

ROLE OF HIGH MOLASSES DIETS IN THE LIVE EXPORTS SUPPLY CHAIN

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SUMMARY

This study compared two nutrition management strategies in the supply chain of cattle exported from northern Australia to the Philippines. One was the traditional protocol, which involved transport from a grazing property to the coast, adaptation to the shipboard diet in yards near the port, a sea voyage and finally finishing on a local feedlot diet in the destination country. The other strategy involved feeding a high molasses diet (50% of the dry matter) for 50 days prior to export, during the voyage and throughout the finishing period. The experiment was conducted under commercial conditions and unplanned events occurred. The data show that feeding cattle productive low cost diets in depots near ports may be a viable alternative to the more conventional export protocol, at times of the year when the supply of northern cattle is restricted due to seasonal conditions.

Keywords: molasses diets, cattle, live exports

INTRODUCTION

This paper reports an experiment conducted under the commercial realities of the live cattle export industry. The primary aim was to evaluate the use of a high molasses diet in the live export supply chain. The poor availability of cattle during the northern wet season presents supply problems to Asian companies and is causing them to look elsewhere for cattle. A supply chain that allows purchase of cattle before the wet season, with backgrounding and value adding in this country, would suit the business of Asian importers. The development of depots for intensive feeding of cattle, based on cheap feedstuffs would be of obvious benefit. Opportunities exist to exploit by-products from the sugar cane industry. Approximately 600,000 tonnes of molasses are exported each year, often at a price much lower than could be attracted on the domestic market. Millions of tonnes of bagasse, the fibrous residue from cane, is also produced. Much of this is burnt as a fuel source for the sugar mills or simply destroyed. Research at CSIRO in Rockhampton has shown that liveweight gains greater than 1.2 kg/d can be achieved on diets containing >45% molasses on a dry matter basis (Hunter 2000). Given the juxtaposition of the sugar industry and the North Queensland live export trade, it is logical to consider how this research might be applied to the live export industry.

MATERIALS AND METHODS

Animals and experimental treatments

A uniform cohort of 415 high grade Brahman steers from a commercial property on the Barkly Tableland were divided into two treatment groups on the basis of liveweight. All steers over 270 kg were allocated to one group and all under 270 kg were allocated to the other group. The initial mean \pm sem weights were 285 ± 0.76 (n=210) and 261 ± 0.66 (n=205). Steers were allocated to treatments in this way because the commercial companies involved wanted all animals to enter the feedlot in the Philippines at about the same weight. The judgment was that the steers fed the high molasses diet prior to export would grow faster than steers fed on pasture during the northern Australian dry season.

The heavier group was allocated to a “normal” supply chain protocol, which involved the following:

- (i) Road transport from the Barkly Tableland to a commercial property near Hughenden (2 days)
- (ii) Grazing (agistment) on pasture for 50 days
- (iii) Road transport from Hughenden to a feeding depot near Townsville (1 day)
- (iv) Pre-shipment adaptation period in Townsville during which they were fed the shipboard diet of Fibremax[®] export pellets (6 days)

- (v) Sea voyage to General Santos, Philippines (11 days)
- (vi) Induction to feedlot (8 Days)
- (vii) Fed control feedlot diets (Table 1,2) for 87 days
- (viii) Transport by sea to Manila (3 days) and slaughter.

The lighter group of steers was allocated to the high molasses supply chain treatment, which involved the following:

- (i) Road and rail transport from the Barkly Tableland to a feeding depot near Townsville (3 days)
- (ii) Fed Fibremax Energy Plus[®] (50% molasses on a dry matter basis) at a depot near Townsville for 56 days
- (iii) Shipment to General Santos, Philippines (11 days)
- (iv) Induction into feedlot, General Santos (8 days)
- (v) Fed high molasses diet in feedlot for 87 days (Tables 1 and 2)
- (vi) Transport by sea to Manila (3 days) and slaughter.

Table 1. Diets fed in Philippine feedlot (% in dry matter)

	Control diets		High molasses diet
	First 31 days	Final 56 days	
Green corn chop	31	55	29
Molasses	12	31	46
Pineapple pulp	15	-	-
Leucaena pulp	-	-	6
Concentrate mix	42	14	19

Husbandry procedures

The protocol for this study was approved by the Tropical Beef Centre Animal Experimentation and Ethics Committee. Steers in the lighter group were implanted with Synovex Plus[®] at the time of allocation to treatment at the property on the Barkly Tableland and both groups were implanted with Synovex Plus[®] during induction to the feedlot. Just prior to export, all steers were treated with Cydectin[®] pour-on to eliminate internal and external parasites. At the feeding depot near Townsville, steers were held in yards and fed once per day from troughs. The contractor engaged to feed and care for the animals had instructions that the diet be fed *ad libitum*. For 8 days after the steers were unloaded in the Philippines, they were adapted to final diets by gradually increasing the ratio of feedlot diet to shipboard diet.

Engine problems on the ship resulted in a reduction in speed and a 3.5-day addition to the voyage from Townsville to General Santos. This necessitated feed restrictions for 5 days. Some animals became weak and some were injured. 24 steers in the standard export protocol and 55 steers in the high molasses protocol were put in hospital yards at the feedlot and fed their allocated treatment diets. Weak and injured animals were treated with multivitamins and/or antibiotics. When health and fitness returned, they were returned to their normal treatment groups (Day 13-18).

Measurements

Individual live weights of steers were measured at the beginning and end of each of the phases in the supply chain. Feed intakes on a group basis were recorded during the 56-day depot period at Townsville and during finishing in the feedlot in the Philippines. At slaughter, carcass weight, fat depth at the P8 rump site, fat colour (AusMeat) and meat colour (AusMeat) were measured.

Statistical analysis

The significance of difference between the productivity and ultimate carcass characteristics of steers on the two export protocols was determined by analysis of variance. Means were considered to be significantly different at $P < 0.05$. Because the two groups of steers were selected to be of different initial live weights, data were adjusted using initial live weight as covariate. Carcass data were adjusted using carcass weight as a covariate.

Table 2. Concentrate mixture fed to cattle in Philippine feedlot (% fresh weight)

	With Standard Diets (%)	With High Molasses Diet (%)
Rice bran	20.00	34.00
Copra meal	59.00	44.00
Leucaena leaf meal	5.00	5.00
Molasses	10.23	11.00
Limestone	2.00	2.00
Urea	1.05	1.05
Sodium Chloride	1.00	1.00
Tricalcium phosphate	1.50	2.00
Vitamin and mineral mix	0.22	0.22

RESULTS*Growth rates during 2 live export supply chain systems*

The changes in live weight and liveweight gain during the various phases of the export supply chain are given in Table 3. The steers allocated to the high molasses export protocol were on average 24 kg lighter than those on the standard protocol at the commencement of the study. When this difference is accounted for statistically so the comparison is made using the same adjusted initial weight, the total weight gains from source property on the Barkly to slaughter in the Philippines were 138 and 147 kg for the high molasses and standard protocol steers respectively (Table 4). The difference was statistically significant ($P<0.05$). The carcass weights of steers on the standard protocol were 8 kg heavier than that from the high molasses steers ($P<0.05$).

Table 3. Liveweight gain and feed intakes during the different phases of the export supply chain

Parameter	Standard Protocol		High Molasses Protocol	
	Mean	No. of Animals	Mean	No. of Animals
Initial wt.at background/depot	262	210	240	205
Wt. gain source to background	-23	210	-21	205
Final wt.at background/depot	299	210	273	205
ADG during pasture agistment/depot (kg) (50 day)	0.74	210	0.68	205
Wt.change during pre-shipment and shipping (18 day)	-25	210	6	204
Wt.on entry to feedlot induction (8 days)	274	210	280	204
Wt.on feedlot entry	282	209	282	204
Final wt.in feedlot	427	207	404	200
Wt.gain in feedlot (kg/d)	1.66	207	1.42	200
Mean feed intake (g DM/kg Lwt) in feedlot	27.0	207	28.2	200
FCE (g DM/kg Lwt gain) in feedlot	6.23	207	7.09	200

The data for subcutaneous fat depth, fat colour and meat colour were adjusted by covariance analysis so comparisons could be made at the same carcass weight. Feeding cattle on the high molasses diet for 162 days significantly ($P<0.001$) reduced fat depth at the P8 rump site and significantly ($P<0.001$) whitened the colour of the fat (Table 4). There was no significant effect on meat colour.

Table 4. Overall weight gain and carcass characteristics of steers. (SPACE BEFORE OVERALL)

	Standard Protocol		High molasses Protocol		SEM	Significance
	Mean	No. of Animals	Mean	No. of Animals		
Initial wt.at source(kg)	285	210	261	205	0.7	$P<0.001$
Final weight (kg) ^A	420	207	411	200	2.0	$P<0.05$
Total weight gain (kg) ^A	147	207	138	200	2.0	$P<0.05$
Carcass weight(kg) ^A	231	195	223	167	1.4	$P<0.05$
P8 fat depth (mm) ^B	16.4	195	12.4	167	0.2	$P<0.001$
Ausmeat fat colour ^B	4.6	195	2.9	167	0.07	$P<0.001$
Ausmeat meat colour ^B	3.1	195	3.3	167	0.05	n.s

^A Adjusted for initial weight

^B Adjusted for carcass weight

DISCUSSION

The results of this study have shown that a strategy in which cattle are prepared for export in depots in Australia is a viable alternative to the more traditional system. Cattle accustomed to the high molasses diet and feedlot conditions while still in Australia adapted more readily to conditions on ship and to conditions in Asia than cattle exported directly off pasture. Stockpiling and adding live weight to cattle in depots close to cheap sources of molasses and fibre would ensure consistency of supply to customers during periods of erratic supply due to seasonal conditions.

In interpreting the results of this study, three significant factors need to be considered. Firstly, growth rate in the depot in Townsville on the high molasses diet (0.68 kg/d) was only half the growth rate on a very similar diet in the Philippine feedlot. Feed intake in the Townsville depot was 2.0% of bodyweight compared to 2.7% bodyweight in the Philippines. Since the dietary formulations were similar it is possible that the animals were fed a restricted rather than a true *ad libitum* diet. Feed intakes in other CSIRO experiments with essentially the same formulation as fed in Townsville were 2.4% to 3% of bodyweight, which suggests that a feed restriction was imposed.

The second significant factor is the decision by the Philippine feedlot to increase the molasses content of their standard diet from 12 % to 31 % when pineapple pulps was withdrawn from the diet after 31 days. This meant that the comparison was between a 31% molasses diet and a 46% molasses diet. It is possible that the obvious rapid growth rates and the robust good health of the 46% molasses steers in those first 27 days gave the feedlot manager the confidence to increase the energy density of their standard diet by the incorporation of 19% more molasses than they had been fed previously. The study fortuitously provided information on the growth rates that can be expected when green chop corn is mixed with molasses at moderate (31%) as well as high (46%) incorporation rates.

The third factor that had a substantial influence on the final live weight of the standard export protocol steers was the rapid liveweight gain (0.74 kg/d) on the agistment property near Hughenden. Such gains are atypical during the northern dry season. A more typical scenario would be liveweight change in the range of -0.3 to +0.3 kg/d. These steers gained 37 kg during the pasture phase. Thus it could be argued that in a more normal dry season, the overall weight gain would have been significantly less than that recorded in this study. The combination of these 3 factors; diet and/or feeding management in Townsville, change to moderate inclusion of molasses in the Philippine feedlot and unusual pastoral conditions in northern Australia, tended to favour the liveweight performance of steers in the standard export protocol.

Feeding steers a 46% molasses diet for 162 days reduced the depth of subcutaneous fat at the P8 site and reduced the yellowness of the fat colour. There is also evidence from other CSIRO experiments that as the inclusion rate of molasses in the diet increases, the depth of subcutaneous fat decreases (Hunter 2000; R.A. Hunter and S.K. Blakeley unpubl. data). Finishing steers on a high molasses diet would be of added benefit in those countries where the market is for leaner beef. The molasses, Fibremax, cotton seed diet that the steers were fed in the Townsville depot contains essentially no β -carotene, so it is not surprising that the steers fed this diet had whiter fat than steers fed appreciable amounts of green corn leaf and stalk.

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