Chapter

Alentejano Pig

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Abstract

The present chapter presents the history and current status of Alentejano pig breed, a Portuguese autochthonous swine breed. A review of literature regarding reproductive and productive traits was carried out. Reproductive performance includes sow age at first parturition and at culling, litters per sow and per year, piglets born alive per litter, percentage of stillborn per litter, piglets birth weight, mortality rate until weaning, piglet weaned per litter, duration of lactation and farrowing interval. Growth performance includes average daily gain and average daily feed intake during lactation, early, middle and late growing stages and fattening stage. Carcass traits were evaluated using age and weight at slaughter, hot carcass weight, carcass yield, lean meat content, back fat thickness at withers and at the level of the last rib, muscle thickness at the cranial edge of *gluteus medius* muscle and loin eye area. Meat and fat quality traits of *longissimus* muscle were evaluated by means of pH at 45 min and 24 hours after slaughter, objective colour (CIE L*, a* and b*), intramuscular fat content and fatty acid composition of intramuscular fat. However, a considerable number of studies on Alentejano pig, data on reproductive performance and some parameters of meat quality are still scarce.

Keywords: traditional European breed, TREASURE, productive traits, phenotype, Portugal

1. History and the current status of the breed (census)

The Alentejano pig belongs to the Mediterranean group [1] and derives, as the Iberian breed pig, from the primitive *Sus scrofa mediterraneus*. Alentejano pig belongs to the Iberian type breeds, characterized by low prolificacy [2] and low growth rate (except under "*montanheira*" regime). It is also quite adipogenic [3]. Its meat and fat are considered as excellent for both fresh meat market and to process high-grade sausage and dry cured products. Alentejano pigs are well adapted to the environment and to the use of natural resources as feed. Already in the first century AD, Roman documents stressed out the importance of acorns from holm oak forests and in the outdoor rearing of these pigs from Lusitanos [4]. Before change and domination of indoors pig production system, Alentejano was the main pig breed in Portugal, representing over 45% of the total national pig population [5]. This breed was predominantly distributed by the regions south of the Tagus river. Due to several factors, this breed declined in numbers and importance, mainly since the second half of the twentieth century, and was on the edge of extinction in the 1980s.

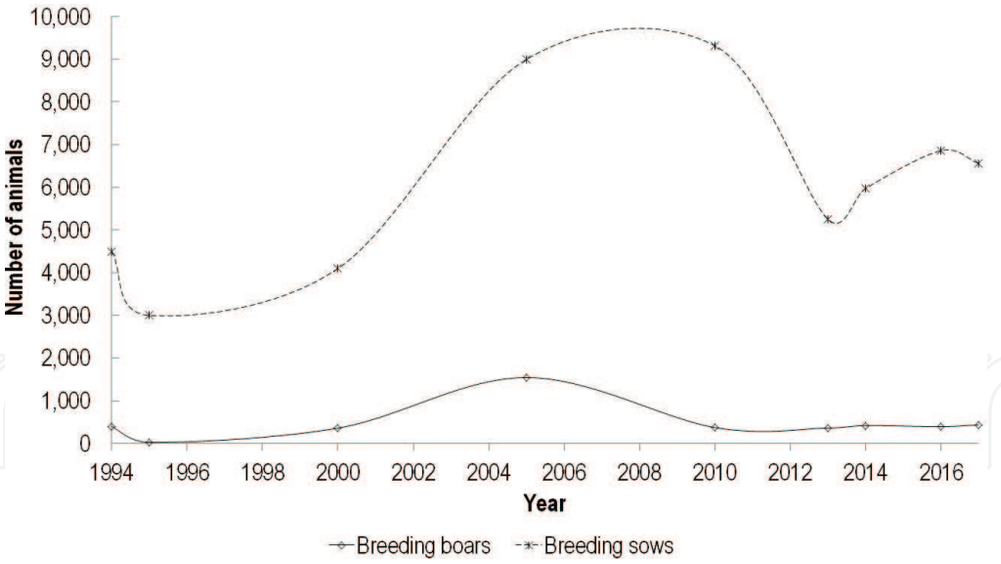

Figure 1.
Census of Alentejano pig breed from 1994 to 2017 [8].

Gradually, from the end of 1980s onward, a slight but consistent recovery of this breed and its traditional production system occurred, fostered by grants of several agents for conservational purposes [6, 7]. Nowadays, the Alentejano pig recovered and represent an economic, ecological and social add value to Alentejo region. Census of Alentejano pig breed is presented in **Figure 1**. By the end of 2017, 6464 breeding sows and 510 boars were registered in the breed herdbook, distributed by 137 herds. Each farm had, on average, 47 sows [8].

2. Exterior phenotypic characteristics

The information on the morphology of the Alentejano pig is summarized in **Table 1**. Alentejano is a medium-sized pig with a light bone structure, black coat colour and scarce black, blonde or reddish thin hair (**Figures 2** and **3**). It has a long, thin head with a pronounced frontonasal angle, and relatively small, thin, forward-facing ears, triangular in shape and slightly tipped out. The body is not too wide and deep; the back is of medium length and width, slightly arched; the shoulders and hams are regularly developed and medium in width; the extremities are short and slim, ending with small feet with uniform black pigmented hooves. Their temperament is considered energetic [4, 9]. Nowadays, the classifications used by the

Measurement (average)	Adult male	Adult female
Body weight (kg)	160	120
Body length[2,3] (cm)	126	
Ear length	Small to medium	Small to medium
Chest girth[3] (cm)	122	
Number of teats		10

[1]*Data provided by ANCPA (personal communication).*
[2]*Measured from the tip of the nose to the starting point of the tail.*
[3]*Entire males at 120 kg live weight [10].*

Table 1.
Summary of morphology information on Alentejano pig breed[1].

Figure 2.
Alentejano sows with piglets.

Figure 3.
Alentejano boar.

technicians from the breeders' association vary between placid and friendly to moderately tractable (ANCPA, personal communication), considering the differences found between farms.

3. Geographical location and production system

This breed's origin and present location is the southwest of the Iberian Peninsula. It is reared under extensive conditions, perfectly adapted to the environment and the use of natural feedstuff resources [7]. It participates into a well-defined agro-sylvo-pastoral system known as "Montado". As a strategic step of this production system, the intensive fattening of animals occurs in *Quercus* forests from late October to late February ("montanheira") [5].

Traditionally, the herds were divided into three categories: breeding sows, growing pigs and fattening pigs [11]. Breeding sows and growing pigs were fed with natural pastures and, when necessary (e.g., during summer) supplemented with cereal grains (barley, oats or corn), legumes (chickling vetch, faba bean or black chickpea), and local agricultural by-products, which conditioned the growth and duration of the production cycle. Pigs fattened with acorns and grass present very high average daily gains [7, 12].

Conversely, nowadays, there is no uniform production system. Breeding season, feeding management, weight and age at slaughter vary among farms, depending on the tradition and the production objectives [7]. However, most production systems usually use two farrowing seasons (spring-summer and fall-winter). Piglets born between April and September go to montanheira the following year. Piglets born between December and March supply the roast piglets' market, the fresh meat market with pigs weighing on average less than 120 kg, and are used for herd replacement when purebred [7, 13]. In some cases, alike the observed in Spain with the Iberian pig, in this last farrowing season, a terminal cross with Duroc breed is used to obtain crossbred pigs with better growth performances, higher yields and leaner carcasses (ANCPA, personal communication). The extensive and semi-extensive systems are the most common, and the presence of a free-range feeding period is obligatory for production of PDO and PGI products. However, Alentejano pigs are increasingly reared in semi-extensive systems where, to improve and standardize performance and productivity, most sows and growing pigs receive concentrated balanced feeds. Breeding farms are also abandoning the traditional concrete facilities ("malhadas") and in most cases, farrowing occurs outdoor, in a "camping" environment with huts and/or collective shelters [14].

4. Organisations for breeding, monitoring and conservation

The Alentejano pig is listed among the endangered Portuguese breeds of farm animals. In 2015, the national legislation (https://dre.pt/web/guest/pesquisa/-/search/66619894/details/maximized) categorized the Alentejano pig breed as in moderate risk of extinction. The names and contacts of the main organizations of the breed are presented in **Table 2**. The breeding program is run by ACEPA, A.C.E. (Alentejano Pig Complementary Consortium of Companies, A.C.E.), created in 2011, which also holds the Alentejano pig Herdbook. Besides ACEPA, two breeders' associations—the Association of the Alentejano Pig Breeders (ACPA), covering mainly the south of the Alentejo region, and the National Association of the Alentejano Pig Breeders (ANCPA), covering mostly the centre and north of the region—collect data that are stored and processed by the database GenPro (Ruralbit Lda.). More recently (in 2014 and 2017), each association created a Group of Producers (ALPORC SA and PACOOP, CRL) for commercial issues.

Name of organisation	Address	E-mail address
ACEPA—Agrupamento Complementar de Empresas do Porco Alentejano, A.C.E.	Rua Diana de Liz, Apartado 123, 7006-802 Évora	aceporcoalentejano@gmail.com
ANCPA—Associação Nacional dos Criadores do Porco Alentejano	Rua Diana de Liz, Apartado 71 7002-501 Évora	porcoalentejano@gmail.com
ACPA—Associação de Criadores de Porco Alentejano	Rua Armação de Pêra, 2 7670-259 Ourique	acpaourique@gmail.com

Table 2.
Contact details of the breeding organisations for Alentejano pig breed.

5. Productive performance

5.1 Reproductive traits

Despite the availability of commercial artificial insemination doses, in most cases females are naturally mated. At farm level, the ratio of boar:sow varies from 1:5 up to 1:15 (ANCPA, personal communication). **Table 3** summarizes the basic data available on the reproductive traits. The mean age of sows at first parturition ranges from 10.6 to 16.6 months, but the gilts management (especially feeding) in each farm can greatly influence this trait, justifying individual variations from 9 up to 24 months of age, at farm level (ANCPA, personal communication). Gestation is shorter than in other breeds or genotypes (111 days [2]). Regarding the litter characteristics, sows of Alentejano breed have a number of live born piglets ranging from 6.7 to 9.4 ([2, 15–19], Charneca R, personal communication), weighing between 1.0 and 1.3 kg at birth [2, 15–17, 20, 21]. The reported stillbirth rate varies between 1.2 and 11.3% [2, 15, 16]. The high rate on stillbirth in one of the studies [15] may be related to the high total prolificacy also observed in that trial. The reported values for stillbirth rate are lower than the reported in modern genotypes [22]. The mortality rate at weaning mentioned in two studies [2, 16] ranged from 18.8 to 27.5%. Both are relatively high values but in line with reported values for other Iberian pigs [23]. The average value for weaned piglets per cycle is 5.7 (ANCPA, personal communication), based on a sample of 2636 records from 20 farms, which is in accordance with the reported values for the prolificacy and mortality rate observed in other scientific studies [2, 15–17]. Due to the relatively low growth rate of sucking piglets [2, 15, 16, 18] and usual poor post-weaning conditions, the lactations are usually longer than the practiced in the modern intensive systems, ranging from 35 to 60 days ([15–17, 20, 21], Charneca R, personal communication). These long lactations increase the farrowing interval and reduce the breed productivity. Regarding the reproductive performance of the Alentejano breed, the information available only covers some data (e.g., number of litters per sow and per year, life production of sow and farrowing interval), representing data collected by the breeders' associations. In the authors' opinion, these data should be used for a clearer monitoring in this breed, after validation. The information available for the Alentejano suggests that this pig breed has a moderate reproductive efficiency.

5.2 Growth performance

Basic data available on growth performance of Alentejano pig are presented in **Tables 4** and **5**. Due to the big differences reported between studies regarding the live weight range covered, the stages for growth performance were defined as lactation (regardless of how long it was), early, middle and late growing stages (from weaning to approximately 30 kg, between 30 and 60, and between 60 and 100 kg live weight, respectively) and fattening stage (above 100 kg live weight). In some sources [17, 24–26], only the overall growth rate for the whole studied period (defined as overall) was provided. It should also be noted that only a small number of studies actually aimed at evaluating the breed potential for growth. In the studies mentioned in **Table 4**, the average daily gain in the lactation period ranged from 133 to 191 g/day. The lactation periods considered varied from 35 to 56 days, and in most cases, piglets were supplemented 15–21 days after birth. Still, all the values are lower than the ones

References	Age at first parturition (mth)	Litters per sow per year	No. of piglets alive per litter	Piglet live weight (kg)	Stillborn per litter (%)	Mortality at weaning (%)	Piglet weaning weight (kg)	Duration of lactation (d)	Farrowing interval (d)	Age at culling (mth)
[2]	–	–	8.0	1.1	1.7	27.0	–	–	–	–
[15]	–	–	9.4	1.1	11.3	–	6.3	35	–	–
[16]	–	–	7.3	1.2	1.2	18.8	11.0	50	–	–
[17]	–	–	7.0	1.3	–	–	11.0	53	–	–
[18]	10.6	–	6.7	–	–	–	–	–	–	–
[19]	–	–	7.9	–	–	–	–	–	–	–
[20]	–	–	–	1.0	–	–	9.0	56	–	–
[21]	–	–	–	1.2	–	–	12.0	60	–	–
Charneca R[1]	–	–	–	–	–	–	6.3	35	–	–
Charneca R[2]	–	–	6.9	–	–	–	–	–	–	–
Charneca R[3]	–	–	7.0	–	–	–	–	–	–	–
ANCPA[4]	16.6 (2247)	1.8 (1991)	–	–	–	–	–	–	206 (1991)	45 (2636)

No.—number; mth—month; d—days.
[1]Charneca R, unpublished data, University of Évora, 2016.
[2]Charneca R, unpublished data from Experimental Centre of Ministry of Agriculture (CEBA), data from 2017.
[3]Charneca R, unpublished data from University of Évora experimental farm (Mitra), data from 2012 to 2015.
[4]ANCPA, 2018. Breed database values representing data collected from 20 farms computed specifically for this chapter. The number of animals considered for each trait is provided within brackets.

Table 3.
Main reproductive traits in Alentejano pig breed.

References	Feeding regime and production system	No. of animals	ADG lactation[1]	ADG growing[2]			ADG fattening[3]	Overall ADG[4]
				Early	Middle	Late		
[2]	Ad Lib; extensive; outdoor	261	163	–	–	–	–	–
[15]	Ad Lib	60	149	–	–	–	–	–
[16]	Ad Lib	5974	191	–	–	–	–	–
[17]	Semi; intensive	15	–	–	–	–	–	556
[18]	Ad Lib; extensive	38	191	–	–	–	–	–
	Ad Lib; extensive	48	–	192	–	715	1000	715
[20]	Ad Lib	1203	142	–	–	–	–	–
[24]	Rest; intensive; indoor	14	–	–	–	–	–	481
[25]	Semi; intensive; indoor	24	–	–	–	–	–	471
[26]	Rest; intensive; indoor	15	–	–	–	–	–	494
[27]	Rest; intensive; indoor	18	–	–	–	450	–	450
	Rest; extensive; outdoor	12	–	–	–	533	–	533
[28]	Ad Lib; intensive; indoor	20	–	–	–	805	–	805
[29]	Ad Lib; intensive; indoor	30	–	–	–	801	–	801
[30]	Rest; intensive; indoor	30	–	–	346	439	–	393
[31]	Rest; intensive; indoor	24	–	–	489	–	–	446
[32]	Rest; intensive; indoor	51	–	–	251	–	–	251
	Ad Lib; intensive; indoor	36	–	–	–	617	–	617
[33]	Semi; intensive; indoor	48	–	–	–	–	–	505
		12	–	–	–	–	–	557
		12	–	–	–	–	336	453
	Ad Lib; extensive; outdoor	12	–	–	–	568	–	568

References	Feeding regime and production system	No. of animals	ADG lactation[1]	ADG growing[2]			ADG fattening[3]	Overall ADG[4]
				Early	Middle	Late		
[34]	Rest; intensive; indoor	24	–	–	–	187	–	187
	Ad Lib; intensive; indoor	12	–	–	–	442	–	442
	Ad Lib; extensive; outdoor	36	–	–	–	627	447	627
[35]	Rest; outdoor	15	–	–	–	671	–	671
[36]	Rest; intensive; indoor	30	–	277	363	502	–	432
[37]	Ad Lib	70	–	–	275	491	–	383
	Rest	22	–	–	–	331	–	331
	Ad Lib	39	–	–	421	461	838	441
	Rest	26	–	–	–	240	–	240
	Ad Lib	40	–	–	339	–	–	339
		20	–	–	339	–	–	339

No, number; ADG, average daily gain in g; w, weaning; Ad Lib, ad libitum feeding regime; Semi, semi ad libitum feeding regime; Rest, restrictive feeding regime.
[1]ADG in period of lactation regardless of how long it was.
[2]ADG in growing period estimated from weaning to approximately 30 kg, between approximately 30 and 60 kg and between approximately 60 and 100 kg live body weight, respectively.
[3]ADG in a period of fattening is reported for above 100 kg live body weight.
[4]When the source provides only the overall growth rate for the whole studied period, this growth rate is defined as overall ADG.

Table 4.
Growth performance in Alentejano pig breed according to different studies.

References	Feeding regime and production system	ME content of feed (MJ/kg)	CP content of feed (%)	No. of animals	ADFI growing[1]		ADFI fattening[2]	Overall ADFI[3]
					middle	late		
[17]	Semi; intensive	–	13.8	15	–	–	–	2.1
[24]	Rest; intensive; indoor	–	16.0	14	–	–	–	2.2
[25]	Semi; intensive; indoor	–	12.8	24	–	–	–	2.2
[27]	Rest; intensive; indoor	–	12.6	18	–	2.3	–	–
	Rest; extensive; outdoor	–	12.6	12	–	2.4	–	–
[29]	Ad Lib; intensive; indoor	13.5	14.6	30	–	3.2	–	–
[30]	Rest; intensive; indoor	–	15.0	30	1.6	2.6	2.5	–
[31]	Rest; intensive; indoor	–	15.0	24	–	–	–	2.2
[32]	Rest; intensive; indoor	–	13.2	51	1.6	–	–	–
[33]	Semi; intensive; indoor	–	17.4	48	–	–	–	2.5
		–	17.4	12	–	–	–	2.5
		–	17.4	12	–	–	2.7	2.6
	Ad Lib; extensive; outdoor	–	17.4	12	–	2.4	–	–
[34]	Rest; intensive; indoor	–	14.7	24	–	1.4	–	–
	Ad Lib; intensive; indoor	–	14.7	12	–	2.5	–	–
[35]	Rest; outdoor	–	15.0	15	–	2.9	–	–
[36]	Rest; intensive; indoor	–	15.0	156	1.7	2.4	–	–

References	Feeding regime and production system	ME content of feed (MJ/kg)	CP content of feed (%)	No. of animals	ADFI growing[1]		ADFI fattening[2]	Overall ADFI[3]
					middle	late		
[37]	Ad Lib	–	17.5	39	2.0	2.8	–	–
	Rest	–	17.5	26	–	1.9	–	–
	Ad Lib	–	14.0	40	1.5	–	–	–
	Ad Lib	–	14.0	20	1.5	–	–	–

No., number; ADFI, average daily feed intake in kg/day; Ad Lib, ad libitum feeding regime; Semi, semi ad libitum feeding regime; Rest, restrictive feeding regime; ME, metabolisable energy; CP, crude protein.
[1]ADFI in growing period estimated between approximately 30 and 60 kg (middle) and between approximately 60 and 100 kg live body weight (late), respectively.
[2]ADFI in a period of fattening is reported for above 100 kg live body weight.
[3]When the source provides only the overall average feed intake for the whole studied period, this feed intake is defined as overall ADFI.

Table 5.
Average daily feed intake (in kg/day) in Alentejano pig breed in different studies.

observed in modern breeds [2]. Average daily gain in the early growing stage (192 g/day; [18]) is also considerably lower than those observed in modern breeds [38, 39], denoting lesser intensity of rearing and/or growth potential. Also, the middle and late growing stages, the fattening stage, and the overall stage are generally characterized by relatively slow growth and high heterogeneity (251–489, 187–805, 336–1000, and 187–805 g/day in middle and late growing stage, fattening stage, and overall stage [17, 18, 24–37]). These differences may be explained by the fact that studies covered distinct situations, where different rearing systems and/or environmental conditions (e.g., season) and also feeding levels were practiced. In the context of the evaluation of growth performance, it is also of interest to observe the extreme values, because it can be assumed that the maximum figures exhibit the growth potential of Alentejano pigs in *ad libitum* conditions of feeding (≈1000 g/day in the fattening stage [18]).

The information on the feed intake and feed nutritional value (**Table 5**) is scarce, which limits the evaluation of the breed´ growth potential. Nevertheless, as expected, average daily feed intake (ADFI) increased with body weight. In restricted animals, ADFI ranged from 1.6 to 1.7 kg in middle growing stage (from ~30 to 60 kg live weight), from 1.9 to 2.9 kg in late growing stage (from 60 to 100 kg live weight) and from 2.5 to 2.7 kg in the fattening stage (>100 kg live weight). The same tendency was observed in *ad libitum* fed animals even tough values are only available for middle (from 1.5 to 2.0 kg ADFI) and late growing stage (from 2.4 to 3.2 kg ADFI).

5.3 Body composition and carcass traits

In Portugal, in most common commercial conditions, Alentejano pigs are slaughtered at weaning for roasted piglet market, at 90–100 kg live weight for the fresh meat market, at 120–140 kg for the production of dry-cured sausages, and at 150–170 kg for the ham industry in Portugal or in Spain [7]. **Table 6** summarizes the available information on the most commonly encountered carcass traits obtained from research and field studies. Alentejano breed pigs involved in these studies were slaughtered at ages ranging from 120 to 360 d, and between 39 and 160 kg live weight. Dressing yields and lean meat contents were calculated based on commercial cuts obtained according to the Portuguese norm NP-2931. The backfat thickness at withers ranged from 45 to 78 mm, while at the level of the last rib it varied from 12 to 63 mm. Similarly, muscularity measured as lean meat content varied from 35.9 to 51.7%, the loin eye area from 15 to 32 cm^2, whereas the muscle thickness measured above *Gluteus medius* muscle varied from 36 to 43 mm, which indicates lower muscular development compared to modern breeds [39, 47, 48]. This variation in backfat and muscle thickness is a consequence of the wide range of final live weights of pigs and different feeding regimes applied in the considered studies.

5.4 Meat and fat quality

Table 7 summarizes the most commonly encountered meat and fat quality traits of Alentejano´ carcasses, as measured in *Longissimus* muscle. In the studies reporting meat quality in Alentejano pigs, pH measured in *Longissimus* muscle at 45 min post-mortem ranged from 5.89 to 6.45, while at 24 h *post mortem* it varied between 5.39 and 5.79. These pH 24 values reported in the carcasses of Alentejano pigs are slightly higher than those from modern breeds [52, 53], suggesting the existence of lower glycogen stores before slaughter and more

References	Feeding regime and production system	No. of animals	Final age (d)	Final BW (kg)	Hot CW (kg)	Dressing yield (%)	Lean meat content (%)	Backfat thickness (mm)		M[1] (mm)	Loin eye area (cm^2)
								At withers	At last rib		
[17]	Semi; intensive	6	–	98.0	75.0	76.5	–	–	–	–	–
[18]	Ad Lib; extensive	12	–	93.0	–	–	–	–	34.6	–	27.9
[24]	Rest; intensive; indoor	14	–	100.2	–	–	–	–	–	–	21.7
[25]	Semi; intensive; indoor	24	–	98.0	78.4	80.0	–	–	–	–	–
[26]	Rest; intensive; indoor	15	299	100.2	80.3	80.1	41.5	–	–	–	22.0
[27]	Rest; intensive; indoor	18	–	99.3	–	–	37.5	–	–	–	–
	Rest; extensive; outdoor	12	–	99.4	–	–	41.1	–	–	–	–
[28]	Ad Lib; intensive; indoor	20	220	93.0	–	–	–	–	28.9	–	–
[29]	Ad Lib; intensive; indoor	30	–	93.0	72.6	78.1	–	–	–	–	–
[30][2]	Rest; intensive; indoor	5	180	40.0	31.1	77.8	51.7	–	–	–	15.5
		5	256	70.0	55.9	79.8	45.0	–	–	–	17.9
		5	275	80.0	65.2	81.5	45.6	–	–	–	18.5
		5	297	90.0	74.1	82.3	42.9	–	–	–	20.0
		5	324	100.0	80.9	80.9	41.5	–	–	–	20.1
		5	360	110.0	88.1	80.1	42.6	–	–	–	20.4
[31]	Rest; intensive; indoor	24	–	99.7	82.7	83.0	42.1	–	–	–	22.1
[32]	Rest; intensive; indoor	15	–	71.8	55.3	77.1	45.9	–	–	–	–
	Ad Lib; intensive; indoor	15	–	113.5	87.1	76.7	35.9	–	–	–	–
[33]	Semi; intensive; indoor	12	–	98.1	74.3	75.7	–	–	–	–	–
	Semi; intensive; indoor	12	–	120.4	93.9	78.0	–	–	–	–	–

References	Feeding regime and production system	No. of animals	Final age (d)	Final BW (kg)	Hot CW (kg)	Dressing yield (%)	Lean meat content (%)	Backfat thickness (mm)		M[1] (mm)	Loin eye area (cm^2)
								At withers	At last rib		
	Ad Lib; extensive; outdoor	4	–	108.6	87.4	78.1	–	–	–	–	–
	Semi; intensive; indoor	12	–	98.1	74.3	75.7	–	–	–	–	–
	Semi; intensive; indoor	12	–	120.4	93.9	78.0	–	–	–	–	–
	Ad Lib; extensive; outdoor	8	–	108.6	84.8	78.1	–	–	–	–	–
	Rest; intensive; indoor	12	–	98.1	75.6	77.1	–	–	38.3	–	22.9
	Ad Lib; extensive; outdoor	12	–	92.1	76.4	83.0	–	–	41.8	–	24.8
	Semi; intensive; indoor	12	–	120.6	96.7	80.2	–	–	44.3	–	30.4
[34]	Rest; intensive; indoor	24	–	70.4	–	–	–	–	12.3	36.4	–
	Ad Lib; intensive; indoor	12	–	91.2	–	–	–	–	18.7	40.3	–
	Ad Lib; extensive; outdoor	36	–	108.9	–	–	–	–	23.2	42.6	–
[35]	Rest; outdoor	15	240	105.0	–	–	–	–	–	–	26.0
[36][2]	Rest; intensive; indoor	10	120	42.2	31.0	73.4	–	–	–	–	17.0
		10	180	70.9	55.6	78.4	–	–	–	–	20.1
		10	240	80.2	63.7	79.5	–	–	–	–	20.4
[37]	Ad Lib	4	–	38.5	29.5	76.5	–	–	–	–	16.4
	Ad Lib	4	–	92.8	71.7	77.3	–	–	–	–	21.5
	Rest	8	–	79.6	61.6	77.3	–	–	–	–	21.0
	Ad Lib	4	–	115.7	92.3	79.8	–	66.5	57.0	–	21.5
	Rest	8	–	115.3	92.1	79.9	–	–	–	–	21.0
	Ad Lib	4	–	130.1	103.6	79.6	–	71.5	61.8	–	21.8

References	Feeding regime and production system	No. of animals	Final age (d)	Final BW (kg)	Hot CW (kg)	Dressing yield (%)	Lean meat content (%)	Backfat thickness (mm)		M[1] (mm)	Loin eye area (cm^2)
								At withers	At last rib		
	Rest	8	–	132.2	104.6	79.1	–	75.9	60.2	–	22.6
	Ad Lib	4	–	115.4	88.9	77.1	–	61.3	45.7	–	21.3
	Rest	8	–	114.8	89.4	77.9	–	63.6	47.1	–	21.4
	Ad Lib	4	–	132.5	105.5	79.6	–	73.3	44.9	–	24.8
	Rest	8	–	129.7	101.2	78.1	–	67.7	46.1	–	22.4
	Ad Lib	4	–	93.8	74.2	79.1	–	52.8	37.4	–	21.6
	Rest	8	–	78.5	61.8	78.7	–	45.0	28.4	–	20.0
	Ad Lib	12	–	131.4	105.7	80.4	–	77.7	63.2	–	21.2
[40]	Rest; intensive; indoor	5	–	70.0	–	–	–	–	34.1	–	17.3
		5	–	80.0	–	–	–	–	34.3	–	17.7
		5	–	90.0	–	–	–	–	33.0	–	17.6
		5	–	100.0	–	–	–	–	31.7	–	19.4
		5	–	110.0	–	–	–	–	36.3	–	21.5
[41, 42]	Ad Lib; intensive; indoor	24	–	100.0	–	–	–	–	41.4	–	–
[43]	Rest; extensive; outdoor	5	–	89.1	70.3	78.9	–	–	–	–	–
		5	–	100.5	80.3	79.9	–	–	–	–	–
		5	–	109.8	89.4	81.4	–	–	–	–	–
[44][2]	Rest; intensive; indoor	5	–	42.2	29.3	69.4	–	–	13.0	–	15.3
		5	–	70.9	52.2	73.6	–	–	30.0	–	18.1
		5	–	80.2	59.9	74.7	–	–	41.0	–	19.0

References	Feeding regime and production system	No. of animals	Final age (d)	Final BW (kg)	Hot CW (kg)	Dressing yield (%)	Lean meat content (%)	Backfat thickness (mm)		M^1 (mm)	Loin eye area (cm^2)
								At withers	At last rib		
		5	–	89.6	66.7	74.4	–	–	51.0	–	20.3
		5	–	100.5	75.6	75.2	–	–	56.0	–	21.1
		5	–	110.0	82.5	75.0	–	–	56.0	–	21.3
[45]	Ad Lib; extensive; outdoor	29	–	160.0	130.4	81.5	–	–	–	–	31.7
[46]	Semi	6	–	96.0	75.7	78.9	–	–	–	–	18.9

No., number; BW, body weight; CW, carcass weight; Ad Lib, ad libitum feeding regime; Semi, semi ad libitum feeding regime; Rest, restrictive feeding regime.
[1]M muscle thickness measured according to ZP method (at the cranial edge of Gluteus medius muscle (mm).
[2]Groups differ in weight at slaughter; to see more details on study design, address to the corresponding source.

Table 6.
Body composition and carcass traits in Alentejano pig breed.

References	Feeding regime and production system	No. of animals	Final BW (kg)	pH		CIE[1]			IMF content (%)	Fatty acid composition[2] (%)			
				45 min	24 h	L*	a*	b*		SFA	MUFA	PUFA	n − 6/n − 3
[24]	Rest; intensive; indoor	14	100	–	5.51	43	13.8	6.5	3.1	–	–	–	–
[27]	Rest; intensive; indoor	18	99	–	–	–	–	–	5.9	38.7	57.2	4.1	16.2
	Rest; extensive; outdoor	12	99	–	–	–	–	–	3.1	38.4	57.5	4.1	13.4
[29]	Ad Lib; intensive; indoor	30	93	6.45	5.73	50	9.7	4.6	4.8	41.5	47.7	10.9	25.2
[33]	Rest; intensive; indoor	12	98	–	–	–	–	–	–	41.8	–	–	–
	Ad Lib; extensive; outdoor	12	92	–	–	–	–	–	–	35.0	–	–	–
	Semi; intensive; indoor	12	121	–	–	–	–	–	–	37.8	–	–	–
[40][3]	Rest; intensive; indoor	5	70	–	–	–	–	–	6.2	–	–	–	–
		5	80	–	–	–	–	–	6.4	–	–	–	–
		5	90	–	–	–	–	–	7.2	–	–	–	–
		5	100	–	–	–	–	–	7.2	–	–	–	–
		5	110	–	–	–	–	–	7.5	–	–	–	–
[41, 42]	Ad Lib; intensive; indoor	24	100	–	5.79	43	10.6	3.9	4.8	–	–	–	–
[46]	Semi	6	96	5.89	5.39	51	–	–	4.1	–	–	–	–
[49]	Ad Lib; extensive; outdoor	8	–	–	–	–	–	–	4.9	41.1	52.1	6.8	–
[50]	Rest Ad; extensive; outdoor	10	105	–	5.71	47	12.0	5.2	6.9	–	–	–	–
[51]	Ad Lib; intensive; indoor	16	96	–	5.76	48	14.0	8.8	4.8	43.7	51.8	4.8	–
	Rest; intensive; indoor	32	81	–	5.62	47	11.9	7.1	3.7	43.3	51.9	4.8	–

No., number; Ad Lib, ad libitum feeding regime; Semi, semi ad libitum feeding regime; Rest, restrictive feeding regime; pH 45, pH measured approximately 45 min post mortem*; pH 24, pH measured approximately 24 h* post mortem*; IMF, intramuscular fat; SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids.*

[1]*CIE, objective colour defined by the Commission Internationale de l'Eclairage; L*, greater value indicates a lighter colour; a*, greater value indicates a redder colour; b*, greater value indicates a more yellow colour.*

[2]*For fatty acid composition, only pigs on control diet were considered. Control diets differ among studies, to see diet composition address to the corresponding source.*

[3]*Groups differ in weight at slaughter; to see more details on study design, address to the corresponding source.*

Table 7.

Summary of collected literature data on meat quality traits measured in Longissimus muscle from pigs of Alentejano pig breed.

oxidative muscle metabolism. These high pH 24 values are also associated with lower drip loss [54], which corroborates with higher intramuscular fat content (ranging from 3.1 and 7.5%) and darker colour (high Minolta L* value; L* varying from 43 to 51). As previously observed, lower pH values are related with higher water losses by drip due to a reduction in the repulsive electrostatic forces between the myofilaments, partial denaturation of the myosin head (address to [55, 56] for review). On the other hand, higher values of intramuscular fat are generally associated to a decrease in the moisture diffusivity coefficient [57]. Intramuscular fat content is highly variable among studies (3.1 and 7.5%; [24, 27, 29, 40–42, 46, 49–51]), mainly due to study conditions (feeding

Product name[1]	**Type of the product**	**Status of the product**
Carne de Porco Alentejano	Raw meat	PDO
Presunto de Barrancos	Dry cured ham	PDO
Paleta de Barrancos	Dry cured shoulder	PDO
Presunto do Alentejo	Dry cured ham	PDO
Paleta do Alentejo	Dry cured shoulder	PDO
Presunto de Campo Maior e Elvas	Dry cured ham	PGI
Paleta de Campo Maior e Elvas	Dry cured shoulder	PGI
Presunto de Santana da Serra	Dry cured ham	PGI
Paleta de Santana da Serra	Dry cured shoulder	PGI
Cacholeira branca de Portalegre	Sausage	PGI
Chouriço de Carne de Estremoz e Borba	Smoked sausage	PGI
Chouriço de Portalegre	Smoked sausage	PGI
Chouriço Grosso de Estremoz e Borba	Smoked sausage	PGI
Chouriço Mouro de Portalegre	Smoked sausage	PGI
Farinheira de Estremoz e Borba	Smoked sausage	PGI
Farinheira de Portalegre	Smoked sausage	PGI
Linguiça de Portalegre	Smoked sausage	PGI
Linguiça do Baixo Alentejo	Smoked sausage	PGI
Lombo Branco de Portalegre	Dry-cured sausage	PGI
Lombo Enguitado de Portalegre	Smoked sausage	PGI
Morcela de Assar de Portalegre	Smoked sausage	PGI
Morcela de Cozer de Portalegre	Sausage	PGI
Morcela de Estremoz e Borba	Smoked sausage	PGI
Paia de Estremoz e Borba	Smoked sausage	PGI
Paia de Lombo de Estremoz e Borba	Smoked sausage	PGI
Paia de Toucinho de Estremoz e Borba	Smoked sausage	PGI
Painho de Portalegre	Smoked sausage	PGI
Paio de Beja	Smoked sausage	PGI

[1]*All related legislation and additional information about these products can be found at https://tradicional.dgadr.gov.pt/en/.*

Table 8.
List of certified products from Alentejano pig breed.

regime, intensity of rearing, age and body weight at slaughter) but generally increases with body weight at slaughter within specific study (e.g., from 6.2% at 70 kg to 7.5% in 110 kg [40]) and is higher when a restrictive feeding regime is applied. The extreme values obtained for SFA, MUFA and PUFA content of intramuscular fat in *Longissimus* muscle were 35.0–43.7, 47.7–57.5, and 4.1–10.9% [27, 29, 33, 49–51]. Due to big differences between studies with regard to the feeding regime, feed composition, final body weight/age, and fatness, which are all important factors influencing the fatty acid composition of meat, the results of the fatty acid composition should be interpreted with caution. Nevertheless, it can be concluded that the results reported in the considered studies indicate higher proportions of SFA and particularly of MUFA, in contrast to lower PUFA content, in comparison to the modern meaty type of pigs [27, 49, 58, 59]. This can be attributed to a higher synthesis of MUFA (which increases with age [60]) and SFA, caused by higher fat deposition, as shown by the results of body composition (backfat thickness at the level of the last rib = 40 mm on average, **Table 6**).

6. Use of the breed and main products

The Alentejano pig is bred for the production of high-quality meat, sausages and dry-cured products. This slow growing-fat local pig breed is mostly reared in extensive finishing conditions, using the different agro-forest resources at their disposal. The high slaughter ages and weights grants great maturity and better flavour to the meat and meat products obtained, as already recognized in ancient Roman documents [4]. Meat from the Alentejano pig has high contents of oleic acid-rich intramuscular fat, micronutrients and antioxidants [27, 61]. It must be produced according to the conditions established in the Portuguese legislation (Decreto-Lei no. 95/2014, 24th of June—MAM, 2014) to be certified under the Protected Designation of Origin ("Carne de Porco Alentejano DOP"). Meat, fat and offal from Alentejano pigs are also used for the production of high-quality products (**Table 8**). There are currently five PDO and 23 PGI certified products [62].

Acknowledgements

This work has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 634476 for project TREASURE. The content of this paper reflects only the authors' view, and the European Union Agency is not responsible for any use that may be made of the information it contains.

DOI: http://dx.doi.org/10.5772/intechopen.83757

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