

## A COMPARISON OF NAKED OATS TO BARLEY WHEN FED IN A GROWER DIET TO BEEF CALVES

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### SUMMARY

The North Dakota Crop Improvement Association released a new variety of naked oats, "Paul," in 1994. This particular variety has a thin hull that is loosely attached to the seed and is easily separated or removed during mechanical harvesting. Hence, Paul is referred to as naked oats. Livestock producers have expressed an interest in Paul oats as a feed due to its high protein (16-18%) and fat (7-9%) content. Two studies were conducted during the fall and winter of 1994-95, to investigate how Paul might be used in feeder calf diets. Seventy-two lightweight feeder calves were used in the first study conducted at the Dickinson Research and Extension Center (DREC) from September 12, to November 7, 1994 (57 days). Effects of unprocessed naked oats compared to coarsely ground barley were evaluated with no differences ( $P > .23$ ) in calf performance. Concentrate and forage portions were either delivered in a total mixed ration (TMR) or fed separately (FSR) to evaluate the effects of method of feed delivery on feeder cattle performance. TMR fed calves had a lower ( $P < .04$ ) dry matter intake with no difference ( $P = .64$ ) in calf weight gains. TMR fed calves also had a higher ( $P < .03$ ) feed efficiency (7.3 lbs feed/lb gain) compared to FSR calves (8.9 lb feed/lb gain). A group of 80 steers were used in a second study to compare naked oats to barley at the Central Grasslands Research Center (CGRC), Streeter, North Dakota. The experiment began December 1, 1994, and ended January 31, 1995 (61 days). Both grains were coarsely ground in this study. Significant advantages in ADG ( $P = .06$ ) and feed efficiency ( $P = .07$ ) were observed for Paul oats fed steers as compared to steers fed barley. It appeared that naked oats provided more energy for growth as reflected in higher daily gains. By

combining the results of both studies, it appears that processing Paul oats can have a major effect on feeder calf growth responses and feed conversions. Because of the magnitude of difference in calf growth between the two studies, additional feeder cattle performance information should be gathered before confident recommendations for use can be offered to producers.

## INTRODUCTION

A market for naked oats has not yet been established and interest for its use as a livestock feed in North Dakota has been expressed by cattle feeders and producers. General feeding guidelines and recommendations for its use are lacking. Furthermore, naked oats has unique properties when compared to other cereal crops. Naked oats is high in crude protein (16-18%) and fat (7-9%), resulting in an increased energy value, (90-94% TDN) compared to barley (84% TDN) or hulled oats (78% TDN). This feed may prove useful in formulating diets for feeder cattle by providing required nutrients for growth with less required concentrate intake or supplemental protein compared to other grains. Naked oats could also provide extra energy for rapid gains in growing cattle diets.

Research conducted at South Dakota State University (Wagner et al., 1988) and the NDSU Carrington Research Center (Anderson, 1992) have demonstrated benefits for feeding backgrounding or finishing diets respectively, in a total mixed ration compared to concentrates and forages fed separately. These studies have suggested both an improvement in ADG and feed efficiency. Provision of a TMR requires additional equipment and therefore, increased animal performance and feed conversions must compensate for these additional expenses over the total number of cattle being fed. Wagner et al. (1988) stated that when feeder cattle are valued at \$80/cwt and if corn, hay and corn silage were worth \$90, \$80 and \$25 per ton respectively, producers would need to feed a minimum of 114 head for 133 days each year to pay for costs associated with owning a mixer wagon. Evaluation of feeds and feed delivery methods more commonly used by North Dakota producers are needed to localize these recommendations.

The main objectives at the DREC were to compare the feeding properties of unprocessed naked oats to coarsely ground barley when fed to lightweight feeder cattle and to evaluate lightweight feeder calf performance and feed efficiency as influenced by feed delivery in a total mixed ration or when concentrates and forages are fed separately. Objectives at the CGRC were to compare the value and feeding properties of naked oats to barley fed in a grower diet to beef steers when both grains were coarsely ground.

## EXPERIMENTAL PROCEDURES

DREC Experiment: In the first study, 32 heifers and 40 steers were used to compare Paul oats and barley at the DREC. The study was conducted from September 12, to November 7, 1994 (57 days). Diets were formulated to provide approximately 2.3 lb average daily steer gains. Calves received either ground barley or unprocessed Paul oats in equal amounts daily. Soybean meal was included in the barley diets to equalize protein concentrations between the two grain treatments. Concentrate and forage portions were either supplied in a total mixed ration (TMR) or fed separately (concentrate was bunk fed and hay offered free choice in round bale feeders). Feed delivery treatments were equally distributed over the Paul oats and barley treatments. Calves were fed in one of 16 pens (4 heifers or 5 steers/pen) with 2 pens/feed delivery and grain treatment combination. Two calves died during the study and were not included in calculations and eight calves were treated for bloat. Nutrient composition of feeds used in the study are given in Table 1 and diet composition in [Table 2](#).

CGRC Experiment: A group of 80 steers were used in a feeder cattle study to compare naked oats to barley at the CGRC, Streeter, North Dakota. Treatments were pound-for-pound substitutions of either coarsely ground Paul oats or barley. The experiment began December 1, 1994, and ended January 31, 1995 (61 days). Soybean meal was included in the barley diet to maintain similar concentrations for each of the treatments. Steers were fed in one of four pens (2 pens/treatment) and the barley diet was formulated to provide for a 3 lb ADG. Nutrient composition of the feeds used in the study are given in [Table 3](#) and diet formulations and nutrient composition are reported in [Table 4](#).

## RESULTS AND DISCUSSION

Calf performance for lightweight feeder calves at the DREC is reported in [Table 5](#). Gains for unprocessed Paul oats and barley were not significantly affected by treatment suggesting that similar ( $P=.84$ ) calf performance can be achieved with either unprocessed Paul oats or rolled barley plus a protein supplement. Because Paul oats does not have a fibrous hull, and earlier studies were conducted without processing, we decided to feed the naked oats unprocessed. This may have been the primary reason we did not see an advantage in the Paul oats fed calves. These results prompted the next study conducted at the CGRC.

Average daily gain was affected by sex ( $P=.02$ ) with heifers gaining 1.85 lb daily and steers 2.17 lb per day. TMR fed calves had a lower DMI ( $P<.04$ ) and a higher feed efficiency ( $P<.03$ ) than FSR fed calves with no difference in ADG ( $P=.75$ ; Table 6). FSR fed calves utilized 8.9 lb feed/lb of gain, where as TMR calves used 7.3 lb feed/lb of gain (Table 6). Because of method of hay delivery (round bale feeders), we cannot be sure that this additional feed was utilized by the animal or was wasted. Either way, there is an additional feed cost for the FSR fed calves over the TMR fed calves. This equates to an economic decision in which a cattle feeder must calculate whether the added benefits of a TMR can cover the costs of owning a mixer wagon.

In the second study conducted at the CGRC, steers were weaned in late October, therefore diets were formulated to produce more rapid daily gains. Steer performance results are given in Table 7. One can not overlook the ADG advantage (nearly .6 lb/day) for the Paul oats fed steers compared to the steers fed barley. Treatment differences were significant ( $P=.06$ ). Feed efficiency was also improved by replacing barley with Paul oats ( $P=.07$ ). It appeared that naked oats provided more energy for growth as reflected in higher daily gains. Furthermore, steers fed naked oats did not require supplemental protein for improvements in ADG and feed efficiencies compared to barley fed steers. The combination of high energy and protein concentrations are a unique feature of Paul oats that many feed grains do not have.

These studies were a part of preliminary work that is continuing at NDSU Experiment Stations and the Department of Animal and Range Sciences (NDSU). Although Paul oats seed supplies are still in the seed increase program and may be somewhat limited, it is our intent to have solid research results on how it may be used in beef diet formulations once it is more available in the production setting. There are also plans at NDSU to evaluate naked oats in finishing cattle, swine and dairy diet formulations.

## LITERATURE CITED

Anderson, V.L., 1992. Observation on totally mixed vs hand fed rations for finishing steers. Carrington Research and Extension Center Beef Field Day Report. Pg. 13-14.

Wagner, J.J., D. Peterson, R. Hanson and H.L. Miller. 1988. Economic analysis of using mixing equipment for growing heifers. South Dakota State University Annual Beef Report. Pg. 56-60.

Table 1. Nutrient composition (DM basis) of feeds used in DREC lightweight feeder calf diets formulated with either barley or naked oats as the concentrate source.

Item	DM	CP	ADF	Calcium	Phosphorus
Naked Oats	91	18.72	4.3	0.39	0.4
Barley	91	13.99	7.5	0.75	0.47
Crested Wheat Hay	92	7.28	42.9	0.6	0.14
Soybean Meal	89	48.1	9.2	0.32	0.35
Bovatec	100	8	11	8.5	0.25
Vitamin/Mineral Supplement	100	0	0	24	6

Table 2. Composition of barley and naked oats diets (DM basis) fed, in either a total mixed ration (TMR) or with concentrate and forage portions fed separately (FSR), to lightweight feeder calves for 57 days at the DREC.

Item, %	Barley		Naked Oats	
	TMR	FSR	TMR	FSR
Barley	37.77	30.52	----	----
Naked oats	----	----	37.19	31.65
Crested Wheat Hay	54.04	62.39	57.2	63.91
Soybean Meal	5.57	4.75	2.65	1.94
Bovatec supplement	2.19	1.88	2.27	1.91

Vitamin/Mineral supplement	0.65	0.56	0.7	0.59
Dry matter intake, lb/day	15.1	17	13.7	17.2
Nutrient composition				
Crude protein	11.95	11.23	12.58	11.66
Acid detergent fiber	26.77	29.71	26.64	29.18
Calcium	0.97	0.91	0.86	0.82
Phosphorus	0.32	0.27	0.29	0.28

Table 3. Nutrient composition (DM basis) of feeds used in CGRC growing steer diets formulated with either barley or naked oats as the concentrate source.					
Item	DM	CP	ADF	Calcium	Phosphorus
Barley	89.8	13	7.3	0.15	0.42
Naked oats	91.2	17	2.9	0.1	0.53
Corn silage	40.4	8.8	26	0.16	0.22
Chopped hay	84.3	11.7	40.7	0.77	0.2
Soybean meal	91.1	50.8	5.1	0.37	0.77
Mineral/Ionophore supplement	93	13.4	12.3	12.8	0.63

Table 4. Composition of barley and naked oats diets (DM basis) fed to growing steers for 61 days at the CGRC.

	Barley		Naked Oats	
Item	% DM	Lbs DM	% DM	Lbs DM
Barley	49.84	10.55	----	----
Naked oats	----	----	51.48	10.63
Corn silage	26.93	5.7	29.08	6.01
Chopped grass hay	14.05	2.97	14.15	2.94
Soybean meal	4.07	0.86	----	----
Mineral/Ionophore supplement	5.12	1.08	5.19	1.07
Nutrient composition, %				
Crude protein	13.24		13.67	
Acid Detergent Fiber	17.19		15.49	
Calcium	0.9		0.87	
Phosphorus	0.36		0.4	

Table 5. Calf performance when fed diets containing similar amounts of either naked oats or barley at the DREC (57 days on feed).

Measurement, lb	Barley	Naked Oats	Significance <sup>a</sup>

In weight	448.3	442.9	0.78
Final weight	562	560.8	0.23
Average daily gain	1.97	1.98	0.84
Dry matter intake	16.07	15.47	0.38
Feed/lb gain	8.19	8.03	0.78
<sup>a</sup> Probability that the difference between the means was due to chance.			

Table 6. Dry matter intake (DMI), average daily gain (ADG) and feed efficiency of lightweight feeder calves fed either a total mixed ration (TMR) or concentrates and forage fed separately (FSR) at DREC.

Item, lb	TMR	FSR	Significance <sup>a</sup>
DMI	14.42	17.13	0.04
ADG	1.99	1.96	0.64
Feed efficiency, (feed/gain)	7.3	8.9	0.03
<sup>a</sup> Probability that the difference between the means is due to chance.			

Table 7. Steer performance at the CGRC when fed diets containing similar amounts of either naked oats or barley (61 days on feed).



Measurement, lb	Barley	Naked oats	Significance <sup>a</sup>
In weight	681.2	680.3	0.52
Final weight	859	789	0.04
ADG	2.92	3.48	0.06
Dry matter intake	21.1	20.7	0.2
Feed/lb of gain	7.2	6.0	0.07
<sup>a</sup> Probability that the difference between the means is due to chance.			

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