

RONNEL AND ITS EFFECTS ON FEEDLOT PERFORMANCE

by

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## SUMMARY

Two hundred sixteen yearling Hereford and Angus X Hereford crossbred steers weighing approximately 645 lbs. were used in a 139 day feeding trial designed to evaluate the effect of feeding Ronnel at four different levels in feedlot rations on feedlot performance and carcass characteristics. The four levels were compared to a control group and a group which was fed a daily 200 mg. level of monensin sodium (trade name Rumensin). All steers were on a 50 percent concentrate ration for the first 56 days of the test and then increased to an 85 percent concentrate ration for the remaining 83 days of the feeding period. The trial was designed to follow normal feedlot feeding and management practices as closely as possible. Levels of Ronnel fed in the ration were 180 mg. per 100 lbs. body weight per day, 90 mg. per 100 lbs. body weight per day, 45 mg. per 100 lbs. body weight per day, and 22.5 mg. per 100 lbs. body weight per day. Average daily gain and total gain favored lower levels of Ronnel and the group fed Rumensin. Efficiency of gain was significantly affected by treatments. Rumensin significantly ( $P < .10$ ) improved efficiency of gain when compared to all other treatments. The 90mg. level of Ronnel was significantly ( $P < .10$ ) more efficient than the control group and the 180 mg. level ( $P < .05$ ). Results from carcass characteristics studied (loineve area, back fat, dressing percent, yield grade, and quality grade) indicated no significant differences.

## INTRODUCTION

Ronnel has been shown to be a very effective insecticide. It

is an organophosphate (O, O-dimethyl O-(2, 4, 5-trichlorophenyl) phosphorothioate) approved for use as an oral systemic for heel fly larvae, lice and grubs, and as a larvicide for horn fly control. It is insoluble in water, stable at room temperature, and unstable in an alkaline media.

More recently it has been studied for use as a feed additive to improve efficiency of gain. Rumsey et al. (1975) studied performance of steers fed Ronnel and found that it had no significant effect on gain, diet digestibility and nitrogen balance. But daily gain and daily feed intake were somewhat greater. From ruminal characteristics it was shown that molar percentage of acetate was higher (52.9 versus 47.5) for the Ronnel fed treatments compared to the control group. Ronnel rations also had higher levels of plasma total essential amino acids (95.0 versus 76.8  $\mu$  Moles per ml.) non-essential amino acids (143.9 versus 124.4) and ammonia (57.3 versus 47.7). However, some of the differences noted could be due partly to intake differences of the Ronnel versus the control.

In work done by Rumsey (1976) it was shown that Ronnel had no apparent effect on ruminal pH,  $\text{NH}_3$ , or total volatile fatty acid concentrations. But the molar percentage acetate increased and the molar percentage butyrate decreased for the Ronnel-fed steers. This work did not show an increase in feed intake, but there was approximately 12 percent improvement in efficiency of feed utilization and gain.

There is only limited research available on Ronnel and its effects on feedlot performance that has been published. The present trial was designed to study Ronnel as an additive similar to the way it would be used in a feedlot situation. The purpose was to compare

the effects of Ronnel fed at four levels on carcass characteristics, weight gain, and feed efficiency.

#### EXPERIMENTAL PROCEDURE

Two hundred sixteen yearling Hereford and Angus X Hereford cross-bred steers originating from one location in Alabama were delivered to Manhattan in early April. The cattle were vaccinated for IBR, leptospirosis, black leg, and malignant edema and conditioned for two weeks prior to going on test. Individual starting weights were taken on April 15 and the 216 head divided into 36 groups of six steers each. Six groups were assigned at random to each of the six treatments to complete a 6X6 factorial design. Pens were 14'X28' with concrete floors and provided 196 square feet of shelter. Water was available at all times and feed was fed "ad libitum" during the entire trial.

A 50 percent concentrate (dry matter basis) growing ration was fed for the first 56 days of the trial. The ration consisted of corn silage, dry rolled corn, supplement, and a premix containing the Ronnel or Rumensin (Table 1). After 56 days the steers were changed to a finishing ration containing 85 percent concentrate, (dry matter basis). Ingredients were haylage, dry rolled corn, supplement and premix containing Ronnel or Rumensin (Table 2). Treatment levels of Ronnel and Rumensin are shown in Table 3 and were incorporated into the ration in a finely ground milo premix. Control groups received the same premix without additives. Rations were formulated to provide 11.5% crude protein, thoroughly mixed, and fed twice daily. Refused feed was weighed back once per week. Initial and final weights were taken after 15 hours without feed or water. Twenty-eight day weights were taken before the a.m. feeding to monitor performance during the trial. Final live weights were ad-

TABLE 1. COMPOSITION OF RATION AND SUPPLEMENT DURING GROWING PHASE

	% Dry matter basis
<u>Ration Ingredients</u>	
Corn Silage	50.0
Rolled Corn	38.0
Supplement	8.0
Premix <sup>a</sup>	4.0
<u>Supplement Ingredients</u>	
Soybean Meal	79.0
Dical	5.0
Limestone	4.0
Vita A <sup>b</sup>	.2
Trace Minerals	.5
Salt	6.3
Dyna K	1.0
Urea	4.0

<sup>a</sup>Premix was pulverized milo fortified with treatment additives to provide the daily levels specified in table 3.

<sup>b</sup>Formulated to supply 30,000 I.U. per steer per day.



TABLE 2. COMPOSITION OF RATION AND SUPPLEMENT DURING FINISHING PHASE

	% Dry matter basis
<u>Ration Ingredients</u>	
Haylage	15.0
Rolled Corn	77.0
Supplement	4.0
Premix	4.0
<u>Supplement Ingredients</u>	
Soybean Meal	79.0
Corn	5.0
Limestone	4.0
Vita A	.2
Trace Minerals	.5
Salt	6.3
Dyna K	1.0
Urea	4.0

<sup>a</sup>Premix was pulverized milo fortified with treatment additives to provide the daily levels specified in table 3.

<sup>b</sup>Formulated to supply 30,000 I.U. per steer per day.

TABLE 3. LEVEL OF DAILY ADDITIVE PROVIDED IN THE RATION PREMIX

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Ingredient	Dosage level per day
Control	No additive
Ronne1	180.0 mg. per 100 lbs. body weight
Ronne1	90.0 mg. per 100 lbs. body weight
Ronne1	45.0 mg. per 100 lbs. body weight
Ronne1	22.5 mg. per 100 lbs. body weight
Rumensin	200 mg. per head

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justed to a 62.7% dress and feedlot performance calculated on that basis.

At the end of 139 days, the steers were weighed off test and sent to Dugdale Packing Co., St. Joseph, Missouri, for slaughter. Yield grade, USDA quality grade, back fat, loin eye area, and dressing percent was collected for each carcass. Statistical analysis of the data were by analysis of variance as described by Steele and Torrie (1960). When statistical significance occurred, Duncan's Multiple Range test as described by Steele and Torrie (1960) was used to determine differences between treatment means.

#### RESULTS

The results of the growing phase of the trial are indicated in Table 4. There were virtually no differences in daily dry matter intake between the four levels of Ronnel and between these levels and the control. But there was a noticeable difference for daily dry matter intake between the Rumensin and all other groups (19.23 lbs. versus 21.16 lbs.), the latter being Ronnel at the 45 mg. level which was the next lowest dry matter intake level.

The average daily gain for the first 56 day period ranged from a low of 2.70 for the Rumensin to a high of 2.86 for the 90mg. level of Ronnel. The control group gained 2.72 lbs. per day.

Rumensin was the most efficient for the first 56 days with 7.15 lbs. dry matter required per lb. of gain compared to 7.62 lbs for the 90 mg. level of Ronnel. All groups fed the experimental additives were more efficient than the control. Data from the growing phase was not statistically analyzed for differences in feed intake, gain, and efficiency because of the limited time period involved.

TABLE 4. EFFECT OF RONNEL AND RUMENSIN ON PERFORMANCE OF FEEDLOT STEERS DURING GROWING PHASE.

Treatment	No. steers	Daily dry matter lbs.	Daily gain lbs.	Efficiency of gain
Control	36	21.49	2.72	7.96
Ronnel 180 mg./cwt./day	36	21.28	2.74	7.77
Ronnel 90 mg./cwt./day	36	21.50	2.86	7.62
Ronnel 45 mg./cwt./day	36	21.16	2.73	7.75
Ronnel 22.5 mg./cwt./day	36	21.76	2.74	7.94
Rumensin 200 mg./head/day	36	19.23	2.70	7.15

TABLE 5. EFFECT OF RONNEL AND RUMENSIN ON PERFORMANCE OF FEEDLOT STEERS DURING FINISHING PHASE.

Treatment	No. steers	Daily dry matter lbs.	Daily gain lbs.	Efficiency of gain
Control	36	19.98	2.49	8.02
Ronnel	180 mg./cwt./day	20.01	2.31	8.66
Ronnel	90 mg./cwt./day	20.51	2.73	7.51
Ronnel	45 mg./cwt./day	20.94	2.74	7.64
Ronnel	22.5 mg./cwt./day	20.84	2.68	7.78
Rumensin	200 mg./head/day	19.03	2.74	6.95

Results of the finishing phase are shown in Table 5. Daily dry matter intake for the Rumensin group was lowest (19 lbs.) of any treatment studied. The control group and the 180 mg. level of Ronnel were virtually the same with the 45 mg. level having the highest intake (20.94 lbs.). Results of the finishing phase tend to suggest that Ronnel increases daily feed intake when fed at rates up to 180 mg.

There was some noticeable variation in daily gain for the finishing phase. The high level of Ronnel (180 mg.) resulted in the lowest daily gain (2.31 lbs.) compared to (2.74 lbs.) for both the 45 mg. level of Ronnel and the Rumensin group. The controls were the second poorest gaining group at 2.49 lbs. per day.

Efficiency of gain for the finishing phase ranged from 6.95 for the Rumensin to 8.66 for the 180 mg. level of Ronnel. The control group had the second poorest efficiency at 8.02 and the 90 mg. level of Ronnel was the second most efficient at 7.51.

Effects on performance for the entire 139 day period are shown in Table 6. Considering the entire feeding period, the daily dry matter intake of the Rumensin group was the lowest. The 180 mg. level of Ronnel and the control were the next lowest (20.55 and 20.63 lbs. respectively) and the 22.5 mg. level of Ronnel showed a dry matter intake of 21.2 lbs. This study shows a trend toward increased feed intake with the Ronnel fed steers.

Daily gain for the 139 day period was not significantly increased by any of the additives. However, there was a trend toward increased daily gains with the 90, 45, and 22.5 mg. levels of Ronnel and the Rumensin treatment as compared to the control and 180 mg. level of Ronnel.

TABLE 6. EFFECT OF RONNEL AND RUMENSIN ON PERFORMANCE OF FEEDLOT STEERS DURING TOTAL 139 DAY FEEDING PERIOD

Treatment	No. steers	Daily dry matter, lbs.	Daily gain lbs.	Efficiency of gain
Control	36	20.63	2.58	8.00
Ronnel 180 mg./cwt./day	36	20.55	2.49	8.25
Ronnel 90 mg./cwt./day	36	20.99	2.78	7.55 <sup>a</sup>
Ronnel 45 mg./cwt./day	36	21.04	2.74	7.68
Ronnel 22.5 mg./cwt./day	36	21.20	2.70	7.85
Rumensin 200 mg./head/day	36	19.17	2.73	7.02 <sup>b</sup>

<sup>a</sup>Significant ( $P < .10$ ) compared to control and ( $P < .05$ ) compared to 180 mg. level.

<sup>b</sup>Significant ( $P < .05$ ) compared to any other group and ( $P < .01$ ) compared to the control.

Efficiency of gain was significantly affected by the feed additives at certain levels. Within the Ronnel treatments the 90 mg. level was the most efficient compared to the control (7.55 vs. 8.00) and was significant at the ( $P < .10$ ) level. The 90 mg. level was also significantly more efficient ( $P < .05$ ) than the 180 mg. level of Ronnel (7.55 vs. 8.25). The Rumensin group was the most efficient of any additive treatment ( $P < .05$ ) including the 90 mg. level of Ronnel (7.02 vs. 7.55). Rumensin was also significantly ( $P < .01$ ) more efficient than the control (7.02 vs. 8.00).

Results of the selected carcass parameters are shown in Table 7. No significant differences were obtained for any the carcass traits. Yield grades ranged from 2.83 to 2.89, average quality grades were in the low choice to average choice range, back fat ranged from .50 in. to .57 in., and the loin eye areas were similar (11.63 square inches to 12.24 square inches). A comprehensive summary of results from the Ronnel feedlot trial is shown in Table 8.

#### DISCUSSION

Ronnel as an additive to feedlot rations appears to have potential. Work by Rumsey et al. (1975) indicated improved feed efficiency and increased feed intake. There was no apparent improvement daily gain, digestibility, and nitrogen balance. In a later trial, Rumsey (1976) again showed an improvement in efficiency of gain for steers fed Ronnel. However, no increase in feed intake was observed in the second trial.

This trial tended to support the observations made by Rumsey. There was significant improvement in efficiency of gain for steers fed the 90 mg. level of Ronnel when compared to the control groups. All Ronnel treatment except the 180 mg. level were more efficient than the control ration. Rumensin in the ration produced the most



TABLE 7. EFFECT OF RONNEL AND RUMENSIN ON CARCASS CHARACTERISTICS OF FEEDLOT STEERS

Treatment	No. steers	Yield grade <sup>a</sup>	USDA quality grade <sup>b</sup>	Back fat, in.	Loin eye area, sq. in.
Control	36	2.83	3.97	.52	11.82
Ronnel 180 mg./cwt./day	36	2.83	3.8	.50	11.74
Ronnel 90 mg./cwt./day	36	2.88	4.0	.53	12.24
Ronnel 45 mg./cwt./day	36	2.89	3.99	.53	11.63
Ronnel 22.5 mg./cwt./day	36	2.86	3.99	.57	12.04
Rumensin 200 mg./head/day	36	2.83	3.97	.55	11.83

<sup>a</sup>Yield grade and quality grade were assigned to each carcass by USDA federal grader.

<sup>b</sup>Quality grade based upon 4.0 average choice, 3.5 low choice and 3.0 high good.

TABLE 8. COMPREHENSIVE SUMMARY OF RESULTS FROM RONNEL FEEDLOT TRIAL

Item	TREATMENT					
	Control	Ronnel 180 mg/cwt/day	Ronnel 90 mg/cwt/day	Ronnel 45 mg/cwt/day	Ronnel 22.5 mg/cwt/day	Rumensin 200 mg/head/day
Number of steers	36	36	36	36	36	36
Average initial weight, lbs.	643.2	645.2	643.7	642.4	642.1	642.5
Average final <sup>a</sup> weight, lbs.	1001.9	991.3	1030.5	1023.2	1018.5	1021.5
Average gain, lbs.	358.6	346.1	386.8	380.8	375.7	379
Average daily gain, lbs.	2.58	2.49	2.78	2.74	2.70	2.73
Daily dry matter, lbs.	20.63	20.55	20.99	21.04	21.20	19.17
Feed/lb. gain	8.00	8.25	7.55	7.68	7.85	7.02
Dressing %	64.2	62.9	62.5	62.8	63.0	65.1
Backfat, in.	.52	.50	.53	.53	.57	.55
Loineye area (sq. in)	11.82	11.74	11.63	11.63	12.04	11.83
USDA grade <sup>b</sup>	3.97	3.80	3.99	3.99	3.99	3.97
Yield grade <sup>c</sup>	2.83	2.83	2.89	2.89	2.86	2.83

<sup>a</sup>Adjusted to 62.7 % dress

<sup>b</sup>Quality grade based upon 4.0 average choice, 3.5 low choice and 3.0 high good.

<sup>c</sup>Yield grade and quality grade were assigned to each carcass by USDA federal grades.

efficient gains with steers requiring one pound less dry matter per pound of gain than the control groups. This difference was significant ( $P < .01$ ). Ronnel appeared to stimulate feed intake at all except the highest level. This agrees with observations by Rumsey (1975). Rumensin significantly ( $P < .01$ ) decreased feed intake which agrees with advertised claims for the recently approved feed additive. Daily gains for the three lower levels of Ronnel and the Rumensin treatment were similar and approximately 0.15 pounds greater than control groups. These differences approached significance ( $P < .10$ ). Little difference was detected between treatments for any of the carcass parameters which is in agreement with Rumsey (1975).

From this study it can be concluded that Ronnel fed at the rate of 180 mg. per hundred pounds of body weight per day was detrimental to feed intake, daily gain and efficiency when compared to the other three Ronnel treatments and the controls. The 90, 45, and 22.5 mg. per hundred pounds of body weight per day levels gave a non-significant improvement in daily gain and feed intake while significantly improving efficiency of gain. Additional studies need to be conducted to determine mode of action, expected response in heifers, and effect on performance when fed in combination with additives such as Rumensin and antibiotics.

## LITERATURE CITED

- Brooks, H. Leroy, and Dell Gates. 1972. Insecticides. Cooperative Extension Service, Kansas State University. C-376 revised.
- Rumsey, T. S., E. E. Williams, and H. D. Evans. 1975. Tissue Residues, Performance and Ruminant and Blood Characteristics of Steers Fed Ronnel and Activated Charcoal. J. Anim. Sci. 40:743.
- Rumsey, T. S. 1976. Feed Utilization and Ruminant Parameters in Steers Fed Ronnel, J. Anim Sci. 43:332.
- Steele, R. G. and J. H. Torrie. 1960. Principles and Procedures of Statistics, McGraw-Hill Book Co., New York.

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A limited amount of research with beef cattle has shown improved feedlot performance when a systemic pesticide Ronnel is used as a ration feed additive. This research trial was designed to compare four levels of Ronnel and one level of monensin sodium with the same basal ration without the specific additives. The four levels of Ronnel were 180, 90, 45 and 22.5 mg. per hundred pounds body weight per day. Monensin sodium was fed at a daily rate of 200 mg. per steer. Control groups were fed the same basal growing and finishing rations without the experimental additives. A 50 percent concentrate ration was used for the first 56 days and an 85 percent concentrate ration for the final 83 days. Two hundred sixteen yearling steers, averaging 643 pounds, were divided into six weight groups and assigned at random to the six replications for each of the six treatments. Ronnel at the 90 mg. level significantly ( $P < .10$ ) improved efficiency of gain when compared to the control ration. Monensin sodium was significantly ( $P < .05$ ) superior to all of the other treatments in efficiency of gain. Three of the four levels of Ronnel had faster rates of gain than the control treatment but these differences were not significant. No significant differences were observed between treatments for any of the carcass parameters measured.