	27.1	26.7
KW/Sec.		0.36^{a}		0.49^{b}	0.41^{c}	0.36^{a}
Whole Kernels, % (Uncracked)		38.4^{a}		31.7^{b}	53.3^{c}	70.1^{d}
GMD, mm		5.33^{a}		5.59^{a}	6.34^{b}	6.83^{c}

KW = Kilowatts; GMD = Geometric Mean Diameter of Grain Particles
Means with Different Superscripts Differ Statistically ($P < 0.10$)

Part 2	Untreated			Conditioned		
Roll Setting	3/32"	1/8"	5/32"	3/32"	1/8"	5/32"
% Moisture[a]	12.7	13.0	12.6	17.7	17.4	17.3
KW/CWT[abc]	12.3	11.7	10.3	15.5	13.7	12.7
Time (Sec./CWT)[a]	22.5	21.5	19.1	28.4	29.2	29.0
KW/Sec.[abc]	0.54	0.53	0.51	0.54	0.45	0.44
Whole Kernels, %[abc]	24.1	39.6	50.6	28.6	45.1	63.2
Whole Kernels, %[bc] (Uncracked)	21.6	32.3	46.4	16.1	30.9	50.9
GMD, mm[abc]	5.26	5.85	5.95	5.28	6.22	6.90

[a]Effects of Moisture ($P < 0.05$)
[b]Effects of Grind ($P < 0.05$)
[c]Moisture by Grind Interactions ($P < 0.10$)

Figure 1: The Effect of Conditioning Corn on Production Rates and Power Requirements During Rolling



Phase 2 was a feeding trial comparing corn conditioned with Grain Prep Processing Aid to a dry grain ration. The target moisture content of the conditioned corn was between 17% and 18%. The control grain moisture content was between 12% and 13%. Monthly composite samples of grain were analyzed for particle size distribution, whole kernels, and uncracked whole kernels. Table 2 contains the geometric mean diameter particle size and whole kernel data.

Since procedures and equipment continued to evolve over the summer, no statistical analysis of these data was performed. However, the physical appearance of the two grain samples is strikingly different and the differences shown in the data are expected to be significant when the trial is repeated.

Figure 2 shows the particle size distribution of the conditioned and dry corn fed in the feeding trial. Again, no statistical analysis was performed, but the trends seen are interesting. Conditioning had relatively little impact on fines, but clearly increased particle size.

Table 3 contains feeding trial data. The cattle purchased were 700 pound steers. By the time all of the mechanical and procedural problems were resolved, they were approaching 1000 pounds with only 53 days left in the feeding period. The observed gain improvement for the Grain Prep Processing Aid treated corn was significant. Much of the variation in other performance data were thought to be caused by processing variations as equipment and procedures were adapted.

Table 2: Particle Size of Fed Rolled Corn

	Geometric Mean Diameter (mm)	% Whole Kernels	% Uncracked Kernels
Untreated Corn			
(12.25% Moisture)			
June Composite	5.422	12.6	6.4
July Composite	5.374	12.8	8.8
August Composite	5.121	10.9	6.2
Trial Average	5.306	12.1	7.1
Conditioned Corn			
(17.35% Moisture)			
June Composite	5.913	23.7	7.6
July Composite	6.033	30.9	9.8
August Composite	5.985	26.2	8.9
Trial Average	5.977	26.9	8.8

Table 3: Feeding Trial Data

	Control	Grain Prep Processing Aid
Number of Pens	6	6
Animals per Pen	8	8
Feeding Period (Days)	53	53
Initial Weight	998	985
Final Weight	1166	1168
Average Daily Gain	3.18^{a}	3.44^{b}
Dry Matter Intake	21.12	21.74
Feed Efficiency	6.65	6.33

^{a,b} Means with different superscripts differ significantly ($P < 0.05$)

Figure 2: Particle Size Distribution of Fed Rolled Corn