

A DEFINITIVE STUDY OF THE DOSE-RESPONSE RELATIONSHIP OF TETRONASIN
IN STEERS ON PASTURE¹

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Summary

Ionophores have been effective in improving gains and/or feed efficiency in beef cattle. The objective of this trial was to mathematically define the biological response curve for weight gain, as measured in steers on pasture, following the continuous administration of tetronasin, an ionophore, at various dose levels. Steers, 144 yearlings, were stratified by breed type and weight and randomly assigned to six treatment groups and three replications of light, intermediate and heavy steers. Treatments included dosage levels of tetronasin of 0, 7.5, 15, 30, 60 and 90 mg per head per day. Steers were grazed in common pastures by replication and gathered daily to receive their treatment level mixed with .91 kg of corn. The trial ran 93 days. Mean daily gains were 1.33, 1.34, 1.35, 1.41, 1.40 and 1.34 kg per head ($P > .05$) for the 0, 7.5, 15, 30, 60 and 90 mg levels, respectively. The 30 and 60 mg levels were the most effective for increasing weight gains over the control group, with gains improved by 6%.

Introduction

Ionophores have proven to be effective for improving weight gains and/or feed efficiency with various classes of cattle on a wide array of feedstuffs and environmental conditions (Oliver, 1975; Turner and Raleigh, 1976; Turner et al., 1980; and Brandt, 1982). Tetronasin is an ionophore structurally similar to monensin and lasalocid, however, the effective dosage rate may be reduced (Bartle et al., 1988). This would make it more attractive for inclusion in a ruminal bolus. The objective of this study was to mathematically define the biological response curve for weight gain, as measured in steers on pasture, following the continuous administration of tetronasin at various dose levels.

Materials and Methods

One hundred forty-four yearling steers were selected from the Eastern Oregon Agricultural Research Center's experimental herds and allotted to six treatment groups and three replications. Animals were stratified by breed type in ascending order of live weight to six groups and randomly assigned to treatment. Replications were derived by selecting the heavy, medium and light thirds within the treatment groups. Breed types included Hereford X Angus, Simmental X Hereford, Shorthorn X mixed breeds and Longhorn X Angus and Hereford. Body weights ranged from 227 to 364 kg.

Treatments included tetronasin levels of 0, 7.5, 15, 30, 60 and 90 mg per head per day. The premix containing tetronasin is shown in table 1. The premix was diluted in ground corn for each treatment at the rate required to administer the appropriate dosage each day. Supplements were prepared to last approximately 3 weeks and sampled and analyzed for tetronasin content immediately after preparation. The supplement was fed daily at the rate of .91 kg per head per day. Trace mineralized salt was provided free choice in mineral boxes.

Steers were run in common pastures by replication. They were gathered daily and sorted into pens to receive their supplement. Sufficient trough space was available so that all steers could feed simultaneously. Steers were individually identified by numbered ear tags which were color coded by treatment to facilitate sorting. Pastures were native flood meadows, which are predominantly rushes and sedges with a grass component of 20 to 30%. Pastures were strip grazed with New Zealand type electric fence. Pastures were clipped in late June, with clippings left on the pastures. Adequate feed was available at all times for maximum gain.

All animals were fed the control ration (.91 kg of corn) 1 week prior to the initiation of the study. The previous fall steers had received clostridials, IBR and BVD vaccinations and revaccinated for the clostridials and injected for internal parasite and external insect control prior to the trial. Insecticidal ear tags were also applied at this time. The trial ran for a 93-day period with non-shrunk morning initial weights taken on May 23 and 24 and final weights on August 24 and 25. The medicated supplements were fed over a 92-day period beginning on May 25 and ending August 24. Steers were allotted based on the first initial weights and an average of the initial and final weights were used for data analyses. Non-shrunk single weights were also recorded on June 21 and July 26. All animals were observed daily for clinical signs of illness. There were no steers that died or had to be removed from the study due to morbidity. All animals consumed the supplement every day with no refusals.

Appropriate LSD tests were applied to the data to test for significant differences among treatments at the $P < .05$ level (Steel and Torrie, 1960).

Results and Discussion

Mean initial weights and gains of steers by treatment and replication are presented in table 2. Initial weights were 252, 284 and 336 kg, respectively, for the light, intermediate and heavy replications, with an overall mean of 291. The range of mean initial weights by treatment was 288 to 294 kg and gains ranged from 124 to 131 kg.

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Table 3 presents daily gains of steers by treatment by period. Gains were somewhat erratic after 28 days and for the middle 35 days. However, these weights represent single non-shrunk weighing conditions which are characteristically variable. No trend was evident after 28 days, except gains on the 90 mg level were depressed. After 63 days, the 15, 30 and 60 mg levels were showing a positive gain response to treatment, and during the final 30 days, the 30 and 60 mg level steers gained .16 kg per head per day more than the controls and the 90 mg level gained .11 kg more.

Daily gains of steers by treatment and replication are shown in table 4. All tetronasin treatments provided a positive gain response. At the 7.5 and 90 mg levels, gains were improved by only 1%, and only 2% at the 15 mg level. However, the 30 and 60 mg levels increased gains by 6% over the controls. With controls gaining 1.33 kg per head per day, the response to the 30 and 60 mg levels of tetronasin is exceptional. For steers on a forage base, the controls were probably gaining close to their genetic potential, which makes it difficult to further improve gains.

Tetronasin proved to be a palatable ingredient in the supplements, with all supplements being consumed aggressively with no orts. All 144 steers remained in the study with no major health problems.

In conclusion, tetronasin at all treatment levels improved gains somewhat, and at the 30 and 60 mg per head per day levels gains were increased by 6% over the controls. So under the conditions of this trial, tetronasin at the 30 and 60 mg levels per head per day was the dosage rate that was most effective.

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TABLE 1. PREMIX COMPOSITION.

Ingredient	%
Tetronasin	5
Ground rice hulls	50
Alfalfa	20
Calcium carbonate	21
Calcium lignosulfonate	4

TABLE 2. INITIAL WEIGHTS AND GAIN OF STEERS BY TREATMENT AND REPLICATION.

Tetronasin level	Replication ^a			Overall	Gain + S.E. ^b
	1	2	3		
mg/head/day	kg	kg	kg	kg	kg
0	253	285	332	290	124 + 3.2
7.5	254	285	342	294	125 + 4.1
15	250	283	331	288	125 + 3.4
30	252	282	332	289	131 + 3.6
60	250	286	336	291	130 + 4.1
90	252	284	344	293	124 + 6.5
Overall	252	284	336	291	127

a Replications 1, 2 and 3 represented light, medium and heavy steers, respectively.

b Gains were not significantly different between treatments ($P > .05$)

TABLE 3. DAILY GAINS OF STEERS BY TREATMENT BY PERIOD.

Tetronasin level	First 28 days	Middle 35 days	Final 30 days
mg/head/day	kg	kg	kg
0	1.56	1.41	1.01
7.5	1.56	1.39	1.08
15	1.63	1.42	1.00
30	1.52	1.54	1.17
60	1.59	1.45	1.17
90	1.43	1.45	1.12
Overall	1.55	1.45	1.09

TABLE 4. DAILY GAINS OF STEERS BY TREATMENT AND REPLICATION.

Tetronasin Level	Replication ^a			Overall	Increase over control
	1	2	3		
mg/head/day	kg	kg	kg	kg	%
0	1.35	1.41	1.23	1.33	-
7.5	1.30	1.35	1.37	1.34	1
15	1.39	1.33	1.33	1.35	2
30	1.49	1.38	1.37	1.41	6
60	1.45	1.43	1.31	1.40	6
90	1.35	1.34	1.31	1.34	1
Overall	1.39	1.37	1.32	1.36	-

^a Replications 1, 2 and 3 represented light, medium and heavy steers, respectively.