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EFFECT OF STRAW AND NEWSPAPER BEDDING ON COLD SEASON FEEDLOT PERFORMANCE IN TWO HOUSING SYSTEMS

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Summary

Two hundred seventy-three crossbred steer calves were fed until slaughter (November through May, 189 days) in either semi-confinement (partial overhead shelter, 88 sq. ft. per steer, concrete pen surface) or conventional open lots (windbreak, 448 sq. ft. per steer, dirt surface with mound). Within each housing system, cattle were provided with no bedding or bedding in the form of oat straw or shredded newspaper. Bedding was provided in amounts necessary to maintain a relatively dry, manure-free area large enough for all cattle to lay down at the same time. There were no interactions between housing systems or bedding treatments ($P>.10$). Feed intake did not differ ($P>.10$) between treatments at any time during the study. On the other hand, overall (day 1 through 189) daily gain was 8.6% greater for steers fed in semi-confinement pens compared to open lots ($P<.001$). Bedding also improved overall gain by 8.3% ($P<.001$) compared to no bedding, with newspaper generally being as effective as straw. Similar benefits of housing and bedding were evident in feed efficiency as well. Housing and bedding improved overall feed efficiency 8.2% and 6.8%, respectively ($P<.001$). Less newspaper than straw was used in this study (232 vs 266 lb per 100 head per day) and break-even values were $141.88 and $114.21 per ton, respectively. Both housing and bedding improved feedlot performance, with bedding being as effective in open lots containing mounds as on concrete. Newspaper can be an effective replacement for more conventional bedding materials.

(Key Words: Steer Calves, Housing, Bedding, Straw, Newspaper.)

Introduction

It is commonly accepted that providing cattle with bedding during cold weather and(or) when pens are muddy improves feedlot performance. The impact of bedding on performance is dependent on several factors, including the effective temperature and amount of mud to which the cattle are exposed. These factors can be altered by protection from wind and the use of concrete pen surfaces or mounds. It could, therefore, be expected that the benefits of bedding would differ between housing systems. Additionally, a variety of materials are available for use as bedding. Not all are equally effective due to differences in physical characteristics such as absorbency. Discarded newspaper will become more plentiful as recycling becomes mandatory in the future and has potential as bedding material.

The objectives of this study were 1) to determine if the use of bedding was as effective in improving performance of cattle fed fall through late spring in mounded, open lots as in semi-confinement on concrete and 2) to determine if shredded newspaper was as effective a bedding material as straw in the feedlot.

Materials and Methods

Two hundred seventy-three crossbred steer calves were randomly allotted to nine semi-confinement and 16 conventional, open lot pens, resulting in 9 and 12 steers per pen, respectively. The semi-confinement pens were 16 x 50 ft. with the feed bunk and 16 ft. of pen length covered by a shed open to the south. The pens were surfaced with concrete and provided 1.7 ft.

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of bunk space per steer. The conventional, open lot dimensions were 48 x 112 ft. with a well packed dirt surface and contained a mound and adjacent windbreak approximately 30 ft. behind the feed bunk. Bunk space was 1.8 ft. per steer. A shelter belt protected the open lots on the north and west sides. Bedding was provided as necessary to provide a relatively dry, manure-free area large enough for all of the steers in a pen to lay down at one time. As a result, new bedding was added every 3 to 10 days, depending on conditions, at a rate that averaged 266 and 232 lb per 100 head per day for straw and newspaper, respectively. Semi-confinement pens were cleaned at 2- to 3-week intervals and the feed apron and surrounding area of the open lots was cleaned after 117 and 161 days on feed. Air temperature and wind speed were recorded hourly by weather instrumentation located in an unprotected area approximately 600 ft. south of the feedlot.

The cattle were vaccinated (IBR, BVD, Lepto, 7-way clostridial), treated with Ivermectin[3], implanted with Ralgro[4], and ear tagged upon arrival at the feedlot. They were reimplanted with Synovex-S[5] after 82 days on test. Weights on and off test were taken after a 16-hour removal from feed and water. Interim 28-day weights were taken after a 16-hour removal of water only. Two diets were fed during the study (Table 1). The first was an 80% concentrate diet which was limit-fed during the first 82 days on test. The second was a more typical 90% concentrate diet fed ad libitum for the remainder of the study. No step-up diets were fed. Switches between the receiving diet (50% concentrate, fed prior to the on-test weight) and limit-fed grower and finisher diets were made by limiting initial intake of the new diet to maintain a constant net energy intake and then gradually increasing to the desired level.

Data were analyzed as a completely random design with a 2 x 3 factorial arrangement of treatments. Comparisons of open lot vs semi-confinement, bedding vs no bedding, and straw vs newspaper were made using orthogonal contrasts.

Results and Discussion

Feedlot performance data for this study are presented in Table 2. No interactions between housing system and bedding were found for the variables tested, indicating that the provision of bedding had the same kind and magnitude of effect on the cattle kept in semi-confinement as on those in the open lots.

The grower diet was fed across treatments at a level set to achieve a specific rate of gain and, as a result, dry matter intakes were not different from 1 through 82 days on test (P>.10). Intakes were also similar among treatments when fed the finishing diet ad libitum (P>.10). Overall dry matter intake (1 through 189 days on test), of course, reflected these results (P>.10).

Semi-confinement housing improved daily gain consistently throughout the study compared to open lots with mounds and windbreaks (P>.001). The advantage was .25 lb per day during both the growing and finishing phases. Feed dry matter required per pound of gain (feed:gain) was reduced by .44 and .55 lb during the growing and finishing phases, respectively (P<.001). Improvements in gain and feed:gain resulted in semi-confinement cattle weighing 15 lb more at slaughter than open lot fed cattle (P<.001).

The provision of bedding (straw or shredded newspaper) increased daily gain by .37 and .24 lb per day compared to no bedding during the finishing phase and overall (P<.001). Bedding effect only approached significance (P=.12) during the growing phase. The reason for this is unknown but may be related to the fact that cattle without bedding appeared to carry more mud, resulting in an overestimate of daily gain. This was apparently not the case with finishing and overall

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[3]IVOMEC, MSD AGVET, Rahway, NJ, 90965.
[4]Pitman-Moore, Inc., Mundelein, IL, 60060.
[5]Syntex Animal Health, Des Moines, IA, 50303.

Table 1. Diets fed to steers during the growing and finishing phases of the study (dry matter basis)

Ingredient	Diets	
	Limit-fed grower	Finisher
	Percent	
Rolled corn	65.3	83.2
Corn distillers grain (wet)	11.5	3.6
Brome hay	20.0	10.0
Limestone	1.6	1.6
Potassium chloride	.4	.5
Urea	.5	.5
Trace mineral salt[a]	.6	.5
Premix[b]	.1	.1

[a] Trace mineral salt contained 97% NaCl, .007% I, .24% Mn, .24% Fe, .05% Mg, .032% Cu, .11% Co., .032% Zn, and .5% Ca.
[b] Provided vitamin A at 50,000 IU/day, monensin at 295 mg/day, and tylosin at 90 mg/day.

gains, since pen conditions were dry at the time of slaughter and dressing percentages did not differ (P>.10). However, gain of cattle bedded with newspaper was equal to those with straw during the finishing phase and overall. Feed:gain reflected the same effects of bedding as did daily gain. Feed:gain was .71 and .42 lb lower for bedded cattle during the finishing phase and overall, respectively, than for nonbedded cattle (P<.001). As with daily gain, straw tended to improve feed:gain during the growing phase, but newspaper did not, resulting in a bedding effect that only approached significance (P=.12).

The benefits of providing bedding and the additional shelter from wind and precipitation in semi-confinement were substantial in this study. However, the impact on performance that can be expected will naturally vary with environmental conditions. Air temperatures were relatively mild during the study, averaging 33 °F. This is 5 °F warmer than long-term, historical averages. With temperatures frequently near or above 32 °F, precipitation in the form of rain and sleet occurred on several occasions and resulted in unusually poor feeding conditions. Benefits of bedding and additional housing may be less in environmental conditions more typical for this region. However, this study does illustrate the sizable negative impact the environment can have on feedlot cattle performance and the potential for modifying it. The lack of an interaction between bedding and housing system also suggests that access to mounds and protection from the wind, while beneficial, are not adequate by themselves to offset this negative impact. Hair coats of cattle receiving bedding were obviously drier and carried less mud than nonbedded cattle throughout much of the study. Dry, clean hair coats provide better insulation and reduce cold stress and maintenance energy requirements.

Less shredded newspaper was used to achieve the same overall effect of straw. This has been found in other studies as well and may be due to the fact that newspaper is about 2.5 times as absorbent as straw. Based on the usage rates in this study and

Table 2. Feedlot performance of steers fed in two housing systems with three types of bedding[a]

Item	Bedding				Housing		
	None	Straw	News-paper	SE	Open lot	Confine-ment	SE
No. steers	99	99	75		192	81	
Initial wt, lb	584	585	582	5.5	588	579	4.4
Final wt, lb[ab]	1079	1121	1118	8.8	1099	1114	7.0
Dry matter intake, lb/day							
1 to 82 days	14.2	14.2	14.2	.03	14.3	14.2	.02
83 to 189 days	21.2	21.7	21.4	.21	21.5	21.4	.17
1 to 189 days	18.2	18.5	18.3	.13	18.3	18.3	.10
Daily gain, lb/day							
1 to 82 days[cd]	2.83	2.96	2.85	.046	2.76	3.01	.037
83 to 189 days[bc]	2.91	3.25	3.32	.056	3.03	3.28	.045
1 to 189 days[bc]	2.88	3.12	3.12	.031	2.91	3.16	.025
Feed:gain							
1 to 82 days[cd]	5.05	4.82	5.01	.081	5.18	4.74	.065
83 to 189 days[bc]	7.32	6.72	6.47	.123	7.11	6.56	.100
1 to 189 days[bc]	6.33	5.93	5.88	.057	6.31	5.79	.046

[a] Least squares means.
[b] No bedding vs bedding (P<.001).
[c] Housing (P<.001).
[d] Straw vs newspaper (P=.12).

assumptions about feed, cattle and yardage costs[6], straw and shredded newspaper had break-even values of $114.21 and $141.88 per ton, respectively. If straw and shredded newspaper had been purchased for $60 per ton, their use would have returned $13.63 and $17.95 per head above bedding cost.

In conclusion, both housing and bedding improved feedlot performance, with bedding being as effective in open lots containing mounds as on concrete. Newspaper can be an effective replacement for more conventional bedding materials.

[6]Assumes $1.03 purchase price for calves, $76.50 fed cattle price, $84.30/ton feed cost, and $.15 per day yardage.