

of microbial protein is higher than corn protein. Consequently such formaldehyde treated corn would prove most useful in rations for animals where quality of protein is less important.

References:

Thornton, J. H. *et al.*, 1976. Okla. Agri. Exp. Sta. MP-96:176

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## Ensiled Corn Grain Moisture Level and Supplement Protein Source Effects on Feed Intake

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### Story in Brief

Ensiled ground high moisture corn of two moisture levels, 24 and 30 percent and containing 24 and 49 percent of nitrogen in a soluble form was fed with either urea or soybean meal supplements to sixteen 500 pound steers to estimate voluntary intake. Consumption of dry matter from the higher moisture - higher soluble nitrogen grain was 12 percent less than the drier - lower soluble nitrogen grain. Urea reduced intake only slightly (5 percent reduction). This study would indicate that: (1) urea can be satisfactorily fed with ensiled corn rations, and (2) grain intake may be increased by ensiling drier grain, although improvement in animal performance may not correspond to increased intake.

### Introduction

Livestockmen feeding ensiled high moisture corn voice two concerns: 1) problems with feed intake, and 2) complications associated with non-protein nitrogen supplements. These two concerns may be inter-related in that a portion of ensiled corn protein is degraded to non-protein nitrogen during storage. Intake depressions in feedlots have been related to high moisture and

high nitrogen solubility of corn grain (Sprague and Brenniman, 1969). Although recent work (Prigge *et al.*, 1975) indicated that nitrogen in ensiled corn grain, as well as urea nitrogen additions to ensiled corn, can be efficiently utilized by steers, effects of added urea on feed intake were unclear. Recent work (page 56 this publication) has shown that soluble or non-protein nitrogen is much lower when ensiled corn grain contains less moisture.

The objectives of this study were to determine effects of moisture and soluble nitrogen level of high moisture corn together with supplement protein solubility (urea vs. soybean meal) on feed intake.

## Materials and Methods

Ensiled ground high moisture corn grain was obtained from two large horizontal silos, packed in plastic bags (approximately 70 pounds wet material per bag), transported to Stillwater, and stored frozen until fed. The corn was fed with cottonseed hulls and either a urea or soybean meal based supplement (Table 1) to provide 11.5 percent crude protein. Two pens, with two-500 pound steers per pen, received each corn-supplement combination for four weeks. Rations were fed twice daily at levels to allow feed refusals. Records of feed consumption and weight gains were recorded. The ensiled grain was analyzed for dry matter, pH, total and soluble nitrogen, and lactic acid.

## Results and Discussions

Ensiled ground high moisture corn grain from silo W (wet) contained 5.7 percent more moisture (Table 2) and over twice as much soluble nitrogen as corn from silo D (dry). Lactic acid was also higher and pH lower in silo W.

Daily intakes (Table 3) and daily gains (Table 4), plus visual observation, indicated animals were gaining well. However, daily intakes of steers

**Table 1. Ration composition, Dry matter basis**

Ingredient	Supplement (percent)	
	Urea	SBM
Ensiled HMCG	70	70
Cottonseed hulls	14	14
Supplement	16	16
Corn	(7.01)	(2.06)
Urea	(0.98)	--
Soybean meal	--	(6.83)
Alfalfa, 17% CP	(6.00)	(6.00)
Ground limestone	(0.78)	(0.85)
TM salt	(0.30)	(0.30)
Potassium chloride	(0.02)	--
Sodium sulfate	(0.17)	--
Vitamin A & D	+	+

**Table 2. Ensiled ground high moisture corn grain analysis**

Item	Silo W	Silo D
Dry matter, %	70.4	76.1
Crude Protein, %	10.0	9.6
Sol. N, % of total N	49.4	23.7
pH	4.0	4.6
Lactic acid, %	1.1	0.6

**Table 3. Ensiled corn and nitrogen supplement effects on ration consumption by 500 pound steers<sup>1</sup>**

Supplement	Average daily intake		
	Silo W	Silo D	Average
	lb/day		
Urea	12.6	13.7	13.2
SBM	12.9	14.9	13.9
Average	12.8 <sup>a</sup>	14.3 <sup>b</sup>	--

<sup>1</sup>Daily intakes during approximately 2 weeks when feed refusals indicated maximum voluntary intake.

<sup>a,b</sup>Significantly different at P<.05.

**Table 4. Ensiled corn and nitrogen supplement effects on sixteen day daily gain**

Supplement	Average daily gain		
	Silo W	Silo D	Average
	lb/day		
Urea	3.66	3.50	3.58
SBM	3.55	3.55	3.55
Average	3.60	3.52	--

receiving grain from silo W were significantly less than those of steers fed grain from silo D. Intakes were only slightly reduced when urea replaced soybean meal as the source of supplemental nitrogen. Depressions in intake were not reflected by reduced daily gains.

This study indicates feed intake depression occurs when ensiled grain contains the higher levels of moisture, soluble nitrogen and/or acids. Since the addition of soluble nitrogen as urea reduced intake only slightly, and indeed less when added to the higher than the lower soluble nitrogen grain, reduced intake may be attributed to factors other than soluble nitrogen. Although gains were measured over only 16 days, these gains illustrate that intake depression from feeding higher moisture - higher soluble nitrogen grain may not detrimentally affect animal performance. Study of energy availability from the two corns is underway. This should determine if intake is reduced simply because more energy is available from corn having a higher moisture content.

#### References:

1. Prigge, E. C., *et al.* 1975. Okla. Agri. Exp. Sta. MP-94, p. 63.
  2. Sprague, J. I. and G. W. Brenniman, 1969. *Feedstuffs* 46:20.
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## Nylon Bag Dry Matter Digestion of Corn as Influenced by Particle Size, Steam Flaking and High Moisture Processing

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### Story in Brief

Corn grain was sieved to obtain distinct particle sizes and incubated in nylon bags for varying time periods in the rumen of a mature Holstein steer. In Experiment 1, dry rolled corn sieved to provide sizes of 6.0, 3.0, 1.5, and 0.75 mm. was incubated for two, four, six or eight hours. Dry matter digestion (DMD) (averaged over all time periods) was similar for 6.0 mm. (4.98 percent), and 3.0 mm. (4.38 percent). However, DMD roughly doubled as particle size was halved to 1.5 mm. (9.74 percent), and 0.75 mm. (18.38 percent). Experiment 2 compared steam flaked (SF) and dry ground (DG) corn at 3.0 mm., 1.5 mm., and 0.75 mm. sizes for two, four, six or eight hours. SF had higher DMD within each particle size than DG. An approximate doubling of DMD as size was halved was not observed with SF as with DG. Experiment 3 was concerned with a comparison of ground, ensiled high moisture corn (HM) and DG at 3.0 mm., 1.5 mm., and 0.75 mm. sizes. Both HM and DG increased in DMD as size was reduced; however, HM generally had higher DM values within each particle size than DG. Particle size also had significant effects on the DMD of corn incubated for 12 or 24 hours, and on DMD of sorghum incubated for two, four, six or eight hours (Experiments 4 and 5, respectively).

This study indicates particle size has an important impact on digestion of processed as well as unprocessed corn, but is probably of greater importance with dry and high moisture, ensiled corn than with steam flaked corn.