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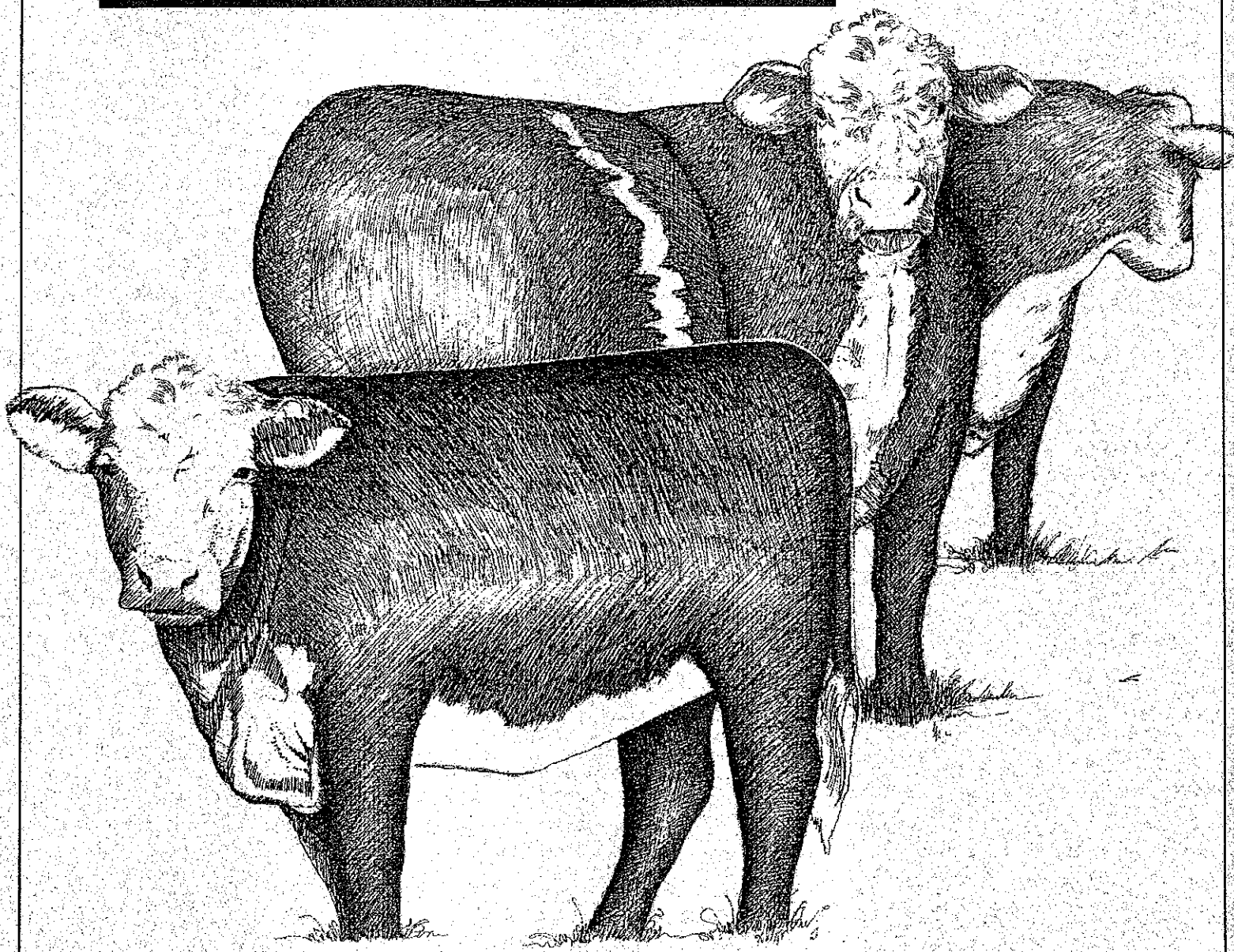
Whole Shelled Corn Diets

for finishing beef steers



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Whole Shelled Corn Diets for Finishing Beef Steers

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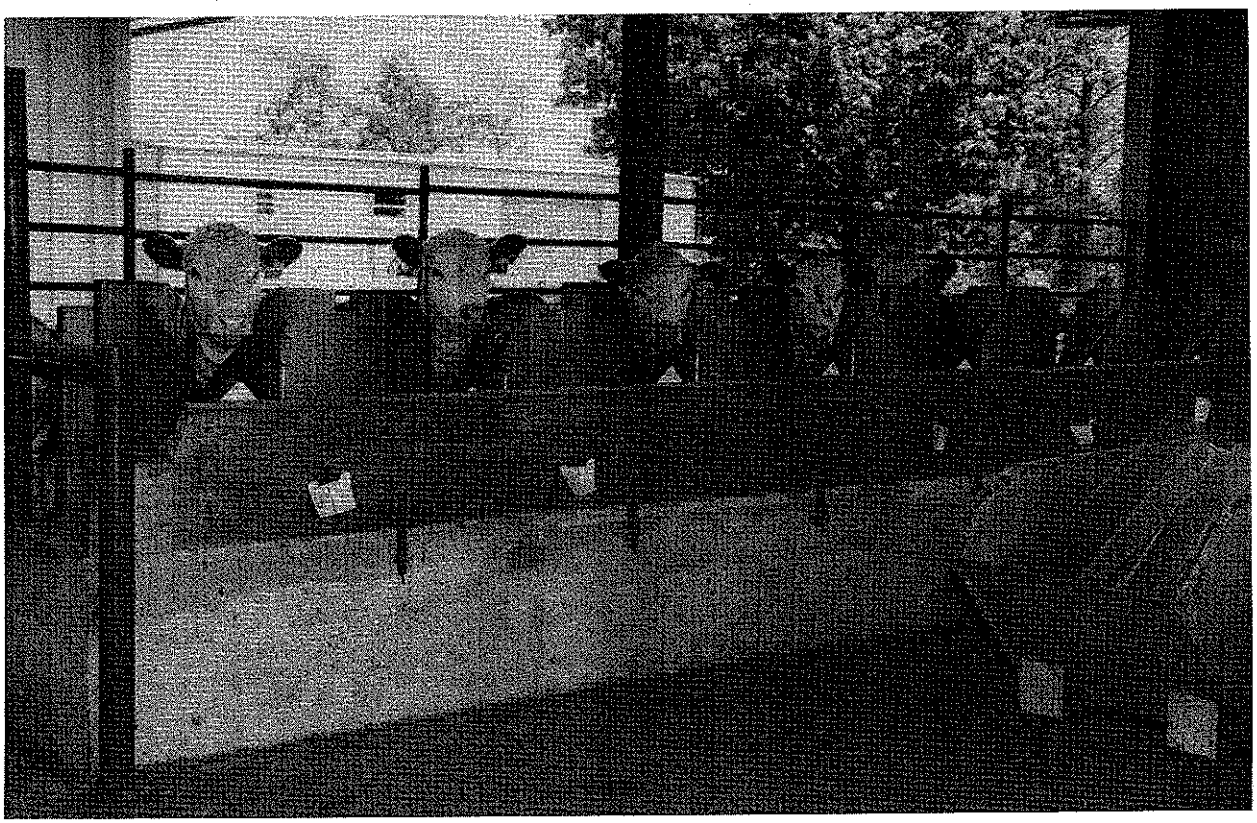
Whole Shelled Corn Diets for Finishing Beef Steers

Incorporation of a roughage into a diet requires expensive grinding and mixing equipment and increases the daily volume of feed required by finishing animals. Ruminant animals have the unique ability to utilize roughages and thus can convert these materials to edible products for humans. Ruminant animals also have the ability to convert diets without roughages into gain and provide a foodstuff for the human population.

Research has been conducted at Mississippi State University during the last 25 years using whole shelled corn for finishing beef cattle (Essig and Smithson, MAFES Info Sheet 1134, 1970; Livestock Field Day, 1978). This concept of feeding whole shelled corn with a protein supplement has been promoted by many commercial companies, and many studies have been conducted by researchers at Experiment Stations in Montana, Colorado, South Dakota, Iowa, Missouri, Ohio, Oklahoma, Louisiana, and Tennessee. Research has indicated that the feeding of whole shelled corn and a protein supplement improves feed efficiency (requires fewer units of feed to produce a unit of gain) when compared to a diet containing a roughage source.

In most experiment station studies, feeding diets without a roughage source causes little difference in animal performance and carcass characteristics.

Objectives of the research summarized in this bulletin were (1) to compare feeding of a conventional mixed complete diet to a whole shelled corn plus pelleted protein supplement diet; (2) to compare feeding whole shelled corn and a pelleted protein supplement containing Bovatec® or without Bovatec; and (3) to compare feeding a protein supplement containing Bovatec for the first 56 days of the finishing period



The slatted floor metabolism barn at the Beef Research Center allows groups of animals to be individually fed and observed for greater efficiency in nutrition research. These steers were the ones used in the fall 1992 trial (data reported in Table 5).

to feeding a protein supplement containing Bovatec throughout the finishing study.

Experimental Procedure

Two hundred, sixty-nine steers of similar quality and of mixed breeding (Charolais, Angus, Hereford, Brahman, Santa Gertrudis x Angus, Hereford x Angus, Brahman x Angus, Brahman x Hereford, Angus x Charolais, or Charolais x Brahman x Angus) weighing from 500 to 825 pounds were used in nine trials over 5 years.

Ingredient compositions of the conventional mixed complete diet and the pelleted protein supplement are listed in Table 1. The protein supplement was made into 3/16-inch pellets to insure a uniform mixture when mixed with corn. The whole shelled corn and pelleted protein supplement were mixed in a ratio of nine parts (90%) whole shelled corn and one part (10%) pelleted protein supplement.

Steers were given routine recommended herd health practices. Steers in some trials were group fed using self feeders; in other trials steers were individually fed in a slatted floor feeding facility. Group-fed steers were maintained in two drylots and given access to a self feeder containing the dietary treatment. Care was taken to see that feed was maintained before animals at all times. Plain white salt blocks were provided to all groups. Steers fed the conventional diet were initially fed 2.5% of their body weight, then feed was increased 1/2-pound daily until steers were at a full feed, when they were changed to self feeders.

Steers fed the whole shelled corn diet were hand-fed for the first 14 days of the trial at an initial rate of 2% of the body weight and increased 1/2-pound daily until the animals were leaving feed (on a full feed); then they were given access to a self feeder containing the whole shelled corn-pelleted protein supplement.

Steers in all trials were weighed at 28-day intervals. Weights on 2 consecutive days were taken at the start and end of each feeding trial. All cattle were slaughtered at the MSU Meat Laboratory. Carcass grade and yield grade were obtained for all cattle 48 hours post-mortem.

In both trials 1 (fall 1988) and 2 (spring 1989), 23 steers of mixed breeding were fed the conventional diet and 24 steers of equal mixtures of breeds were fed the whole shelled corn diet (Table 2).

Trial 3 (spring 1990), trial 4 (summer 1990), and trial 5 (fall 1990) were conducted to compare whole shelled corn/supplement diets with and without Bovatec (Table 3). Initial weights of steers used in these trials ranged from about 550 to 760 pounds. Steers were of mixed breeding and were group fed using a self feeder in a drylot.

Trial 6 (fall 1991), trial 7 (winter 1991), and trial 8 (summer 1992) were conducted to measure the influence of feeding Bovatec for the first 56 days of the study or feeding Bovatec for the duration of the trial

Table 1. Dietary treatments of finishing beef steers.

Ingredients	Conventional	WSC[a] + SUPP[b]	Price/lb,$
	---------- % ----------		
Cottonseed hulls	18.91	–	.0300
Soybean meal (50% CP)	12.3	81.4[b]	.1000
Corn, ground shelled	66.93	–	.0500
Salt, TM	.45	1.95[b]	.0225
DiCaPhos	.32	5.35[b]	.1600
Limestone, feed grade	1.09	6.3[b]	.0300
Vitamin A (million IU/ton)	(2.0)	(20)[b]	(.1000)
Bovatec (when used)	–	[c]	3.0000
Corn, whole shelled	–	[a]	.0450
Bentonite	–	2.5[b]	.0775
Masonex	–	2.5[b]	.1400
Pelleting cost/cwt,$	2.50		
Total cost/cwt,$			
Conventional diet	5.25		
WSC + Supp	5.74		
WSC + Supp w/Bovatec	5.76		
Supp	12.37		
Supp w/Bovatec	12.59		

[a]Whole shelled corn (WSC) and pelleted protein supplement were fed in a ratio of 9:1 (corn:supp).

[b]Composition of 3/16-in. pelleted protein supplement.

[c]Bovatec-68 added at a rate of 1,600 gm per ton

Table 2. Conventional diet and whole shelled corn plus a protein supplement for finishing beef cattle.

Item	Diet	
	Conventional	WSC/protein supplement
Fall 1988 (112 days)		
Number of steers	23	24
Initial weight, lb	647.2	642.4
Gain, lb	365.0[b]	370.8[b]
ADG, lb	3.22[b]	3.28[b]
Feed/gain, lb	9.8	6.1
Quality grade[a]	10.8[b]	10.1[b]
Yield grade	2.9[b]	2.8[b]
Feed cost per lb gain,$	.52	.32
Spring 1989 (112 days)		
Number of steers	23	24
Initial weight, lb	532.7	528.2
Gain, lb	384.5[b]	356.8[b]
ADG, lb	3.43[b]	3.19[b]
Quality grade	11.3[b]	11.0[b]
Yield grade	2.6[b]	2.4[b]

[a]Quality grade code: 10, select; 11, high select; 12, low choice
[b]Means within a row with common letters are not different (P<.05)

Table 3. Whole shelled corn plus pelleted supplement with or without Bovatec.

Item	Diet	
	WSC/protein supplement	WSC/protein supp W/Bovatec
Spring 1990 (112 Days)		
Number of steers	10	10
Initial weight, lb	596.0	596.2
Gain, lb	324.0[b]	347.2[b]
ADG, lb	2.91[b]	3.34[b]
Quality grade[a]	12.1[b]	11.9[b]
Yield grade	2.7[b]	2.5[b]
Summer 1990 (112 days)		
Number of steers	17	17
Initial weight, lb	767.3	762.2
Gain, lb	273.3[b]	279.5[b]
ADG, lb	3.25[b]	3.33[b]
Feed/gain, lb	6.6	7.0
Quality grade[a]	11.1[b]	11.4[b]
Yield grade	2.8[b]	2.9[b]
Feed cost of lb gain,$	.35	.37
Fall 1990 (140 days)		
Number of steers	9	9
Initial weight, lb	556.7	542.2
Gain, lb	398.0[b]	413.3[b]
ADG, lb	2.56[b]	2.66[b]
Feed/gain, lb	6.9	7.1
Quality grade[a]	11.1[b]	11.1[b]
Yield grade	2.6[b]	2.4[b]
Feed cost per lb gain,$	.36	.38

[a]Quality grade code: 11, high select; 12, low choice; 13, choice
[b]Means within a row with common letters are not different (P<.05)

(Table 4). Trial 6 was conducted in drylot with self feeders. Trials 7 and 8 were conducted in a slatted floor facility where the animals were individually fed the dietary treatments.

Trial 9 (fall 1992) was a comparison of feeding the whole shelled corn/supplement without Bovatec to feeding whole shelled corn/supplement with Bovatec for the first 56 days of the study or feeding Bovatec for the entire 112 day trial. Steers in trial 9 were individually fed in a slatted floor facility.

The conventional diet consisted of cottonseed hulls, soybean meal, corn, minerals, and vitamin A (Table 1). Ingredient prices are given for comparison purpose and do not necessarily reflect current feed costs. Cost of the conventional diet was calculated to be $5.25 per hundred pounds.

Protein supplement without Bovatec was calculated to cost $12.37/cwt, and with Bovatec $12.59/cwt. Cost of the corn:supplement (9:1) diet without Bovatec was $5.74 and with Bovatec $5.76/cwt.

The protein supplement was formulated to provide adequate protein, minerals, and vitamin A when fed with whole shelled corn in a 9:1 (corn:supplement) ratio. The protein supplement was pelleted to help reduce the sorting of whole shelled corn and protein supplement. Bovatec was included in some diets in trials 3 through 9 to provide about 300 mg daily.

Statistical analysis was conducted for each trial using the general linear model (GLM) procedure of SAS (1988) with treatments arranged in a completely randomized design.

Results and Discussion

In trial 2, three Brahman steers were fed the whole shelled corn diet without any detrimental effects such as founder or lameness. Initial weight of steers in trial 1 was 647.2 pounds, whereas in trial 2, initial weight was 532.7 pounds (Table 2). There were no differences in gain, ADG, pounds of feed per pound of gain, quality, or yield grade due to dietary treatments fed during fall 1988 or spring 1989 finishing periods (trials 1 and 2).

There were 9.8 pounds of feed required to produce a pound of gain when steers were fed the conventional diet, but only 6.1 pounds of whole shelled corn/supplement diet were required to produce a pound of gain. Feed cost of a pound of gain produced by the conventional diet was $0.52 compared to $0.32 for the whole shelled corn/protein supplement diet for steers fed during the fall of 1988. Units of feed per unit of gain and feed cost per unit of gain were not calculated for spring 1989 and spring 1990.

In trials 3 and 4 there were no differences in gain, ADG, pounds of feed per pound of gain, quality grade, or yield grade due to inclusion of Bovatec in the pro-

Table 4. Whole shelled corn plus protein supplement with Bovatec for 56 days or Bovatec throughout the study.

Item	Diet: Bovatec 1st 56 days	Diet: Bovatec 84 days
Fall 1991 (84 days)		
Days fed Bovatec	56	84
Number of steers	15	15
Initial weight, lb	668.9	668.3
Gain, lb	346.0[b]	365.3[b]
ADG, lb	4.16[b]	4.39[b]
Feed/gain, lb	6.4[b]	6.1[b]
Quality grade[a]	9.5[b]	9.3[b]
Yield grade	2.5[b]	2.3[b]
Feed cost per lb gain, $	.34	.32
Winter 1991 (126 days)		
Days fed Bovatec	56	126
Number of steers	12	12
Initial weight, lb	518.1	506.7
Gain, lb	486[b]	486[b]
ADG, lb	3.86[b]	3.86[b]
Feed/gain, lb	4.9[b]	4.7[b]
Quality grade[a]	11.8[b]	11.3[b]
Yield grade	2.4[b]	2.6[b]
Feed cost per lb gain,$	.26	.25
Summer 1992 (112 days)		
Days fed Bovatec	56	112
Number of steers	12	12
Initial weight, lb	827.2	826.3
Gain, lb	422.9[b]	404.6[b]
ADG, lb	3.78[b]	3.61[b]
Feed/gain, lb	5.9[b]	6.2[b]
Quality grade[a]	11.6[b]	11.7[b]
Yield grade	3.6[b]	3.6[b]
Feed cost per lb gain,$	.31	.33

[a]Quality grade code: 9, low select; 10, select; 11, high select; 12, low choice
[b]Means within a row with common letters are not different (P < .05)

tein supplement (Table 3). Feed cost per pound of gain ranged from $0.35 to $0.38, which was a very economical production cost.

In trials 6, 7, and 8 there were no differences in gain, ADG, pounds of feed per pound of gain, quality grade, or yield grade for steers fed Bovatec for either 56 days or for the duration of the feeding period (Table 4). Average daily gain of steers ranged from 3.6 to 4.4 pounds, which was very acceptable performance. Pounds of feed required to produce a pound of gain ranged from 4.7 to 6.2. Feed cost per pound of gain ranged from $0.25 to $0.34 and suggested that gains can be very profitable when using whole shelled corn.

Gain of steers in trial 9 ranged from 3.03 pounds (control) to 3.34 pounds (Bovatec 56 days) per day and was not significantly different (Table 5). Pounds of feed required to produce a pound of gain ranged from 5.6 (Bovatec 1st 56 days) to 6.0 for the other treatments and these values were not significantly different. Feed cost per pound of gain ranged from $0.29 to $0.32, again suggesting that economical gain can be obtained by feeding a whole shelled corn/protein supplement diet to finishing steers.

Summary

Feed cost per pound of gain was lower when finishing steers were fed whole shelled corn/supplement than when they were fed a conventional mixed complete diet. There were no differences in gain, feed efficiency, quality, or yield grade of finishing beef steers fed a conventional mixed complete diet or a whole shelled corn/protein supplement diet. Inclusion of Bovatec in the protein supplement for the first 56 days of the trial or for the entire length of the study

Table 5. Whole shelled corn without Bovatec or with Bovatec for either 56 or 112 days.

Item	Diet: No Bovatec (Control)	Diet: Bovatec 1st 56 days	Diet: Bovatec all 112 days
Fall 1992 (112 days)			
Days fed Bovatec	0	56	112
Number of steers	7	8	8
Initial weight, lb	544	531	548
Gain, lb	439.9[b]	484.4[b]	482.8[b]
ADG, lb	3.03[b]	3.34[b]	3.28[b]
Feed/gain, lb	6.0[b]	5.6[b]	6.0[b]
Quality grade[a]	10.9[b]	11.7[b]	10.0[b]
Yield grade	3.1[b]	2.6[b]	3.1[b]
Feed cost per lb gain, $	.32	.29	.32

[a]Quality grade code: 10, select; 11, high select; 12, low choice
[b]Means within a row with common letters are not different (P < .05)

did not significantly influence gain, feed efficiency, carcass, or yield grade.

These data suggest that gain can be produced at a feed cost of less than $0.40 per pound when using whole shelled corn/protein supplement diets for finishing beef steers.

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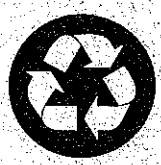

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