

# Sicilian Black Pig

Subjects: Zoology

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In the paper we report, for the first time, an overview about a Italian local pig breed with the aim to offer a general overview concerning the Sicilian black pig and to review the recent findings related to genome investigation. The recent use of Next Generation Sequencing (NGS) technologies in the study of autochthonous breeds genome showed that polymorphism of some candidate genes for productions performance and phenotypic traits represent important information for selection processes. The Food and Agriculture Organization (FAO) has expressed concern about the lack of interest in local breeds compared to high-output animals and conservation programs have been implemented by various countries worldwide. Autochthonous pig breeds represent a valuable genetic reserve to be utilized for typical products linked to Italian gastronomic traditions, or for recovering some organoleptic proprieties of pork which have been lost through of severe selective programmes. Furthermore, consumers' concerns about animal welfare, sensorial meat quality and specificity of meat products have led to increasing demand for foodstuffs obtained from local breeds reared under natural conditions. Considering that the information on the Italian local pigs is limited, it is necessary to increase a suitable activity of research to exploit these breeds and to increase the knowledge of their genetic variability. The present paper could be of great interest to the scientific community; in particular to readers of "Animals", involved in the field of animal breeding and genetics, animal genomics, and involved in local pig productions.

Keywords: Sicilian Black Pig ; local Italian breed ; phenotype traits ; productive traits ; rearing systems ; food productions ; genetic traits ; biodiversity

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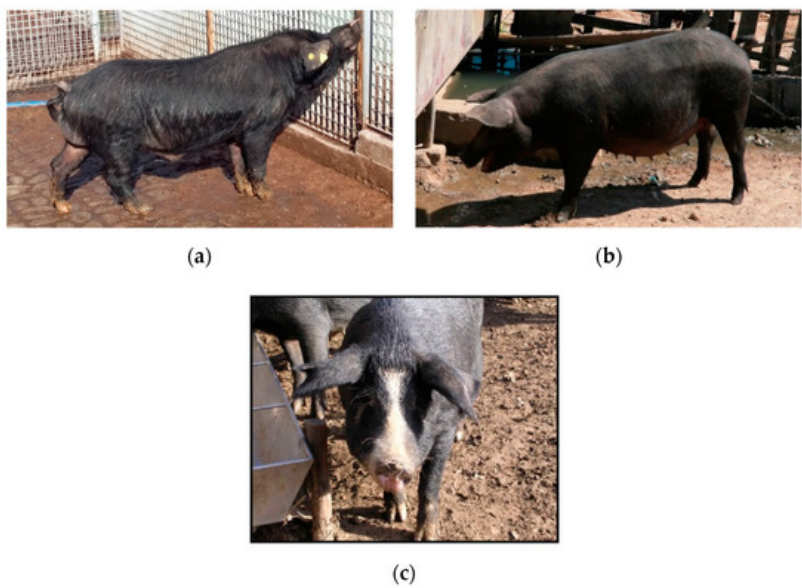
## 1. Introduction

The Nero Siciliano pig (Sicilian black (SB) pig) is an autochthonous Italian breed from Sicily<sup>[1]</sup>, a Mediterranean island in southern Italy. Historical traces, such as fossil remains and written texts, reveal its presence since the Greek and Carthaginian periods (seventh–sixth century BC). According to Chicoli (1870)<sup>[2]</sup>, even the Greek poet Omero in his stories mentioned the existence of a black pig that was highly rustic, almost wild, and completely free in the woods. The breeding of black pigs in Sicily was known in Rome as early as the second century BC. In the ninth century BC, pig farming experienced a temporary reduction during the Arab colonization in Sicily for religious reasons. However, this breeding was recovered with the Norman conquest<sup>[2]</sup>. The origin of the SB pig is controversial. The well-defined characteristics suggest that this breed descends from various breeds and pig populations deriving from the Neapolitan black-haired breed<sup>[3]</sup>. The SB breed is considered as an expression of ethnic–genetic heterogeneity, showing an evident polymorphism influenced by the natural living environment, the rearing systems, and the type of targeted production system. According to Pino<sup>[3]</sup>, the breed variants identified in general terms are to be referred to as Casertana (Pelatella), Cinta Senese, and Parmigiana for Italians, as the Large Black, Large White, and Berkshire for the English, and as Chester White and Poland China for Americans. Among the mentioned breeds, the Casertana is the most ancient, even though, for commercial reasons and low productivity, its breeding registered an attenuation<sup>[3]</sup>. Further authors have conducted studies on the above-mentioned breeds. Besides the Large Black and Large White reproducers, the Sicilian Livestock Research Institute imported subjects of the Casertana breed characterized by low fertility and affinity with the SB pig<sup>[4]</sup>. For example, Marchi<sup>[5]</sup> studied the influence of the Neapolitan breed and Cassella<sup>[6]</sup> on Calascibetta pigs bred in the province of Enna. Cassella<sup>[6]</sup> suggested that SB pigs, such as the North African one, could have origins from the Neapolitan breed. The Large Black has also been present in Sicily, directly introduced into the island from England. This pig is known to be a good grazer, characterized by very large, long, and drooping ears, which could limit its visibility in open spaces, thus conditioning the possibility of running openly in the pastures<sup>[4]</sup>. The Large White breed was introduced in Italy by Zanelli and later in Sicily by Tucci<sup>[6]</sup>. This breed was used alone or crossed with other breeds even if it showed weak performances in an extensive condition because of the absence of rusticity<sup>[6]</sup>. The SB breed is generally considered an "Indigenous Sicilian" population, which for some authors derives from an unique autochthonous line<sup>[6][7]</sup>, for others from individuals of the "Neapolitan" breed<sup>[8]</sup>, and for others from the "Iberian type of Sanson"<sup>[2][9][10]</sup>. According to Chicoli (1870)<sup>[2]</sup>, the Iberian type of Sanson was based on some typical differential characteristics of the skeleton (mainly the number of dorsal and lumbar vertebrae), defining a brachycephalic morphological type (Asian pig) and a dolichocephalic type (pigs from southern Europe), the latter of which

describes SB pigs. Chicoli described various pig breeds in Sicily that lead to the “Neapolitan” breed with a characteristic “ordinary” black coat. These breeds have been listed as follows: (i) Saint Agata di Militello; (ii) Castelbuono; (iii) Trapani; (iv) Patornese; (v) and Cesarotana. According to Romolotti <sup>[11]</sup>, the SB pig was the only one with well-defined characteristics. This could be in line with what was reported by Marchi and Pucci<sup>[12]</sup> that the Mediterranean areas would be influenced by the introduction of foreign blood, corroborating the fact that the better-defined breeds would have been observed in the island. Furthermore, breeding in the thickest woods in the wildest regions of the island could play as a barrier in countering possible genetic pollution.

## 2. Morphological Characteristics

These animals are characterized by a black coat with very thick black slate skin that features coarse black hairs, as well as coarse black hairs on the cervical that create a mane. Some of them are called “Faccioli pigs” due to their partially or totally white face. Its head shows a remarkable development, a long and straight profile, and a narrow and inclined muzzle, while the nasal profile of the forehead shows a tendency to be straight, sometimes presenting *Keloidism*<sup>[3]</sup>. The ears are small and obliquely turned upwards, with the tips carried horizontally forward<sup>[13]</sup>. The limbs are of medium length and sturdy and present dry joints and strong nails. The height at the withers is approximately 62–67 cm (see [Figure 1](#)). SB pigs are known to be adapted to difficult conditions and are valued for their reproductive performance, disease resistance, and meat production<sup>[14][15][16][17]</sup>.



**Figure 1.** Pigs with different coat colour patterns: Sicilian black sow (a), Sicilian black boar (b), Facciolo pig (c).

In [Table 1](#), the information relating to adult body morphology of the SB pig breed (ANAS,<sup>[13]</sup>) expressed as an average value is shown. Body length shown refers to measurement.

**Table 1.** Summary of morphology information.

Morphological Traits <sup>1</sup>	Adult Male	Adult Female
Body weight (kg)	148	128
Body length (cm)	104	90
Ear length	small	small
Chest girth (cm)	131	120
Height at withers (cm)	62–67	62–67
Number of teat	11.4	11.4

## 3. Monitoring and Protection of Breed

In 2001, the SB pig breed received official recognition as a native breed, with a population of ~13,200, ~4000 of which were sows and ~1500 of which were boars, from over 115 farms (ANAS—Italian Pig Breeders Association, 2020). In 2003, a consortium called “Consorzio di Tutela Suino Nero dei Nebrodi”, supported by the Regional Breeders Association

of Sicily in the province of Messina, was established. In 2005, an official demand to recognize fresh Sicilian black meat with the Protected Denomination of Origin (PDO) was issued to Ministry of Agricultural, Food and Forestry Policies. An official PDO request was also initiated for Nero Siciliano's cured ham in 2011.

## 4. “Plein Air” and Productive Performances

The importance of the SB pig as an autochthonous genetic type (AGT) is well-known, thus representing a cultural and historic heritage. To overcome the feeding uncertainty connected with the climate and season, common feeds such as grains, with some vitamins and minerals as well as suitable shelters to serve the animals according to their necessity and autonomously, were made available. These expedients created the conditions to carry out the so-called “élevage en plein air”<sup>[16][17]</sup>. The “plein air” in fact can be considered an evolution of the extensive rearing system, as it provides for the confinement of animals in fenced areas, the presence of water troughs, shelters, and food supply systems. To evaluate the quantitative and qualitative responses, animals reared in extensive conditions and those “en plein air” were compared, determining performance “in vitam” and “post mortem”<sup>[18]</sup>. Observations from summer to autumn showed an average daily gain (ADG) of 77 g for the animals reared in extensive conditions, while animals raised “en plein air” showed an ADG of 320 g<sup>[19]</sup>. In pigs reared in extensive systems, the non-esterified fatty acids (NEFAs) associated with fat catabolism had significantly higher values during summer months, during which the animals lost fat up to a physiological balance of 0 ADG, indicating the high energetic requirements. In autumn, these parameters were low<sup>[19][20]</sup>. The notable increase in glucose in the months of July and August could be related to stressful situations. In pigs reared “en plein air”, the best results were those relating to the values of energy and protein metabolism<sup>[21][22]</sup>. The rearing of animals in extensive conditions showed a slaughter weight of 70.88 kg at 250 days of age, while those raised “en plein air” showed a slaughter weight of 79.71 kg at 160 days of age<sup>[20]</sup>. Pigs reared “en plein air” showed better slaughter yields and back fat thickness (BFT) than pigs reared under extensive conditions, similar to those obtained for different growth performances<sup>[23]</sup>. Animals reared “en plein air” showed slightly higher biometric data regarding the length of the half carcass and the thoracic depth<sup>[24][25]</sup>.

The article is from [10.3390/ani10122326](https://doi.org/10.3390/ani10122326)

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