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Effects of slaughter weight and sex on carcass traits and meat quality of Casertana pigs reared outdoors

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ABSTRACT: The effects of different slaughter weights (W) and sex (S) on carcass traits and *longissimus dorsi* meat quality (pH, WHC, colour, cholesterol and collagen) of Casertana pigs were studied. Thirty-six pure breed Casertana pigs, 24 barrows (B) and 12 gilts (G), were evaluated in a 2x2 factorial design involving different slaughter live weights (L, 125.6 kg; H, 152.5 kg) and S (B and G). H pigs had higher carcass weight (P<0.01), dressing percentage (P<0.05), ham yield (+ 7.9 %; P<0.01), lean meat cuts (P<0.01) and backfat thickness (+13.3%; P<0.05), and lower (P<0.01) loin yield and fatty cuts. W did not affect pH and WHC. L pigs produced lighter (P<0.01) and more yellow meat (P<0.01), while H pigs showed lower (P<0.01) hue value. Cholesterol content resulted higher (P<0.05) in H pig meat. Collagen properties were affected by W. Compared to G, B had higher dressing percentage (P<0.05) and backfat thickness (P<0.01), smaller loin area (P<0.01), slightly lower (P<0.08) loin yield and less (P<0.01) lean cuts. S did not affect any meat quality traits.

Key words: Casertana breed, Carcass traits, Meat quality, Intramuscular collagen.

INTRODUCTION – Recently, an increasing interest and appreciation by consumers has been shown in Italy for local pig breeds and their typical products. "Casertana" is one of the few Italian local pig breeds that has survived despite the introduction of higher performance breeds. The present research aims to extend our knowledge of the Casertana breed, and to evaluate the effects of slaughter weight and sex on carcass traits and meat quality of this pig.

MATERIAL AND METHODS – Thirty-six pure breed Casertana pigs, 24 barrows (B) and 12 gilts (G), were reared according to sex. During the trial, each group (6 pigs) were housed in a single hut (a covered surface of 12 square meters and a height of 2 m, the front side was completely open to an outdoor paddock of 40 square meters; the hut floor was covered with straw) and fed on the basis of live weight (from initial weight to 60 kg; from 60 to 100 kg; from 100 kg until slaughter). Diets were supplied based on 9% of metabolic weight. Animals were conventionally slaughtered (ASPA, 1991) at two live weights/ages: 12 barrows and 6 gilts at 125.6 kg (light = L)/258.4 ± 1.7d; 12 barrows and 6 gilts at 152.5 kg (heavy = H)/368.7 ± 1.7d. Live weight at slaughter and hot carcass weight were recorded and dressing percentage was calculated. *Longissimus dorsi* (LD) muscle pH and colour (L*, a*, b*, chroma and hue) were measured at 45 min and 24h *post mortem*. In addition, backfat thickness (last thoracic vertebra) and LD muscle area were measured. The left side of each carcass was dissected into lean cuts (ham, loin, neck, shoulder), fat cuts (backfat, belly, jowl, kidney fat) and other cuts (head, trotter, kidney) expressed as a percentage of carcass side. LD muscle was removed from the right side of all carcasses (after 24 h at 2 to 4 °C) and water-holding capacity (WHC) (Grau and Hamm,1953), cholesterol (Maraschiello *et al*. 1996) and intramuscular collagen (IMC) properties (collagen and crosslink concentrations) were carried out. For IMC analyses, muscles were trimmed of fat and epimysium, lyophilized, and hydrolyzed in 6N HCl for determination of hydroxyproline and hydroxylysylpiridinoline (HLP) crosslinks (Maiorano *et al*., 1999). HLP was expressed as moles of HLP per mole of collagen and also as µg HLP/mg

of lyophilized tissue. ANOVA was performed with GLM of SPSS (2000) using a factorial model, where slaughter weight (W: L and H) and sex (S) were the main factors (interactions were not significant and are not reported).

RESULTS AND CONCLUSIONS – Carcass traits are presented in Table 1. As expected, H pigs had a higher (P<0.01) carcass weight than that of L; in addition, they showed higher dressing percentage (P<0.05), ham yield (+ 7.9 %; P<0.01) and backfat thickness (+13.3%; P<0.05), and lower (P<0.01) loin yield. LD muscle area was not significantly affected by W. As slaughter weight increased, lean meat cuts increased (P<0.01), while fatty cuts and other cuts decreased (P<0.01).

Table 1. Effect of slaughter weight and sex on carcass traits of Casertana pigs.

		W		S		SEM	P value	
		L	H	B	G		W	S
Slaughter weight	kg	125.6	152.5	140.4	134.2	2.3	0.001	0.787
Range		(122.5-128.7)	(148.6-156.0)					
Carcass weight	"	100.5	124.5	114.4	107.3	2.1	0.001	0.220
Dressing percentage	%	80.1	81.6	81.4	79.9	0.3	0.037	0.020
Backfat thickness	cm	3.9	4.5	4.5	3.7	0.1	0.020	0.007
Longissimus area	cm^2	42.0	43.0	40.1	45.9	1.0	0.101	0.001
Ham	%	21.2	29.1	25.1	24.3	0.6	0.001	0.332
Loin	"	9.5	7.3	8.1	9.1	0.1 0	001	0.077
Lean cuts[1]	"	50.4	55.4	52.2	53.2	0.5	0.001	0.002
Fatty cuts[2]	"	25.4	23.2	24.0	24.9	0.2	0.001	0.172
Other cuts[3]	"	10.3	9.1	9.8	9.7	0.2	0.001	0.270

[1]Lean cuts = ham, loin, neck, shoulder. [2]Fatty cuts = backfat, belly, jowl, kidney fat. [3]Other cuts = head, trotter, kidney.

The Casertana pig is a non-selected breed that has been considered as late-maturing, although there is little scientific research about its performance, this result confirms that the Casertana breed takes a long time to mature. B and G showed similar carcass weight, but B had higher dressing percentage (P<0.05). In agreement with literature (Franci *et al*., 1994; Lebret *et al*., 2001), B had higher (P<0.01) backfat thickness, smaller (P<0.01) loin area, slightly lower (P<0.08) loin yield and less (P< 0.01) lean cuts. Sex did not significantly affect fatty cuts and other cuts.
In table 2 meat quality traits are reported. W did not affect pH values and WHC. In agreement with Nold *et al*. (1999), L pigs produced lighter (P<0.01) and more yellow meat (P<0.01). The lower (P<0.01) hue value for H pigs, 2-fold less than that showed by L pigs, made their meat more acceptable than that of the latter (Franci *et al*., 2005). Iberian and Cinta Senese pigs, also, showed a hue value lower than cosmopolite pigs (Serra *et al*., 1998; Franci *et al*., 2005). The values of pH and colour, and the small range of WHC recorded in this study suggest that Casertana pigs do not produce meat exposed to PSE and DFD risk or which should have negligible influence on the quality of the elaborated products. Cholesterol content resulted higher (P<0.05) in the meat of H pigs. The cholesterol levels depended mainly on animal-related factors: genotype, age, muscle type. However, the average cholesterol concentrations found for LD muscle are similar to those reported in literature on pigs. IMC properties, responsible for the background toughness of meat (McCormick,1999) and also indicators of technological behaviour (Boutten *et al*., 2000), were affected by W. Compared to H, L pigs had higher IMC (P<0.01) and HLP (P<0.05) concentration (µg/mg), but similar collagen maturation (mol HLP/mol collagen). This result indicates that L pigs have produced a meat that could be tougher than that of H pigs. Differences in collagen amount and maturation mainly depend by animal-related factors: genotype, age, and growth rate (McCormick, 1999). S did not affect any meat quality traits. In conclusion regardless of carcass weight or sex class, the differences found in this study may help to identify new marketing strategies for this autochthonous breed. Of particular interest in the present study are the overall high values for HLP in the *longissimus* muscle; these values, ranging from 0.234 to 0.262 mol HPL/mol collagen, are the highest HLP crosslink concentrations of the connective tissue from pig skeletal muscle yet reported; this property assumes a strong commercial importance from the technological point of view.

Table 2. Effect of slaughter weight and sex on longissimus dorsi muscle quality traits of Casertana pigs.

			W		S		SEM	P value	
			L	H	B	G		W	S
pH_{45}			6.29	6.30	6.30	6.29	0.04	0.863	0.675
pH_{24}			5.62	5.66	5.65	5.63	0.02	0.318	0.564
Water-holding capacity		%	18.13	17.03	17.37	17.97	0.31	0.126	0.530
Colour	45 min	L*	41.62	39.50	40.96	40.27	0.66	0.110	0.384
		a*	8.66	7.83	8.88	7.50	0.42	0.209	0.175
		b*	2.71	2.18	2.76	2.08	0.27	0.225	0.170
		Chroma	9.12	8.18	9.36	7.81	0.47	0.211	0.101
		Hue	0.28	0.26	0.28	0.27	0.02	0.558	0.783
	24 h	L*	48.16	43.88	45.88	46.67	0.62	0.001	0.932
		a*	9.70	9.71	10.06	9.24	0.28	0.678	0.126
		b*	3.23	1.68	2.55	2.51	0.22	0.001	0.374
		Chroma	10.2	9.88	10.45	9.62	0.30	0.304	0.117
		Hue	0.32	0.17	0.24	0.26	0.02	0.001	0.808
Cholesterol		mg/100	g 50.73	53.78	47.09	48.24	1.79	0.041	0.804
IMC[1]		µg/mg[2]	17.38	14.72	16.08	16.38	0.42	0.001	0.768
HLP[3]		"	6.04	5.05	5.19	6.02	0.20	0.025	0.101
HLP[3]/IMC[1]		mol/mol	0.252	0.242	0.234	0.262	0.01	0.806	0.104

[1]Intramuscular collagen. [2]Of lyophilized muscular tissue. [3]Hydroxylysylpyridinoline.

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