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MEAT QUALITY CHARACTERISTICS OF A CROSSBRED BETWEEN PIEDMONT BULL AND CHIANA COW IN COMPARISON WITH RELATIVE PURE-BREEDS

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INTRODUCTION

The meat Italian bovine breeds (Chiana, Piedmont, Marche, Romagna) are utilized for crossbreed on milk and local breeds and as pure breed for production of valuable meat. Because the experiences in this context were not exhaustive (Mazziotti *et al.*, 1981), ten years ago, we conducted a large experiment, supported by Italian Ministry of Agriculture, in cooperation with several University Institutes, for the optimization of type of crossbreed and weight of slaughter for meat production (Gigli *et al.*, 1987; Lucifero *et al.*, 1987; Malossini *et al.*, 1987; Zappa *et al.*, 1987) involving also the French breeds (Charolais and Limousin). In this trial meat quality (Matassino *et al.*, 1985) and economic aspects (Endrighi *et al.*, 1990) were also estimated. The overall results of the trial showed that Chiana and Piedmont breeds were the best for global efficiency and carcass and meat quality.

Pure bred Chiana is better for the very high average daily gain, the remarkable final weight and the big food intake (Lucifero *et al.*, 1991), while Piedmont is the better for the good conformation and low fatness of carcass, the very high dressing and meat percentage and the excellent meat quality (Tartari *et al.*, 1988).

The first-cross between a Piedmont bull and a Chiana cow, if it blends the best characteristics of these two breeds, is expected to be a good meat producer and also an efficient bull to be utilized on cows of milk and local breeds.

The general aim of this trial was to confirm this hypothesis using performance and progeny testing. In this communication we show in particular the meat quality results of performance test of Chiana, Piedmont and their crossbred.

MATERIALS AND METHODS

In vivo performance testing was performed on 84 young bulls (15 Chiana (CN), 12 Piedmont (PD) and 57 PDxCN). The start was at an average of six months of age and the end at 15 months. The animals were reared on slatted floors and fed with a diet based on maize silage.

The best 20 PDxCN crossbreeds were chosen as bulls for progeny testing, that is in development, on milk breed (Friesian) in artificial insemination and also on local breed (Sarda, Podolica and Maremmana) in natural matings.

On 62 young bulls (13 CN, 12 PD and 37 PDxCN) all the usual data at slaughter and at dissection (ASPA, 1986) and also quality characteristics was collected.

On five muscles (*longissimus dorsi* (LD), *gluteobiceps* (GB), *caput longum tricipitis brachii* (CLoTB), *semitendinosus* (ST) *semimembranosus* (SM)) the physical quality of meat was examined. The parameters studied were: hardness (on raw and cooked samples) performed with INSTRON 1011 using Warner Bratzler Shear (four recordings for each muscle); water losses during conservation and after cooking in water at 75°C for 55 minutes; colour on raw meat, using a MacBeth 1400 spectrophotometer with the CIELAB system analyzing Hue (H), Saturation (C) and Lightness

(L) (with illuminant C 6770°K cloudy weather day light) (three recordings for each muscle). The data were analyzed with the SAS GLM procedure according to the following statistical model:

$$Y_{ijk} = M + A_i + B_j + (AB)_{ij} + E_{ijk}$$

where: M = mean;

A_i = genotype (i = 1,...,3);

B_j = muscle (j = 1,....,5);

E_{ijk} = residual variance.

RESULTS AND DISCUSSION

The productive performance of PDxCN were very good. ADG was similar to CN (1.388kg/d vs 1.432kg/d) and higher than PD (1.202kg/d; +15.5%) with a lower conversion index (6.45MFU/kg vs 7.16MFU/kg). The heterosis for these parameters was +5.4% and -7.2% (Gigli *et al.*, 1992).

Net dressing percentage and tissue composition (percentage of meat, fat and bone) of PDxCN were intermediate in comparison with parental breeds (heterosis is +0.425, -0,49%, +9.13% and -0.90% respectively).

The PDxCN showed in the raw meat (average on five muscles) an intermediate value of hardness between parental breeds, higher in comparison with PD (+27.7%) and lower with respect to CN (-3.6%). For cooked meat instead PDxCN showed the highest value both versus PD (14.2%) and versus CN (+3.8%) but was not significant versus CN.

The hardness of crossbreeds was higher compared with the mean values (+10%) of parental breeds both in raw and cooked meat. The water losses from raw meat don't show differences between genotypes while for cooked meat the PDxCN was intermediate to parental breeds (0.99 percentage points vs CN and +2.64pp vs PD); the heterosis was +4.8% and +2.9% respectively for raw and cooked meat. The colour characteristics of PDxCN were not different from those of CN; The lightness and hue of PDxCN and CN were lower than PD (-3.6% and -5.0%) while the saturation was higher (+5.8%). The PD meat had a colour which was brighter, less saturated and more away from purple-red in comparison with CN and PDxCN.

The crossbreed showed a negative heterosis for lightness and hue (2.2%) and positive for saturation (+3.1%). This means that the meat of PDxCN was less light, more saturated and near purple-red compared with parental breeds.

ST presented the highest value of hardness, followed by CLoTB and SM, while the lowest values were shown by GB and LD; the trend is similar for water loss parameters.

For colour the ST muscle had the highest values for lightness, hue and saturation; the GB muscle showed the lowest values for all three parameters; the other muscles were a intermediate, the SM and LD muscles differed only for saturation which was higher for SM.

The rank of the muscles was almost the same for all the parameters considered since the characteristics depend on structure and function of each muscle.

There were important interactions between breeds and muscles, particularity in the colour, in fact LD and ST muscles in PDxCN showed a similar luminosity to PD (-1.5%).

CONCLUSIONS

The very good in vivo results were not confirmed for meat quality characteristics. The crossbreed PDxCN showed higher heterosis for the quantitative characteristics, ADG and conversion index, while for qualitative parameters like dressing percentage, tissue content in side and quality characteristics of meat, the improvement of crossbreed in

comparison with parental breed was very low.

The other hand the meat quality of PD and CN young bulls was very good (Lucifero *et al.*, 1991) and so it is very difficult to improve this situation.

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Table 1. Meat quality characteristics.

	Hardness (kg/cm^2)		Water losses (%)	
	Raw	Cooked	Raw	Cooked
Genotypes				
PDxCN	2.67[a]	1.93[a]	1.75	26.68[b]
CN	2.77[a]	1.86[a]	1.62	30.67[a]
PD	2.09[b]	1.69[b]	1.73	27.04[c]
Muscles				
ST	3.23[a]	2.30[a]	2.32[a]	31.79[a]
GB	2.13[c]	1.52[c]	1.33[d]	28.19[c]
CLoTB	2.54[b]	1.85[b]	1.51[cd]	29.53[bc]
SM	2.61[b]	1.90[b]	1.77[b]	30.12[b]
LD	2.02[c]	1.59[c]	1.57[c]	26.01[d]
Mean	2.58	1.87	1.72	29.39
Res. Var.	0.262	0.083	0.243	12.804

	Colour		
	Lightness	Saturation	Hue
Genotypes			
PDxCN	40.83[b]	28.53[a]	34.89[b]
CN	41.10[b]	28.42[a]	34.72[b]
PD	42.50[a]	26.91[b]	36.63[a]
Muscles			
ST	45.44[a]	28.92[a]	38.94[a]
GB	39.83[c]	26.90[c]	33.88[d]
CLoTB	40.54[b]	27.92[b]	33.96[d]
SM	41.00[b]	29.53[a]	35.58[b]
LD	40.55[b]	26.50[c]	34.72[c]
Mean	41.21	28.20	35.19
Res. Var.	4.479	4.650	2.465

Different superscripts in each factor indicate significant differences ($P<0.05$).