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THE HISTORY AND THE MORPHO-PRODUCTIVE CHARACTERS OF THE BROWN CATTLE BREEDS

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Abstract

The theories underlying the studies on the origin of the cattle breeds place the Brown breed in the Bos taurus brachyceros type, based on the craniological characters identified in cattle from the mountain area. Today, at European level, a distinction is made between Braunvieh (original Braun-Schwyz) and Brown Suiss. The Braunvieh breed, a breed with milk-meat skills, was formed in the canton of Schwyz in Switzerland, based on successive crosses between local cattle and those brought by the Burgundians, Germans and Romans, later spreading to many countries in Europe. The Brown Suiss breed, specialized breed for milk, was formed in America, based on cattle imports from Switzerland (1869 - the first imports). While the Brauvieh breed achieves milk production of approximately 6,000 kg per lactation, with 4% fat and 3 .4% protein, the Brown Suiss breed, which has become a breeder for milk production, has achieved yields of over 10,000 kg of milk per lactation in the US. The proportion of beta casein type A2 (which gives better digestibility to milk) is much higher in the milk of these breeds compared to other breeds (over 80% in Brown Suiss compared to Holstein 62%).

Key words*: Brown cattle breeds, Braunvieh, origin, performance.*

INTRODUCTION

Looking to the tendency of worldwide development of population and them consumption needs, dairy industry is trying to manage this objective more and amore (Franzoi et al., 2020). In this dynamic atmosphere, the breeding and enhancement of cattle breeds become essential to meet demand and ensure sustainable and efficient production (Zhao et al., 2015). Moreover, in the quest to optimise yield and milk quality, numerous genetic improvement programs have been initiated globally (Mapel et al., 2022; Pacheco et al., 2023). These programs target the selection and improvement of morpho-productive traits of cattle breeds, including milk production, fat and protein content, disease resistance, and adaptability to various environments (Pacheco et al., 2023). Thus, genetic aspects of cow breeds could be considered, to identify diversity even within the same breed (Moscarelli et al., 2020). A representative breed which is present all over the world, and has an important place in cattle population, is figured by the Brown cattle breed (Unal et al., 2019). Being a popular breed for both industries, beef and dairy (Bozkurt & Dogan, 2019), the distribution of the Brown Swiss or Braunvieh is worldwide, starting with Europe, America, Canada, USA, even in New Zealand and South Africa (The cattle site). Moreover, this breed has istorical relevance, its origin is attributed to the Alpine region of Switzerland, where it was first raised over 4000 years ago, where researchers demonstrate that prehistorical bones of cattle found in a lake, are similar with Brown cattle from today (Del Bo et al., 2001; Moscarelli et al., 2020). Since then, the brown breed has spread worldwide. However, at the European level, there are three different groups of brown cattle population, starting wih original Braunvieh, which is the oldest one, the Braunvieh, and of course the Brown Swiss (Hagger, 2005; Moscarelli et al., 2020). Furthremore, the productive longevity of the udder in Brown swiss is superior and durable, even compared to Holstein Friza (Gibson et al., 2018). Researchers such as Moscarelli et al. (2020) has shown that several factors (geography, environment, natural selection etc.) and practices (artificial insemination) affect the

genetics characteristics of Brown cattle breeds population.

The Brown cattle breed, originating from Europe and developed in the Swiss Alps region, represents a globally significant breed with a corresponding genetic heritage, featuring remarkable characteristics in acclimatization. It demonstrates efficiency in various cold, rugged, arid, and dry environments, at high altitudes as well as in warm environments with poor pastures. Possessing mixed production traits, it has been improved over the past 150 years for milk production, ranging from 2,000 kg milk/lactation (Turkey) to 17,188 kg milk/365 days (record holder Agata cow, Germany) (Georgescu, 1998). This cattle breed has an average feed intake of 1.1 U.N./kg of milk, exhibiting exceptional quality (B-type K-casein). The Brown breed also maintains a significant position in meat production, with a carcass yield of over 50%, potentially reaching up to 59% with a daily average gain of over 850 grams/day, up to 1200 grams/day with a specific intake of 5.5-6.5 U.N./kg gain. It stands at a wither height of 132-147 cm, with calves weighing 35-40 kg at birth (Georgescu, 1998).

Therefore, the objective of the present study was to highlight aspects of the evolution, as well as the historical spread of Brown cattle breed, including the morpho-productive characters.

MATERIALS AND METHODS

For the accomplishment of this study, a systematic looking for other relevant scientific articles on the chosen subject was conducted in the considerable publishing platforms, such as PubMed, Google Scholar, Frontiers and MDPI databases. Relevant articles published in recent years, in the filed of brown cattle breeds were examined, and the references of included studies were also consulted to acquare additional bibliographic sources.

RESULTS AND DISCUSSIONS

American Brown Swiss

The American Brown originates from the Schwyz breed, it appeared in the USA in 1869 in Massachusetts, where 6 Browns and a bull from the canton of Schwyz (Switzerland) were brought. The Americans, as with the Friesian breed, focused their attention on milk production, making intensive improvements in this regard in the USA. meat production was not of interest to this breed as it was satisfied by local breeds bred for this production. As results, we can mention the year 1953 when a number of 400,000 heads were registered in the genealogical register, this doubling in 1978 reaching a number of 830,000 females under observation. US transformed the mixed breed he had imported into a breed specialized in milk production appreciated and sought after worldwide (BSA, 2024).

The Brown Swiss benefits from a robust constitution, fertility and precocity being at high levels, the temperament is lively, the character is gentle showing health and good adaptability to different climates. This breed stands out for its milk production achieving 6050 kg per lactation with 4.1%. As records we can remember at the age of 30 months a production of 7205 kg with a fat of 4.53%. The maximum production at that time was 15787 kg of milk with a fat content of 4.53% (Table 1), the first calving takes place at an age of less than 30 months, in the first lactation they produce somewhere at 75% of the maximum amount, we can also remember the uniformity of the milk. Consumption is 1 U.N./kg of milk with praiseworthy skills for mechanical milking. The Brown Cow can be found on the American continents, such as Mexico, Cuba, Panama, Costa Rica, Chile, Peru, Venezuela, Colombia, and Brazil (BSA, 2024).

Table 1. American Brown Swiss production for last 10 years (source: https://www.brownswissusa.com/)

Year	Milk quantity (kg)	Fat (%)	Fat (kg)	Protein (%)	Protein (kg)
2022	1175	4.09	480	3.34	392
2021	11575	4.04	468	3.33	385
2020	11444	4.03	461	3.32	380
2019	11811	4.02	455	3.34	377
2018	11391	4.07	463	3.33	379
2017	11430	4.05	462	3.32	379
2016	11441	4.03	461	3.31	378
2015	11231	4.02	451	3.32	373
2014	11114	4.09	454	3.34	370
2013	11143	4.03	449	3.31	368

Austrian Brown (Österreichisches Braunvieh)
These animals were bred and improved for the rugged areas of Austria. The Braunvieh shows great resistance of the legs, over 28% of the adult animals being grazed, mostly the youth reaching the alpine pastures. The Austrians believe that this breed cannot be beaten by any other in terms of its endurance in transhumance. Through its long productive life, it becomes a fairly economical breed. Regardless of the pressure placed on this animal, both in terms of production and the maintenance system (BSAA, 2024). The height at the withers is 132 cm, the average weight is 550 kg, the sexual dimorphism is quite pronounced, the bulls reaching a height at the withers of 138 cm with a weight of 850 kg. Milk production is around 4,000-5,000 kg. In Austria, for this breed, the percentage of foreign blood accepted was 12.5% until 2009, being a small population, the objective being to reach a percentage of foreign genes of 6.25% in 2014, all these in females. In Austria, we find a herd of 100,000 animals representing 6% of the total cattle herd in this country (BSA, 2024).

German Brown Swiss (Braunvieh)
The origin of the Brown breed dates back to the mountain areas of Switzerland, from where it was introduced to Germany in the 16th and 17th centuries. The breed adapted well to the mountain conditions of southern Germany and became popular for its hardiness, adaptability and milk production. In the 20th century, with changes in farming practices and the introduction of other specialized milk breeds, the Brown population in Germany declined.
The number in Germany is 350,230 animals of the Good breed, of which 163,726 are dairy cows, 146,965 are in milk production control (90%) (GGI-Spermex).
It is an animal with an enviable adaptability for areas lacking in the breeding of other breeds of cows, it is 142-155cm tall, weighs over 600 kg, reaches productions of 8,000-9,000 kg of milk with at least 7-8% fat and protein (GBSA, 2024).
The average milk production per lactation of the Brown breed in Germany is about 7,658 liters, the milk has a fat content of 4.25% and a protein content of 3.62% (GGI-Spermex).
The breed is valued for its milk quality, suitable for various traditional German dairy products, is used in small and family farms in mountain areas, for crossbreeding programs with other breeds to improve certain characteristics and last but not least as part of conservation initiatives native races and the countryside (GGI-Spermex).

Bruna de los Pirineos (Spanish Brown Swiss)
This breed results from the fusion and absorption of local Catalan breeds, the first Brown Swiss imports took place in 1880 without being recorded in any writing. In 1922 with the first registrations, the consolidation of the breed took place later until 1960. The Spaniards bet on meat production directing the breed in this direction. This breed is bred in an extensive system in its natural habitat, mainly in the Pyrenees area. It is appreciated for its average weight at birth (46.5 kg) which leads to ease of calving, the average daily gain is high, here we can also mention the increased fertility of these females. The product subjected to fattening can reach a weight of 540-550 kg at the age of 12-13 months, as reproduction, the mount is used, not using artificial insemination. The color is typical of Browns, with a height at the withers of 142 cm in males and 140 in females, males reaching a weight of 1,050 kg, females reaching a weight of 600 kg (BBLA, 2024).
Females reach sexual maturity at 24 months, males reach sexual maturity at 15 months, and they are used for reproduction on average until the age of 69 months. The first calving is recorded at 33.5 months, with an interval between calvings of 385 days, the number of calvings per year is 0.95. Females are exploited for an average of 9 years (BBLA, 2024).
Meat production, fattened calves have an average daily gain of 1300 gr, the average slaughter age is 12 months reaching a carcass weight of 270 kg with a yield of 61% (BBLA, 2024).
On 31.12.2022 in Spain we found a number of 3,682 females, in the same reference date we can remember a number of 3,708 calves. The number of purebred females is 687 heads, with only 646 registered in the breed book. In the mountainous area, this race has a responsibility of 75%. The total number of browns is 17,057

with 2,492 breeding males. The distribution area being Barcelona, Girona, Lleida (BBLA, 2024).

Table 2. Average national lactations/305 days in Spanish Brown Swiss (2020)
(source:https://www.mapa.gob.es/es/)

Total	Nr. of lactations	Milk kg	Fat kg	Fat %	Protein kg	Protein %
First lactation	432	7351	301	3.88	274	3.60
Second and thirs lactation	938	7696	326	3.82	297	3.57
All animals	1370	7524	314	3.85	285	3.58

Brazilian Brown Breed (Raça Pardo Suíço)

The Brown breed race in Brazil it was first introduced at the beginning of the 20th century, appearing in 1905 (FAO, 2024). Although not as popular as other cattle breeds in Brazil, the Brown breed is valued for its adaptability to the tropical climate, milk production and carcass quality (https://www.fazentatamandua.com.br/)
The Brazilian Brown breed has an average milk yield per lactation of around 4,000-5,000 litres, with a fat content of 3.8-4.0% and a protein content of 3.2-3.4%. The breed is valued for the quality of its milk, which is ideal for the production of cheeses and other dairy products (Carneiro & Lush, 1954).

Turkish Brown Breed (Montofon)

It was first introduced at the end of the 19th century. The breed has gained popularity in regions of the country due to its adaptability to the local climate, milk production and carcass quality. The Turkish Brown breed has an average milk production per lactation of around 5,000-6,000 litres. milk has a fat content of 3.8-4.0% and a protein content of 3.2-3.4% (TBSA, 2024). The breed is valued for the quality of its milk, which is ideal for the production of cheeses and other dairy products. The meat obtained from cows of this breed is also of good quality. The Brown breed in Turkey is mainly used for milk production (TBSA, 2024).
The reproduction of this breed in Turkey, has an early sexual maturity, with an average age at first calving of 24-26 months, the average interval between calving is 12-14 months, the fertility of the breed is good, with a conception rate of 80-90%. The number of animals is about 50,000 cows in Turkey. The breed is concentrated in the mountainous and submontane areas of the west and north of the country (TBSA, 2024).

Rusian Brown Swiss (Shvitskaya)

The first series of Brune was imported to Russia from Switzerland in 1861, on a farm of the Moscow Agricultural Academy. This breed quickly became popular in the Moscow, Smolensk and Tula regions, as well as in other parts of Russia. Imports of genetic resources continued in the 1920s and 1930s, also from Switzerland, and between 1958 and 1972 there were imports from Austria, Switzerland, Hungary and the USA. Later, importation of semen and bulls from USA and Canada continued (BSRF, 2024).
The Russian Brown breed has an average milk production per lactation of around 5,000-6,000 litres. Milk has a fat content of 3.8-4.0% and a protein content of 3.2-3.4%. The Russian Brown breed has an early sexual maturity with an average age at first calving of 24-26 months, Average calving interval is 12-14 months, breed fertility is good with a conception rate of 80-90% (BSRF, 2024).
The Russian Brown breed is mainly used for milk production and is valued for its adaptability to various climates, being an important option for farmers in areas with extreme temperatures. The meat obtained from cows of this breed is also of good quality (BSRF, 2024).
According to the statistics of 2023, the total cow population in Russia was about 20.8 million, assuming that the brown Swiss breed represents 0.93% of the total, this would result in a number of about 205,920 head of brown cows (BSRF, 2024).

Table 3. Production and reproduction data at Russian Brown (2020)
(source: https://www.fao.org/dad-is/browse-by-country-and-species/en/)

Average milk production	6221 kg
Milk Fat	4.03%
Milk Proteine	3.34 %
Farms milk average	13,000-14,500 kg
Female weigh	570-600 kg
Male weigh	900-1000 kg

Italian Brown Swiss

The Italian Brown Swiss breed has a population of around 500,000 animals. More than 8,000 dedicated breeders participate in selection programs, raising an average of 21 animals per farm (14 cows). In Italy, it is used both for meat and milk production (ANARB, 2024). The mean national output of the cohort of 104,000 managed bovines amounted to 6,954 kg, exhibiting a consistent annual increment of 100 kg over a decade. This output is characterized by a protein content of 3.50% and a fat content of 3.96%. Notably, within this population, there exist 20 elite herds demonstrating superior performance, boasting an average yield of approximately 10,607 kg coupled with an average protein content of 3.69% (ANARB, 2024).

Romanian Brown Swiss (Maramures Brown Swiss)

It was formed in the north of the country, in the current territory of Maramureș County. the first browns were brought from Allgau Germany, around the towns of Sighet and Vișeu where cows from the Schwyz breed were brought, thus starting the absorption of local breeds. In the 1890s and 1910s cows were still imported from Austria and Germany, in 1904 imports were also made from Switzerland, with up to 500 Schwyz cows and heifers being brought annually (ANARZ, 2024). In the 1920s bulls were imported. In 1930, the first Schwyz cow farm was established in the commune of Beclean, Romania. Between the years 1948-1949, 119 breeding bulls and 700 pregnant heifers were imported, these imports being made by the former I.A.S. from Maramureș, part of the bulls being distributed in some counties in the Subcarpathian area of Muntenia and Moldova. Another variety (the Allgau variety from Bavaria) of the Schwyz breed was brought to the north of Muntenia between 1900 and 1910, from Germany (ANARZ, 2024). The Brown race began to expand in the rest of the country, in the southern area, in Argeș County, Vâlcea, Mehedinți, Prahova, Buzău, Gorj. During the expansion of the breeds, the degree of interbreeding was very different due to the local breeds that were in the respective areas, but also to the different climatic conditions, the various forms of forage, the maintenance conditions and last but not least the interest in breeding. At the end of 2000, the Brown breed was found in a percentage of 29.8% of the total bull herd in Romania, with an increase of 1-2% every 5 years. currently at a standard production of 5 097 kg, with frequent production limits between 3,000 and 6,000 kg/lactation (ANARZ, 2024).

Table 4. Average milk production in Romanian Brown Swiss (source: https://www.anarz.eu/)

Average milk production						
Farm number	Ended lactations	Milk kg	Fat		Protein	
			kg	%	kg	%
15237	12093	5453	214	3.92	182	3.35

These animals have a good feed utilization capacity, on average for one liter of milk a Brown breed cow needs 0.8 and 1.3 U.N., with a protein intake of 95,100 digestible crude protein, for each nutritional unit (ANARZ, 2024). Here we can also mention the meat production which can be neglected, the bulls can reach the age of 12 months at a weight of 360 kilograms, achieving an average gain of 990 g/day with a slaughter yield of 54-55% obtaining a prized meat (ANARZ, 2024).

Figure 1. Natural pasture of a Brown Swiss cattle from Romania (source: own source)

It lends itself to all exploitation systems, being well adapted to environmental conditions and resistant to diseases. In the case of the male

youth, at calving it reaches 30-35 kg, and at 12 months it can exceed 320 kg with weight gains of 0.8-0.9 kg, in semi-intensive conditions, with a consumption of about 7 UNC/kg.

CONCLUSIONS

In conclusion, Brown swiss cattle breed is spred all over the world, adapting its morpho-productive characteristics depending on the country of origin. Brown swiss is one of the oldest breeds of cows, first registered in Switzerland, thus becoming their autochthonous breed of cows. This breed lends itself well to both meat and milk production, being a resistant breed.

By deeply understanding the morpho-productive traits and history of Brown swiss cattle breed, we can direct our efforts towards the sustainable improvement of the dairy industry and animal welfare.

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