



EXTENSION
BEEF CATTLE RESEARCH UPDATE
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Effect of Increasing Corn Silage Inclusion in Finishing Diets With or Without Tylosin on Performance and Liver Abscesses

Corn silage is a common feed ingredient used in many growing and finishing beef operations. Research has shown that it can be economically beneficial for cattle feeders with access to corn, who also have ownership of fed cattle, to use their corn crop as a feedstuff (corn silage) and realize profits in the form of pounds of beef.^{1,2} Increasing roughage concentration in high concentrate diets reduces the risk of acidosis, bloat, and liver abscesses resulting from feeding highly fermentable carbohydrates.³ However, with the high starch concentration of corn silage compared to other traditional roughages (like alfalfa or grass hay), the effect of corn silage inclusion level on liver abscesses is not well understood.

Tylosin phosphate (Tylan, Elanco Animal Health) is an antibiotic that is commonly fed to feedlot cattle to decrease the incidence of liver abscesses. Due to regulatory changes pertaining to the use of in-feed antibiotics in cattle production, there is growing interest in alternatives to antibiotics for liver abscess control. The interaction between corn silage as a roughage source and the use of tylosin and how it affects liver abscesses is not well understood. University of Nebraska researchers conducted a study to evaluate the impact of corn silage inclusion on performance and abscessed livers with and without the addition of antibiotics.⁴

Prior to a live animal study, a pooled analysis was conducted by these researchers to investigate the interactions between corn silage concentration and abscessed livers. The pooled analysis consisted of data from 5 feeding trials (122 pens; 1116 cattle) conducted at the University of Nebraska-Lincoln at the Eastern Nebraska Research Extension and Education Center near Mead Nebraska. These trials contained treatments with 15% and 45% corn silage inclusions, all containing tylosin, and the incidence of abscessed livers was measured. This analysis showed that cattle fed 15% corn silage had 7.8% abscessed livers compared to 4.1% for cattle fed 45% corn silage when all diets contained tylosin.

Based on these results, a finishing study was conducted to determine the impact of silage inclusion in finishing diets with and without tylosin on performance and incidence of abscessed livers in beef cattle. This study used 640 crossbred steers (initial weight = 646 lb) that were sorted into two weight blocks and assigned randomly to pens with a 2 × 2 factorial design. Treatments included two concentrations of corn silage (15% and 45% of diet dry matter, DM), with or without tylosin for liver abscesses. All steers were fed monensin (Rumensin, Elanco Animal Health, Greenfield, IN) at 30 grams/ton of DM and tylosin phosphate (Tylan; Elanco Animal Health) was included at 8.8 grams/ton of DM. The study used 32 pens of cattle with 20 steers per pen and 8 pens per treatment. with a 2 × 2 factorial treatment design. By design, all cattle were fed to a similar 12th rib fat thickness ($P \geq 0.10$) to ensure equal degree of finish when comparing performance and carcass characteristics.

The effects for carcass adjusted performance of cattle fed 15% or 45% corn silage with or without tylosin are shown in Table 1. As was expected, cattle fed 45% corn silage had greater ($P \leq 0.01$) live final body weight (BW), carcass-adjusted final BW, and hot carcass weight (HCW) compared to cattle fed 15% corn silage due to the greater days fed to equalize fatness (28 days). Cattle fed 45% corn silage had greater dry matter intake (DMI) but decreased average daily gain (ADG) compared to cattle fed 15% corn silage ($P \leq 0.01$). There was no effect of silage inclusion rate had no effect on ribeye area, marbling, or dressing percentage ($P \geq 0.15$). Calculated yield grade was greater for cattle fed 45% corn silage ($P < 0.01$). There were no interactions for any carcass characteristics ($P \geq 0.20$).

These authors reported that there was a tendency for an interaction for feed efficiency (Gain:Feed ratio; $P = 0.10$). Cattle fed 15% corn silage with tylosin were the most efficient (0.162), 15% corn silage without tylosin was intermediate (0.158), and both 45% corn silage with and without tylosin had the poorest efficiencies (0.140 and 0.139). No improvement in efficiency was observed when tylosin was added to the diet of cattle fed 45% corn silage.

The incidence of abscessed livers ranged from 12.0 to 34.5%. There was an interaction between silage and tylosin inclusion for abscessed livers ($P = 0.05$). Cattle fed 15% corn silage without tylosin had the greatest incidence of abscessed livers (34.5%) compared to other treatments ($P = 0.05$). Cattle fed 15% corn silage benefited from the addition of tylosin in the diet by reducing the incidence of abscessed livers from 34.5% to 19.2% (44.3% reduction). No differences in the incidence of abscessed livers were observed when cattle were fed 45% corn silage with tylosin (12.7%) or without tylosin (12.0%).

Table 1. Simple effects for carcass adjusted performance of cattle fed 15% or 45% corn silage with or without tylosin.

Item	Treatment ¹				P-value		
	- Tylosin		+ Tylosin		Tylosin x Silage	Tylosin	Silage
	CS15	CS45	TCS15	TCS45			
Days on Feed	185	213	185	213	-	-	-
Initial BW, lb	648	648	646	648	0.97	0.94	0.97
Live final BW, lb	1286	1338	1297	1343	0.77	0.60	<0.01
Carcass adjusted performance ²							
Final BW, lb	1283	1338	1299	1332	0.51	0.82	0.01
DMI, lb/day	21.8	23.2	21.8	23.2	0.94	0.86	<0.01
ADG, lb/day	3.44	3.24	3.53	3.22	0.21	0.55	<0.01
Gain:Feed	0.158 ^b	0.140 ^c	0.162 ^a	0.139 ^c	0.10	0.27	<0.01
Return, \$/steer	-9.57	13.43	9.61	7.39	0.14	0.44	0.22
Carcass Characteristics							
HCW, lb	809	842	818	838	0.53	0.84	0.01
Ribeye area, sq in	13.9	13.8	13.9	13.6	0.53	0.53	0.18
Rib fat, in	0.48	0.49	0.46	0.49	0.50	0.69	0.10
Marbling	456	446	440	445	0.33	0.25	0.69
Yield Grade	2.82	3.01	2.83	3.07	0.60	0.54	<0.01
Dressing, %	63.2	63.2	63.3	62.7	0.20	0.33	0.15
Abscessed livers, % ⁴	34.5 ^a	12.0 ^b	19.2 ^b	12.7 ^b	0.05	0.09	<0.01

a, b, c Means within rows with different superscripts differ ($P \leq 0.05$).

¹Treatments included CS15, Corn silage included at 15% of diet DM without tylosin; CS45, Corn silage included at 45% of diet DM without tylosin; TCS15, Corn silage included at 15% with tylosin; TCS45, Corn silage included at 45% with tylosin.

²Calculated on a carcass-adjusted basis using a common dressing percentage (63%).

³Marbling Score 300 = Slight, 400 = Small, 500 = Modest, etc.

⁴Calculated as a percent of total steers; deads removed.

Adapted from Wilson et al., 2023.

A tendency for an interaction ($P = 0.14$) between corn silage and tylosin inclusion for returns (\$/steer) was also observed. Projected profitability was least (\$-9.57/steer) for feeding 15% corn silage without tylosin compared to \$13.43, \$9.61, and \$7.39 for 45% corn silage without tylosin, 15% corn silage with tylosin, and 45% corn silage with tylosin, respectively. Cattle fed 15% corn silage without tylosin suffered performance losses, with poorer feed conversions, compared to cattle fed

15% corn silage with tylosin. The greatest returns were observed when cattle were fed 45% corn silage without tylosin due to increased final and carcass weights while also decreasing the overall cost of the ration. Even though cattle were fed longer and had poorer efficiencies when fed 45% corn silage, the reduced feed costs and increased BW led to similar or greater returns compared to just adding tylosin to 15% corn silage diets.

In summary, feeding 45% corn silage as compared to 15% corn silage decreased daily gain but increased final body weight when fed to an equal fatness (cattle fed 45% corn silage were fed 28 days longer). By feeding 28 days longer, live weight and carcass weight increased. So, despite more yardage and feed inputs, the diet cost was lower, and the slightly heavier cattle (26.5 lb more carcass weight) allowed for the operation to be more profitable. The estimated increased profit was approximately \$10.50 per head. These researchers concluded that “feeding elevated concentrations of corn silage may be an economically viable method to reduce incidence of liver abscesses without antibiotic use for smaller operations that can manage more corn silage in finishing diets”.

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- ¹ Ovinge, L. A., F. H. Hilscher, B. M. Boyd, J. N. Anderson, G. E. Erickson. 2019. Effects of varying silage inclusion of brown midrib corn silage on finishing and economic performance of steers. Nebraska Beef Cattle Report MP106:69-71.
- ² Hilscher, F. H., D. B. Burken, C. J. Bittner, J. L. Gramkow, R. G. Bondurant, M. L. Jolly-Breithaupt, A. K. Watson, J. C. MacDonald, T. J. Klopfenstein, and G. E. Erickson. 2019. Impact of corn silage moisture at harvest on performance of growing steers with supplemental rumen undegradable protein, finishing steer performance, and nutrient digestibility by lambs. *Transl. Anim. Sci.* 3:761–774. Available at: <https://doi.org/10.1093/tas/txz011>.
- ³ Owens, F. N., D. S. Secrist, W. J. Hill and D. R. Gill. 1998. Acidosis in cattle: A review. *J. Anim. Sci.* 76: 275-286.
- ⁴ Wilson, H. C., L. J. McPhillips, B. M. Boyd, A. K. Watson, J. C. MacDonald and G. E. Erickson. 2023. Effect of increasing corn silage inclusion in finishing diets cattle with or without tylosin on performance and liver abscesses. *J. Anim. Sci.* 101. Available at: <https://doi.org/10.1093/jas/skac380>.