

Breeding? Chestnut Ham (jamón de castaña), a Quality Regional Product from Valle del Genal¹

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Iberian ham is a luxury item and one of the most recognisable and characteristic products of animal origin in Spain. The highest quality products come from Iberian pigs, which are characterised by at least 50% breed purity and kept extensively in dehesa, a floristically unique pasture system in Europe. Iberian ham owes its quality and taste largely to its multi-staged maintenance, as the ham must be dry-cured for 24-48 months (www.saboramalaga.es). All of these requirements make it an irresistible and praised product, valued for its taste and health-promoting properties.



Iberian breed sow with piglets on a farm in Farájan (phot. K. Paleczny)

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In the last decade, one of the most exclusive products from Iberian pigs has been released onto the Spanish market, i.e. the chestnut ham (jamón de castaña). The forage fed to the pigs has been enriched with chestnuts (*Castanea sativa*). Introduced to the diet fed to the animals, next to cereals and fodder peas, this nut from the beech family makes the difference in the final product, making it way more exclusive than jamón de bellota, the most popular Spanish ham. Today chestnut ham is mostly produced in Valle del Genal (Genal Valley), the province of Malaga. The Genal Valley is surrounded by La Serranía de Ronda (the Ronda Mountains) and has a favourable climate, including temperature, humidity and average precipitation, as well as a perfect floristic ecosystem, fit for both pig farming and for curing and storing products from the locally bred Iberian pigs. In the uneven hilly area, the pigs need to be constantly active and climb up to 600 metres above sea level, which has a positive effect on their muscular system and fat quality. Simultaneously, the average annual precipitation of c.a. 1000 l/m² g guarantees the appropriate amount and quality of grass forage which supplements the diet, with cereals and leguminous plants as the main ingredients, enriched in the autumn with three acorn species, from holly oak, cork oak and Portuguese oak (*Quercus ilex*, *suber* and *lusitanica*) and with sweet chestnut fruit (*Castanea sativa*). The management conditions and selected dietary components make the chestnut ham characterised by a higher oleic acid content compared to acorn ham, a difference made by the 10% share of sweet chestnut in the diet fed to pigs (<http://www.malagaenlamesa.com/noticias/2014>). The specific aromas and tastes of ham at the processing stage are obtained largely owing to proper regulation of the oxidation reaction via the heme (prosthetic) group with a bound iron cation (Lopez Bote et al., 2000).

Iberian Pig Breeding and Chestnut Ham Production in Valle del Genal

Pig breeding used to be a strong pillar of Valle del Genal's economy from the Reconquista until the end of the 1950s, when exodus from the region's rural areas started. The process was typical not only of Andalusia, but of Spain in general. In the 1950s pig population in Spain equalled 2,688,000 specimens and was by more than 1.5 million smaller than in 1924. Until the 1970s the main source of pig feed was natural vegetation from dehesa pastures, with minimum contribution, e.g. of cereals. This production pattern was applied until the 1980s, a time marked by the revival of pig breeding, maintaining and feeding on the Iberian Peninsula (Acción and Mora, 2007) (Tab. 1). This over three-decade-long development of the pig breeding sector, including the revival and popularisation of native breeds, has led to a nearly twofold increase in Spain's pig population to 30 million specimens, ranking the country first within the European Union, with Germany and France as runners-up (DGPMA, MAPAMA, 2017).

Table 1. Pig numbers in Spain in the years 1917–2017

<i>Year</i>	<i>Pig numbers (thous. head)</i>
1917	3640
1924	4159
1950	2688
1970	6914
1992	18260
1999	22418
2001	23858
2003	24056
2005	24884
2017*	30000

*Source: Benito et al. (1992), *MAPAMA (2017).*



*Iberian pig farm located on the slopes of Valle del Genal in Farájan – farrowing houses
(phot. P. Radomski)*



Iberian piglets on a farm in Farájan (phot. P. Radomski)

A considerable role in the process was played by the population increase on natural dehesas, i.e. the multifunctional pasture system with at least 50% of grasslands, including *Quercus sp.* and *Castanea sp. trees*, where Iberian pigs, cattle, sheep and goats are kept (Libro Verde de la Dehesa, 2010) (Tab. 2). The maintenance of Iberian pigs on dehesas is an excellent example of extensive production while keeping harmonious relations between the animals and their natural behaviour, outside of which they would find it difficult to survive. Until the 1950s Iberian pig remained the dominant species only to become endangered afterwards, as a result of production intensification in Spain (<https://www.eez.csic.es/files/>). Today, with the extensive production within dehesas, the animals are growing in importance, among others, owing to the high-quality items offered on the Spanish market and obtained from the species, marked as CHNP, CHOG and GTS.

Table 2. Animal production in the dehesa pasture system in Andalusia and Extremadura (head/%)

Species	Number of animals kept on dehesa pastures, (head/%)	Region with the highest number of pigs kept (head)	Breed
Pigs	2,058,739 / 24.73	Sewilla – Sevilla 224,566	Ibérico x Duroc
Cattle	865,500 / 58.5	Extremadura 309,500	Limusine, Charolais
Sheep	9,201,432 / 38.4	Kordoba – Córdoba 651,918	Merina, Castellana, Talaverana

Source: www.mapa.es; www.juntadeandalucia.es



Fatteners on Jamones Alto Genal farm in Farájan (phot. K. Paleczny)



Weaners on Jamones Alto Genal farm in Farájan (phot. K. Paleczny)

The Grenal Valley including, in particular, the Pujerra, Faraján and Júcar regions, where vegetation is dominated by oak and chestnut forests, makes a friendly environment for Iberian pig breeding, mainly because of the sweet chestnut fruit, a dietary supplement for pigs that adds a special tone to the local pork foods.

Jamones Alto Genal is a family business with a long tradition, based in Faraján, specialising in limited production of chestnut hams and offering control of the same at every stage: from breeding and management of the Iberian pigs on Valle del Genal farms, through their slaughter to drying of the hams and cured meats in specially adapted storage facilities. Iberian pigs are kept on two farms in the region. One has the area of 56 ha and is grazed by 50 porkers, while the other one has the area of 114 ha and is grazed by 100 porkers. All animals have their diet supplemented with foodstuffs offered by natural pastures, with oaks and chestnut trees playing the dominant role. Porkers weighing 60-90 kg are prepared for pasturing, through which they supplement their diet with sweet chestnuts growing within the dehesa in the valley, i.e. enter the fattening period that precedes the ‘montanera’ grazing (Real Decreto, 2014). The proper montanera time starts in October, when the animals exceed 90 kilograms of liveweight and ends with 150-165 kg (Benito et al., 1992). The minimum slaughter age in the montanera fattening period is 14 months (Tab. 3).

Gestating sows are kept on the farm in Faraján in 15 farrowing pens. Bred for 5 years, they have 2 litters per month, 10-12 piglets in each, with losses of c.a. 10%.

Table 3. Characteristics of Iberian pig management in the dehesa system

Name of fattening phase	Characteristics of fattening
Premontanera*	July to November, 60–100 kg, preparation for montanera
Montanera	1 X – 15 XII, slaughter between 15 December and 31 March, average initial weight 92–115 kg, minimal gain 46 kg during the first >60 days, minimal age at slaughter 14 months, minimal carcass weight 115 kg compared to 108 kg for 100% ibérico

Source: Real Decreto (2014), *Benito et al. (1993).

The Jamones Alto Genal farms use a slaughterhouse located 400 km from Faraján, with the selection of the facility (preceded by tests of 20 similar plants), by no means accidental, having been made out of concern for the quality of the foods produced. The slaughterhouse selected provides a guarantee of origin for each and every element processed and satisfies the requirements for animal welfare. Prior to slaughter the pigs are ensured several hours of rest, whereupon they are put down with carbon dioxide in a dedicated chamber. The process ends at 12.00 so that the hams, blades and loin can be frozen and transported to the storehouse in Faraján on the very same day. Other elements remaining after the butchering are sold directly in the slaughterhouse. With all this, the price of transport (10 EUR per 1 specimen) and slaughter (25 EUR per 1 specimen) is not so important for the company budget as quality of the product.

The process of curing cold meats and chestnut ham from Genal Valley takes from 4 to 48 months. The loins are macerated in olive oil for a few days and left to age for 4 to 6 months in dedicated, duly adapted microclimate chambers, compared to 2 years for blade shoulder and 3-4 years for ham. However, prior to the proper storage period, primal cuts are covered with sea salt for 10 days and then washed and re-exsanguinated. Subsequently, the meat is placed in dedicated chambers to dry and mature in temperatures between 3 and 30°C and humidity of 60 to 90% (the values are different for different storage phases). In the multi-staged maturing period, blades and hams get covered with mould (*Penicillium roqueforti*), with colour as one of determinants of their quality (the darker the mould the higher the product quality).

The quality of foods produced in Jamones Alto Genal is further proved by the sales agreement signed by the company with ‘El Pimpi’, one of Malaga’s most popular restaurants which holds exclusive rights to sell the Alto Genal chestnut ham.



Maturing jamón de castaña hams
(phot. K. Paleczny)



Cutting Iberian ham in a special rack
(cutter Juan Carlos Torres Chacón, owner
of the Faraján farm) (phot. K. Paleczny)



Labelling of Iberian hams
(phot. P. Moskała)

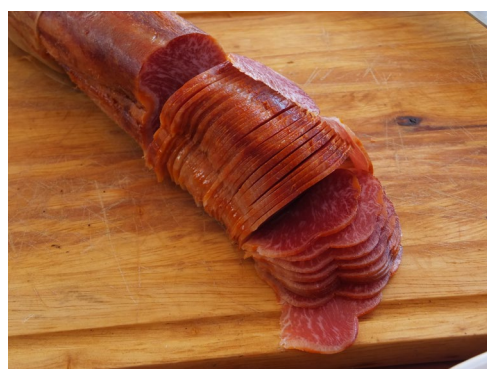
Health Benefits of De Bellota and De Castaña Iberian Hams

The new challenges facing agriculture and animal production demand a range of actions, among others, to obtain high-quality products in keeping with regulations that guarantee fair standards of animal well-being and ecological certification.

Animal production has been seriously affecting climate changes, through the detrimental effect of the accompanying GHG emissions on the environment, a problem that has provoked structural efforts to replace animal proteins with vegetable proteins and products obtained from processed insects. In this context, the values of pork foods, including Iberian hams, are rarely advertised. Nonetheless, these products have been proved to have health-promoting properties, with the thesis put forward in the title of this chapter having been confirmed by tests carried out over the last decade by Spanish scientists. In 2000 a team led by Lopez Bote reported higher content of oleic acid (55%) in fat from Iberian pigs bred in the montanera system compared to those fattened conventionally (49.1%), a fact later confirmed by Andrés et al. (2001) (Tab. 4).



Jamón de castaña – Iberian ham



Lomo – Iberian loin

(phot. K. Paleczny)

Table 4. Content of fatty acids in the Iberian pig meat (%)

Fatty acid	Dehesa pasture fattening on acorns	Conventional fattening
myristic	1.21	1.4
palmitic	20.02	24.1
palmitoleic	2.00	2.4
stearic	9.2	12.4
oleic	55.6	49.1
linoleic	8.9	8.02
linolenic	0.6	0.4

Source: Source: Lopez Bote et al. (2000).

Table 5. Comparison of fatty acid content in vegetable matter, acorns and pig fat (%)

Fatty acid	Olive oil	Acorns	Iberian pig fat	White pig fat
palmitic	10.7	15.8	21.0	22.0
stearic	3.5	2.7	9.0	12.2
palmitoleic	0.6	0	4.5	2.8
oleic	67.2	62.8	58.2	41.0
linoleic	10.2	16.3	5.1	8.7
linolenic	1.2	2.0	0.008	0.08

Source: Botejara (2006).

In his research Botejara (2006) showed that white pig meat contains 40 to 45% of oleic acid, compared to 56-58% for Iberian pigs, which he linked to dehesa grazing and bigger activity of the latter as well as the presence of acorns and sweet chestnuts in their diet, products containing more than 60% of oleic acid (Tab. 5). Additionally, Pugliese et al. proved (2005) that the diet fed to Iberian pigs, enriched with sweet chestnuts, increases PUFA content in the animals' fat, which has been linked to higher content of polyunsaturated fatty acids in sweet chestnuts compared to acorns (Lopez-Bote, 1998, cf. Szyndler-Nedza and Nowicki, 2018). The diet of dehesa-grazed pigs is also rich in different herbs which, when combined with bigger activity of the animals, increases the content of anti-oxidative agents in their bodies (Botejara, 2006).

Research conducted by Botejara (2006) on a group of 19 mature women on a diet rich in Iberian ham (120g/day/6 weeks) and olive oil showed reduced total cholesterol (TC, 208 mg/dL) and LDL (129 mg/dL) in their bodies compared to the base levels (221 and 137 mg/dL respectively). Going further, the concentration of fibrinogen which, when increased, brings about the risk of thrombosis, dropped as well, from 515 to 314 m/dL. Similar results, showing TC and LDL decrease after using a diet rich in Iberian ham was obtained in a group of 18 women and 18 men with hypercholesterolaemia.

The comparison of different pig maintenance patterns, e.g. extensive montanera on dehesa pastures, extensive grazing with limited access to dehesa pastures and intensive maintenance, practised by the above-mentioned author showed, among others, higher glucose and triglyceride content in the blood of pigs bred in the montanera and extensive system with limited access to pastures compared to animals from intensive systems. Finally, pigs grazed on montanera pastures with unlimited access to grass and herbs rich in α - and γ -Tocopherol had bigger amounts of the antioxidant in their blood, liver and muscles than intensively bred animals, whose blood (and liver and muscles) contained significantly less vitamin E (Botejara, 2006) (Tab. 6).

Table 6. Effect of management systems on the level of vitamin E in Iberian pigs (mg)

<i>Item</i>	<i>Montanera</i>	<i>Extensive with limited access to pasture</i>	<i>Intensive</i>
<i>Blood (mg/L)</i>	5.0	4.1	3.3
<i>Liver (mg/g)</i>	2938	1007	592
<i>Muscle tissue (mg/g)</i>	416	237	153

Source: Botejara (2006).

Mayoral et al. tested the impact of diet rich in bellota ham on oxidative stress in humans. After the experiment was closed, the women and men participating in the research were reported to have lower lipid peroxidation level compared to the results obtained in the follow-up study (Mayoral et al., 2003).

The studies described above lead to the conclusion that, when consumed as part of a diet containing cereal products, vegetables, fruit or fish, the bellota and castaña hams originating from Iberian pigs have numerous health benefits, i.e. contribute to normal blood cholesterol levels, prevent thrombosis, and reduce the risk of oxidative stress in humans.

In this context, new actions initiated in Spain by the sector of Iberian pig producers and co-funded by the Spanish Ministry of Agriculture, Fishery and Environment and the EU need more attention. Their aim is to define the environmental impact of Iberian pig production and draft the environmental product declaration (EPD, Spanish DAP; <https://agrinews.es/2018/08/17/>). Owing to these actions, it will be possible to assess the environmental characteristics of different pig maintenance patterns during the whole life-cycle of the product in 16 categories of environmental impact, i.e. the carbon footprint, use of resources, land conversion, impact on human health or climate change. Additionally, critical points in the production chain will be identified, to improve the environment. As a result, ecological footprint will be introduced for Iberian pork products and their economic and environmental aspects will be assessed. The data will serve as the source of information for producers, buyers, importers, retailers and consumers, next to the information governed by a number of ISO standards concerning product labelling.

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CHESTNUT HAM (JAMÓN DE CASTAÑA) – A QUALITY REGIONAL PRODUCT FROM VALLE DEL GENAL

Summary

Iberian ham is one of the most recognizable and characteristic products of animal origin in Spain. The highest quality products come from Iberian pigs, which are characterized by at least 50% breed purity and kept extensively in dehesa, a floristically unique pasture system in Europe. The management conditions and selected dietary components make the chestnut ham (jamón de castaña) characterized by a higher oleic acid content compared to acorn ham (jamón de bellota). The limited production of chestnut hams is controlled at every stage: breeding and management of the Iberian pigs on Valle del Genal farms, their slaughter, drying of the hams and cured meats in specially adapted storage facilities. The *bellota* and *castaña* hams, which originate from Iberian pigs and form part of the diet containing cereal products, vegetables, fruit or fish, have health benefits which contribute to normal blood cholesterol levels, prevent thrombosis, and reduce the risk of oxidative stress in humans.

Key words: Iberian hams, regional product, dehesa system, Environmental Product Declaration



*Traditional shop offering hams and cheeses in a Spanish marketplace (mercado)
(phot. K. Paleczny)*