CARCASS CHARACTERISTICS AND PORK QUALITY IN CULL SOWS

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Background

In Argentina a significant number of cull sows from the farms is slaughtered every year due to limb lesions, body state, age and reproductive failure. In most countries the annual rates of sow elimination range from 35% to 50% and according to different authors more than 50% of sows are elimitated between their third and fifth farrowing; whereas an elevated rate (14%) consists of young females with only one farrowing (Martin Rillo,1988). These carcasses are commercially depreciated because they would only be destined for sausages production. Nevertheless, it has been fequently observed that sow meat is destined for other products and the consumption of fresh pork. Thus, owing to age and productive life, some of these animals would present carcass fit for other more valuable commercial uses (Basso *et al.*,2000a). Despite the reduced number of research papers on the study of carcass and meat quality of multiparous sows, authors like Aziz *et al.*(1990 and 1993) concluded that the carcass composition of said sows was more related to subcutaneous fat thickness than to their weight due to the existance of important variations in fatness. Therefore, it was determined that as subcutaneous fat rose, the intramuscular fat content of the loin increased and water content in the muscle decreased. Furthermore, loin muscle became darker, redder and more yellow as carcass weight increased.

Objectives

Compare the principal carcass characteristics and pork quality of gilts market weight, with cull sows of different farrowings and ages.

Methods

Fifty two females were used, originated by crossing Landrace x Yorkshire chosen at random from commercial farm. Such females were divided into four groups according to the number of farrowings when they were rejected. The groups included sows of even eight farrowings (S1-2; S3-4; S5-6; S7-8); in addition, a fifth group consisting of gilts was included. After slaughter carcasses were weighed and the following measurements were made: total length; subcutaneous fat depth along the center line at the shoulder, at last rib level and on *Gluteus medius* muscle. After 24 hours samples of *Longissimus dorsi* muscle (LD) were obtained starting from a transversal cut of the carcass at the point of the last rib; with said samples the following measurements were carried out : pH_u (Testo 230 with electrode of penetration and temperature compensator); colour (Minolta CR-300, L*, a*, b*), also determining C* value; Warner-Bratzler shear force using Instron 1011 apparatus on 3 cooked samples (1 cm^2 diameter, 75°C, 50') (ASPA, 1996); chemical analysis were determined by AOAC (1984). Samples of subcutaneous fat (inner and outer layer) were obtained to determine composition in fatty acids extracted according to Folch *et al.* (1957) and analysed by gas chromatography (Shimadzu GC-14B) of the respective methyl-esters on a capillary column (Ulbon HR-SS-10; 0,32 I.D.x 50 mL) and using Helium as carrier gas. For the variables analysis GLM procedure of SAS (1998) was used and mean values were compared using Tuckey test (5%).

Results and discussion

The relation between age and the number of farrowings becomes evident since sows are cast off the moment their productivity diminishes.An increase in carcass weight of sows with the number of farrowings has been observed estabilizing as from their third farrowing and decreasing later on (Table 1). The increase in carcass length with weight was reported in many papers, such increase being lower in pigs with heavy weight (Prandini *et al.*, 1996); in this experience said results were verified for sows with more than three farrowings. Although pigs with heavy weight present greater carcass fatness, in this test no differences between gilts and cull sows were found due to the use of body reserves through the successive lactation of sows. The pH_u in LD did not show any significant differences, in concurrence with other authors that analized this measurement in carcass of different weight (Garcia Macias *et al.,* 1996) and between gilts and once bred gilts (Ellis *et al.*, 1996; Basso *et al.*, 2002). However, Zbinden *et al.* (1995) reported higher pH_u values for once bred gilts, a similar tendency has been observed in this paper. Results for L* value in the meat of gilts and sows with few farrowings confirm Basso *et al.* (2002) report, as no differences have been found; whereas in older sows a greater darkness is observed concurring with Aziz *et al.*(1993). Also, greater redness in the meat (a*) of multiparous sows was verified in relation to a higher concentration of myoglobine in the muscle as the age of animals increased, corroborating what Aziz *et al.*(1993) and Ellis *et al.*(1996) mentioned, whereas the yellow index (b*) did not show any significant differences as those authors had reported. A higher C* value in sows indicates that the meat corresponding to said animals presents higher light saturation. No differences in pork tenderness for the different treatments were found as reported by Stewart *et al.* (1995) for once bred gilts. The LD intramuscular fat content was higher for sows with more than two farrrowings ($p< 0,05$), whereas no differences between gilts and young sows were observed as reported by Basso *et al.* (2002). No differences in dry matter and LD protein among sows were determined, confirming Wajda and Daszkiewicz (1998) reports. Fatty acids composition of subcutaneous fat is shown in Table 2 where differences ($p<0,05$) for acids C14:0, C17:0 and C18:0 between gilts and sows are observed. Furthemore, no significant differences neither in SFA and UFA rates nor in the relation SFA/UFA were found. The higher C18:2 content in the fat of multiparous sows may be due to dietary contributions and the level of nutritional restrictions during the successive reproductive cycles (Basso *et al.* 2000b). An increase in slaughter weight did not determine a rise in C18:0 and C18:1 levels, as reported for pigs by Wood *et al.* (1989) and Garcia Macias *et al.* (1996). There were no differences in UFA content, however, in some cases C18:2 and UFA rates considered critical for fat firmness were higher.

Conclusions

This study demonstrates that both the low carcass fatness and the optimun intramuscular fat content may let pork be destined for the making of quality cured products; restrictions to fresh pork comsumption have not been observed. In order to avoid an industrial depreciation that damages the producer, some of the parameters determined in this work could be considered to assess each animal's marketing correctly.

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Table 1: Least-squares means and residual standard deviation (RSD) of carcass mesurements and meat quality (*M. Longissimus dorsi)* in gilts and cull sows with different farrowing. Different letters indicate significant differences (p<0,05).

	Gilts	Cull sows and farrowing				RSD
		C1-2	C3-4	C5-6	C7-8	
Number of animals	14	14	12	12	14	--
Age at slaughter (days)	189 **e**	447 **d**	784 **c**	1113 **b**	1265 **a**	99
Hot carcass weight (kg)	81,17 **c**	138,67 **b**	191,71 **a**	186,10 **a**	175,00 **a**	21,51
Carcass length (cm)	80,58 **c**	98,22 **b**	107,86 **ab**	111,10 **a**	107,67 **ab**	6,81
Fat thickness shoulder (mm)	30,58	32,89	32,57	28,00	30,67	9,90
Fat thickness last rib (mm)	19,58	19,33	19,43	15,80	19,50	7,42
Fat thickness *Gluteus medius* (mm)	16,17	14,67	18,86	17,60	16,67	7,91
pH_u	5,53	5,68	5,77	5,76	5,80	0,19
L* (Lightness)	52,95 **a**	48,73 **ab**	46,65 **ab**	46,03 **b**	45,05 **b**	4,72
a* (Redness)	8,03 **b**	13,28 **a**	16,28 **a**	16,28 **a**	16,33 **a**	2,56
b* (Yellowness)	5,71	4,44	3,68	3,25	4,06	1,85
Chroma C *	9,89 **b**	14,30 **a**	16,72 **a**	16,63 **a**	16,86 **a**	2,69
Shear force (kgf)	7,30	8,22	9,16	8,74	7,65	2,23
Intramuscular fat (%)	1,21 **b**	2,51 **ab**	3,88 **a**	3,85 **a**	2,96 **a**	1,43
Dry matter (%)	--	27,48	27,63	26,47	27,47	2,40
Protein (%)	--	22,85	22,63	21,74	23,68	1,52

Table 2: Least-squares means and residual standard deviation (RSD) of fatty acid composition (%) of subcutaneous fat (inner+outer layer) in gilts and cull sows with different farrowing. Different letters indicate significant differences (p<0,05).

	Gilts	Cull sows and farrowing				RSD
		C1-2	C3-4	C5-6	C7-8	
Miristic C14:0	2,98 **a**	1,89 **b**	1,19 **b**	1,25 **b**	1,28 **b**	0,59
Palmitic C16:0	26,38 **a**	25,32 **ab**	22,30 **b**	23,42 **ab**	23,45 **ab**	2,16
Palmitoleic C16:1	2,28	2,11	2,11	2,13	2,24	0,37
Heptadecanoic C17:0	0,71 **a**	0,49 **b**	0,31 **b**	0,31 **b**	0,31 **b**	0,12
Stearic C18:0	9,51	10,59	11,61	12,48	11,67	2,32
Oleic C18:1	44,31	42,87	43,91	42,01	43,51	3,99
Linoleic C18:2	12,18 **b**	15,18 **a**	16,56 **a**	16,39 **a**	15,81 **a**	1,89
Linolenic C18:3	0,83	0,72	0,71	0,67	0,57	0,19
SFA	40,22	38,73	35,89	37,96	37,03	3,77
UFA	59,77	61,40	64,45	62,39	63,15	3,78