



Slaughter value and meat quality of young bulls of three genotypes fed a semi-intensive system involving flax extrudate*

P. Domaradzki, Z. Litwińczuk, M. Kowalczyk, P. Żółkiewski, P. Stanek, A. Kaliniak-Dziura, E. Kowalczuk-Vasilev

Faculty of Animal Sciences and Bioeconomy, University of Life Sciences in Lublin, Akademicka 13, 20-950 Lublin, Poland

Introduction

Several studies have been conducted on diet supplementation with oilseeds to produce beef with enhanced levels of components with potential health benefits. Particularly, the effects of flaxseed supplementation on the fatty acid profiles of meat are well known whereas scarce data are available on how the inclusion of flaxseed in the diet could affect on the slaughter value and meat quality of different breeds of cattle. The use of raw flax seeds in human and animal nutrition is limited by the presence of anti-nutritional substances. Hence, the use of the extrusion process in the processing of flax seeds allows to limit the content of anti-nutritional substances while maintaining their optimal nutritional value.

Material & Methods

The aim of the study was to assess the slaughter value and meat quality of Limousine (LM), Polish Holstein-Friesian (HO) and commercial crossbreed (CC) bulls fed with a semi-intensive system with the addition of flax extrudate.

The bulls were fed with TMR (alfalfa silage, meadow hay, grain meal) enriched in the last 4 months before slaughter with the addition of flax, in the form of an extrudate in the amount of 8% of the dry weight of the diet. During the control fattening of bulls between 8 and 23 months of age, the weight gain was monitored, and after slaughter, the dressing percentage and the EUROP classification. Nutritional values (water, protein, fat, ash and heme iron content, calorific value) and physicochemical properties (pH, colour, water holding capacity, TBARS and shear force) were determined in *longissimus lumborum* (LL) and *semitendinosus* (SM) muscles.

Results

LM bulls had the highest warm carcass weight (373.7 kg) as well as dressing percentage (58%), and significant differences ($p < 0.05$) were confirmed in comparison with HO bulls (317.8 kg and 53.6%, respectively). CC bulls had the highest daily gains (794.3 g) and body weight (645.9 kg), and the differences in relation to HO bulls were confirmed at $p < 0.05$ level. The carcasses of LM and MM bulls were classified in U and R classes, while 83% of HO bulls were classified in the lower quality class, i.e. O. The pH values of the bulls' muscles of all genotypes were at a similar level, and the obtained results indicated the correct course of post-mortem glycolysis without DFD syndromes. The muscles of the LM and MM bulls contained significantly more protein and less fat compared to HO. On the other hand, the muscles of the HO bulls were characterized by the highest lightness (L^* ; $p < 0.05$). The shear force showed a more favorable tenderness of the SM muscle compared to the LL muscle in bulls of all genotypes (average 57 N vs. 102 N).

Table 1. Slaughter value of young bulls

Item	LM (n=6)	CC (n=7)	HO (n=6)	SEM
Age at start of fattening, months	7,15	8,02	7,18	0,30
Initial body weight, kg	291,0 ^b	280,3 ^b	254,0 ^a	5,2
Daily weight gain, g	743,6 ^{ab}	794,3 ^b	713,2 ^a	12,1
Age at slaughter, months	22,80	23,05	22,84	0,20
Body weight before slaughter, kg	642,8 ^b	645,9 ^b	593,0 ^a	12,7
Warm carcass weight, kg	373,7 ^b	371,0 ^b	317,8 ^a	10,8
Dressing percentage, %	58,0 ^b	57,3 ^b	53,6 ^a	0,8
Cooling loss of carcass, %	2,70	2,62	2,75	0,07

EUROP classification

Carcass conformation, class	U - 50%; R - 50%	U - 43%; R - 43%; O - 14%	R - 17%; O - 83%
Fat cover, class	2 - 83%; 3 - 17%	2 - 86%; 3 - 14%	2 - 100%

SEM - standard error of the mean; a, b - means marked in the lines differ significantly $p < 0.05$; LM - Limousine bulls; MM - commercial crossbreed bulls; HO - Polish Holstein-Friesian bulls

Table 2. Colour parameters (according to CIE $L^*a^*b^*$) of muscles of bulls of three genotypes

Item	<i>m. longissimus lumborum</i>				<i>m. semitendinosus</i>			
	LM	CC	HO	SEM	LM	CC	HO	SEM
L^*	34,68 ^a	36,33 ^b	37,27 ^c	0,15	39,33 ^a	40,05 ^a	40,93 ^b	0,10
a^*	12,11 ^b	11,28 ^a	11,04 ^a	0,08	12,96 ^a	12,41 ^a	12,59 ^a	0,09
b^*	10,62 ^a	11,54 ^b	10,93 ^a	0,08	14,44 ^a	14,50 ^a	15,62 ^b	0,09

Markings as under the table 1

Table 3. Water-holding capacity, shear force (WBSF) and TBRAS value of the muscles of bulls of three genotypes

Item	<i>m. longissimus lumborum</i>				<i>m. semitendinosus</i>			
	LM	CC	HO	SEM	LM	CC	HO	SEM
CL	26,74 ^a	27,80 ^a	27,86 ^a	0,50	31,81 ^a	36,13 ^a	35,13 ^a	1,01
G-H	28,23 ^{ab}	30,71 ^b	25,93 ^a	0,92	33,35 ^a	33,72 ^a	35,31 ^a	0,76
WBSF	99,79 ^a	100,31 ^a	106,19 ^a	2,32	59,64 ^a	56,18 ^a	56,22 ^a	1,20
TBARS	0,16 ^a	0,12 ^a	0,28 ^b	0,01	0,15 ^{ab}	0,09 ^a	0,17 ^b	0,01

CL - Cooking loss in %; G-H - meat water-holding capacity, expressed as % of free water was determined using the Grau and Hamm paper method (1953); WBSF - Warner-Bratzler shear force in N; TBARS - thiobarbituric acid reactive substances in mg MDA/kg; Other markings as under the table 1

Table 4. Proximate composition (%), energy value (kcal/100 g) and heme iron content (mg/100g) muscles of bulls of three genotypes

Item	<i>m. longissimus lumborum</i>				<i>m. semitendinosus</i>			
	LM	CC	HO	SEM	LM	CC	HO	SEM
Water	75,43 ^a	75,48 ^a	75,74 ^a	0,21	76,52 ^{ab}	76,19 ^a	76,79 ^b	0,09
Protein	22,60 ^b	22,90 ^b	21,53 ^a	0,18	22,16 ^{ab}	22,70 ^b	21,24 ^a	0,29
Fat	1,35 ^a	1,56 ^{ab}	1,72 ^b	0,10	1,12 ^a	1,07 ^a	1,20 ^a	0,08
Energy value	102,53 ^a	106,00 ^a	102,42 ^a	1,46	98,69 ^a	100,67 ^a	95,55 ^a	1,23
Fe heme	1,50 ^b	1,47 ^b	1,14 ^a	0,05	1,18 ^b	1,20 ^b	0,88 ^a	0,06

Markings as under the table 1

Conclusions

Flax seed extrudate may be a valuable feed additive, as previous literature data indicate its beneficial effect on the fatty acid profile of intramuscular fat, while the conducted research proves that the meat of the assessed young bulls was characterized by the desired physicochemical properties, from the technological and consumer point of view as well. Also the traits of slaughter value obtained for bulls of three genotypes should be considered satisfactory and typical for semi-intensive feeding system

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