CARCASS AND MEAT PROPERTIES OF HOLSTEIN BULLS AND HOLSTEIN X PIEMONTESE BULLS AND HEIFERS

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BACKGROUND

Carcass traits of dairy, as well as dual purpose cattle breeds are getting of lower quality with selection to high milk production. One way to improve these traits in their progeny is to apply industrial crossing, to use beef breed bulls with high genetic value for meat production traits. Breeds which exhibit double muscling are of special interest because of high dressing percentage, good conformation, high lean meat yield and high quality of meat (Arthur, 1995; Bailey et al., 1982; Boccard, 1982; Menessier, 1982). Improvement of carcass quality and meat traits is partly also the result of heterosis, which can vary among different crossbreeding combinations (Gregory et al. 1994, Hirooka et al. 1998).

OBJECTIVES

The aim of this experiment was to examine carcass and meat traits of purebred Holstein (H) and their crossbreeds with Piemontese breed.

METHODS

Three groups of animals (6 H bulls, 12 HxPi bulls and 9 HxPi heifers) were fattened at the experimental farm. The animals were fed on grass and maize silage supplemented with concentrate in order to meet the nutritive requirements for approximately 1.0 kg daily weight gain. Animals were slaughtered at the same degree of fatness. To define the tissue proportion, 20 right halves (6 H; 7 HxPi bulls and 7HxPi heifers) were dissected into lean, fat, bone and tendons. 24h after slaughter pH and meat color were measured on the cross section of *musculus longissimus dorsi* (MLD) between ribs 7 and 8. Color was measured with Minolta chromometer CR30. MLD samples for chemical, sensory and collagen analysis were taken between 8^{th} and 13^{th} rib and frozen at -20 °C prior to analysis. Shear force values were recorded with Instron instrument. Colorometric analysis for hydroxyproline was used to determine the collagen concentration (Bergman and Loxely, 1963 adopted by Matissek et al. 1992). Collagen solubility was determined after 1h extraction at 77°C in ringer solution (Hill, 1966).

Statistical analysis was performed by GLM procedure (SAS, 1989), differences among .three groups were tested with contrasts.

RESULTS AND DISCUSSION

Purebred Holstein bulls were slaughtered at 537 kg live weight, crossbred bulls at 481 kg and heifers at 417 kg (Table 1). Crossbred bulls had 4.5 % higher dressing percentage than purebreed bulls. In dressing percentage heifers also exceed the H bulls for more than 3%. Similar results were presented also by Purchas et al. (1992). Crossbreeds exhibited almost for one class better conformation at the same degree of fatness. Carcass of H bulls were longer and deeper than carcass of HxPi animals. HxPI bulls had the highest lean percentage, followed by heifers and H bulls, but only the difference between both groups of bulls were statistically significant. HxPi bulls had also the lowest percentage of carcass fat and differed significantly from other two groups. Crossbreed animals had also lower percentage of bone. Heifers exhibited statistically significant lower pH values 24h post mortem than bulls. Crossbreeds had statistically significantly lighter meat (higher L value). Groups differed also in chemical composition of MLD muscle. Heifers exhibited the highest intramuscular fat and the lowest total collagen content. Crossbreeds showed lower sheare force values and better tenderness, but only the difference between HxPi and H bulls were statistical significant. There were no differences among three groups in juiciness and aroma. Also Augustini et al. (1992) found advantages in carcass quality from cross breeding German Braunvieh with beef breed, but the differences in meat quality were less pronounced.

CONCLUSIONS

The most important result of crossing Holstein cows with Piemontese bulls was improvement of dressing percentage, conformation and carcass composition. From meat quality traits, tenderness of meat was also improved.

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Table 1: LSQ-means and standard errors for carcass traits of Holstein and their crossbreeds with Piemontese

	LS means ± SE		
	Holstein	Holstein x Piemontese	Holstein x Piemontese
	Bulls	Bulls	Heifers
Live weigh at slaughter, kg	537 ±12^{a}	481 ±9^{b}	417 ±10^{c}
Carcass weight, kg	283 ±8^{a}	275 ±6^{a}	229 ±6^{b}
Dressing percentage, %	52.7 ±0.4^{a}	57.2 ±0.3^{b}	55.0 ±0.4^{c}
EUROP-conformation[1]	2.17 ±0.14^{a}	3.08 ±0.10^{b}	3.11 ±0.11^{b}
EUROP-fatness	3.00 ±0.01^{a}	3.00 ±06^{a}	3.11 ±0.06^{a}
Carcass length, cm	134.1 ±1.4^{a}	129.6 ±1.0^{b}	128.1 ±1.1^{b}
Carcass depth, cm	43.9 ±0.6^{a}	41.9 ±0.4^{b}	38.5 ±0.5^{c}
Carcass composition			
-lean, %	71.3 ±0.8^{a}	76.1 ±0.8^{b}	74.0 ±0.8^{ab}
-fat, %	6.7 ±0.5^{a}	4.8 ±0.5^{b}	7.6 ±0.5^{a}
-bone, %	20.5 ±0.8^{a}	17.9 ±0.8^{b}	17.4 ±0.8^{b}
Share of more valuable cuts, %[2]	54.1 ±0.6^{a}	55.9 ±0.6^{b}	57.4 ±0.5^{b}

[1] *E = 5; U = 4; R = 3; O = 2; P = 1.*

[2] *hind leg without shank, tender loin, loin, back and shoulder*

Values marked with different letters differ significantly ($p<0.05$)

Table 2: LSQ-means and standard errors for meat characteristics of Holstein and their crossbreeds with Piemontese

	LS means ± SE		
	Holstein	Holstein x Piemontese	Holstein x Piemontese
	Bulls	Bulls	Heifers
MLD muscle			
pH24	5.74 ±0.02^{a}	5.74 ±0.02^{a}	5.66 ±0.02^{b}
Meat colour			
-L	39.22 ±0.87^{a}	43.69 ±0.87^{b}	42.28 ±0.87^{b}
-a*	21.63 ±0.90^{a}	22.27 ±0.84^{a}	22.02 ±0.84^{a}
-b*	10.95 ±0.6^{a}	11.58 ±0.62^{a}	11.36 ±0.62^{a}
MLD chemical composition			
water, %	72.63 ±0.42^{a}	73.87 ±0.39^{b}	71.45 ±0.42^{a}
intramuscular fat, %	4.59 ±0.73^{ab}	4.05 ±0.67^{a}	6.26 ±0.73^{b}
total collagen, mg/g	5.79 ±0.615^{a}	6.08 ±0.57^{a}	3.92 ±0.57^{b}
soluble collagen, mg/g	0.79 ±0.24^{a}	1.12 ±0.23^{a}	0.57 ±0.23^{a}
% of soluble collagen, %	13.47 ±2.55^{a}	18.14 ±2.36^{a}	15.15 ±2.36^{a}
shear force – longitudinal, N	42.1 ±2.5^{a}	27.5 ±2.3^{b}	27.2 ±2.3^{b}
shear force – transverse, N	45.8 ±2.5^{a}	32.0 ±2.3^{b}	38.8 ±2.3^{ab}
Sensory traits[1]			
tenderness	5.0 ±0.3^{a}	6.1 ±0.3^{b}	5.7 ±0.3^{ab}
juiciness	5.8 ±0.1^{a}	6.1 ±0.1^{a}	6.1 ±0.1^{a}
aroma	5.8 ±0.1^{a}	5.8 ±0.1^{a}	5.8 ±0.1^{a}

[1] *- 1 - is the worst and 7 the best note*

Values marked with different letters differ significantly ($p<0.05$)