Meat quality of "Nero Siciliano" pigs fed with different diets

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Abstract

The effects of two different feeding strategies used during the fattening period on the meat quality of 24 "Nero Siciliano" pigs were examined. Animals were divided into two groups called Acorn (A) and Barley (B), consisting of 12 animals each, homogenous for live weight and sex. The trial was carried out over a period of 90 days. After slaughtering, *Longissimus lumborum* (Ll) muscle samples were taken from the left half of each carcass and examined for: pH_1 (after 45') and pHu (after 24h), colour parameters, cooking loss, Warner-Bratzler shear force, chemical and fatty acid composition. Results showed that pH_1 (A 6.28 *vs.* B 6.12), pHu (A 5.77 *vs.* B 5.63), cooking loss (A 24.60 *vs.* B 20.68), lightness (L*) (A 46.44 *vs.* B 48.61), C18:1ω9 (A 50.47 *vs.* B 43.91), MUFA (A 59.93 *vs.* B 48.90), SFA (A 34.04 *vs.* B 39.66), and PUFA (A 6.03 *vs.* B 11.44) between the two diets were statistically different.

Introduction

The "Nero Siciliano" pig is an autochthnous genetic type of the rural areas in north Sicily (Italy), traditionally reared under extensive conditions. Its presence is proved by fossil remains and by references of ancient writers in the Greek period (VII-VI b.C.). It is characterised by rusticity and good adaptability to the environment, and it grows with difficulty. It eats grasses, leaves, acorn, tubers, roots, and wild fruits. Because of its conformation (long muzzle, presence of strong bristles in dorsal trait) and habits, this pig is often confused with wild boars. Recently, the number of breeding animals increased, because of an enhanced demand of "Nero Siciliano" products. The aim of this work was to assess the effect of two different diets, on chemical-physical characteristics of meat and fatty acid composition of intramuscular fat of "Nero Siciliano" pigs.

Material and methods

The trial was carried out on 24 "Nero Siciliano" pigs, reared in the Nebrodi mountain region of Sicily. Animals were assigned to two groups called Acorn (A) and Barley (B), consisting of 12 animals each, homogenous for sex (castrated males) and body weight (BW, 79.48 ± 0.15 kg). Animals of group A were kept in a wooded area of 12 hectares, appropriately enclosed, and fed with acorn during the fattening period (90 days). Animals of group B were reared within an open-air system in the same rural region and fed with germinated barley on a basis of 2.5 kg/pig/d during the fattening period. After 90 days and a fasting period of 18 hours (ASPA, 1991), animals were slaughtered. At 45 minutes and at 24 hours post-mortem, pH_1 and pHu were respectively measured. Determinations on *Longissimus lumborum* muscle (Ll), carried out according to ASPA (1996), were: 1) chemical composition (moisture content, intramuscular fat percentage (IMF) as ether extract, protein percentage and ash); 2) water-holding capacity, determined by cooking loss in a water bath; 3) shear force measurements, by Warner-Bratzler Instron 5542 apparatus (WBS) on cooked meat in water bath; and 4) colour parameters L*, a* and b*, with a Minolta chromameter CR200. Fatty acid composition was analysed on intramuscular fat. In addition, the atherogenic index (AI) and the thrombogenic index (TI) were calculated by means of the equations proposed by Ulbricht and Southgate (1991). Data were analysed by using the GLM procedure of SAS (2001).

Results and discussion

Measurements of intramuscular pH values offer some useful provisional information about the possible defects of pork meat (PSE, DFD). In this case, the pH_1 (Table 1) was lower in pigs fed with barley (6.12) compared to those fed with acorns (6.28). In both groups, pH_1 values were similar to those reported by Zumbo *et al*. (2002) in the same breed. However, the pH_1 measured in group A was slightly lower than the one reported by Hansen *et al.* (2002) in pigs reared outdoors and fed with a similar diet (6.28 *vs.* 6.41). This difference, however, might be due to the different genetic types. The pHu resulted higher in group A (5.77) than in group B (5.63).

Table.1. Physical-chemical traits. Values found in *Ll* muscle samples in both groups

	Acorn	Barley	SE.	*P*
pH_1	6.28	6.12	0.04	**
pH_U	5.77	5.63	0.03	**
Weight loss (%)	24.60	20.68	0.94	**
WBS (kg f/cm^2)	3.92	3.98	0.16	N.S.
Moisture (%)	72.68	71.72	0.52	N.S.
Crude protein (%)	23.22	23.51	0.18	N.S.
Ether extract (%)	3.04	3.68	0.38	N.S.
Ash (%)	1.06	1.09	0.01	N.S.

** P<0.01; N.S. not significant

Weight loss (Tab. 1) in meat samples cooked in a water bath was 24.60% in group A and 20.68% in group B, supporting the findings of Zumbo *et al*. (2002). However, sample weight loss was lower than the one reported by Pugliese *et al*. (1999) in Large White x Cinta Senese breeds reared in open-air systems (34.07%). As measured by Warner-Braztler shear force (Tab. 1), the meat samples showed an almost identical tenderness in both groups (A 3.92 vs. B 3.98) that was lower than the 9.70 reported by Pugliese *et al*. (2004) in the same breed. No significant differences between the groups were found for chemical composition of *Ll* muscle. Fig. 1 shows the dietary-induced effects on the colour parameters of *Ll* muscle.

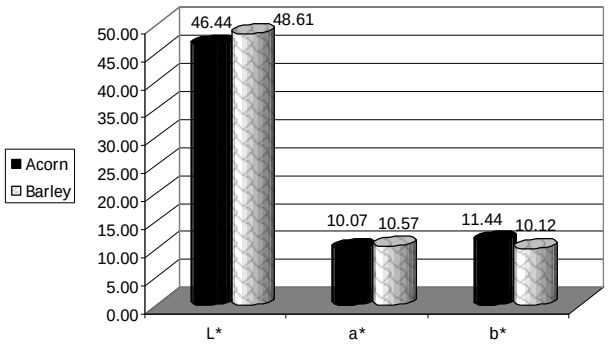

Figure 1. Comparison of colorimetric parameters found in *Ll* muscle samples.

Group A showed a lightness (L*) of 46.44, whereas the one found by Hansen *et al*. (2002) resulted higher (52.8) in pigs fed with similar diet. However, the index of redness (a*) and the index of yellowness (b*) resulted higher than those reported by Hansen *et al.* (2002) (10.07 vs. 8.99 and 11.44 vs. 6.04, respectively). The colorimetric parameters found for group B were similar to those of group A (L* 48.61; a* 10.57; b* 10.12). Results of both groups were in agreement with those reported by Estevez *et al*. (2002) for three lines of free-range reared Iberian pigs. Regarding the fatty acid composition, the *Ll* muscle of the pigs fed with acorn (Tab. 2 and Fig. 2), showed a higher and significant percentage of oleic acid C18:1ω9 (A 50.47 *vs.* B 43.91; P < 0.001) and total MUFA (A 59.93 *vs.* B 48.90; P < 0.001), than those fed with barley. Similar results were found by Daza *et al*. (2007) in the *Longissimus dorsi* (Ld) muscle of Iberian barrows of the Torbiscal line, fed with acorn and grass during the final 111 days of fattening (C18:1 48.32, and total MUFA 58.12). Group A, compared to group B, showed (Fig. 2) a lower percentage of SFA (A 34.04 *vs.* B 39.66; P < 0.001) and a better ratio of saturated and unsaturated fatty acids (A 1.94 vs B 1.52; P < 0.001). Statistically significant values (Tab. 2 and Fig. 2) were found for the *Ll* muscle of group B compared with group A for C18:2n6 (A 4.72 *vs* B 7.10; P < 0.001), C18:3n3 (A 0.23 *vs* B 0.90; P < 0.001), total PUFA (A 6.03 *vs* B 11.44; P < 0.001), for the polyunsaturated fatty acids of the series n6 (A 5.59 *vs* B 8.85; P < 0.001) and n3 (A 0.43 *vs* B 2.59; P < 0.001). The higher content of polyunsaturated fatty acids observed in the Ll muscle of group B animals might be traceable to the major presence of these fatty acids in barley.

Table 2. *Ll* muscle percentage of total fats and several UFAs of nutritional interest

	Acorn	Barley	ES	P
Lipid	3.04	3.68	0.03	0.2400
$C_{18:1\omega9}$	50.47	43.91	0.18	<0.001
$C_{18:2n6}$	4.72	7.10	0.02	<0.001
$C_{18:3n3}$	0.23	0.90	0.05	<0.001
$C_{20:4n6}$	0.87	1.75	0.02	<0.001
$C_{22:5n3}$	0.12	0.85	0.03	<0.001

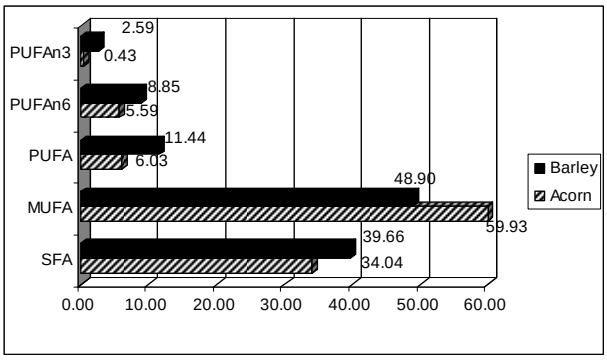

Figure 2. Acidic classes (%) found in the *Ll* muscle.

Regarding the dietetic nutritional quality of the Ll muscle, the atherogenic index (A 0.40 *vs.* B 0.44; P < 0.001) and the thrombogenic index (A 1.01 *vs.* B 1.02; P = 0.212) resulted favourable for group A. A major content of unsaturated fatty acids in pork meat has a beneficial effect on human health (Ahn *et al*., 1996). In conclusion, the type of diet used during fattening does influence partially the meat quality of "Nero Siciliano" pigs.

Acknowledgments

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