Utilization of the Casertana pig to obtain traditional, typified labelled salami. II. Qualitative characteristics of meat at carcass jointing

Castellano N., Colatruglio P., Barone C.M.A., Gigante G., Rossetti C.E., Zullo A., Matassino D.

in

Audiot A. (ed.), Casabianca F. (ed.), Monin G. (ed.).
5. International Symposium on the Mediterranean Pig

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 76

2007
pages 207-211

Utilization of the Casertana pig to obtain traditional, typified labelled salami. II. Qualitative characteristics of meat at carcass jointing

N. Castellano*, P. Colatruglio, C.M.A. Barone**, G. Gigante*, C.E. Rossetti*, A. Zullo** and D. Matassino*,*****

*ConSDABI. NFP.I.- FAO.- Centro di Genomica e di Proteomica per la Qualità e per l'Eccellenza alimentare, Piano Cappell, 82100 Benevento, Italy

**Dipartimento Scienze zootecniche e Ispezione degli alimenti-Università di Napoli Federico II Via Università 100, 80055 Portici (Napoli), Italy

***Dipartimento Scienze biologiche e ambientali – Università degli Studi del Sannio Via Port'Arsa,11, 82100 Benevento, Italy

SUMMARY – The research was carried out on 15 castrated males and 10 females of the Casertana pig slaughtered at a live weight ranging from 130 kg to 250 kg. Rheological and colorimetric characteristics were determined on the following muscles: *caput longum tricipitis brachii (CL), longissimus dorsi (LD), psoas maior (PM), anconeus (PA), supraspinatus (SS)* after storing at -20°C for 120±10 days . Data were elaborated by GLM procedure of SAS using live weight as covariate and sex, muscle and their interaction as fixed factors. Results showed that females have darker meat (P<0.01), with a lower value of a* (P<0.001) and a higher value of b* (P<0.001) in comparison with castrated males. LD muscle showed the lowest values of a* and b* and it was characterised by greater lightness, with the lowest chroma and the highest hue values. On the other hand, PA was the darkest muscle and showed the worst rheological traits. PM, which was the most red muscle with the highest b* value, exhibited the lowest hardness and chewiness values. Sex did not significantly affect rheological characteristics.

Keywords: Pork, autochthonous genetic type, texture, colour, meat quality.

RESUME – *"Utilisation de porcins de race Casertana pour produire le salami sous label "type traditionnel". II. Caractéristiques qualitatives de la viande à la découpe de la carcasse". L'étude a été conduite sur 15 mâles castrés et 10 femelles de porcs de race "Casertana" abattus à un poids vif (PV) compris entre 130 kg et 250 kg. Les caractéristiques rhéologiques et colorimétriques de la viande ont été mesurées sur les muscles: caput longum tricipitis brachii (CL), longissimus dorsi (LD), psoas maior (PM), anconeus (PA), supraspinatus (SS) après 120±10 jours de congélation à -20°C. Les résultats ont mis en évidence que les femelles ont une viande plus foncée (P<0,01), avec une valeur inférieure de a* (P<0,001) et une valeur plus élevée de b* (P<0,001) par rapport aux mâles castrés. Le muscle LD a montré une valeur inférieure de a* et b* et il était plus brillant, avec la valeur la plus basse de saturation (C) et la tonalité de couleur (H) la plus élevée. Au contraire le PA s'est révélé le muscle plus foncé et avec les plus mauvaises caractéristiques rhéologiques. Le PM, qui s'est révélé le muscle le plus rouge avec la valeur la plus grande de b*, a montré les valeurs les plus basses de dureté et de masticabilité. On n'a observé aucune différence significative entre les deux sexes pour ce qui est des caractéristiques rhéologiques.*

Mots-clés : *Porc, types génétiques autochtones, couleur, qualité de la viande.*

Introduction

Italy is characterized by numerous and diversified cultural traditions which are strongly anchored to rural territory. These traditions are expressed as *traditional typified products,* a treasure that needs to be preserved and increased in order to improve the sustainable development of our agro-ecosystem. Valorisation of these *productive specificities* is strictly linked to the employment of autochthonous genetic types (AGT). These populations represent the result of biological modifications which have occurred throughout the centuries (Matassino, 1997). Previous results on AGT showed that the qualitative characteristics of meat are comparable with those of improved breeds (Grasso *et al.*, 1996a; Zullo *et al.,* 2003). Salami also obtained from several AGTs are characterized by good colour, rheology and sensory traits (Diaferia *et al.,* 1996, 2000; Grasso *et al.,* 1996b; Zullo *et al.,* 1996*a*; 1996*b*; 2000).

The aim of this study was to investigate the qualitative characteristics of meat of the autochthonous genetic type Casertana in order to define its utilization for *traditional typified labelled salami.* The initial results will be discussed in this paper.

Materials and methods

The study was carried out on 15 castrated males and 15 entire females of Casertana pig, reared in an intensive system, at the experimental farm of ConSDABI. The pigs were slaughtered once they had reached a live weight ranging from 130 to 250 kg. After 72 hours of refrigeration (4°C) the muscles *caput longum tricipitis brachii (CL), longissimus dorsi (LD), psoas maior (PM), anconeus (PA), supraspinatus (SS)* were isolated from carcasses.

For each muscle two/three determinations were made after storing at –20°C for 120±10 days using a U3000 spectrophotometer (Hitachi) equipped with integrating sphere (A and D65 as illuminants and 10° as standard observer) for colour and the Texturometer (Zenken, Tokio) for rheological characteristics. Moreover Chroma $(a^{*2}+b^{*2})^{0.5}$ and Hue (arctg b*/a*) were also calculated.

Data were analysed by GLM procedure (SAS, 1997) using live weight as covariate and sex, muscle and their interaction as fixed factors (Matassino *et al*., 1984). Mean values of factors that interact were estimated according to Zullo *et al*. (2003) and the significance of the differences among the estimated means was tested using Student's *t* test.

Results and discussion

The obtained results allowed us to explain between 44 and 81% of the total variability in rheological and colour values. Muscle and sex are significant factors for colorimetric aspect of meat and they significantly interact only for L* and Hue. Females have darker meat (P<0.01), lower redness value (P<0.01) and higher yellowness (P<0.01), in comparison to castrated males (Table 1), according to the results of Palazzo *et al*. (2000) in Calabrese, Cinta senese and Nero Siciliano AGT. On the other hand, sex did not significantly affect rheological characteristics (Table 1).

Table 1. Estimated mean value (± std error) of colour and rheological traits and significant (*) comparisons between sex

Factor	1. Colour characteristics				
	Lightness ($L^{\dagger}$)	Redness ($a^{\dagger}$)	Yellowness ($b^{\dagger}$)	Chroma	Hue
Illuminant A					
Castrated m.	39.03 ± 0.37^{a}	14.29 ± 0.28^{A}	9.17 ± 0.20	16.96 ± 0.30^{A}	32.88 ± 0.60^{B}
Females	37.46 ± 0.49^{b}	10.71 ± 0.37^{B}	9.89 ± 0.26	14.65 ± 0.40^{B}	42.24 ± 0.80^{A}
Illuminant D65					
Castrated males	37.72 ± 0.36	8.21 ± 0.22^{A}	9.30 ± 0.16^{B}	12.44 ± 0.22	49.57 ± 0.78^{B}
Entire females	36.38 ± 0.48	5.04 ± 0.29^{B}	10.47 ± 0.22^{A}	11.65 ± 0.30	63.81 ± 1.04^{A}
	2. Rheological characteristics				
	Hardness	Cohesiveness	Springiness	Adhesiveness	Chewiness
Castrated males	1.99 ± 0.08	0.563 ± 0.01	12.04 ± 0.12	3.96 ± 0.35	1401 ± 52
Entire females	1.90 ± 0.10	0.522 ± 0.01	12.32 ± 0.15	4.03 ± 0.46	1207 ± 67

† Means in the same column with different superscripts are significantly different (a,b: P<0.05; A,B: P<0.01).

LD muscle had the lowest value of redness (a*), yellowness (b*) and the highest L*, so that it appeared globally lighter than the other muscles, also showing lower value of Chroma and high value of Hue; on the other hand PA muscle appeared to be the darkest (Table 2). The different behaviour of LD muscle is also evident from Fig. 1: the reflectance spectra of CL, PM, PA, SS are very similar, whereas LD differs greatly from the others.

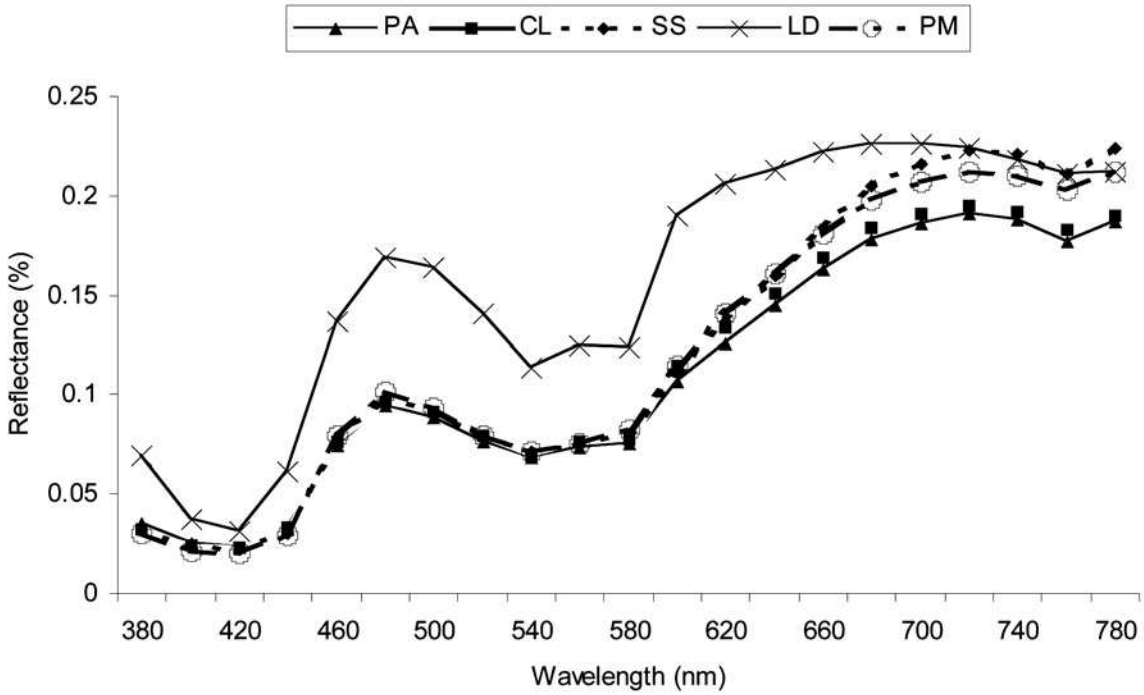

Fig. 1. Reflectance spectrum of the considered muscles.

The colour of muscle, mainly due to myoglobin, changes in relation to physiological function and to proportions of various fibre types. In fact, LD appears to be less red than PM because of its high number of glycolitic fibres (Barone *et al*., 2000); in turn, PM muscle contains a high number of oxidative fibres.

The rheological characteristics of meat, were significantly affected only by muscle factor (Table 2): the most red PM with high value of yellowness, showed the lowest value of hardness and chewiness, while PA muscle evidenced the worst rheological traits, followed by CL. Also Palazzo *et al*. (2000) observed that PM has better rheological characteristics and muscles occupy the same position, confirming the strong individuality (due to the composition and function).

Conclusion

The results of this study confirmed previous studies on autochthonous genetic types: muscle is one of the most important sources of variation for qualitative characteristics. The *longissimus dorsi* appeared to be the lightest and the least red muscle probably due to its high number of glycolitic fibres, whereas PM is one of the most red muscles due to the higher number of oxidative fibres. Furthermore few investigations present the reflectance spectrum of meat and meat products, although the reflectance spectrum could be more explicative than CIE L*a*b* coordinates.

Table 2. Estimated mean value (± std error) of colour and rheological traits and significant (†) comparisons between muscles

Traits	Muscle				
	PA	CL	SS	LD	PM
Illuminant A					
L†	35.68 ± 0.35^{c}	36.45 ± 0.46^{bc}	36.73 ± 0.35^{b}	45.35 ± 0.36^{a}	37.03 ± 0.34^{b}
a†	11.92 ± 0.26^{a}	12.43 ± 0.35^{a}	13.45 ± 0.26^{bc}	11.29 ± 0.27^{c}	13.41 ± 0.26^{d}
b†	9.16 ± 0.19^{c}	9.74 ± 0.25^{ac}	10.17 ± 0.19^{a}	8.33 ± 0.19^{b}	10.25 ± 0.19^{a}
Chroma	15.14 ± 0.28^{b}	15.87 ± 0.38^{b}	16.92 ± 0.28^{a}	14.14 ± 0.29^{c}	16.94 ± 0.28^{a}
Hue	37.77 ± 0.56^{a}	38.60 ± 0.76^{a}	37.12 ± 0.56^{a}	66.90 ± 0.58^{a}	37.43 ± 0.56^{a}
Illuminant D65					
L†	34.53 ± 0.34^{c}	35.24 ± 0.45^{cb}	35.41 ± 0.34^{cb}	44.35 ± 0.35^{a}	35.72 ± 0.34^{b}
a†	6.33 ± 0.21^{a}	6.74 ± 0.28^{ac}	7.47 ± 0.21^{b}	5.24 ± 0.21^{d}	7.36 ± 0.21^{bc}
b†	9.39 ± 0.15^{c}	9.93 ± 0.21^{b}	10.24 ± 0.15^{ba}	9.36 ± 0.16^{c}	10.50 ± 0.15^{a}
Chroma	11.48 ± 0.21^{c}	12.15 ± 0.28^{b}	12.79 ± 0.21^{ba}	10.89 ± 0.22^{c}	12.91 ± 0.21^{a}
Hue	56.02 ± 0.74^{b}	56.36 ± 0.99^{b}	54.04 ± 0.74^{b}	62.05 ± 0.76^{a}	54.97 ± 0.74^{b}
Hardness	3.51 ± 0.13^{a}	2.56 ± 0.17^{b}	1.26 ± 0.14^{d}	1.78 ± 0.13^{c}	0.61 ± 0.13^{e}
Cohesiveness	0.588 ± 0.01^{a}	0.571 ± 0.01^{ab}	0.475 ± 0.01^{d}	0.548 ± 0.01^{b}	0.532 ± 0.01^{bc}
Springiness	12.03 ± 0.19^{a}	11.84 ± 0.26^{a}	12.13 ± 0.20^{ab}	12.25 ± 0.20^{ab}	12.64 ± 0.20^{b}
Adhesiveness	0.802 ± 0.59^{b}	1.412 ± 0.78^{b}	2.388 ± 0.62^{b}	7.787 ± 0.61^{a}	7.593 ± 0.60^{a}
Chewingness	2358 ± 87^{a}	1788 ± 114^{b}	735 ± 91^{d}	1231 ± 90^{c}	411 ± 88^{e}

† Different letters in the same row indicate significant level of P<0.05.

Acknowledgements

Research supported by MiPAF, Regione Campania, Provincia di Benevento and EU.

References

Barone, C.M.A., Abbatiello, M., Esposito, I., Cappuccio, A., Occidente, M. and Matassino, D. (2000). Some aspects of meat production in pig autochthonous genetic types. III. Morphometric characteristics of fibre types and adipocytes. *Proc. 4th Int. Symp. on Mediterranean Pig*. Évora (Portugal), 26-28 November 1998. Tradition and innovation in Mediterranean pig production. *Options Méditerranéennes, Serie A,* n.41,*CIHEAM;* pp. 233-236.

Diaferia, C., La Pietra, L., Longo, M., Magliano, V., Pirone, G. and Rocco, M. (2000). "Napoli type" salami processing from various, indigenous genetics lines of pigs. III. Chemical-physicl and microbiological characteristics. *Proc. 4th Int. Symp. on Mediterranean Pig*. Évora (Portugal), 26-28 November, 1998. Tradition and innovation in Mediterranean pig production. *Options Méditerranéennes, Serie A,* no 41,*CIHEAM*, pp. 241-244.

Diaferia, C., Cappuccio, A., D'Occhio, C., Grasso, F., La Pietra, L., Pirone, G. and Zullo, A. (1996). Impiego di microrganismi autoctoni per la preparazione del salame Napoli: caratteristiche finali in funzione del tipo e del livello di zucchero. *Atti III Symp. Int. sul Suino Mediterraneo.* Benevento, 30 Novembre, 2 Decembre 1995. *Prod. Anim.,* 9, III Serie, pp. 139-142.

Grasso, F., Cappuccio, A., Colatruglio, P., Girolami, A., Napolitano, F., Zullo, A. and Matassino. D. (1996a). Confronto fra suini Casertana e soui derivati. II. Alcuni rilievi alla sezionatura della carcassa. *Atti III Symp. Int. sul Suino Mediterraneo.* Benevento, 30 Novembre, 2 Decembre 1995. *Prod. Anim.,* 9, III Serie, pp. 125-129.

Grasso, F., Barone, C.M.A., Cappuccio, A., Colatruglio, P., Lucia, R., Zullo, A. and Matassino. D. (1996b). Il suino Calabrese per la produzione del salame *Napoli* con diversi tipi di zuccheri. III. Alcune caratteristiche colorimetriche. *Atti III Symp. Int. sul Suino Mediterraneo.* Benevento, 30 Novembre, 2 Decembre 1995. *Prod. Anim.,* 9, III Serie, pp. 171-174.

Matassino, D. (1997). Introduction to national strategies and local approaches and experiences. *Int. Symp. on Mediterranean animal germplasm and future challenges*, Benevento, 26-29 November 1995, *EAAP Publ.,* N°85: 251-260.

SAS (1997). User's guide 6.12 version. SAS Institute Inc., Cary, NC, USA.

Zullo A., Barone, C.M.A., Colatruglio, P., D'Agostino, N., Grasso, F., Palazzo, M. and Matassino, D. (1996a). Il suino Calabrese per la produzione del salame *Napoli* con diversi tipi di zuccheri. II. Alcune caratteristiche reologiche. *Atti III Symp. Int. sul Suino Mediterraneo.* Benevento, 30 Novembre, 2 Decembre 1995. *Prod. Anim.,* 9, III Serie, pp. 167-170.

Zullo, A., Diaferia, C., Grasso, F., Magliano, V., Palazzo, M., Palomba, C. and Matassino, D. (1996b). Il suino Calabrese per la la produzione del salame tipo Napoli con diversi tipi di zuccheri. IV. Alcune caratteristiche sensoriali. *Atti III Symp. Int. sul Suino Mediterraneo***.** Benevento, 30 Novembre, 2 Decembre 1995*. Prod. Anim.,* 9, III Serie, pp. 175-178.

Zullo, A., Diaferia, C., Genovino,G., Palazzo, M. and Matassino, D. (2000). Production of Napoli salami from some swine autochthonous genetic types. II. Sensory evaluation. *Proc. 4th Int. Symp. on Mediterranean Pig*. Évora (Portugal), 26-28 November, 1998. Tradition and innovation in Mediterranean pig production. *Options Méditerranéennes, Serie A,* n.41,*CIHEAM*, pp. 237-240.

Zullo, A., Barone, C.M.A., Colatruglio, P., Girolami, A. and Matassino, D. (2003). Chemical composition in pig meat of the genetic type "Casertana" and its crossbreeds. *Meat Sci,* 63: 89-100.