

COMPARISON OF CARCASS COMPOSITION AND MEAT QUALITY BETWEEN WHITE-BLUE BELGIAN AND BLACK PIED BULLS

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Developments in agriculture demand a greater selection in beef cattle breeding that would aim at larger animals with bigger muscle accretion resulting in meatier carcasses. An extreme way to do that is to use the White-Blue Belgian breed. The double-muscled type shows a hypertrophy of all muscles. Various studies on carcass value and meat quality of cattle were carried out by RENAND (1988), ARTHUR et al. (1989), ANDERSEN (1991). The phenomenon of muscle hypertrophy was analysed by TOURAILLE (1991), MENISSIER (1982), DUMONT (1982), ANONYM (1994). An obvious increase of muscle content in double-muscled cattle was found. Growth and carcass characteristics of the Belgian Blue breed in pure- and crossbreds were shown by HANSET et al. (1989). The aim of this study was to characterize the growth behaviour and carcass value of the breeds White-Blue Belgian and Black Pied cattle by direct comparison. First results are shown.

Objective

The effects of breed and age on carcass traits in White-Blue Belgian and Black Pied cattle were investigated. This included carcass weight, carcass dressing, classification in EUROP-grading system, internal fat, amounts of selected carcass pieces, tissue composition (meat, fat, bone, protein) and parameters of meat quality (share force value, intramuscular fat content, pressure value, pH-value, marbling score).

Methods

White-Blue Belgian bulls $n = 9$ (12 months) and $n = 14$ (24 months) as well as Black Pied bulls $n = 10$ of each age group were used in this study. The bulls were kept in single-feeding places. The animals' food rations were set according to their genotype, based on a daily gain of 1100 g/d for White-Blue Belgian and 900 g/d for Black Pied bulls. 17 h post mortem the cooled carcasses were entirely dissected and than analysed. Protein and fat content were analysed by a near infrared based technique (INFRADEC). The brightness of meat was recorded with a MINOLTA- device. For statistical analysis the data were subjected to analysis of variance using the GLM procedure (SAS) considering the effects of breed and age. The confidence intervals for gain from 12 to 24 months were determined.

Results and discussion

The data in table 1 show a considerable potential of muscle accretion in the White-Blue Belgian. The carcass dressing of nearly 70% and the carcass weight of almost 470kg are in accordance with previously found data and demonstrate the advantages of this breed (ANONYM, 1994). In comparison to the Black Pied the White-Blue Belgian are dominant in carcass dressing (13% higher). The possible cause for the higher meatiness could be the lower absolute content of red offal and slaughter byproducts in White-Blue Belgian bulls. The hide percentage in relation to carcass weight (warm) is significantly lower in White-Blue Belgian. There is no significant difference between 12 and 24 months. Muscle hypertrophy is extremely visible at the round and the shoulder. The carcasses were graded according to the EUROP-classification into group E only. There are no differences in grading between ages. The internal fat content of White-Blue Belgian is remarkably low with only 3.4% (24 months). In comparison to the White-Blue Belgian the Black Pied show nearly 10% more internal fat. With regard to the hierarchical deposition of fat, the intramuscular fat content must be on a very low level. That supposition has been confirmed. White-Blue Belgian show an intramuscular fat content of only 1% (table 2). That's why the meat seems to be more healthy for human nutrition. The carcass composition of this breed is also very different in contrast to Black Pied. Most obvious is the low content of fat (4.4%) and bone (12%) in the White-Blue Belgian. It is significantly different from the Black Pied bulls. Especially interesting is the very high content of protein in the meat of the White-Blue Belgian. It shows the high level of nearly 17% (81kg), whereas the Black Pied ranges at 14% (54kg). These results are in accordance with statements made by other authors who also found very low contents of fat and bone, the carcasses were very meaty instead (HANSET, et al. (1989). Meat quality was tested in musculus longissimus dorsi 17 h post mortem. Black Pied's meat was significantly darker (24 months) and in share force value only the groups of 12 months differed. The share force values are on comparably high level, because the study was carried out without a meat maturity. The Black Pied's meat is good in marbling, the White-Blue Belgian's meat was without any visible fat.

Conclusions

Double-muscled White-Blue Belgian bulls produce a very high content of protein per day. The meat contains very low fat at all stages of age. Therefore, the meat can be valued as healthy for human nutrition. The results in carcass dressing, in the amount of meat and in meatiness are on a very high level. Age-related differences in the fat content of the carcasses are not matter significantly in White-Blue Belgian. For this reason the breed can be kept until high live weights, without any risk of increasing fatness. The low bone content in White-Blue Belgian can be unfavourable for animals health. It can be positive to use White-Blue Belgian as fathers in crossbreeding with large dairy cows, in order to increase the meatiness of the products. However, the risks for little cows in calving should be considered.

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Table 1: Least squares means of carcass composition and meat quality characteristics; gain from 12 to 24 months, confidence interval

parameter	LS-means ¹⁾				gain 12 - 24 months ; CI ²⁾				
	White-Blue Belgian		Black Pied		White-Blue Belgian		Black Pied		
	12 month	24 month	12 month	24 month	\bar{x}	CI	\bar{x}	CI	
live weight at slaughter	kg	389.33 _a	681.86 _A	407.50 _a	701.70 _A	292.5	< 259.4 ; 325.6 >	294.2	< 259.5 ; 328.9 >
carcass weight, cold	kg	259.90 _a	468.73 _A	214.31 _b	397.68 _B	208.8	< 184.7 ; 232.9 >	183.4	< 158.1 ; 208.6 >
hide	kg	22.98 _a	40.66 _A	31.97 _b	46.40 _B	17.7	< 14.7 ; 20.7 >	14.4	< 11.3 ; 17.5 >
hide in relation to carcass weight, cold	%	5.90 _a	5.97 _A	7.84 _b	6.62 _B		ns	-1.2	< -1.7 ; -0.8 >
carcass dressing percentage ³⁾	%	67.90 _a	69.72 _A	53.45 _b	57.32 _B	1.8	< 0.3 ; 3.3 >	3.9	< 2.3 ; 5.4 >
EUROP-system meatiness	1-5	1.00 _a	1.00 _A	4.30 _b	4.00 _B		ns		ns
EUROP-system fatness	1-5	1.00 _a	1.07 _A	2.00 _b	2.80 _B		ns	0.8	< 0.4 ; 1.1 >
internal fat ⁴⁾	kg	4.45 _a	15.99 _A	20.48 _b	54.39 _B	11.5	< 5.2 ; 17.9 >	34.0	< 27.3 ; 40.5 >
internal fat in relation to carcass weight, w. part of back ⁵⁾	%	1.68 _a	3.37 _A	9.40 _b	13.49 _B	1.7	< 0.1 ; 3.4 >	4.1	< 2.5 ; 5.7 >
part of back in relation to carcass weight, cold round ⁶⁾	kg	36.77 _a	74.89 _A	31.62 _b	62.17 _B	38.1	< 34.2 ; 42.0 >	30.5	< 26.5 ; 34.6 >
part of back in relation to carcass weight, cold round ⁶⁾	%	28.49 _a	31.86 _A	29.59 _b	62.17 _B	3.4	< 2.7 ; 4.0 >	1.6	< 0.9 ; 2.3 >
round in relation to carcass weight, cold	kg	41.86 _a	68.94 _A	29.77 _b	50.57 _B	27.1	< 24.0 ; 30.2 >	20.8	< 17.5 ; 24.0 >
round in relation to carcass weight, cold	%	32.43 _a	29.37 _A	27.92 _b	25.37 _B	-3.1	< -3.8 ; -2.3 >	-2.5	< -3.3 ; -1.8 >

¹⁾ _a or _A, _b or _B characterize significant differences between breeds per age (P ≤ 0.05)

²⁾ confidence interval for gain from 12 to 24 months, (1 - α = 0.95)

³⁾ carcass weight, warm in relation to weight at slaughter

⁴⁾ internal fat = kidney fat + snowball fat + web fat + aitch fat

⁵⁾ part of back = roastbeef + fillet + chuck back rib + neck

⁶⁾ round = round beef without leg, German cut

Table 2: Least squares means of carcass composition and meat quality characteristics; gain from 12 to 24 months, confidence interval

parameter	LS-means ¹⁾				gain 12 - 24 months ; CI ²⁾				
	White-Blue Belgian		Black Pied		White-Blue Belgian		Black Pied		
	12 month	24 month	12 month	24 month	\bar{x}	CI	\bar{x}	CI	
amount of meat ³⁾	kg	100.70 _a	189.33 _A	64.98 _b	110.49 _B	88.6	< 78.4 ; 98.9 >	45.5	< 32.7 ; 58.3 >
percentage meat in carcass	%	78.00 _a	77.2 _A	60.84 _b	56.13 _B		ns	-4.7	< -7.4 ; -2.0 >
amount of bone ³⁾	kg	17.31 _a	27.52 _A	19.35 _b	31.18 _B	10.2	< 8.7 ; 11.4 >	11.8	< 10.2 ; 13.4 >
percentage bone in carcass	%	13.43 _a	11.76 _A	18.16 _b	15.70 _B	-1.7	< -2.5 ; -0.8 >	-2.5	< -3.3 ; -1.6 >
amount of protein in carcass ⁴⁾	kg	45.46 _a	81.56 _A	30.52 _b	54.46 _B	36.1	< 31.7 ; 40.5 >	23.9	< 19.4 ; 28.5 >
percentage protein in carcass	%	17.61 _a	17.35 _A	14.28 _b	13.65 _B		ns	0.6	< -1.2 ; 0.0 >
amount of fat in carcass ⁴⁾	kg	6.51 _a	20.68 _A	24.36 _b	72.60 _B	14.2	< 5.7 ; 22.6 >	48.2	< 39.4 ; 57.1 >
percentage fat in carcass	%	2.50 _a	4.41 _A	11.39 _b	18.18 _B		ns	6.8	< 4.5 ; 9.1 >
area of mld	cm ²	115.54 _a	148.33 _A	57.11 _b	89.00 _B	32.8	< 23.3 ; 42.3 >	31.9	< 21.9 ; 41.8 >
pH ₁₇ - value ⁵⁾		5.73 _a	5.53 _A	5.67 _a	5.56 _A	-0.2	< -0.4 ; 0.0 >		n.s.
brightness of meat colour ⁵⁾	L*	37.40 _a	34.29 _A	35.84 _a	31.77 _B	-4.1	< -6.2 ; -1.2 >	-3.1	< -5.1 ; -1.1 >
marbling score ⁵⁾	1-6	1.00 _a	1.00 _A	1.80 _b	2.80 _B		ns	1.0	< 0.5 ; 1.5 >
shear force ⁵⁾	kp	21.63 _a	11.70 _A	16.04 _b	9.78 _A	-9.9	< -13.3 ; -6.6 >	-6.3	< -9.4 ; -3.8 >
fondue loss ⁵⁾	g	40.18 _a	42.27 _A	42.28 _b	45.16 _B		ns	2.8	< 0.6 ; 5.1 >
pressure value ⁵⁾	%	24.77 _a	27.30 _A	29.80 _b	31.06 _B		ns		n.s.
intramuscular fat ⁵⁾	%	0.27 _a	0.62 _A	2.07 _b	4.95 _B		ns	2.9	< 1.8 ; 4.0 >

¹⁾ _a or _A, _b or _B characterize significant differences between breeds within same age (P ≤ 0.05)

²⁾ confidence interval for gain from 12 to 24 months, (1 - α = 0.95)

³⁾ amount meat or bone = sum of meat or bone amount of the 12 carcass pieces (German cut, DLG)

⁴⁾ amount protein or fat analysed by a near infrared based method (INFRATEC)

⁵⁾ musculus longissimus dorsi