The Portuguese Serrana goat breed – a review

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Abstract
Goats were among the first animals to be domesticated, over 10,000 years ago and are part of human societies since the beginning of agriculture. Goats play a major role in both commercial farming systems and in subsistence agriculture systems, particularly in tropical, subtropical and Mediterranean regions where they are crucial for the supply of meat, milk, fibre and dung. This review concerns the Serrana breed, the most important and numerous indigenous goat breed from Portugal that was furthermore exported to other regions of the world notably South America during Portuguese colonization. Herein, we describe the origin and history of the breed as well as the productive performance and most common production systems. Finally, we address the local and traditional PDO (Protected Denomination of Origin) and PGI (Protected Geographic Indication) that are produced from these animals.

Keywords: Longhaired goat, Dairy goat; Goat Ecotypes; PDO and PGI goat cheeses and kid meat
Introduction

Goats are associated with human since the beginning of agriculture and animal domestication over 10,000 years ago. Presently and worldwide, goats play a very important role around the world in both commercial and in subsistence agriculture systems. Indeed, goats play a major socioeconomic role in many countries (Solaiman, 2010) worldwide but with a particular relevance in the Tropics, Subtropics and the Mediterranean regions. In Portugal, goat production is extremely important. Not only for the produced meat and milk, but also because they provide an income in impoverished and highly depopulated regions in mountainous regions of the interior and where alternative economic activities are scarce (Silva 2007). This situation is analogous to those in other Mediterranean countries. In such regions, they furthermore play a major role in controlling biomass production and consequently in the prevention of bushfires.

Autochthonous or indigenous goat breeds represent a very valuable genetic heritage and have an extraordinary potential for both income generation and the maintenance of local traditions in the regions where they are farmed. They have therefore an intrinsic value related to the local heritage, gastronomy, bringing additional benefits to local populations. Autochthonous goat breeds are therefore part of the country’s historical and cultural heritage, originating traditional quality products (Pena 2018), some of them part of the EU certification schemes such as PDO (Protected Denomination of Origin) and PGI (Protected Geographic Indication).

These breeds are the result of domestic animal selection highlighting the adaptation to the local environments and production conditions. Indigenous breeds have therefore a high degree of adaptation and uniformity and are fully adapted to local production conditions, particularly harsh in most cases. This is in clear contrast with exotic breeds that albeit with higher production levels per animal, lack such adaptation and production ability in difficult conditions (Mantas 2009). In Portugal, Indigenous goat breeds are farmed chiefly in inland regions in balanced, ecological and sustainable extensive systems, in many cases unchanged for several centuries. Being mostly extensive systems, it is possible to use resources that would be wasted and at the same time produce high quality products of relevant economic value. Thus, the profitability of the farms is increased and the environment and cultural heritage are preserved. Autochthonous breeds show an enormous level of adaptability and resistance and represent an important genetic pool that can be of use as a response to several unforeseen factors such as climate change and disease outbreaks, furthermore fulfilling the nutrition
requirements of an exponentially growing population, particularly those of proteinaceous foods (Dantas and Espadinha 2020).

In Portugal, with 10 million inhabitants is one of the richest countries regarding domestic animal genetic diversity. The country has six goat autochthonous breeds officially recognized: Bravia, Serrana, Preta de Montesinho, Charnequeira, Serpentina and Algarvia. Such breeds represent only 12.5% of the total of the national goat inventory, whereas exotic breeds represent only 5% of such inventory. The remainder percentage are result concerns crosses between several breeds (Carolino et al. 2017), a very important problem, particularly in goats. The most representative breed is the Serrana goat with around 14,500 females registered in the herd book, followed by the Bravia breed with 11,400 thousand females (SPREGA 2020). Portuguese breeds have very diverse and genetic differences that are not influenced by geographical distribution. For example, Serpentina and Charnequeira are geographical close albeit being the most divergent breeds. On the contrary, Bravia and Algarvia, geographically are the most distant breeds, but those with the highest breed similarity (Pereira et al. 2005). Like many other Portuguese breeds, these animals were transported former Portuguese colonies in the tropics and the subtropics, particularly Brazil, where they used in the formation of local breeds where they have shown to be particularly adaptable.

The objective of this review is to describe and globally characterize the Portuguese Serrana goat breed. We will start to describe the origin and history of the breed on the first section. Subsequently, we describe the breed standards as defined by the Portuguese Serrana Breeders Association that manages the herdbook. On a third section, we will describe the breed production performances concerning milk and meat. On the fourth section, we will describe the uses of the breed in Portugal. On a fifth section, we will address the use of Serrana animals in the establishment of goat breeds elsewhere. Finally, we will end this review with major conclusions and some future perspectives for the Serrana breed in the present context.
**Origin and history of Serrana breed**

Goats were the first animal to be domesticated over 10,000 years ago. Some authors describe that domesticated goats were adapted from wild bezoar ibex (*Capra aegagrus*) since the Neolithic farmers started keeping them to use their milk and meat (Hirst 2019). On the contrary, other authors consider the existence of three groups involved in the origin: *Capra aegagrus* that belongs to the European group (*Ovis capra europaea*), *Capra falconeri* and *Capra prisca* belonging to the Asian group (*Ovis capra asiatica*) and *Capra nubiana* or *sinaiatica* to the African group (Almendra 1996; Ministério das Obras Públicas, Comércio e Industrias 1873; Kukovics 2018). Solamain (2010) consider the existence of five wild ancestors: *Capra hircus* (the true goat including the bezoar), *Capra ibex* (the ibexes) *Capra caucasica* (the Caucasian tur), *Capra pyrenaica* (Spanish ibex) and *Capra falconeri* (the markhor).

Despite the fact that their origin is not fully clear, previous studies indicate that Portuguese goat breeds descend from the three groups of goats of the Quaternary. In the Iberian Peninsula, with animal evolution and because of migrations in mountain ranges, the Pyrenees goat (*Capra pyrenaica*) replaced the original wild species. *Capra pyrenaica* was therefore the direct ancestor of Portuguese and Spanish breeds (Almendra 1996). According to Bruno-de-Sousa (2011), the Bravia and the Algarvia breeds descend from independent ancestral populations whereas other breeds descend from various ancestral populations present in the Iberian Peninsula for a long time. Autochthonous breeds closely located show a weak differentiation although present high levels of genetic diversity. Some specific Portuguese goat breeds took part from the origin of a Brazilian breed (*Crespa*) in result of the introduction of animals during the colonial period. Lopes et al. (2016) for instance clearly established the Algarvia and Serrana breeds as being the sources of *Crespa* breed.

The origin of the Serrana breed are not fully known and it is difficult to determine (DGAV 2018). Archaeology studies found ancestral fossils that date to the Quaternary period of Cenozoic era, i.e. 3 million years ago, suggesting that the origin was the previously mentioned wild species. According to Almendra (1996), there was another wild species in the Gerês mountain region (Northern Portugal) that was hunted to extinction in the last decade of the 19th Century. It was called *Capra lusitanica* or wild Gerês goat. It is believed that it was one of the closest wild relative of the Portuguese breeds.

In 1873, on the general livestock census of Portugal, there was already reference to two different goats’ groups spread across different regions. They were classified as either longhaired or shorthaired goats. There was also a clear size distinction according to the region
of the country. The smallest animals were found in the Barroso mountain range in Northern Portugal, whereas the heaviest animals were found in the vicinity of Lisbon and in the Serra da Estrela mountain range (Central Portugal). Medium sized animals were located mostly in the Alentejo and Ribatejo provinces in Southern Portugal (Ministério das Obras Públicas, Comércio e Indústrias 1873).

Subsequently, in 1926, Portuguese goats were classified as either Serra da Estrela with Jarmelo and Saloia ecotypes or Charnequeira (also known as Serrana) with Barrosã, Ribatejana and Alentejana ecotypes. The first had long hair, large frame, large udder and high production levels. The second group had short hair and were smaller (Correia, 2004).

In the fifties, two groups were further separated; the Serrana breed and the Charnequeira breed with different morpho-functional characteristics (Magro 1959). In 1990 the National Serrana Breeders Association (ANCRAS) was founded, and in 1992 it became the official managing entity of the breed herd book (Castro 2016).

The only certainty is that Serrana goats originate from the Serra da Estrela mountain range in central Portugal. From there, they spread throughout the country to the Trás-os-Montes, Ribatejo and Estremadura regions (figure 1). Over the years, the number of goats of this breed has decreased and nowadays we cannot see this breed in the Northeast and Central regions of the country whereas 40 years ago it was quite common in coastal areas. The breed evolved into four ecotypes depending on the climate and region: a) Transmontano from the north-western interior of Portugal (Vila Real and Bragança districts in the Trás-os-Montes region); b) Jarmelista from the central mountainous regions (Guarda, district in the Beira region); c) Ribatejano from the Santarém, Leiria and Lisboa districts in the Ribatejo and Extremadura regions. Finally, a fourth and almost extinct Serra ecotype can be found in the Serra da Estrela mountain range, also in the Guarda, Castelo Branco and Viseu districts in the Beira region (Pereira 2005).

In 1996, the Official Journal of the European Communities registered five traditional products made with products obtained from the Serrana goat breed. Two as protected denominations of origin (PDO): Queijo de Cabra Transmontano (Transmontano Goat Cheese) and Cabrito Transmontano (Transmontano kid). Three as protected geographical indications (PGI): Cabrito do Barroso (Barroso kid), Cabrito das Altas Terras do Minho (Minho Highlands kid) and Cabrito da Beira (Beira kid) (Pereira 2005). Presently, the Serrana breed is the most important autochthonous Portuguese breed with 14.528 females and 662 males registered (SPREGA 2020), being the only breed currently not in danger of extinction.
Figure 1 – Origin of the *Serrana* breed in the Serra da Estrela mountain range in central Portugal and subsequent migration to other regions of the country where the different ecotypes were established.
**Serrana breed standards**

The breed standards are described in the webpage of ANCRAS and are shown in figure 2.

According to Margatho (2020), *Serrana* goats can have pear-shaped or pendular cylindrical udder, but the most prominent shape is the globular as described by ANCRAS (2020). The udder perimeter is $31.3 \pm 9.1$ cm, the udder cleft $21.6 \pm 8.0$ cm and the udder depth $6.4 \pm 4.0$ cm. The udder shape is very important in milk production as it can be related to the occurrence of mammary infections or mastitis. Goats with pendular cylindrical udder present higher somatic cell count, then goats with globular and pear-shaped udders so are more likely to have infections.

The standards are the same for the four ecotypes, the only difference is the coat colour: ecotype of *Serra* and *Ribatejano* have a black coat with black legs and the *Ribatejano* may also have a dark brown colour. The *Jarmelista* ecotype is brown with brown legs or bay with brown legs. The ecotype *Jarmelista* ecotype features additionally two streaks on the face, lighter...
brown in color and Ribatejano can have these streaks as well (Teixeira 2015). Finally, the Transmontano ecotype has a very distinctive silver coat, very different from all the others. On figure 3, we present the difference of colours in the *Serrana* breed.

**Figure 3** - *Serrana* goats of the four different ecotypes. A - Goats of the *Ribatejano* ecotype brown animals and the *Transmontano* ecotype (silver coat animal at the centre); B - *Jarmelista* ecotype kid. C - *Serra* ecotype with the distinctive black coat. d) *Ribatejano* ecotype goats with dark brown coat. All photos by the authors.
**Serrana breed production performance**

*Serrana* goat is farmed mostly as a dual-purpose breed used in meat and milk production (Pires et al. 2015). However, in some regions, it is used primarily for dairy production (Pereira 2005). Goats from temperate regions reproduce preferentially on decreasing photoperiod month (late Summer-Autumn). Generally, goats from South Europe are less seasonal and some females can show oestrus and ovulation year-round (Mateus et al., 2015). In the study done by Simões and Bauer (2017) using data collected between 1987 and 2015 from records of the herd book and in order to describe the reproductive profile and milk production of *Serrana* breed, authors concluded that natural mating in *Serrana* goats has two clear kidding peaks as shown in figure 4. One of the peaks occurs in January and the other in October so it means that natural breeding occurs respectively in August and May. From January until June/July the kidding percentage decrease coinciding with the natural breeding season. The increasing until October confirms the sexual activity in the non-reproductive season from this breed.

![Figure 4 - Monthly distribution (in percentage) of parturitions by natural mating of Serrana goats. Adapted from Simões and Bauer (2017).](image)

The age to puberty is influenced by the birth season. The kids born in winter reach puberty earlier at 7 or 8 months, than kids born in the summer that reach puberty around 11...
months (Correia et al. 2001). According to ANCRAS the age at puberty is between 8 and 12 months, a 4-month interval that can be explained by the birth season. Multiparous goats usually have a higher percentage of polyovulatory oestrus than nulliparous (Simões et al. 2008). The ovulation can occur just in one ovary or on both and Serrana goats present a high percentage on both ovaries. The mean for the interovulatory interval can be 21.2±0.8 days (Simões et al. 2006) or 21.1 ± 0.3 days (Simões and Mascarenhas 2007) and in multiparous goats this interval is larger (Simões et al. 2006). In goats where ovulation occurs in both ovaries the, first preovulatory follicle emerges earlier than the second and both with same diameter, suggesting that an ovarian endogenous factor can exert an influence (Simões and Mascarenhas 2007). Serrana goats can have three to five waves per oestrous cycle but in most cases have four and the first one is longer than the others (Simões et al. 2006).

The duration of gestation in goats usually is 149 days but can vary between 144 and 150.8 days. The gestation period can be influenced by season of the year, parity, age of the dam, sex and number of kids at birth (Solaiman, 2010). Ribatejano and Transmontano are furthermore the most prolific ecotypes with 1.43 to 1.63 kids per kidding (ANCRAS, 2020; Margatho et al. 2019). The breed fertility is high varying between 90 and 95% and prolificity rates between 170 and 180% (ANCRAS 2020), presenting frequently twin births (Pereira 2015).

Regarding milk production, Serrana breed ecotypes show considerable differences. Data from records of the herd book between 1987 and 2015 were described by Simões and Bauer (2017). The results showed that the most productive ecotype is the Ribatejano with 220.7 ± 0.5 L produced per 150-days normalized lactation. The mean milk production for the Transmontano ecotype is 96.1 L, being heavily influenced by the number of lactations. The production per lactation tend to increase until the fourth (101.0 ± 0.3 L) lactation, is typically maintained during the fifth and sixth lactations and start to decrease after that. Margatho et al. (2019) described the same for this ecotype, the first lactation is the lowest (90.1 ± 32.2 L), reach the maximum at the third (100.2 ± 40.7 L) and start to decrease before, remaining higher than the first until tenth lactation. The Jarmelista ecotype presents a 150-days normalized milk production of 146.7 ± 0.4 L. These values are lower than the values from Serrana breed standard (table 2) probably because they used a longer range of years and ANCRAS used values obtained during the 2012 to 2015 seasons. Indeed and according to ANCRAS (2020), the average daily milk production is 0.59 L, 1.45 L, 1.14 L and 1.02 L for the Transmontano, Ribatejano, Jarmelista and Serra ecotypes, respectively. Although Ribatejano is the most productive, Transmontano ecotype can furthermore produce milk longer than the other
The milk from the Serrana breed is used in cheese production, so milk solid content is of the utmost importance. With data collected from the bulk tank of 42 Serrana goat dairy herds, it was possible to determine the mean percentage of milk protein, fat, lactose and solids-not-fat: 3.63±0.24, 5.22±0.70, 4.72±0.25 and 8.92±0.44, respectively (Margatho et al. 2018). The milk composition is influenced by several factors: season, amount of milk produced and stage of lactation (Margatho et al. 2018). Milk yield and protein percentage may be influenced by exons of the gGH (growth hormone) gene. Indeed, and according to Marques et al. (2003), in Serrana goats, exons 2 and 4 influence positively milk yield and exons 1 and 2 the protein percentage.

Comparing the Serrana breed dairy production standards to those of the most productive breeds that are used in many countries around the world for milk production (Saanen and Alpine), the production traits for the Serrana goat are relatively low as observed in table 1. Saanen and Alpine goats produce twice the milk of Portuguese goat breeds and their lactation lasts more than 300 days. Indeed, the average daily production of Saanen and Alpine breeds are 3.1 L and 3.04 L, respectively, however the fat and protein contents are lower than in the Serrana breed.

<table>
<thead>
<tr>
<th>Transmontano</th>
<th>Ribatejano</th>
<th>Jarmelista</th>
<th>Serra</th>
<th>Saanen</th>
<th>Alpine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total milk production (L)</strong></td>
<td>105,3 a)</td>
<td>247,7 a)</td>
<td>178,4 a)</td>
<td>156,2 a)</td>
<td>994 c)</td>
</tr>
<tr>
<td><strong>Daily average production (L)</strong></td>
<td>0,59 a)</td>
<td>1,45 a)</td>
<td>1,14 a)</td>
<td>1,02 a)</td>
<td>3,1 c)</td>
</tr>
<tr>
<td><strong>Lactation duration (days)</strong></td>
<td>177,2 a)</td>
<td>170,2 a)</td>
<td>157,8 a)</td>
<td>154,6 a)</td>
<td>321 c)</td>
</tr>
<tr>
<td><strong>Milk fat (g/100g)</strong></td>
<td>5,22 b)</td>
<td></td>
<td></td>
<td></td>
<td>3,66 c)</td>
</tr>
<tr>
<td><strong>Milk protein (g/100g)</strong></td>
<td>3,63 b)</td>
<td></td>
<td></td>
<td></td>
<td>3,24 c)</td>
</tr>
<tr>
<td><strong>Prolificacy (kid/parturition)</strong></td>
<td>1,45 a)</td>
<td>1,63 a)</td>
<td>1,37 a)</td>
<td>1,38 a)</td>
<td></td>
</tr>
</tbody>
</table>
Aiming to evaluate the effects of non-genetic factors on weights and on average daily gain of *Transmontano* kids, Jiménez-Badillo et al. (2009) analysed data from three years’ performance records from 8930 animals from the ANCRAS herdbook. The birth weight average was $2.3 \pm 0.41$ kg, the adjusted live weight at 30 days was $5.8 \pm 0.02$ kg, the weaning weight was $8.2 \pm 0.07$ kg and the male kids were as expected heavier than females. Another effect was the dam’s age as it was observed that kids from does kidding in the first year were lighter at birth and at weaning time than the kids of goats kidding on their 2-5<sup>th</sup> parturition.

The climate conditions also had an influence in these parameters as they have strong implications for pasture production and the nutritive value of grass and forage hence affecting nutrition. As winter and summer have the worst conditions for goat production, the kids born in the autumn were the heaviest and the higher weaning weight was obtained in kids born in spring. These values are within the range described by ANCRAS in the breed standards (birth weight between 2.2 and 3 kg, live weight at 30-40 days between 6 and 8 kg).

The carcass from *Serrana* kids show a lower proportion of subcutaneous and intermuscular fat deposits and higher proportion of muscle. By the preferences of Mediterranean consumers these characteristics increase the potential of the breed because it makes it a lean meat source (Teixeira 1995). According to Quaresma et al. (2016), the meat presents lower total lipid content and higher contents of total cholesterol than kids from non-certified breeds and twice the total PUFA content and the triple content of n-3 PUFA. Teixeira et al. (2015) conducted a study using 400 Serrana goats aged between 5 and 9 years old and with live weights between 35 and 40 kg. The authors ascertained the chemical composition of fresh meat, and observed a mean of 21.17% for protein content, 76.25% for moisture content, 2.44% for ash content, 0.87% of connective tissue content and 2.37% of fat content. Another study done by Santos et al. (2008) showed furthermore that are no differences in meat quality of goats between male and female kids.
Uses of the breed

As previously stated, Serrana breed is a dual purpose breed and some of the ecotypes have a clear dairy aptitude. Nevertheless, goat milk is not usually consumed fresh in Portugal, except for on farm consumption, and it is used in its entirety for cheese production (Carolino et al. 2017).

In the kid goat meat market, usually kids are sold and slaughtered at very young ages (2-5 months old) and in most cases, they are kept with the females in the herd during grazing until they are sold. In the absence of technological expertise in this area, the carcasses do not achieve the best conformation (Teixeira, 2005). Following the trends of the lamb and kid market in Portugal, Serrana kids are sold mainly for the Easter and Christmas seasons (ANCRAS 2020).

The ecotypes Jarmelista and Ribatejano are exploited mainly for their milk aptitude and the Transmontano ecotype is exploited in the dual function milk/meat (Barbosa et al. 2014). From this breed two PDO and two PGI are produced. Transmontano kid PDO is produced in some parts of the Trás-os-Montes region. The animals are fed mainly of spontaneous vegetation existing in the uncultured and fallow areas. The kids are fed with milk, being slaughtered at weaning, which occurs between 30 and 90 days of life. The carcass should weigh between 4 and 9 kg. The milk from the goats is used to produce the Transmontano PDO Goat Cheese. The cheese is obtained from raw milk and is a cured into an extra hard cheese with a slightly spicy taste. The cheese making is based on traditional methods. Firstly, the milk is heated to 35°C, it is curdled, the curd is pressed manually to remove the whey and is placed in molds, salt is added and left to mature for at least 60 days, at a temperature between 5 to 18 °C and a relative humidity of 70 to 85% (Direção-Geral de Agricultura e Desenvolvimento Rural 2020). In figure 5 some of the steps for traditional Serrana goat milk cheese making are shown.
Figure 5 – Steps of traditional cheese making. A - The milk is heated and the curd is forming. B - The curd is pressed manually. C - The curd is placed in molds. D – Maturation rooms with fresh and cured cheeses. All photos by the author.

The Barroso kid is produced in the Vila Real district (Trás-os-Montes region) from Serrana and Bravia kids or from the crossing of the two breeds. The animals are produced in an extensive system, essentially with free grazing. They occasionally housed during the winter. The feeding of the kids is essentially composed of goat milk and they are slaughtered at the age of three months, staying with the goats until slaughter age. The Minho Highlands kid has the same specifications but is produced in a different region and may be slaughtered between the second or fourth month of age. The Beira kid is produced in the centre of Portugal using both Serrana and Charnequeira breeds or their crosses. The production system is the same previously described but the kids are slaughtered at 40-45 days, under 7 kg (Direção-Geral de Agricultura e Desenvolvimento Rural 2020).
Serrana goats and their importance in the establishment of tropical goat breeds

Goat production in Iberian Peninsula represents 25% of the total in European Union and there are officially recognized 6 and 22 caprine breeds from Portugal and Spain, respectively. These are very similar genetically as there are no geographical barriers and both countries had the custom of seasonal pastoralism and transhumance (Martinez et al., 2015). This production system made genetic exchanges among populations from distant places very easy (Manunza et al., 2016). Furthermore, and because of their size, adaptability and versatility, Iberian goats were transported to other continents, particularly the Americas during the colonial period (Ribeiro et al., 2011; Sevane et al., 2017). Until the end of the 15th century, domestic livestock (horses, goats, cattle, pigs) did not exist in the American continent (Gama et al., 2020), since their civilization just had domesticated a few animal species like South American camelids (Ginja et al., 2017).

The Creole goat breeds are an example of these species spread through the continent. Some studies assume that probably these breeds derive from goats that were brought by colonizers from Iberian Peninsula and from the archipelagos of the Canaries and Cape Verde, where the ships made stopovers to resupplying (Ribeiro et al., 2011; Ginja et al., 2016; Sevane et al., 2017; Gama et al. 2020).

Sevane et al. (2017), using microsatellite markers, studied the genetic diversity from 71 breeds, including the six Portuguese breeds and 23 Spanish. The main conclusion was that all Creole breeds had origin from Iberian and African breeds and their genetic diversity derives from admixture between both lineages. Ginja et al. (2016) using a similar analysis studied the genetic diversity from 24 Creole goat populations from different countries. The Brazilian breeds showed a differentiation comparing to other countries breeds that reinforces their common origin from goats introduced by Portuguese in the colonial period. Moxotó breed showed a similar pattern to Serpentina breed with white or cream coat, black legs and a black stripe on the back. The breeds Graína and Azul evidenced phenotypic patterns very similar to those of the Serrana breed. Ribeiro et al. (2011) also demonstrated that Brazilian breeds show signs of a common ancestry with Portuguese goats, especially Graína and Canindé. These works clearly show the importance of Iberian breeds, and particularly the Serrana breed, in the establishment of the first tropical goat breeds in the Americas as well as the extraordinary adaptability of these animals to novel environments.
Conclusions and future prospects

The Serrana is an interesting goat breed to use in traditional production systems, leading to the production of highly valued and high quality products. Being an autochthonous breed, it is well adapted to the local climate and production conditions. The breed is very rustic and is able to thrive in the harsh interior mountainous regions of North and Central Portugal. The extensive systems, in which the breed is farmed, leads to the possibility of producing high quality products in a sustainable way. It would be important to work more in animal selection and benefit from the advantages of this breed with the aim of increase the milk production and better carcass conformation. As this breed is the origin of different tropical breeds in Brazil, it would be interesting to conduct further genetic studies to ascertain the influence of the Serrana goat breed in the establishment of other local breeds in those countries.
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