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Evaluation of the productive parameters in different strains of Iberian pig

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SUMMARY - Before the crisis of the 60s, the Iberian pig showed a large livestock diversity with plenty of local and regional types. However, great part of this variety of lines disappeared from the ecosystem of *dehesa.* Although at the end of the 80s, a clear recovery of the census appeared, due to sanitary, social and economic conditions. The main purpose of this work is focused on the knowledge and evaluation, from a productive point of view, of some of the current different strains of the Iberian pig and some of its crosses. Iberian pigs from different prestigious stockbreeding were kept for three tests, from weaning to slaughter, in the Valdesequera farm. Different types of crosses were also tested, hybrid among strains of Iberian pig. The purpose of this was to check the use of the possible heterosis, particularly regarding the growth characteristics present in the crossing of lines genetically distant. Two strains of public property were used as the basis of the comparisons carried out in the different tests. On one hand, Valdesequera line representative of the phenotype *retinto* colour. The *retinto* line is currently the largest one regarding the livestock within the Iberian pig. On the other hand, Torbiscal line, which is the result from the union of 4 ancestral strains. The obtained results evidenced relevant differences as regard the growth speed among the compared pure strains, during the *recría* period as well as during the period of *montanera*. Effects of heterosis were as well found in the cross among some of them. Differences were also found in the carcass composition. These differences are statistically relevant among the strains and/or crosses. However, as it was expected, heterosis was not present in this group of characteristics.

Key words: Iberian pig strains, heterosis.

RESUME - *"Evaluation des paramètres productifs chez différentes souches de porc ibérique". Avant la crise des années 60, le porc ibérique montrait une grande hétérogénéité génétique, avec um très grand nombre de types locaux. A la fin de la décade des années 80, commence une nette augmentation des effectifs, mais, à cause des problèmes sanitaires, sociaux et économiques, une grande partie de cette variété de souches a disparu de la zone de "dehesa". Les objectifs de ce travail sont la connaissance et l'évaluation de quelques-unes des diverses souches actuelles du porc ibérique et de quelques-uns de ses croisements, principalement du point de vue de leurs caractéristiques productives. Pour celui-ci, des porcs ibériques provenant de plusieurs élevages très reconnus ont été élevés pendant trois années dans le domaine "Valdesequera", après le sevrage jusqu'à l'abattage. De même, plusieurs types de croisements entre diverses souches du porc ibérique ont été étudiés, avec l'objet de constater la possible existence d'hétérosis, qui peut apparaître dans les croisements entre souches génétiquement éloignées, surtout pour des caractères de croissance. Deux souches provenant d'Organismes publics ont été employées comme base des comparaisons effectuées dans les différentes années : La souche "Valdesequera", représentante du génotype "retinto" (de couleur rouge), actuellement la plus répandue dans la population du porc ibérique, et la souche synthétique "Torbiscal", provenant des croisements entre quatre anciennes souches. Les résultats obtenus montraient des différences significatives dans la vitesse de croissance entre les souches comparées, aussi bien pendant l'élevage ("recría") comme dans la phase d'engraissement en "montanera". De même, des effets d'hétérosis pour ce caractère ont été trouvés dans le croisement entre quelques-unes de celles-ci. Dans les caractéristiques de composition de la carcasse on trouve aussi des différences significatives entre les souches et/ou croisements, mais, comme il était prévisible, on ne trouve pas d'hétérosis pour cet ensemble de caractères.*

Mots-clés : *Souches de porc ibérique, hétérosis.*

Introduction

The Iberian pig livestock has suffered a significant change in the last decades (Dobao *et al.,* 1987; Benito *et al.,* 1997). Since the livestock crisis from the 60s, with the disappearance of

numerous strains proper of the *dehesa* (sparsely forested grassland originated from livestock management of Mediterranean woods of acorn trees) at that time, up to the recovery of the census in the 90s. This improvement was due to the extinction of the African swine fever; to a greater social consideration of the Iberian cured products; and also to the increasing interest in fostering the extensive livestock production with the purpose of preserving specific ecosystems from the biodiversity point of view. It is in this context where the recent efforts carried out by private and public institutions have to be placed in order to know and value the present diversity in the Iberian pig livestock. Therefore, the Research and Technological Development Service of the Extremadura Government and the National Institute for Farm and Food Research and Technology of the Agricultural Ministry (MAPA), have developed from 1993 to 1996 a common project in which productive characteristics and quality meat of different Iberian pig strains and some of its crosses have been evaluated and compared.

Some of the most relevant results obtained in this project on growth characteristics and carcass composition are stated in this work.

Material and methods

The general approach was the same for the three tests of 1994/95, 1995/96, and 1996/97. The animals were born in the Autumn farrowing in private stockbreeding's in the province of Badajoz, in Valdesequera farm (property of the Extremadura government) or in El Dehesón del Encinar (another public farm property of the Castilla-La Mancha government). At the beginning of the year, the sucking pigs born out of Valdesequera were carried to this farm. Therefore, up to slaughter, the breeding was common to all of them. The management of the animals during the *recría* (period from weaning in December until June, with fodder and spring pastures feeding) and during *premontanera* (summer period, only with fodder feeding) in Valdesequera was the usual one in the farm, extensive system inside enclosures of about 25 ha. At first, the animals were provided with a food ration of 1.25 kg per head and day of a traditional fodder made up by corn, barley, soya and vitamin-mineral corrector. This ration was completed with the use of spring pastures existing in the enclosures. The pastures were slightly variable in the different years. When the *premontanera* begins, in June, due to the lack of pastures, the animals depended exclusively on the supplied daily ration, which was increasing little by little up to reach 2 kg in September. At the beginning of November, when the animals weighted from 100 to 110 kg, the *montanera* started. At this point, apart from weight, the dorsal fat layer thickness was measured through ultrasound. In the three tests *montanera* takes place in three farms in the area around Valdesequera. Farms of about 1.700 ha, with the typical characteristics common in the ecosystem of *dehesa*. As the pigs reached the commercial slaughter weight established according to the test, from 160 to 170 kg, the animals were taken to a slaughter house and processing industry of Iberian pig products.

The following information was registered at the slaughter house: carcass weight and length, perimeter and length of hams, thickness of dorsal fat in three different points of each hemicarcass, weights of loins and sirloins (only in the second and third test), weight of forelegs and hams cut in V. Furthermore samples of subcutaneous fat were taken from the lumbar area, other samples were taken from the loin (a steak of the head of the loin in the first test and a steak of the middle of the loin in the second and third test) and another sample was taken from the muscle of the ham in the last two tests (a small steak from the Gracilis muscle). In both steaks the intramuscular fat was extracted and quantified.

Strains and crosses in each test

Test of 1994/95 (E-94/95)

Valdesequera (VAL): *Retinta* line (red coat), well-known by being one of the two public herds, and by belonging to the most widespread phenotype (Benito *et al.,* 1992).

Torbiscal (TOR): Coming from the Dehesón del Encinar. The second of the public herds, result of the crosses of 4 ancient strains in 1964 (Rodrigáñez, 1992).

Retinto Oliventino (ROL): *Retinto* animals whose origin is due to a particular stockbreeding from Olivenza (Badajoz).

Lampiño (LRZ): *Lampiño* (coat without hair) animals, though with certain *retinto* origin from a particular stockbreeding in the area of Zafra (Badajoz).

Test of 1995/96 (E-95/96)

Valdesequera (VAL) and Torbiscal (TOR)

Retinto from the Sierra of San Pedro (RSP): *Retinto* animals coming from a private stockbreeding located in the foothills of San Pedro sierra.

VAL x TOR: Cross between Valdesequera and Torbiscal obtained half of them in the Dehesón del Encinar (both strains performed as paternal and maternal line).

VAL x GUA: Cross between Valdesequera and Guadyerbas, black *lampiño* strain denominated *pelón guadianés*, coming from the meadow of the Guadiana river. This strain is kept since 1995 in El Dehesón del Encinar (Rodrigáñez, 1992). Guadyerbas always acted as maternal line.

TOR x GUA: Cross between Torbiscal and Guadyerbas, in which both strains performed as maternal and paternal lines.

Test of 1996/97 (E-96/97)

Valdesequera (VAL) and Torbiscal (TOR)

RSP x TOR: Cross between *retinto* boars from Sierra de San Pedro and Torbiscal female pigs.

NLS x TOR: Cross between black *lampiño* boars, which come from one of the private stockbreeding in the area of La Serena belonging to the region of Badajoz, and Torbiscal female pigs.

NLS x VAL: Cross between boars from the previous stockbreeding and Valdesequera female pigs.

RVM x VAL: Cross between *retinto* boars of big complexion, coming from one of the private stockbreeding located in the Valle de Matamoros (Badajoz) and Valdesequera female pigs.

Therefore, Valdesequera and Torbiscal take part in the three tests, acting as control strains. Table 1 shows the final number of slaughtered animals of each strain or cross in each test. In Table 2 the means and variation coefficients of weights at the beginning of the test are shown, considering also these values at different times of the test (the entrance in *montanera* and at slaughter), and the means and variation coefficient of the carcass weight, together with the age at slaughter.

Table 1. Number of animals per strain and cross at the beginning and end of each test

E-94/95

VAL		TOR		ROL		LRZ		Total	
50	46	48	40	50	49	50	47	198	182

E-95/96

VAL		TOR		RSP		VAL x TOR		VAL x GUA		TOR x GUA		Total	
26	23	26	25	48	45	49	46	50	46	50	46	249	231

E-96/97

VAL		TOR		RSP x TOR		NLS x TOR		NLS x VAL		RVM x VAL		Total	
26	24	27	24	50	49	50	43	50	47	40	39	243	226

Table 2. Mean and variation coefficient of weights and slaughter age in the three tests

	Initial weight		Entrance in *Montanera* weight		Slaughter final weight		Carcass weight		Final slaughter age	
E-94/95	29.87	(21.2)	96.19	(11.2)	160.18	(4.2)	131.82	(3.9)	475	(3.8)
E-95/96	30.94	(16.4)	99.22	(15.1)	149.60	(8.6)	117.60	(8.1)	481	(2.2)
E-96/97	32.66	(17.0)	109.90	(10.0)	168.82	(5.3)	137.16	(5.4)	476	(3.9)

The statistical analysis of the studied characteristics was carried out through a model of fixed effects which included sex and strain and the type of cross. Furthermore, different covariables were adjusted in the models according to the characteristic considered. Later on in the results section, these covariables will be specified. A comparison of the estimate least square means of the fixed effect strain or type of cross was established in all the cases.

Results

The results obtained in the three tests regarding the most productive characteristics are shown in the following tables. The values correspond to the estimate least square means of the fixed effect strain or cross in each of the characteristics. Besides this, the values with different super-indexes are statistically different at a level of significance of the 5%.

The results regarding growth speed in the *Test of 1994/95* (Table 3) show a greater average daily gain at *recría* (included *premontanera* period) in those animals coming from the stockbreeding with the *lampiño* phenotype (LRZ). However, this result turns to be deceiving since in this campaign the animals had to be subdivided into two different lots. This was done because of the animals' low weight, proper of many animals coming from private stockbreeding, at the time when they reached Valdesequera. This low weight was due to an early weaning. In the public herds the sucking pigs are weaned at 56 days while in many private herds weaning takes place before.

Table 3. Least square means in the test of 1994/95

	VAL	TOR	ROL	LRZ
ADG *recría* (g/day)	252^{b}	238^{c}	207^{d}	267^{a}
ADG *montanera* (g/day)	800^{b}	949^{a}	830^{b}	801^{b}
Slaughter weight (kg)†	159.38^{b}	162.35^{a}	160.42^{ab}	159.13^{b}
Carcass weight (kg)	131.61^{a}	132.10^{a}	131.10^{a}	132.67^{a}
Carcass length††	79.64^{c}	85.89^{a}	82.31^{b}	81.61^{b}
Yield (%)	82.58^{b}	81.15^{d}	82.04^{c}	83.28^{a}
BFT_{95} (mm)†††	27.93^{a}	23.66^{b}	25.01^{b}	29.03^{a}
Hams weight (kg)††	20.31^{b}	20.88^{a}	19.97^{b}	19.45^{c}
Forelegs weight (kg)††	13.91^{a}	13.96^{a}	13.45^{b}	13.47^{b}
Loins weight (kg)††	2.94^{c}	3.33^{a}	3.18^{b}	3.13^{b}
DFT carcass (mm)††††	73.77^{b}	73.70^{b}	75.98^{b}	81.97^{a}
Intramuscular fat†††††	6.06^{a}	5.99^{a}	6.19^{a}	5.43^{a}

†Corrected by the slaughter age
††Corrected by the carcass weight
†††Backfat thickness measured through ultrasound, adjusted at 95 kg of weight
††††Measurement of the dorsal fat thickness measured in three points of each hemicarcass
†††††Analysis carried out from samples of 40 hams (10 of each strain)

Regarding the average daily gain Torbiscal shows a better behaviour, presenting ROL slights evidences of compensatory growth. The *lampiño* line, which is fattier, gets better yield, while hardly differences are found in the slaughter weight and the carcass weight, since in this campaign, due to a good *montanera*, the established slaughter weight (160 kg) was reached in nearly all the animals. Regarding the measurement results of the backfat thickness (BFT) carried out through ultrasound, the *lampiño* strain and VAL are the fattiest ones.

The results derived from the weight of the *nobles* pieces (hams, forelegs and loins) show a better composition in hams of TOR and a worse composition in the ones of LRZ. As regard to forelegs, VAL also shows a good conformation. However, in the weights of the loins this strain reflects the shortest carcass length. Fat deposition in the carcass (DFT) varies depending on the anatomical location. So, whereas the *lampiño* strain showed higher values in the three points of the carcass, other strains' behaviour was different depending on the carcass considered point. The values of Table 4 refer to the measurements of all the measuring carried out. The strain effect was not relevant regarding the percentage of intramuscular fat in the ham. This is surely due to the scarce numbers of observations. Anyway, in the Gracilis as well as in the head of the loin (results non-included), VAL showed greater infiltration.

All the results of the *Test of 1995/96* (Table 4), except those ones for ADG at *recría*, are strongly conditioned by the impossibility for the animals of reaching the established slaughter weight; since the great amount of rainfall fell during the Autumn in this campaign gave place to a rare and bad *montanera*. The slaughter weight (Table 2) was 13 @ (1@ equal to 11.5 kg), inferior to the commercial weight in the sector, which was set from 14 to 16 @. These circumstances are noticed in the ADG at *montanera*, with values of about 600 g/day. These values were much more inferior to the ones obtained in the other tests. This is translated, on one hand, into important differences in the slaughter weight and the carcass weight among the different types of animals; on the other hand, it is translated into a regression coefficient with a high negative value (-0.5 kg/day) of the slaughter age over the weight.

During the *recría*, Torbiscal and the cross VAL x TOR surpass in speed to the rest, being the cross TOR x GUA the one with the worst results, likely due to the fact that it was originated from crosses among 4 ancestral strains, one of them was Guadyerbas itself. The *retinto* strain belonging to Sierra of San Pedro (RSP), as it happened in the previous test with ROL and LRZ, reached Valdesequera farm with a weight inferior to the rest. As it has already been commented, this low weight could be a consequence of an early weaning. Its growth is limited because of the food rivalry with stronger animals. At the *montanera*, except TOR, the others pure strains, together with the crosses in which GUA takes part (black *lampiño*), hardly reach a average daily gain (ADG) of 600 g/day.

Table 4. Least square means in the Test of 1995/96

	VAL	TOR	RSP	VAL x TOR	VAL x GUA	TOR x GUA
ADG *recría* (g/day)	239^{c}	263^{ab}	233^{c}	278^{a}	259^{b}	226^{c}
ADG *montanera* (g/day)	535^{d}	633^{a}	608^{abc}	621^{ab}	584^{c}	586^{bc}
Slaughter weight (kg)	143.48^{b}	154.99^{a}	141.52^{b}	157.52^{a}	154.93^{a}	143.55^{b}
Carcass weight (kg)	114.47^{c}	119.59^{a}	112.18^{c}	123.85^{a}	122.15^{ab}	112.13^{c}
Carcass length (cm)†	80.51^{c}	84.23^{a}	82.54^{b}	81.71^{bc}	82.53^{b}	83.84^{a}
Yield (%)	79.79^{a}	77.20^{d}	79.28^{ab}	78.69^{bc}	78.88^{b}	78.20^{c}
BFT_{100} (mm)††	27.75^{a}	22.55^{d}	24.06^{c}	25.45^{b}	26.35^{b}	23.11^{cd}
Hams weight (kg)†	20.13^{ab}	20.43^{ab}	20.13^{ab}	20.21^{ab}	21.01^{a}	20.05^{b}
Forelegs weight (kg)†	13.63^{a}	13.61^{a}	13.56^{a}	13.52^{a}	13.28^{b}	13.20^{b}
Loins weight (kg)†	3.20^{b}	3.44^{a}	3.41^{a}	3.25^{b}	3.28^{b}	3.46^{a}
DFT carcass (mm)†††	66.87^{b}	68.11^{ab}	70.57^{a}	69.79^{a}	69.33^{ab}	69.73^{a}
Intramuscular fat ham	5.66^{a}	5.13^{ab}	5.23^{ab}	5.23^{ab}	4.76^{b}	4.83^{b}
Intramuscular fat loin	5.31^{ab}	4.80^{bc}	5.52^{a}	5.35^{ab}	4.60^{b}	4.33^{b}

†Corrected by the carcass weight
††Backfat thickness measured through Ultrasound, adjusted at 100 kg of weight
†††Mean of the dorsal fat thickness measured in three points of each hemicarcass

The yield, again due to the low slaughter weight, never reaches the 80%. As it has already happened in the previous test, the presence of Torbiscal is translated into inferior values, due to less body condition. The BFT measured before the *montanera* period, with a mean weight of 100 kg, corroborates the greatest fat deposition of VAL and its crosses, as well as the least thickness of TOR. Furthermore, VAL shows an earlier deposition, since it is the only case in which the weight partial regression over the characteristic is not significantly different from zero. The results of the carcass composition again are influenced by the low slaughter weight. In the analysis of the hams weight the effect cross type was not relevant; only the cross VAL x GUA (21.01 kg) was different from TOR x GUA (20.05 kg). In the other two pieces, both crosses in which GUA takes part presented inferior values regarding the forelegs weight, while VAL and its crosses present less weight of loins (again justified by a shorter carcass length).

The thickness of the dorsal fat measured in the carcass is the most affected characteristic because of the low slaughter weight. The animals did not complete their full process. So, they did not develop all their potential in this sense. That is why relevant differences do not appear among the genotype. However the obtained values in each anatomical location confirm the evidences in the previous test. These evidences were oriented towards a different deposition depending on genotype and location. The results of the degree of fatty infiltration in the muscle, for the ham as well as for the loin, show common points in both pieces. So, Valdesequera and RSP have greater infiltration, while the crosses with Guadyerbas never reach the 5%.

In the *Test of 1996/97* (Table 5) the purpose was to reach a slaughter weight bigger than in the previous ones, of 170 kg, so that the different genotypes could express all their growth potential. This aspect is present in the higher *recría* ADG (due to a slight increase of the rations indicated before) as well as the biggest weight at the beginning of *montanera* (110 kg). This slaughter weight could be reached in Torbiscal and in the crosses between Torbiscal and the *retinto* of San Pedro (RSP) and between Valdesequera and the *retinto* of the Valle de Matamoros (RVM). Valdesequera, *retinto* of smaller complexion and, particularly, the two crosses with black *lampiño* from La Serena (NLS), did not reach the prefixed 170 kg.

Table 5. Least square means in the Test of 1996/97

	VAL	TOR	RSP x TOR	NLS x TOR	NLS x VAL	RVM x VAL
ADG *recría* (g/day)	299^{b}	312^{b}	335^{a}	311^{b}	281^{c}	305^{b}
ADG *montanera* (g/day)	710^{bc}	789^{a}	743^{ab}	665^{c}	651^{c}	723^{ab}
Slaughter weight (kg)†	168.53^{abc}	172.22^{a}	169.69^{ab}	166.03^{c}	166.76^{bc}	171.31^{a}
Carcass weight (kg)†	137.08^{a}	137.91^{a}	137.90^{a}	132.74^{b}	134.66^{b}	140.26^{a}
Carcass length (cm)††	79.39^{d}	86.12^{a}	85.77^{ab}	84.89^{b}	80.07^{d}	81.53^{c}
Yield (%)	81.49^{ab}	80.51^{b}	81.37^{ab}	80.71^{b}	81.40^{ab}	81.95^{a}
BFT_{110} (mm)†††	26.98^{bc}	24.18^{d}	26.23^{c}	27.83^{ab}	29.13^{a}	28.31^{ab}
Hams weight (kg)††	21.24^{c}	21.85^{ab}	21.77^{b}	22.25^{a}	21.77^{b}	22.02^{ab}
Forelegs weight (kg)††	15.16^{a}	15.20^{a}	14.96^{ab}	14.84^{b}	14.42^{c}	15.17^{a}
Loin weight (kg)††	3.39^{b}	3.80^{a}	3.86^{a}	3.76^{a}	3.50^{b}	3.52^{b}
DFT Carcass (mm)††††	76.25^{ab}	77.16^{ab}	74.50^{b}	78.44^{a}	78.74^{a}	76.38^{ab}
Intramuscular fat ham	7.13^{b}	5.62^{cd}	4.96^{d}	5.87^{c}	6.27^{bc}	8.58^{a}
Intramuscular fat loin	7.82^{ab}	7.09^{ab}	5.86^{c}	5.97^{c}	6.92^{b}	7.88^{a}

†Corrected by the slaughter age
††Corrected by the carcass weight
†††Backfat thickness measured through ultrasound, adjusted at 110 kg of weight
††††Mean of the dorsal fat thickness measured in three points of each hemicarcass

Within the growth process during *recría* the cross RSP x TOR surpasses TOR (clear example of heterosis, being RSP a line of less growth than Torbiscal). The crosses with NLS do not exceed the pure strains, since *lampiño* is an animal with inferior growth rate than *retinto*. In *montanera*, again TOR and, at a lesser extent, its cross with RSP, has superior growth. The two

crosses with *lampiño* are the only ones whose values are under 700 g/day. In yield, even when the cross effect is not relevant, as it happened in the previous tests, VAL and its crosses surpass TOR and all its crosses. This aspect is repeated in BFT with 110 kg, in which again TOR behaves as a much slower strain regarding fat deposition. The crosses in which VAL or NLS are involved surpass the rest. VAL is once more the only case in which the weight regression over the thickness is not different from zero, showing an earlier greasing in comparison to the rest.

In the carcass composition characteristics, the weight estimates of hams do not allow to obtain exact conclusions. Therefore, the cross TOR x NLS surpasses the rest clearly. The cross VAL x RVM and Torbiscal also offer good results regarding this characteristic. With respect to the forelegs weight, the crosses with black *lampiño* are inferior, while the lowest loin weight are proper of VAL and its crosses due to their carcass shortness. The different measurements of DFT in carcass show clearly less deposition of VAL in the area of the sacrum and greater deposition (together with its crosses) in the scapular area, as it happened in the first test. TOR (and its crosses) tends to deposit less amount of fat in this last area. If we consider all the measurements, the crosses with *lampiño* are slightly superior to the rest. Concerning the intramuscular fat percentage, it is surprising the amount of fat which is slightly greater in the loin than in the Gracilis muscles, since the opposite happened in the previous test. In both pieces the cross RVM x VAL reaches greater infiltration. It is particularly relevant the value obtained in the ham, up to 1.45% greater than in the following genotype. VAL also in both cases is placed immediately behind the previous cross. All the estimates of TOR and its crosses, except in the loin of the own pure strain, are placed below the 6%.

Discussion

Growth

In the traditional extensive management system of the Iberian pig, the feeding at *recría* (considered from weaning to *montanera*) is restricted. Therefore, the animals do not develop all their growth potential during this period. In this system a feeding competition is established. This competition is favourable to the strongest, biggest and fiercest animals. That is why, in the two first tests, the sucking pigs belonging to particular stockbreeding's, which reached Valdesequera farm with lower weight, were seriously affected.

As a whole, a better growth can be pointed out during the *recría* of Torbiscal, except in the first test in which some of the sucking pigs presented symptom proper of chronic infection by *Erisepelotris rusopathie* (Red fever). The crosses tested in previous years also presented a good behaviour in this characteristic, particular those tests in which the cross among strains were genetically different. The values obtained in some of them would be superior to the expected values means in the own pure strains (v. g. VAL x TOR, VAL x GUA, RSP x TOR, RVM x VAL). As a result, heterosis is present among strains in the growth characteristics. This has already been stated in previous tests (García Casco, 1993). There are some exceptions which contradict the above statement such as the crosses between Torbiscal and Guadyerbas (Table 4) or between the black *lampiño* of la Serena and Valdesequera (Table 5). In the first case, this could be explained because a 35% of the genes in Torbiscal come from Guadyerbas; while in the second cross that exception could be due to the fact of being NLS a strain of scarce growth in *recría* as it has already been shown in previous analyses (García Casco, 1993).

A particular aspect proper of Valdesequera seems to be its tendency to a greater precociousness in its fat deposition, at least in the lumbar area, since in both tests of 1995/96 (ETD_{100}) and 1996/97 (ETD_{110}), it is the only strain in which the weight regression over thickness is not significantly different from zero. In addition, the thickness predictions show higher values in Valdesequera and its crosses, particularly with *lampiño* animals. The LRZ strain corroborates these considerations.

In *montanera*, Torbiscal, animal of big complexion retarded in its greasing, shows a good growth rate in all the tests. These characteristics can be related to its multiple genetical origin, which would allow this cross the adaptation to different and even adverse environmental circumstances; as it happened in the rainy *montanera* of 1995/96. Furthermore, Torbiscal counts in its composition on golden Alentejan genes, extinguished strains nowadays, whose main characteristic was great growth and big size (García Casco, 1993). It is, all in all, a type of

animal which should be slaughtered at higher weights (16 @), increasing its yield and its degree of fatty infiltration. These peculiarities could be repeated for the crosses VAL x TOR and RSP x TOR, crosses between Torbiscal and *retintas* lines. However, this does not occur between Torbiscal and black *lampiño* (GUA y NLS). The reason is not only due to the own characteristics of the *lampiño* strains, but also due to the fact that both lines were involved in the formation of Torbiscal. Regarding Valdesequera, it can be said that it is a smaller animal, more precocious in its fatty characteristics and with an ideal slaughter weight which could be established about 14 @. In its crosses with TOR and RVM, of bigger size, its behaviour in *montanera* improves clearly, in an obvious show of heterosis. The crosses in which these two *lampiñas* strains take part, have a smaller growth in this period. Their ideal slaughter weight never could be higher than 165 kg, weight in which the animal is finished with plenty of fats. This aspect is also noticed in the LRZ strains. Although it also grew in *montanera* in a similar way to ROL and VAL, great amounts of fats were accumulated, particularly in the carcass area. Guadyerbas corroborates its ancestors' characteristics, which presented smaller average daily gain. The origin of these animals (Puebla de la Calzada, located in the meadow of the Guadiana river) justifies this peculiarity, because these animals were slaughtered at less high weights.

Finally, the obtained values regarding the average daily gain in *recría* and in *montanera* seem to indicate no correlation between both (0.112, -0.082 and -0.070 in 1994/95, 1995/96 and 1996/97, respectively). I mean, strains with good growth in *recría* do not necessary have good growth in *montanera*; there are not clear evidences of compensatory growth either (a bad *recría* could have good growth in *montanera* and *vice versa*). A final note has to be taken into account with respect to the test of 1995/96. The usual stockbreeding practice acts against the adverse years for *montanera*, supplying the animals with fodder. In this case that action has not been taken in order to keep a feeding system based just in grass and acorn.

Carcass composition

As it was expected, through numerous works on white pigs as well as through previous studies on crosses between Iberian strains (García Casco, 1993), the carcass composition characteristics are very additive, that is why they show hardly heterosis. However, there are differences between strains and crosses, which support the consideration of this race as a heterogeneous one from the productive point of view. From the results, general conclusions can be pointed out, avoiding in a great deal the results obtained in the test of 1995/96 due to the circumstances already commented on the necessity of slaughtering at lower weights than the usual ones.

So, big differences are not noticed regarding the hams weight. There is a general good behaviour of Torbiscal and nearly all the crosses. In this sense, at first it is surprising the excellent weight found in the cross TOR x NLS. However, previous analyses (García Casco, 1993) evidenced the good conformation of hams obtained from black *lampiños* of La Serena. As regard the weight of the forelegs both pure strains taken as reference, which are Torbiscal and Valdesequera, offer good registers. In the crosses with *lampiño*, particularly in the test of 1995/96 (even though these results have to be taken with caution), this characteristic shows inferior values, confirmed by the ones of 1996/97. Once more previous works (García Casco, 1993) support this conclusion The estimated weight values for loins certify the least format of Valdesequera, in purity and in its crosses, as well as the largest format of Torbiscal. The weight of this piece is closely related to the carcass length. According to the dorsal fat thickness measured in the carcass, apart from noticing relevant differences between strains depending on the place where the measuring was carried out, the results show a greater fatty deposition in the crosses with *lampiños* animals, except in the test of 1995/96. In this sense the value obtained in LRZ in the first test can be pointed out with a thickness nearly 6 mm bigger than in any of the other three strains (even in the scapular area the estimated measurements reached 101 mm).

Finally, the degree of infiltration has to be stood out. In the loin as well as in the ham muscle *Gracilis,* the level of infiltration presents a very high variation coefficient. It can be set from the 2% to 14%, with great variability among the animals. The estimated values in 1995/96, lower than the ones in the other two tests, once more could be influenced by the lowest slaughter weight, without exceeding the 6%. The test of 1996/97, the only one in which the values are representative enough by being based upon a good number of observations, the estimated measurements are set between 4.96% and 8.58%. According to the difference between strains and crosses, there is a clear tendency towards a greater infiltration of

Valdesequera (and its crosses) versus Torbiscal (and its crosses). It is also notorious the fact that a greater thickness of dorsal fat, at least in these results, has not derived into a greater percentage of intramuscular fat. In this sense, the values obtained of 1994/95 in LRZ, of 1995/96 in the crosses with Guadyerbas and, to a lesser extent, the results of 1996/97 in the crosses with NLS, seem to underline smaller infiltration in the *lampiños* animals. If we stick to the believing, widely spread in the sector, which relate cured product quality to high percentage of intramuscular fat, this result contradicts the opinion which pointed out a better butcher aptitude of the *lampiñas* strains.

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