Nutritive value for finishing beef steers of wheat grain conserved by different techniques

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Introduction Wheat grain harvested at dry matter (DM) concentrations above 860 g/kg is slow to deteriorate during long-term storage. However, high moisture grain (HMG) ranging from below 600 to 750 g DM/kg is conserved on some farms in the form of anaerobic storage of acid-treated, rolled wheat (AR) and urea-treated whole-wheat (UN) (Stacey *et al.,* 2003). This experiment quantified the nutritive value for beef cattle of standard wheat grain (propionic acid-treated and rolled:PR) compared to AR and UN at different levels of intake.

Materials and methods The experiment was a 3 (forms of wheat: AR, UN, PR) x 3 (levels of wheat offered: low (L), medium (M), high (H)) factorial arrangement of treatments, and with a control group of animals on grass silage only (GS). Friesian steers (n=120) were allocated to 10 treatments in a randomised complete block design. For 144 days, all animals were offered grass silage *ad libitum* as the sole diet (GS) or supplemented with either PR, UN or AR at 3 kg/head (L), 6 kg/head (M) or *ad libitum* (H). Total faecal collections were made on all animals over a 24 h duration between days 102 and 109, and assessed for DM and starch concentration. Carcass weight (hot carcass x 0.98) was recorded after slaughter and carcass weight gain was estimated as the difference between final carcass weight and 0.48 of initial live weight. Samples of *M. longissimus dorsi* were taken 24 h post-mortem from between ribs 5 to 7 and stored at 3˚C for a further 24 h. Colour measurements (lightness (l), redness (a) and yellowness (b) of the muscle and subcutaneous fat) were made using a Minolta ChromaMeter CR 100. Animal data were analysed as a factorial arrangement of nine treatments (3 wheat forms x 3 wheat levels) and as 10 treatments within a randomised complete block design using Genstat 5.0.

Results The mean (s.d) DM, pH, crude protein (CP) and organic matter digestibility (OMD) values for GS at feedout were 226 (9.7) g/kg, 3.9 (0.11), 152 (4.6) g/kg DM and 679 (14.1) g/kg, respectively. The mean (s.d.) DM (g/kg), pH, CP (g/kg DM, starch (g/kg DM) and OMD (g/kg) values at feed out for AR were 693 (10.1), 4.3 (0.15), 116 (2.4), 671 (18.5) and 925 (7.4). The corresponding values for UN were 738 (9.1), 9.3 (0.07), 145 (3.9), 664 (39.0) and 934 (9.7) and for PR were 827 (8.1), 4.8 (0.26), 111 (4.8), 655 (23.4) and 933 (9.4), respectively. GS had the highest (P<0.001) silage DM intake (SDMI) but the lowest (P<0.001) daily live weight (DLG) and daily carcass weight (DCG) gains (Table 1). Increasing levels of wheat consumption progressively reduced SDMI and increased DLG and DCG. SDMI was equally lower (P<0.001) with AR and PR compared to UN whereas DLG and DCG were equally higher (P<0.05) with AR and PR compared to UN. For steers offered wheat *ad libitum*, wheat DM intake was lower (P<0.001) with AR than UN or PR, while DLG and DCG were lower (P<0.001) with UN than AR or PR. UN had the highest (P<0.001) amount of starch in the faeces indicating considerable loss of undigested grains. Muscle redness ('a value') was not influenced by method of wheat management but was higher at M compared to L level of supplementation. Fat yellowness ('b value') was higher (P<0.01) with UN than AR, while M>L>H.

Table 1 Performance, DM intakes, faecal results and meat data from 144 day feeding trial

Diet	GS	AR			UN			PR			10 treatments		9 treatments[1]	
Wheat level (W_L)	0	L	M	H	L	M	H	L	M	H	s.e.	Sig.	s.e.	Sig.
SDMI[3] (kg/ d)	7.4	5.4	3.7	1.3	5.9	4.6	1.5	5.8	3.9	1.2	0.15	***	0.15	NS
WDMI[4] (kg/d)	0	2.5	4.9	7.8	2.4	4.8	8.3	2.4	4.9	8.2	0.10	***	0.11	*
DLG[5] (g)	100	719	887	983	612	724	843	622	870	1043	65.5	***	64.1	NS
KO[6] (g/kg)	484	503	502	516	495	502	501	497	511	520	4.4	***	4.1	NS
DCG[7] (g)	64	421	517	629	351	433	491	362	545	676	35.6	***	35.1	NS
Faecal DM (g/kg)	143	158	160	184	155	162	204	147	152	175	6.0	***	5.9	NS
Starch[8] (g/kg DM)	8	9	15	31	51	99	118	9	14	20	10.2	**	10.4	**
Muscle 'a' value	13.0	13.1	13.4	14.3	13.1	14.0	13.5	12.9	14.2	13.3	0.38	NS	0.38	NS
Fat 'b' value	13.7	12.6	13.2	11.4	13.6	14.5	12.4	13.2	14.3	11.5	0.39	NS	0.39	NS

[1]W_F[2] x W_L; [2]Wheat form; [3]silage DM intake; [4]wheat DM intake; [5]daily liveweight gain; [6]killout; [7]daily carcass gain; [8]in faeces

Conclusions AR replaced PR in finishing beef rations without compromising performance or meat colour (qualitative conservation losses for both forms of wheat were restricted). The severe faecal losses of undigested grains with UN resulted in inferior growth rates compared to AR or PR. The relative magnitude of the decrease in performance appeared greater as the level of wheat ingestion increased.