

THE EFFECTS OF ACTIVATED ZEOLITE ON THE PERFORMANCE OF PRIME LAMBS UNDER FEEDLOT CONDITIONS

Abstract

The effects of zeolite on the performance of feed lotting cattle has been well documented. It was surmised that the effect on prime lambs would be similar. In the lamb feedlot trials undertaken, the addition of Activated zeolite at rates of 2.5%, 5% and 7.5% in the ration have had the effect of increased weight gain, reduction in scouring (diarrhoea) and improvement in carcass composition. It was noted that in the first three weeks of the trial that there was an incremental increase in the body weight of the lambs in proportion to the amount of activated zeolite in their ration. The last six weeks of the trial reversed this early trend. The final results indicated that adding activated zeolite to the prime lamb ration did increase the body weight and improve the final dollar per head return by up to 44%.

The trials have indicated that for the low protein feed mix used, best results may be achieved by the addition of Zeolite for the first 3 week period and then reverting to normal rations for the remainder of the trial.

Introduction

This prime lamb feedlot trial was set up and run in conjunction with the agricultural students at Mount Barker High School (350kms south of Perth in Western Australia). The trial was looking at whether the addition of zeolite to the lambs usual feedlot ration would increase the economic return on the lambs at the end of the trial. Specifically the areas targeted were an increase in body weight and an improvement in the dressing out percentage of the carcass. The use of zeolite in animal science as reviewed by Mumpton and Fishman (1977) indicated that weight gains in animals could be expected by adding this material to the diet. The use of Activated Zeolite in cattle feedlots in Queensland in 2001 indicated that by the addition of 5% Activated Zeolite to a feedlot ration, a

significant improvement in animal weight gain could be expected (Supersorb internal report).

Materials & Methodology

- The zeolite is sourced from the Supersorb Environmental operations near Emerald in Queensland. Product sizing was 100% <0.9mm (note: specification sheet attached)
- The 102 lambs were split into four groups (randomly assigned) and put into four, one acre pens with ad lib water and oaten hay. The feedlot mix was put into 1.5 metre long self-feeders.
- The lambs were mixed-sex poll dorset merino cross. Their average entry weight was 31-32kgs. Their expected weight gain was 150-200 grams/day and their expected finish weight was 40-45kgs.
- The trial commenced on 18 March 2002 and finished on 30 May 2002

Rations

These lambs were trial fed a maintenance ration of 20 grams/day of lupins, twice a week for 2 months prior to the commencement of the trial. The last week before the commencement of the trial, the ration changed to lupins and barley at the rate of 200 grams/day plus ad lib hay. On day one of the trial, the lambs got fresh hay in the morning and then went onto the feedlot mix in the afternoon.

The feedlot ration consisted of lupins, barley and the mineral mix. It was a very basic low protein ration. (see Table 3 for details)

Treatments, Measurements & Climate Conditions

The lambs were individually tagged with coloured and numbered tags. The control group had black tags, the 2.5% zeolite had blue tags, the 5% zeolite had red tags and the 7.5% zeolite had purple tags.

Each lamb was weighed at the start of the trial and then weighed again on day 23, day 51 and finally on day 71. A condition score of the individual lambs was done on day 51 and day 71.

The weather conditions during the trial were mild except for one week during April when 175mm of rain fell over 4 days and the lambs got very wet and cold. The rain made a mess of the hay being fed in the 3 zeolite pens as their bales were $\frac{1}{2}$ to $\frac{3}{4}$ eaten whereas the control pen had been given a fresh bale just before the rain.

After 73 days on the feedlot, the lambs were taken to the WAMCO abattoir at Katanning and slaughtered. Their hot and cold weights were recorded as was their carcass classification. Their average value per kilogram was also noted. For the benefit of the slaughter results, two lambs that were condemned with arthritis were discounted from the results, as were two lambs that did not put on any weight during the trial (maybe shy feeders or something physically wrong with them).

Results and Discussion

The effects of activated zeolite on the body weight of the lambs are summarised in Chart 1. The weight gains over the three different weigh-in periods during the trial are summarised on Chart 2.

It can be seen from Chart 1 that 2.5% activated zeolite in the ration achieved the greatest overall weight gain. Chart 2 shows that the greatest effect that the zeolite had on these lambs was in the first weighing period. It is assumed that this would be while the lambs are accustomising to the feedlot ration and suffering the effects of acidosis. The weight gains in the second and third weigh-in periods indicated that once the lambs had become accustomed to the ration, the “zeolite affect” was overtaken by the reduction of protein in particularly the 5% and 7.5% zeolite ration. Some of the reduction in weight gain in the second weigh-in period can be attributed to the extremely wet week in April and more particularly to the fact that the zeolite group of sheep did not have fresh hay in their pens for these very wet days. There was little or no scouring in any of the groups of lambs for the majority of the trial except for during the very wet week in April (The fact that there was so little scouring noticed could indicate that there was room to increase the amount of protein in this ration. If the protein level had been higher, maybe 16%, it could be expected that the zeolite effect would be more pronounced.

Table 2 indicates the condition score of the lambs does not change significantly with zeolite in the ration. However, the average value received per kilogram (Table 3) showed an increase in return for the zeolite groups possibly indicating an improved carcass composition.

Data from Greece on the effects of dietary clinoptolite rich tuff (zeolite) on pigs (Colefla and Mumpton; 2000) suggested that the addition of 6% zeolite in the diet of finishing pigs resulted in increased lean percentage and decreased fat percentage in the carcass. These two scientists also surmised that the changes in the nitrogen metabolism associated with differences in amounts of ammonia processed by intestinal epithelium, liver and kidneys may have occurred in the presence of clinoptolite (zeolite) as a highly selective cation exchange for NH_4 (ammonia) in the upper gastrointestinal tract.

The amount of grain eaten per head reduced from 97.5 kilograms in the control group to 96.1 kilograms in the 2.5% zeolite group, then reduced further to 95 kilograms in the 5% zeolite group and finally down to 89 kilograms for the 7.5% group. To a large extent, this balanced out the cost of the zeolite (see Table 1).

Economic Data

It can be seen from the data on Table 3 that all three activated zeolite treatments increased the body weight of the lambs over that of the control group. The 2.5% zeolite group improved their bodyweight by 8.4% over the control, the 5% zeolite group improved by 1.6% and the 7.5% zeolite group improved their bodyweight by 3.1%.

When the average value received per kilogram and the feed cost per head are taken into account it can be seen that the three zeolite groups significantly outperformed the control group.

The best economic return came from the 2.5% zeolite group. Their net return per head was 44%, higher than that of the control. The 5% zeolite group showed a 10.2% increase and the 7.5% zeolite group showed a 17.4% improvement over the control.

The feed intake for the zeolite groups of lambs is less than for the control group but the value of the activated zeolite eaten means that the overall dollar for the zeolite groups (see Tables 3 and 4).

Summary and Conclusions

The effects of adding activated zeolite at 2.5%, 5% and 7.5% to the feedlot ration of prime lambs gave the following results:

- The addition of activated zeolite at all three rates used in the trial showed an improvement in weight gain.
- The carcass composition of the zeolite lambs was better than that of the control group.
- No deaths were recorded during the trial for any of the groups of lambs.
- It appears that the zeolite effect is greater in the first three weeks of the trial and then the protein content of the ration becomes an issue.
- The results of the trial indicated that using activated zeolite in a prime lamb feedlot ration may be economically advantageous, with a net return improved by up to 44% in the best performing group (2.5% zeolite addition).
- There were no antibiotics in this feedlot ration.

Further Work

It is anticipated that further work will be done in this area to explore how the addition of zeolite to a high protein (17-18%) ration would effect the performance of lambs in a feedlot situation.

The area that will be looked at is whether the addition of zeolite to a lamb feedlot ration for the first three weeks of the feedlot only is of economic benefit.

TABLE 4
ESTIMATED FINAL RETURN AND COSTS ON MOUNT BARKER PRIME LAMB TRIAL

Assuming that zeolite was only fed for the first 3 weeks of the trial.
Then all groups grew at the same rate as the control group did for the remainder of the trial (Note: cumulative weight graphs)

Treatment	Increase in weight while on feedlot (kg)	Average value per kg when sold (\$)	Average return per head (\$)	Feed cost per head ~ no zeolite (\$)	Feed cost per head ~ zeolite (\$)	Nett return per head (\$)
Control	10.04	2.98	29.92	21.22	-	8.70
2.5% Zeolite	10.65	3.07*	32.70	21.00#	0.30#	11.40
5% Zeolite	11.43	3.06*	34.98	20.75#	0.60#	13.63
7.5% Zeolite	12.07	3.05*	36.81	20.50#	0.90#	15.41

* Average value per/kg is halved between control average value and final trial value assuming 1/2 the affect of price per kg is caused by Zeolite application.

These figures are best guess approximate

TABLE 3
FINAL RETURN AND COSTS ON MOUNT BARKER PRIME LAMB TRIAL

Treatment	Increase in weight while on feedlot (kg)	Average value per kg when sold (\$)	Average return per head (\$)	Feed cost per head ~ no zeolite (\$)	Feed cost per head ~ zeolite (\$)	Nett return per head (\$)
Control	10.04	2.98	29.92	21.22	-	8.70
2.5% Zeolite	10.91	3.15	34.37	20.95	0.88	12.54
5% Zeolite	10.2	3.14	32.03	20.64	1.80	9.59
7.5% Zeolite	10.35	3.11	32.19	19.39	2.59	10.21

Table 2

Condition Score of Lambs (Number in Each Bracket)

Condition Score	Control	2.5% Zeolite	5% Zeolite	7.5% Zeolite
1½	1	-	1	-
2	8	6	8	6
2½	10	11	14	13
3	7	7	2	7

The condition score was done on 30 May 2002

Table 1
Ration Consumption and Value of Ration per Head

Date	Control	2.50%	5%	7.50%
18-Mar-02	250kg	256kg	262kg	268kg
28-Mar-02	250kg	256kg	262kg	268kg
5-Apr-02	250kg	256kg	262kg	268kg
9-Apr-02	250kg	256kg	262kg	268kg
16-Apr-02	250kg	256kg	262kg	268kg
23-Apr-02	250kg	256kg	262kg	268kg
30-Apr-02	250kg	190kg	210kg	200kg
7-May-02	250kg	170kg	210kg	200kg
14-May-02	250kg	180kg	230kg	210kg
23-May-02	250kg	350kg	350kg	350kg
31-May-02	100			
Total (kg)	2600kg	2426kg	2572kg	2568kg
Total Zeolite included in the ration	0kg	60.65kg	128.6kg	192.6kg
Number of Lambs	26	24	25	26
Total grain and minerals eaten (kg)	2600kg	2365kg	2443kg	2375kg
Amount of ration eaten/head (kg)	100kg	102kg	103kg	99kg
Amount eaten/head ~ Minerals (kg)	2.5kg	2.5kg	2.4kg	2.3kg
Amount eaten/head ~ Lupins at 19.5%* (kg)	19.5kg	19.2kg	19kg	17.8kg
Amount eaten/head ~ Barley at 78%* (kg)	78kg	76.9kg	76kg	71.2kg
Value of zeolite/head (\$)	-	\$0.88	\$1.80	\$2.59
Value of minerals/head (\$)	\$2.50	\$2.50	\$2.40	\$2.30
Value of lupins/head at 24c/kg (\$)	\$4.68	\$4.61	\$4.56	\$4.27
Value of barley/head at 18c/kg (\$)	\$14.04	\$13.84	\$13.68	\$12.82
Total Value of Ration/head (\$)	\$21.22	\$21.83	\$22.44	\$21.98
* % = age of ration				