

SLAUGHTERING TRAITS AND MEAT QUALITY IN MARCHIGIANA CATTLE BREED

Matassino D.^{1,2}, Barone C.M.A.¹, Colatruglio P.¹, Zullo A.¹, Fornataro, D.², Incoronato, V.² and Occidente M.²

¹Department of Animal Science and Food Inspection – Section T.M. Bettini, University of Naples 'Federico II', 80055 Portici (NA), Italy

² Consortium for Experimentation, Dissemination and Application of Innovative Biotechniques (COOnSDABI), Italian National Focal Point (NFP.I – FAO) for the safeguard of animal germplasm at risk of extinction. C.da Casaldianni, 80020 Circello (BN), Italy

Background

The Marchigiana breed reared in Campania region has 8,259 registered heads of which 7,018 in Benevento province (ANABIC, 2001). It is a breed characterised by high somatic development and daily weight gain. As regards its aptitude for meat production, Falaschini *et al.* (1997) registered marked variability in the age and slaughter weight, due to different techniques of breeding (including feeding), and high net yield (67-68 %) that indicate a remarkable aptitude for meat production. Moreover, Marchigiana, in comparison with Piemontese and Romagnola breeds, showed great development of the hindquarters (thigh and loins) and was considerably superior for the 1st and 2nd quality gourmet cuts (Falaschini *et al.*, 1995). In previous papers, examining rheological and colour traits of meat obtained from subjects derived by crossbreeding cattle with meat production aptitude (Charollais, Chianina, Limousin, Piemontese, Red Pied Friuli, Romagnola) and Italian friesian and Italian Brown Swiss, Matassino *et al.* (1975 a e b, 1985a e b, 1986) evidenced that Marchigiana crossbreeds occupy an intermediate qualitative level when compared with other crossbreeds considered.

Objective

The aim of this research is to evaluate the production and qualitative characteristics of meat obtained from Marchigiana cattle breed, males and females, reared in Benevento province. These results will be compared with those obtained in other studies in order to verify if the Marchigiana reared in this environment has modified the meat production aptitude during the last years, as consequence of selection and genetic improvement.

Methods

Thirty - two subjects of which 26 males and 6 females were used. The animals could be considered as a representative sample of the breed reared in Benevento province. The average live weight at slaughter was 656.8±42.2 kg for the males (20 months of age) and 488.7± 60.4 kg for females (17 months of age). The carcasses were refrigerated for 4 days at 0-2 °C. After slaughtering the following data were registered: weight of the hot carcass, chest depth, side length, length and wide of leg. The qualitative characteristics of meat were evaluated on *Longissimus dorsi* (LD) and *Semitendinosus* (St) muscles of ten males and four females. The rheological traits (hardness, cohesiveness, springiness, adhesiveness, chewiness and total released water) were assessed using texturometer. Meat colour (L*, a*, b*, chroma and hue) were detected using spectrophotometer U3000 Hitachi equipped for semisolid material. Moreover the percentage of myoglobin, oxymyoglobin and metmyoglobin was computed in accordance with Krzywicki (1979). Experimental data were processed using the following model of variance analysis: $y_{ijk} = \mu + \text{sex}_i + \mu_j + \epsilon_{ijk}$ where: y = experimental data, μ = overall mean; sex = effect of sex ($i=1,2$), μ_j = effect of muscle ($j=1,2$); ϵ = error. The interaction between factors was eliminated from the model because not significant.

Results and discussion

At the slaughtering the males, as attended, gave a heavier carcass than females (408.3±32.5 kg vs 293.2±45.6 kg; $P<0.001$). Moreover the gross yield was respectively 62.17% and 59.80% in two sexes ($P<0.05$) and males were characterised by a longer side (137.4 cm vs 127.0 cm; $P<0.001$), a higher chest wide (46.83 cm vs 42.67 cm; $P<0.001$) and leg having higher value of length (85.17cm vs 81.00 cm; $P<0.05$) and width (129.81 cm vs 117.5 cm; $P<0.001$). These results, particularly for side length and yield at the slaughter, agree with those obtained by Falaschini *et al.* (1995) on males.

Regarding rheological characteristics of meat (table 1), males were not statistically different from females, even if the former tends to have higher values of hardness and chewiness and a lower water holding capacity.

The sex has no influence on colour traits: reflectance spectrum from 380 to 780 nm, lightness (L*), redness (a*) and yellowness (b*). The only significant difference was for oxymyoglobin percentage, higher in males (table 1).

Between the considered muscles, St was the hardest, having a high value of chewiness and lower water holding capacity ($P<0.001$); moreover the same muscle was lighter for the higher reflectance percentage at the considered wave length ($P<0.001$) and showed higher values of lightness ($P<0.001$), red index, yellow index and chroma ($P<0.01$).

Meat colour, as known, is linked to myoglobin content, that on average is 80-90% of the total pigment and its forms: oxymyoglobin, responsible for bright red, and metmyoglobin that produces undesirable brown pigment. The content in myoglobin and its derivative forms was not different between the two considered muscles and the observed differences estimated a percentage of oxymyoglobin that tends ($P<0.10$) to be higher in LD, whereas metamyoglobin percentage tends to be higher in ST muscle. The pigment content seems to be related to the function of muscle: postural muscles, such as *Longissimus*, have usually a lower myoglobin content than locomotory muscles.

In conclusion, qualitative traits of the meat obtained from Marchigiana place this breed at sufficiently high level, confirming what evidenced by Gigli *et al.* (1994) in a study with the aim to compare qualitative characteristics of LD muscles in Chianina, Romagnola and Marchigiana breeds; in particular, the above cited authors evidenced that the Marchigiana gives more tender meat characterised by a higher water holding capacity and intermediate values of lightness, chroma and hue.

Pertinent literature

ANABIC (2001). Associazione nazionale allevatori bovini italiani da carne.

Falaschini, A., Massari, M. e Trombetta, M.F. (1995). Marchigiana, Romagnola, Piemontese: razze italiane per la produzione del vitellone. *Taurus*, VII (4), 12.

- Falaschini, A., Mondini, S., Filippini, F., Trombetta, M.F. (1997). Valutazione al macello della progenie di tori marchigiani sottoposti o meno al performance test. *Taurus*, IX (2), 28.
- Gigli, S., Iacurto, M., Cennamo, D. (1994). Vitelloni di razza Chianoina, Marchigiana e Romagnola: caratteristiche chimico-fisiche del Longissimus dorsi. *Proc. Italian beef cattle contest*. Perugia 16-18 september 1994, 249.
- Matassino, D., Girolami, A., Colatruglio, P., Cosentino, E., Votino, D., Bordi, A. (1975a). Colour evaluation of muscles in 10 bovine crossbreeds. *EEC Sem. on Criteria and methods for assesment of carcass and meat chraracteristics in beef production experimnts*. Zeist; Netherlands, 285.
- Matassino, D., Bordi, A., Colatruglio, P., Cosentino, E., Girolami, A., Casalini, F and Chiericato, G. (1975b). Alcune caratteristiche fisiche rilevate con la tecnica tessurometrica su muscoli di carcasse di 10 tipi genetici bovini. *Genetica agraria*, XXIX (1-2), 11.
- Matassino, D., Cosentino, E., Girolami, A., Barone, C.M.A., Colatruglio, P., Grasso, F., Ramunno, L., Zullo, A. - (1985a) .Alcune caratteristiche qualitative della carne di vitelloni appartenenti a 14 tipi genetici. *Agricoltura Ricerca*, 7 (50), n.s., 7.
- Matassino, D., Cosentino, E., Girolami, A., Barone, C.M.A., Colatruglio, P., Grasso, F., Ramunno, L., Zullo, A. (1985b) - Alcune caratteristiche qualitative della carne di vitelloni appartenenti a 6 tipi genetici. *Agricoltura Ricerca*, 7 (50), n.s., 35.
- Matassino, D., Cosentino, E., Colatruglio, P., Girolami, A., Grasso, F., Napolitano, F., Ramunno, L., Zullo, A (1986)- Alcune caratteristiche qualitative della carne di vitelloni appartenenti a 10 tipi genetici. *Agricoltura Ricerca*, 8 (67), n.s., 57.
- Krzywicki, K. (1979). Assessment of relative content of myoglobin, oxymyoglobin and metmyoglobin at the surface of beef. *Meat Sci.*, 3, 1.

Acknowledgment

Research supported by INEA- POM-A06 and Departmental founds.

Table I. Mean value (m) and variation coefficient (v.c., %) of some meat qualitative characteristics.

Characteristics (¹)	Sex (²)				Muscle (²)			
	male		female		St		LD	
	m	v.c., %	m	v.c., %	m	v.c., %	m	v.c., %
Hardness, kg	2.93	36	2.72	40	3.58 a	28	2.08 b	22
Cohesiveness, TU	0.591	11	0.576	10	0.581	12	0.586	9
Springiness, mm	12.07	10	12.42	10	12.49	10	12.00	9
Adhesiveness, TU	5.51	141	3.55	111	5.32	144	3.75	120
Chewiness, TU	2100	40	1953	44	2595 A	30	1457 B	27
Total released water, cm ²	40.13	31	34.41	42	42.45 A	30	32.09 B	31
Lightness (L*), %	45.37	6	45.31	5	46.89 A	4	43.79 B	4
Red index (a*), %	17.90	13	18.61	5	19.08 a	9	17.43 b	12
Yellow index (b*), %	13.09	16	13.84	7	14.17 a	12	12.76 b	15
Chroma, %	22.18	14	23.20	5	23.77 a	10	21.61 b	12
Hue, %	36.10	5	36.64	4	36.60	4	36.15	5
Myoglobin, %	1.72	10	1.80	4	1.78	7	1.74	10
Oxymyoglobin, %	96.55 a	0	96.46 b	0	96.47	0	96.54	0
Metamyoglobin, %	1.73	3	1.74	3	1.75	3	1.72	3

(¹) UT = Texturometer Unit.

(²) Different letters indicate significant difference for $P < 0.01$ (small letter) and $P < 0.001$ (capital letter).