Simon P. Marsh, Principal Lecturer, Harper Adams University, Newport, Shropshire, TF10 8NB

Animal Science Research Centre - Beef Unit Trial Results – 2014 (c)

Evaluation of the partial replacement of wheat and rapeseed meal with distillers grains and increasing the digestible undegraded protein content of beef rations with AminoMax-R for intensively finished dairy-bred bulls

Introduction and Objective:

With the increasing availability of distillers grains they represent an opportunity to reduce feed costs with intensively fed cattle. Recent studies at Harper Adams however have shown that a marked reduction in the starch content of intensive beef rations can result in deterioration in animal performance (Marsh & Brown, 2007 and Marsh *et al.,* 2014). There is also increasing interest in the supplementation of intensively fed beef cattle with digestible undegraded protein (DUP).

The objective of this experiment was to determine the effect of the partial replacement of wheat and rapeseed meal with distillers grains and increasing the DUP content of the ration with AminoMax-R with 225kg intensively finished Holstein and Continental cross Holstein bulls.

Animals & Timing:

48 Jan-Mar 2013 born Holstein (n = 42) and British Blue x Holstein (n = 6) dairy-bred bulls weighing approximately 225kg at 5-6½ months old randomized according to live weight and breed to the following treatments:

Comparison:

Cereals (30.1% starch 'as fed')
A*d libitum* 14% CP compound feed based on barley, wheat, rapeseed meal, wheatfeed, soya hulls, palm kernel, maize, molasses and minerals i.e. Carrs Billington 'standard' intensive beef nut.

Distillers (24.8% starch 'as fed')
A*d libitum* 14% CP compound feed based on barley, wheatfeed, distillers grains, soya hulls, palm kernel, wheat, maize, molasses and minerals. Ensus Distillers were included @ 12.5%

DUP (30.0% starch 'as fed')
A*d libitum* 14% CP compound feed based on barley, wheat, AminoMax-R, soya hulls, wheatfeed, palm kernel, maize, molasses and minerals therefore containing elevated levels of DUP (36% DUP as a % of CP compared to 28.1% and 26.6% for the cereals and distillers rations respectively).

Straw was offered *ad lib* to the bulls from racks.

Results:

Table 1: Animal performance (kg)

(Kg/bull)	Control	Distillers	DUP	P Value	Sig
Start wt	226	228	222	0.856	NS
Slaughter wt	545	560	546	0.069	Trend
Days to slaughter	246	242	248	0.163	NS
DLWG	1.30	1.37	1.31	0.098	Trend
Age at slaughter (days)	425	420	423	0.765	NS

NS = not significant, * = P<0.05, ** = P<0.01, *** = P<0.001

Table 2: Carcase characteristics

	Control	Distillers	DUP	P Value	Sig
Carcase wt (kg)	284.3	290.4	283.3	0.379	NS
Kill out (%)	52.1	51.8	51.9	0.813	NS
Carcase DG (kg)	0.73	0.76	0.72	0.312	NS
Conformation[1] (1-7)	2.00 (-O)	2.21	1.97	0.487	NS
Fat class[1] (1-7)	2.86	3.00	2.64	0.122	NS
Liver score[2] (1-5)	1.93	1.93	1.21	0.278	NS

[1] EUROP carcase classification: Conformation: P+=1 and E=7, Fat class: 1=1 and 5H=7.
[2] Liver assessment: 1= Healthy liver and 5 = Severe abscesses (due to acidosis)

Table 3: Feed intakes (kg/bull) and feed conversion ratio (FCR)

	Control	Distillers	DUP
Total concentrate intake (kg)	2,011	2,204	2,086
Daily concentrate intake (kg)	8.17	9.11	8.41
FCR (kg feed: kg lwt gain)	6.30	6.64	6.44
FCR (kg feed: kg carcase gain)	11.20	11.98	11.68

The FCRs (kg feed: kg liveweight gain) appear relatively high compared to the target of 5.4:1 for cereal fed Holstein bulls but it must be taken into consideration that the experiment did not include the period of growth from 110kg to 225kg. During this rearing phase Holstein bulls at Harper Adams University typically record an FCR of 3.7:1 with a DLWG of 1.45kg having consumed 425kg of concentrates. Overall feed intakes from 12 weeks old to slaughter were approximately 2.44t (fresh weight) per head for the control bulls.

Table 4: Financial performance (£)

	Control	Distillers	DUP
Carcase price (£/kg) – Feb-May 2014	3.09	3.17	3.14
Carcase value (£)	883	923	892
Feed cost (£/t)	228	225	235
Feed cost (£/bull)	459	496	490
Margin over Feed (£/bull)	424	427	402
Feed cost/kg live wt gain (£/kg)	1.43	1.50	1.51
Feed cost/kg carcase gain (£/kg)	2.55	2.70	2.75

Overall the Holstein bulls returned a gross margin of £154 and Blues £225 per bull when calculated from being reared from calves through to slaughter. This was a significant reduction compared to a previous batch of bulls marketed in October-December 2013, prior to the drop in finished beef prices, when they recorded gross margins of £283 and £313/bull respectively for Holsteins and Blues.

Discussion & Conclusions:

- Overall performance of the bulls was satisfactory achieving similar results to the EBLEX (2012) targets for intensive cereal beef production.
- There were no significant differences in animal performance or carcase characteristics with replacing wheat and rapeseed meal with distillers grains in an intensive beef nut. There was however a trend for higher slaughter weights (P=0.069) and DLWG (P=0.098) with the bulls fed distillers. The distillers grains fed bull also recorded the highest numerical carcase weights and conformation score.
- Feed intakes were increased by 193kg with distillers grains compared to the control fed bulls with a slight deterioration in FCR (kg feed: kg live weight gain) from 6.30 to 6.64. This increase in feed intake with a lower starch and higher fibre based diet is consistent to most other published work.
- Based on the costs prevailing at the time of the study replacing wheat and rapeseed meal with distillers grains with intensively finished beef cattle increased the carcase value by £40 but increased feed costs per bull by £37. Feed costs per kg liveweight and carcase weight gain were increased with distillers grains.
- There were no significant differences in carcase characteristics or liver damage scores. However the bulls fed DUP recorded numerically lower fat classifications.
- There were no significant effects on animal performance with supplementing 225kg bulls with DUP supplied from AminoMax-R. With an increase in ration costs and no effect on cattle performance this resulted in the DUP fed bulls recording the lowest margin over feed and highest feed cost per kg gain.
- It is suggested that future studies should be carried out on rations containing over 20% distillers grains and feeding rations with elevated levels of DUP to young bulls from 100 to 225kg.

Acknowledgement:

Financial support from Carrs Billington is gratefully acknowledged.

References:

EBLEX Beef BRP Manual 10. 2012. Better Returns from Pure Dairy-bred Males. Huntingdon: EBLEX

Marsh, S.P. and Brown, S.T. 2007 Effect of feeding a compound feed with a reduced starch content on the performance of intensively fed beef cattle *Proceedings of the British Society of Animal Science.* Paper 127

Marsh, S.P., Harries, D.P.R. and Vickers, M. 2014. Effect of reducing the starch content of cereal based rations by the partial replacement of barley with soya hulls for intensively finished beef cattle. *Proceedings of the British Society of Animal Science.* Paper 128

July 2014