

Sarsaponin in Beef Cattle Rations

S. R. Goodall and J. K. Matsushima

Sarsaponin is a naturally occurring plant steroid derived from yucca and other plant sources. It is currently being used as a fermentation stimulant in biodegradable waste treatment applications.

Previous *in vitro* and *in vivo* rumen fermentation research conducted at this laboratory has demonstrated that sarsaponin enhances rumen fermentation. Total volatile fatty acid concentrations were increased, while the acetic / propionic ratios were decreased both *in vitro* and *in vivo*.

Objectives

The objectives of the experiment were (1) to test the effects of sarsaponin upon feedlot performance and carcass characteristics, and (2) to determine, within an approximate range, what the optimum dose of sarsaponin is for feedlot cattle.

Procedure

Forty Hereford yearling steers of average flesh, similar origin and genetic background, and weighing an average of 746 pounds were lotted by weight, 10 head each, to one of four treatments in a single factor variable level design.

Treatments consisted of 0, 50, 100 or 200 ppm sarsaponin in the daily ration on an air dry basis.

Cattle were started on a 30 percent grain, 70 percent corn silage ration and gradually adapted to an 80 percent concentrate ration over a 12-week period. This made it possible to study the effects of sarsaponin in the absence of any dietary stress and to determine whether or not the type of response might change as the diet changed.

No anabolic steroids or antibiotics were used in this study, and all cattle were fed 130 days.

Intermediate weights were taken when the cattle reached the 70 percent concentrate level. They were subsequently adapted to an 80 percent concentrate diet and fed for another 50 days, weighed and slaughtered. Carcass data then were collected.

Data were analyzed statistically via a one-way analysis of variance and multiple regression, while individual means were compared by a Duncan's Multiple Range Test.

Results and Discussion

Feedlot performance and carcass characteristics are given in Table 1. Cattle receiving 100 ppm sarsaponin

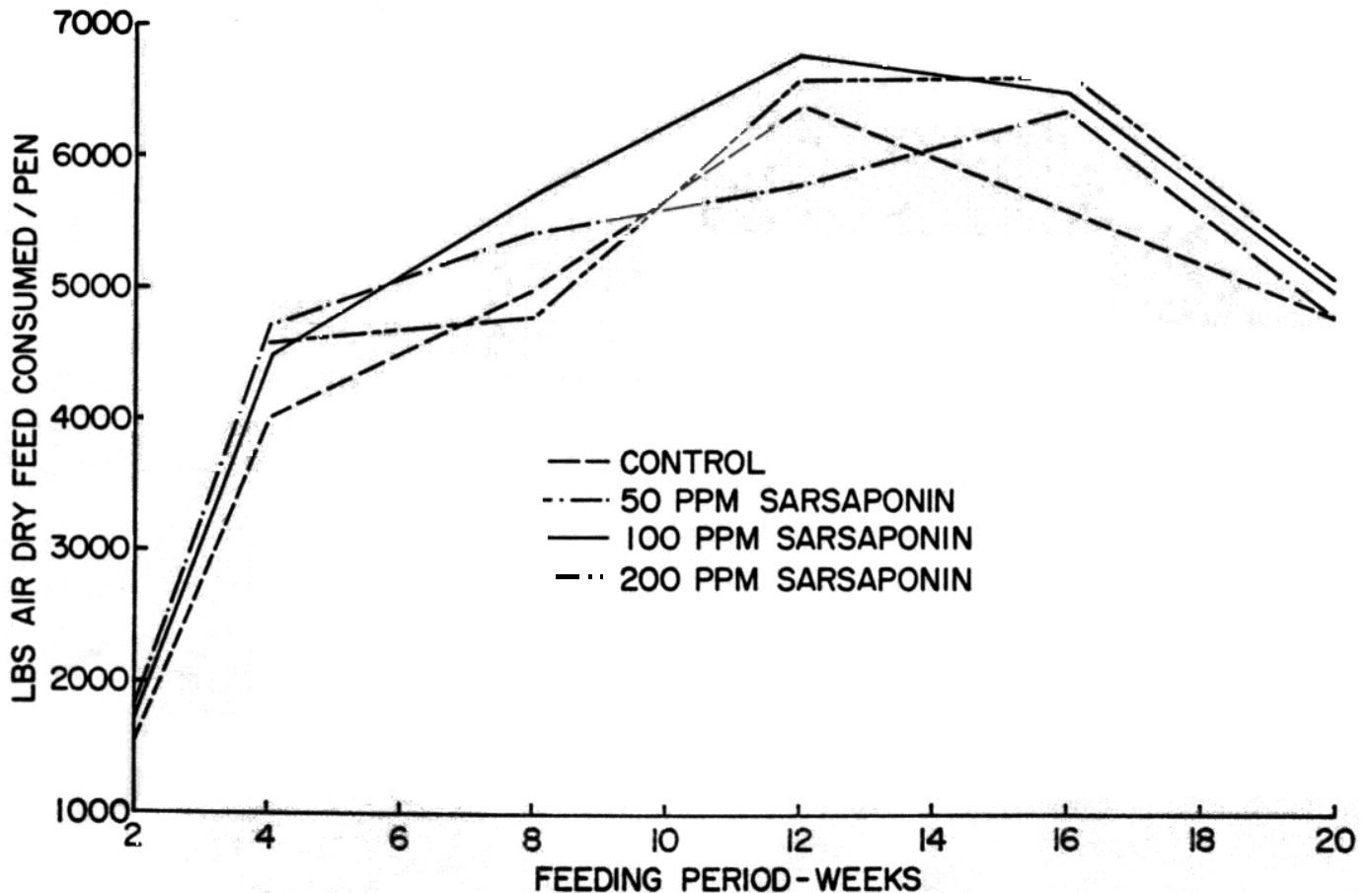


Figure 1. Feed Intake by Four Week Periods.

Table 1. Feedlot Performance and Carcass Data of Cattle Fed Sarsaponin.

Treatment	0	50	100	200
No. steers	10	10	10	10
Initial weight, lbs.	746	746	746	745
Final weight, lbs.	1063	1088	1111	1086
Total gain, lbs.	317 ^a	342 ^a	365 ^b	340 ^a
Average daily gain, lbs.	2.44 ^a	2.63 ^a	2.81 ^b	2.62 ^a
Avg. daily ration, air dry basis, lbs.:				
Flaked corn	10.0	11.3	12.0	11.7
Beet pulp	1.9	2.0	2.1	2.0
Protein supplement	.7	.7	.8	.8
Corn silage	6.8	7.2	7.5	7.2
Alfalfa hay	.9	1.0	1.0	1.0
Salt	.26	.27	.27	.26
Total air dry feed	21.5	22.5	23.7	23.0
Feed/cwt. gain (lbs.)				
Over total feeding period:	819	794	782	813
1st 11 weeks:	612	615	614	621
Last 7 weeks:	1108	1006	969	1023
Dressing % ¹	64.41	64.52	64.76	64.46
Liver Abscesses, %	30.0	30.0	00.0	00.0
Marbling score ²	5.2 ^a	6.3 ^b	6.8 ^b	6.5 ^b
Fat thickness, in.	.51	.55	.54	.56
Ribeye area, sq. in.	12.1	12.0	12.4	12.9
USDA yield grade	2.8	3.0	2.9	2.7
% cutability	50.5	50.0	50.2	50.7

¹Hot carcass weight divided by final weight less 4% shrink.

²5 = small; 6 = modest.

^{a,b}Means with different superscripts differ significantly ($P < .05$).

significantly outgained the control cattle by 15.2 percent ($P < .05$) with an average daily gain of 2.81 pounds versus 2.44. The 50 and 200 ppm cattle also outgained the control cattle, both by an average of 7.8 percent at 2.63 and 2.62 pounds per day, respectively. However, this difference was not significant. Total gains by treatment were 317, 342, 365 and 340 pounds for 0, 50, 100 and 200 ppm. Both the average daily gains and the total gains were determined from carcass weight and dressing percent.

Total air dry feed consumed per head per day also was highest for the 100 ppm group (23.7 pounds), while the control group averaged a full 2 pounds less (21.5 pounds).

A graph depicting the total air dry feed consumed during each four-week interval by pen is given in Figure 1.

Cattle fed 100 ppm sarsaponin consistently consumed more feed than the controls.

Feed required for 100 pounds of gain was lowest for the group fed 100 ppm sarsaponin (782 pounds versus 819 pounds for the controls). Although feed efficiencies for the treated cattle during the entire feeding period averaged from only 3 to 5 percent higher than the controls, all increases in feed efficiency were realized during the last 50 days on feed. During the first 77 days, feed efficiencies were almost identical (Table 1). This was indicative of primarily an intake and gain response at high or

intermediate roughage feeding levels. But during the last 50 days on feed at 80 percent concentrate, feed per 100 pounds of gain was decreased by 10.14, 14.34 and 7.82 percent for 50, 100 and 200 ppm sarsaponin over the controls indicating a feed efficiency response at higher concentrate levels.

Carcass data (Table 1) showed little or no difference in dressing percent, fat thickness or USDA yield grade. but marbling scores were significantly increased in all the sarsaponin treated cattle ($P < .05$). However, this increase in marbling score simply may reflect an increase in their carcass weights.

A noticeable decrease in percent liver abscesses also was observed in the 100 and 200 ppm cattle versus the 0 and 50 ppm groups.

The relationship between different treatment levels was found to be quadratic by multiple regression analysis, and thus suggests that 100 ppm sarsaponin was the optimum treatment level.

In summary, the addition of all levels of sarsaponin to the diets of feedlot cattle in this experiment resulted in increases in animal performance, while the addition of 100 ppm sarsaponin generally resulted in significantly greater responses in both feedlot performance and carcass data.