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Genetic diversity and production systems of horses in Tunisia

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The Arabian horse holds significant historical and cultural value in Tunisia. This study examines the technical and administrative frameworks governing horse breeding, focusing on the National Foundation for the Improvement of the Equine Breed (FNARC). It highlights FNARC's efforts to align with the World Arabian Horse Organization (WAHO) standards. Through an analysis of historical records, breeding programs, and distribution data, the study explores FNARC's structured initiatives, including the maintenance of the Tunisian Arabian Stud Book, essential for preserving lineage purity. The research also maps the distribution of Barb and Arabian horses, showing a concentration of Barb horses in western Tunisia and Arabian horses in the greater Tunis area. The findings underscore FNARC's role in maintaining genetic integrity and enhancing Arabian horse quality, reinforcing Tunisia's position in the global equine industry and its commitment to equine heritage.

Keywords: Genetic diversity, Horse breeds, Equine production systems, Tunisia

INTRODUCTION

Equine resources have captivated global interest for centuries, driving efforts to enhance performance, preserve pure breeds and effectively manage these invaluable assets (Furdek and Conners, 2015). Horses hold significant historical and economic importance in North Africa, particularly in Tunisia, where they contribute to development and environmental conservation efforts (Hall and Ruane, 1993). Horses play a vital role in landscape management, biodiversity enhancement and are deeply embedded socially and in rural life, such as in tasks like pulling carts on small traditional farms (Younge and Vial, 2012).

Tunisia has a rich diversity of horse breeds, including Arabian, Thoroughbred, Barb, Arab-Barb and Mogods Pony. As of 2015, the country was home to approximately 26,000 horses, with Barb and Arab-Barb breeds constituting the majority (FNARC, 2015). Arabian horses, renowned for their speed, endurance and resilience in hot, dry climates, are integral to Tunisia's equine heritage dating back to the 7th century (Cosgrove et al., 2020). These horses have played a crucial role in improving other breeds globally, highlighting their importance not only locally but also on the international stage (Bensouf et al., 2022).

The Thoroughbred horse, famous for its racing abilities, holds a legendary place in mythology and history. The origins of this breed are often traced to the Arabian Peninsula and surrounding regions, though its exact lineage remains debated (Belhajyahia et al., 2020). In Tunisia,

Thoroughbreds, along with Arabian horses, are primarily used for racing and recreational activities. The breeding and enhancement of these horses are meticulously overseen by governmental bodies, particularly the National Foundation for Equine Breed Improvement (FNARC), which adheres to international standards to maintain the purity and quality of these breeds.

Despite modern challenges, the equine industry in Tunisia remains a vital and cherished part of the country's cultural heritage and agricultural economy (Jemmali et al., 2017). Efforts by FNARC to align with global standards, such as those set by the World Arabian Horse Organization (WAHO), demonstrate Tunisia's commitment to preserving its equine heritage and promoting the quality of its horse breeds on the international stage (Waho, 2012). This study aims to explore the genetic diversity and production systems of horses in Tunisia, providing a comprehensive examination of the initiatives and frameworks supporting the country's equine sector.

GENERAL OVERVIEW AND PRESENTATION

Taxonomy

The horse, known scientifically as Equus caballus (Table 1) is an herbivorous mammal belonging to the Equidae family. It falls under the category of ungulates animals, with structures at the end of their feet. These animals are considered perissodactyls, which means they have a number of toes with the middle one being the strongest for support. Throughout history, horses have held a place in society and their roles have evolved over time. They were highly valued for carrying fighters in battles, parades and hunting expeditions. Horses are also used for transportation, sports and recreational activities. In times dating back to around 30 thousand years ago, horses were hunted by humans as depicted in cave paintings created by Cro Magnon people.

Fossils discovered in the United States and Europe have enabled scientists to piece the ancestral lineage of horses dating back to ancient times.

The Origin and Evolution of Horses

Domestication of the Horse

The horse is considered as the last animal among the animals which were domesticated by humans in a successful way. Boldness, watchfulness and ferocity of living wilds horses could be the reason why domestication was delayed for a long. The first evidence of horse domestication was found in the Grassland Europe, between the 4,000- and 5,000-years B.C. The farming methods got better after the creatures, dogs, goats, sheep and cattle, had been tamed. It is still the mystery as to who among the sedentary people or also the nomads were the first humans who domesticated horses (Epstein, 1955). Regardless, the Neolithic man will utilize it for daily tasks, whether harnessed to sledges or plows (Lazaris, 2012).

The genetic studies revealed that the common wild horses had two subspecies including small horses with erect manes, which were the typical inhabitants of open landscapes like steppes and prairies and the larger Przewalski's horses (Equus ferus przewalskii), which co-existed with woodland vegetation. It is also assumed by some scholars that the domestication took place in different locations and that the breeds of domestic horses (Equus ferus caballus) had their origin from one of the two wild forms (Lazaris, 2012).

The geographical distribution of horses worldwide

Once upon a time, horses lived wild and free in the prairies of North America, South America, Europe, Asia and Africa (Figure 1). Today, most of them have been tamed by humans to live alongside them almost everywhere on earth. There is only one wild horse left which goes by the

name Przewalski's Horse but it can mainly be found in zoos. A few of these wild horses descended from previous domesticated breeds (Universalis, 1999).

In the past, the Przewalski's horse was widespread across Europe and most parts of Asia. In France, Italy and Spain alone, there were 610 drawings of this wild animal in decorated caves by early human beings. The earliest paintings can be traced back to about 30 thousand years ago (the recent ones being about 9000 years old). However, they are now becoming rare due to modern times (Clement, 2015). There are a total of 290 equine breeds distributed as follows: Europe 156, Asia: 67, North America: 19, South America: 13, Africa: 28 and Oceania: 6 (Librado et al., 2021).

The evolution of global horse populations

A decline in the number of equines follows the mechanization of agriculture, with the use of horses for work gradually fading in favor of their use in sports and leisure activities (Rzekęć et al., 2020).

For example, in Poland, following the mechanization of agriculture, its equine population decreased from over 2 million in the early 1980s to 300,000 by the 2000s (FAO, 2000).

In 2010, half of Europe's equine population, totaling approximately 475,000, was located in France, Germany and the United Kingdom.

In 2013, the FAO estimated that there were over 58 million horses worldwide, distributed as follows: 32 million in the Americas, 14 million in Asia, 5.9 million in Africa and 5.8 million in Europe.

In 2017, the total number of horses varied between 58 and 60 million (FAOSTAT, 2024).

Equine Physiology

Horses have a wide range of weights, the smallest riding horses can weigh as little as 500 kgs while the largest draft breeds can top 1,200 kg. Knowing a horse's weight is critical to a wide array of treatments and healthcare options. From deworming medications being administered according to a horse's weight to feeding decisions being based on it, the need to know how heavy the horse is becoming apparent (Doligez and Le Masne, 2018). Horses typically live between 20 to 30 years, though some breeds live longer than others. Ponies and draught horses tend to have longer lifespans on average in comparison to lighter horse breeds. Ownership by humans plays a significant role in prolonging a domestic horse's days, as proper care can see some equines reach four decades of age. Meanwhile, unique traits like hardiness or size may also contribute to variances in longevity across different types. Overall, responsible human involvement helps horses beat the odds and survive well past their third decade (Bibré, 2023). The horse has three main parts outside: the front (including the head, neck and front legs), the back (including the bottom, hips, back legs and tail) and the body, which is the middle part (Figure 2). When not moving, an adult horse has a usual heart rate of 32-44 beats in a minute, while a baby horse's heart rate is between 50 and 70 beats in a minute. These are usual numbers that can change depending on the horse (size, mood, etc.) and outside things (worry, effort, etc.).

Senses of the horse

Horses have five ways to know things, but some say they have a sixth one too. Horses are very good at smelling, hearing and touching. For example, the hairs on its chin help it feel things it can't see and its sense of smell can tell it who or what is around, like people, plants, or food, even from far away.

Horses see well. Their eyes can see around them, but they can't see right in front or behind. For this, approach them gently. Let them smell your hand before touching them. If they are blind, they

still can have a good life with a friend. In 1999, a blind horse was the best at French horse dancing (Nadeau, 1969).

Feeding

Horses require special attention to both their diet and surroundings. Their food needs to balance with their activities and body functions, like growth and reproduction. For understanding the horse's dietary needs, we must pay close attention to its health and habit. Normally, horses eat fodder that includes hay, oats and barley.

Sometimes, they'll have a mix of other grains like rice and corn or beans and bran. This diet gives them the required energy, protein and vitamins. While in a pasture, their diet is mostly grass, about 70%, with 20% legumes and the remaining 10% of various plants. Grass isn't very rich in energy, so horses that roam need to eat a lot, almost 40 kg daily. Also, they usually drink around 20 to 40 liters of water daily. Nevertheless, in hot weather or for bigger horses, this quantity can double (Nadeau, 1969).

Locomotion and Gaits

A horse moves by arranging its legs in a certain pattern. That's how we define the 'gaits' or unique ways they move. There are three types of gaits: the ones they naturally do, the ones they are trained to do and then the ones that show they might be hurt (Hoyt and Taylor, 1981).

Natural gaits are executed instinctively by the horse and include the walk (Figure 3 A), trot (Figure 3 B), canter and gallop (Figure 3 C). Artificial gaits are acquired through training, such as the passage, derived from the trot, the school walk and the Spanish walk.

Faulty gaits result from pain or improper use of the horse, such as forging (hind trotting and front galloping), crossfiring (front trotting and hind galloping), plaiting (trotting that is disjointed or disunited due to dissociation of diagonal pairs) and disunited galloping (right hind galloping and left front galloping, or vice versa (Hoyt and Taylor, 1981).

TUNISIAN HORSE BREEDING: GENETIC DIVERSITY AND PRODUCTION SYSTEMS

Tunisian Horse breeding

Five horse breeds call Tunisia home, recognized for their use and large numbers: These include the Barb, Arab-Barb, Mogod Pony, Arabian and English Thoroughbred. Besides horses, you'll find donkeys and mules in Tunisia as well. These breeds are part of history; they've been crucial in different tasks. Keeping them protected and properly managed is key to preserving their unique genes and the role they play in culture (Ouled ahmed et al., 2018).

Back in 2015, there were 26,000 horses in total. This tally included 20,000 Barb and Arab-Barb breeds, 5,000 that were Arabian breeds and the remainder, a 1,000, were Thoroughbreds (Jemmali et al., 2015).

Horses are found in various parts of Tunisia, though not evenly. Some areas have notably more horses of different breeds than others (Haddad et al., 2014).

Race horses

The English Thoroughbreds

This horse breed is popular in racing and other horse sports. The breed started in England in the mid-18th century. Known for being quick and agile, these horses are also high spirited. They have unique physical features. High withers, long backs and firm loins are some of them. They also have a broad chest that sits high, a croup that slightly slopes and muscular legs with large flexible joints. The average height of thoroughbreds' ranges from 15 to 17 hands. They're awesome at galloping races. But that's not all. They also show their skills in eventing, show jumping and dressage. The Thoroughbred comes in several colors like bay, dark bay, chestnut, black and gray. Lastly, one more thing that makes this breed special is their thin skin (Courtnee, 2022).

Tunisia's English Thoroughbred horses stem from mares and stallions brought in from France, Great Britain and Ireland. The breeding habits of these Thoroughbred horses are tradition-rich, enforced by global rules that ban artificial insemination, which hinders better productivity. However, only a few breeders have continued this breeding activity, as Thoroughbreds are delicate animals that require significant resources and expertise.

The Arabian horse

Having a history traced back over 2,000 years, the Arabian is the most ancient horse breed. Evidence points to its origins in the Middle East with reliable documentation and visual depictions (Cosgrove et al., 2020).

The Arabian horse shines in flat racing, its top event. Known for its power, smarts, class and strength, this horse is a gem. It holds high value worldwide, both financially and culturally (Bensouf et al., 2022).

The Arabian horse has a studbook and Tunisia is an active member of the World Arabian Horse Organization (WAHO) which has 57-member countries. In Tunisia we have a long history and tradition in breeding Arabian horses and the registration of these horses started in 1866 (Msaada, 2011).

The Barb horses

Originating from the northern Africa's Maghreb region, the Barb is a light horse suited for riding. Initially dubbed as 'barbarian', this term wasn't replaced with 'Barb' until 1534 (Roux, 1987).

The history of this breed started in Africa during the 8th century. In what is now Algeria, there was a fearless group of horse riders called Zanatah. They used Barbs to journey across the dry fields and lush mountains of the Barbary Coast (Rahal et al., 2009).

In 1896, the French military established the first Tunisian Barb breed stud book with the objective of improving the native horses. The French stud book was not revived until 1987. Currently, there is an international desire to rehabilitate the Barb horse (Guedaoura et al., 2011).

The Arab-Barb horses

The Arab-Barb is a unique type of riding horse from the Maghreb. The Jumenterie de Tiaret created the breed in 1878. They crossed Arabian and Barb breeds. In the early 1900s, this mix served military cavalry needs. It also appealed to breeders wanting to improve the Barb horse, the native breed. They reached this improvement by crossing it with the Arabian horse. This resulted in the Arab-Barb horse. Future generation from this cross were bred together or with one of the original breeds (Mounir et al., 2018).

The Arab-Barb horse represents Tunisian breeding success. It's a combination of the Barb's toughness, strength and simplicity and the Arabian's speedy elegance. The Arab-Barb shines when the percentage of Arabian blood is below 50%. Changes in Arabian blood percentages created Arab-

Barb horses with a wide range of measurements, from the Barb's to the Arabian's sizes. Do note, horses with over 75% Arabian blood are not allowed in the Barb horse registry.

The Mogod Pony

The Mogod Pony, also known as the Tunisian Pony, comes from the northern tip of Tunisia. Many think it's related to the Barb horse. These horses have been carefully shaped and adjusted to their local surroundings over hundreds of years. The local people greatly depend on these horses. They use them to carry people, wood, tobacco and water on tough, steep paths. They also use them for farming jobs like plowing and pulling little wagons (Haddad et al., 2014).

The Mogod Pony has a broad face, straightforward profile and big eyes. It has a short neck and back, a slowly descending rump, a full belly and a roomy chest. The mane is usually short to medium, but the tail can grow strikingly long. In 1906, Bernard pointed out that horses seen in Roman mosaics with big backsides, a hefty walk, thin faces and skinny legs, yet are short, are likely Mogod ponies, not "purebred Arabians". We still don't know exactly where the Mogod pony population in Tunisia comes from.

The significance of the equine sector in Tunisia

The numerical significance

In Tunisia, the equine population is relatively significant. According to a five-year plan [2020-2025] conducted by FNARC, the total number of equids is 66,000, with 26,000 of them being horses. This figure is divided into 5,000 Arabian horses, 1,000 Thoroughbred English horses, 2,000 Barb and derivative horses, with the remaining population composed of other equids.

The Arabian and English Thoroughbreds are typically involved in flat racing, saddle activities and breeding. Barb horses, Arabian-Barb crosses, or those of indeterminate origin are generally utilized for traction and agricultural work in rural settings. They are most commonly found in traditional breeding farms (Mounir et al., 2018).

Due to the rise of machines and cars for transport, horse numbers of all types are steadily dropping. Specifically, in Tunisia, there has been a big 58% decrease in horse numbers since the 1970s. That's a decrease from 98,000 horses in 1971 to just 57,000 now.

In the year 2015, around 26,000 horses were recorded. This included 20,000 mixes of Barb and Arabian-Barb, along with 5,000 Arabian horses, plus 1,000 Arabian. Other equines were also present, about 40,000 mules in fact (Jemmali et al., 2015). Fast forward to 2017, the horse count had increased to about 57,254 heads (Jemmali et al., 2017).

Distribution

The equine population is unevenly distributed across Tunisian territory. The highest number of Barb horses is found in the western regions of Tunisia, along the border with Algeria and in the adjacent plains of Kasserine and Kef. The central region of Tunisia, particularly the area around Kairouan, represents the second zone with a significant population of Barb horses. For Arabian horses, they are generally concentrated in the greater Tunis area, particularly in the region of Ariana (Fnarc, 2012).

Historical background of horse breeding in Tunisia

The first organized structures for horse breeding in Tunisia date back to 1830, coinciding with the establishment of the Bardo Polytechnic School by the first Mushir Ahmed Bey. The El Battan barracks will be accompanying the initial trials of administered breeding.

The objective of these efforts was to provide the emerging Tunisian army with a skilled cavalry capable of effectively executing political missions outlined in the agreements of December 17, 1830 and February 6, 1831, between Hussein Bey and General Clauzel. However, it was Sadok Bey who, in 1866, established the first organized stud farm following the model of the French national stud farms: the Sidi Thabet Stud Farm. The initial attempts to establish horse racing societies date back over a century. The first one, the Hippodrome and Racing Society of Tunis, was founded in 1884 during the reign of Bey Ali III (Le cheval: Patrimoine National – Cheval & Tunisie, 2024).

The Arabian Horse in Tunisia

General presentation

Arabian horses (Figure 4) are widely regarded as one of the most influential breeds in the world. It's also one of the oldest breeds, with archaeological evidence of horses in the Middle East resembling modern Arabians dating back 4,500 years. Throughout history, Arabian horses have spread worldwide through both warfare and trade, used to enhance other breeds in terms of speed, refinement, endurance and sturdy bone structure. Today, Arabian bloodlines can be found in nearly every modern riding horse breed. The Arabian horse is characterized by its natural beauty, graceful movements, athletic endurance and ability to thrive in hot, dry environments (Cosgrove et al., 2020). All these qualities combined explain why Arabs have always so jealously guarded the purity of the breed, only allowed purebred matings and very reluctantly parted with their horses. Arabian horse is one that is registered as "purebred" in an accredited Arabian Stud Book.

Registry and listed as acceptable by the WAHO (World Arabian Horse Organization). In order to avoid misunderstandings and false interpretations, the "definition" of the Arabian horse was presented and accepted by delegates at the WAHO constitutional meeting in 1974 in Malmö, Sweden. This definition is now mandatory for every horse presented for registration (waho, 2018).

The origin of the Arabian Thoroughbred horse

The Arabian horses hold a spot as one of the world's ancient and impactful horse breeds, surrounded by many stories and legends. The breed's evolution is closely linked to Islam, yet, its precise beginnings are not clear. Some think they first appeared on the Arabian Peninsula, especially in areas like Yemen, Saudi Arabia and Iran. Others believe their roots could be in even more remote parts of the Middle East (Głażewska, 2010).

According to the FAO, the emergence of the Arabian in Tunisia dates back to the 7th century, with its population increasing due to various invasions and successive migrations that affected the local Barb horse population.

However, the breeding of Arabian for racing purposes handiest started out in Tunisia in 1881, with the importation of the first 4 mares bought from the Pompadour stud farm through the Sidi Thabet Breeding Establishment. The offspring of these mares have been finally used to establish personal studs which includes Dr. Lovy's in Meknassy in 1908, Pavillier's in 1918 and later Admiral Cordonnier's in Sidi Bou Hadid.

The first foundation sires were likely imported from Egypt or Syria and include Mechta, Kamil and Aden. Later, additional stallions were introduced, among them Ibech, Balek, Salami, Nasr, Dynamite II, Ibn Fayda, Bango and Souci. More recently, Chetoui, Cheikh El Orbane, Ibn and Esmet Ali have been added to the list (FNARC, 2015).

Tunisia additionally imported Arabian stallions born and raised inside the southwest of France in 1935 (including Duc II, Ben Mouret, Nikital, Kriss II...) alongside pregnant broodmares from the identical place for personal breeders.

The distribution of Arabian broodmares in Tunisia

Arabian horses are found throughout Tunisia. Most breeding takes place in Greater Tunis and the governorates of Kairouan, Sidi Bouzid, Bizerte, Nabeul and Médenine, typically near racetracks (Abdelhalek and Khelifa, 2007).

Arabian broodmares are mostly kept by 718 breeders, accounting for 95% of them. They usually gather around the National Stud Farms, like the centers of Sidi Thabet, Raccada, Meknessy and Ben Guerdane. Other breeders are spread out all over the country (Table 2). Typically, these are small family groups owning about two broodmares. The rest, the 5% left, is managed by FNARC (2012).

Abilities and uses of the Arabian horse

The Arabian horse holds remarkable abilities due to its roots and structure. It's been a subject of fascination in both breeding and enhancement efforts and competitive sporting and endurance contests. In fact, this horse continues to show top tier performances no matter what discipline or activity is asked of it. There's a saying that it was designed to carry "heavily," "quickly," and "a long way" (Préaudeau, 2002). Despite its numerous abilities, the uses of the Arabian horse in Tunisia are relatively limited. Gallop racing events are the main utilization (Ben Ammar and Theret, 1980).

Light horses worldwide have greatly benefited from the Arabian horse's breeding. This breed stands out as one that enhances others. When the Arabian horse is used as a sire, it keeps its unique traits, even when mixed with different breeds. In fact, it's considered the best in improving other horse breeds. It passes on features like well-proportioned form, texture, finesse, stamina, durability and smarts to its young. When you look at its mixed breed offspring, you see the Arabian horse's dominant genetic influence, at least in physical appearance. This breed helped create the famous Anglo Arab and Arabian Barb breeds, which have done very well in horseback riding competitions and trail rides (Blomac and Bogros, 1978).

Bloodlines of the Arabian horse

Tunisian bloodlines

Tunisian Arabian trace their lineage back to four mares of Syrian origin (Table 3), originating from the Pompadour stud (Ben Ammar and Theret, 1980).

Arabian stallions used as breeding stock at the Sidi Thabet stud farm were partly imported from Syria and Egypt, while others were supplied by military establishments (Ben Ammar and Theret, 1980). Below some lineages are described.

Nasr

This lineage dominates the Arabian population in Tunisia. It includes a significant number of stallions that have made their mark on the breed, the most illustrious being Esmet- Ali (Table 4).

Dynamite II

Born in 1920 in Saudi Arabia, Dynamite is part of the Hamdani lineage and the Simeri family. He snagged four big wins in 1925 and came in second place a total of eight times over two years. His prominent offspring, Ibn, was born in 1941. He was sired by Dynamite II and Gafir and he rises to prominence following the lineage of Esmet-Ali. As a sire, Ibn did amazingly well. He fathered 36 superior horses.

Among those born of him include famous names like Soufyan, Koufi, Ghaleb, Aal and Sibawaih. Interestingly, Ibn has a record of producing more winning female horses, with 18 compared to only 4 male winners. Tina, who mothered Lathlath by Dynamite III, is one of the notable among them.

Tunisia also boasts of other significant horse family strains, like Hellal, who fathered Loubieh, Chetoui, Misk and Daoues and Cheikh El Ourbane, who produced Raoui, Horria and Joulan.

Foreign lineages

In 1998, Tunisia allowed the importation of Arabian horses recognized by WAHO. This new strategy truly began in 1999 with the importation of three stallions: Sarki d'Espiens, Vent Dredy and Manganello. In the following years, other stallions with better performance were introduced, such as Hajjam, Fardjala, Farouk Al Mels and Saint Faust.

Roughly 25 to 30% of the total Arabian foal births stem from these Franco-Tunisian crossings (FNARC (2012)) .The successful outcomes of the initial generations with Maysoun, Mohrat El Badia, Nahab, Najuri and the promising prospects for the racing program have encouraged breeders to show increased interest in these Franco-Tunisian crossings

Badr Stud, a private horse farm, brought in three stallions with esteemed French heritage: Hakim du Bac (Manganate and Cook de Carrere) was born in 1995, Jesroy de Chailac (Ke•sberoy and Beskem) came in 1997 and Gipten (Dormane and Aïcha) in 1994. Breeders can use these stallions for mating. It's thought this move will aid in reenergizing the breeding and racing industry.

Valuable stallions have been imported by two private breeders: Hajjam (by Djourman) born in 1995, Sarki d'Espiens (by Tidjani) born in 1992, Farouk Al Mels (by Dormane) born in 1993 and Saint Faust (by Nuit St Georges) born in 1996. The total number of imported stallions was 9. They were primarily located in Sidi Thabet: Hajjam, Vent Dredy, Saint Faust, Farouk Al Mels, Jesroy de Chailac, Hakim du Bac and Gipten. Sarki d'Espiens was situated in Meknassy and Fardjala in Ben Gardane.

Vent Dredy, Farouk Al Mels and Gipten are sons of Dormane. Fardjala and Hakim du Bac are descendants of Manganate, a renowned French stallion. Sarki d'Espeins is the son of Tidjani, the full sister of Manganate.

The technical and administrative organization of horse breeding

Global scale: World Arabian Horse Organization

Founded in 1970, WAHO is a registered charity with the responsibility of ensuring the establishment and maintenance of acceptable standards in the regulation, registration methods and production of Stud Books among all its member countries, representing a registration authority (waho (2018)). Its headquarters are located in the United Kingdom. It has 82 affiliated members representing a registration authority.

The main goals of the World Arabian Horse Organization (WAHO) were to keep Arabian horse bloodlines pure and promote interest in their breeding science, share knowledge about their history, coordinate member activities, work with other organizations to standardize terminology and procedures and advise in discussions with authorities on Arabian horse matters (Jemmali et al., 2017).

FNARC

In Tunisia, the National Foundation for the Improvement of the Equine Breed FNARC (formerly the National Stud Farm established in 1913) is a public institution created in 1988 by Law No. 82-88 of

July 11, 1988. It enjoys autonomy in management and aims to implement a rational policy for the development of the equine sector .

FNARC in Tunisia is highly involved in enriching the horse industry. Their roles are versatile, from creating breeding plans and boosting horse genetics, to logging all horse details. They offer public stud services and promote horse sports and tourism. They are tasked with being representatives both locally and globally and manage breeding documentation. Another role is aiding breeders with methods, arranging sales and competitions and overseeing horse health. They engage in horse related projects and research and provide training for technicians.

Four Arabian breeding hubs are under their management, each being in a unique location (FNARC, 2016).

The Arabian Stud Book

The Tunisian Arabian Stud Book is managed by the National Foundation for the Improvement of the Equine Breed (FNARC), under the jurisdiction of the Tunisian Ministry of Agriculture. It is published at least every four years and includes sections for stallions and their registered offspring, as well as mares with their progeny and breeding results, along with a list of imported horses.

In 1791, the Arabian was added to stud book, which focused on breeding English Thoroughbreds. The first stud book was made in Algeria in 1886. Listing ancestors in the registry for a long time helps maintain stable traits.

FNARC Arabian Breeding Centers

Sidi Thabet Stud Farm

The Sidi Thabet Estate is located in the Medjerda Valley, 22 km northwest of Tunis and specializes in breeding Tunisian Arabian. The estate was transferred to the Franco-African Society in 1880, which expanded the stud farm several times. It had a herd of 40 broodmares, including 30 Arabian s and 3 Arabian stallions affiliated with the stud farm (Landolsi (2012)).

In 1877, a breeding center for fine horses was set up in Tiaret. This center was meant to provide other farms in Algeria and Tunisia with high-quality horses. In Tunisia, a dedicated service was formed for horse management in 1884. After this, all horse facilities in North Africa were combined. In 1905, the depot supplying horses and stallions was relocated from the privately-owned area of Sidi Thabet to El Battan, near Tebourba. The government bought the Sidi Thabet horse farm in 1913 from the Franco-African Society.

They transformed the farm into an agriculture department. With buildings and lands adding up to 3913 hectares, the goal was to build a research facility for horse development. Since then, it has been used as a testing and breeding station, primarily for purebred Arab horses. Other Barb-Arabian and Barb females were made available for purchase.

The National Stud Farm at El Battan

The National Stud Farm of El Battan, located in the northern region of the country, in the Manouba governorate, accommodates all national stallions of Purebred, Barb, Arabian- Barb and Mogods Pony breeds. It oversees the activities of breeding stations (FNARC, 2015).

The Raccada Stud Farm

The Raccada Stud Farm, located 15 kilometers south of Kairouan, houses the Arabian Purebred breed and other horse breeds. It used to be a breeding station as well. Currently, it functions as a

depot for Arabian, Barb and Arabian-Barb stallions (FNARC, 2001).

The Meknassy Stud Farm

The Meknassy Stud Farm is located 50 kilometers southeast of Sidi Bouzid. It welcomes all horse breeds, including the Arabian. Nowadays, this stud farm serves as a depot for Arabian, Barb and Arabian-Barb stallions (FNARC, 2001).

The Ben Guerdane Stud Farm

The newest stud farm, established in 1998, is located in Ben Guerdane (Governorate of Medenine) and also serves as a depot for Arabian, Barb and Arabian-Barb stallions. Since its inception in 1998, this stud farm has had 10 horse stalls (FNARC, 2001).

Race organization

The global framework: International Federation of Arabian Horse Racing

Established officially on January 11, 1999, in Paris, the International Federation of Arabian Horse Racing is a non-profit organization with the following objectives: to promote and enhance Arabian horse racing worldwide, to support all racing organizations by encouraging increased sponsorship from the private sector and raising the level of prize money available for Arabian horse races, to foster a professional atmosphere within the Arabian horse racing industry and to develop committees to study various aspects of Arabian horse racing (International federation of arabian horse racing authorities, 2018).

Tunisian Racing Company

The Tunisian Racing Company (SCH) is an important part of the horse industry in Tunisia. It helps out by setting up horse races which are a big deal for Thoroughbred horses. This keeps everyone involved happy and also boosts the country’s economy. But that’s not all, it’s a leader in making this sector better. This sector needs more ways to get money and grow and the SCH is just the ticket for that (Société des courses hippiques de Tunis, 2011).

Back in 1884, the Tunisian Racing Companywas set up. Following the decree on April 21, 1892, they got the green light to arrange races. The company transformed into the Tunis Racing Society by 1902, focusing on race organizing. The year 2012 was a turning point with their first official racing bulletin. It gained public utility status in 1908 (Société des courses hippiques de Tunis, 2011).

In 1895, the Sahel Hippic and Racing Society was formed, along with others like the Southern Tunisia Racing Society, Beja Racing Society, Kairouan Racing Society, Kef Racing Society and Souk El Arbaa Racing Society (now Jendouba). In 1912, the Horse Breed Improvement Society was founded, coinciding with the introduction of the racing code.

In Tunisia, various racing groups united to establish a Federation. By 1919, this Fede- ration encompassed all the Tunisian racing communities. In August 1952, a law was introduced to guide the Tunis Racing Society. This was aimed at improving horse breeding, which marked the official beginning of horse racing in Tunisia. Post-independence, the Tunis Racing Society was established in November 1961. Changes were made to its structure in July 1967 by forming a board that represented government ministries. In 1969, the racing society was dissolved and its activities were absorbed by the Office of Breeding and Pastures. But a year later, in 1970, the racing society was reinstated by law and was tasked with organizing races and managing two racetracks: Ksar Saïd for weekly races and Monastir for races held in June and July (Société des courses hippiques de Tunis, 2011).

In general, the main tasks of the Tunis Racing Company are to organize horse races, especially flat races and to take care of the racecourses. They also publish racing rules and schedules and work to strengthen relationships with other horse racing organizations worldwide. Additionally, they arrange local horse festivals and races across the country. To support horse owners, they provide training tracks, transportation, veterinary care and stabling facilities (Société des courses hippiques de Tunis, 2011).

Race codes

In 1911, the Society for the Encouragement of Breeding in France requested the Tunisian Equestrian and Racing Society to establish a code governing Tunisian horse racing events (Chabchoub et al., 2004).

In 1912, the Tunisian Equestrian and Racing Society introduced a Tunisian racing code for flat races and adopted the code and regulations of the Society of Steeplechase Racing in France for steeplechase events and the code of the Society for the Improvement of the French Half-Blood Horse for trotting races. On November 17, 1912, the Tunisian Racing Code was adopted by the Society for the Improvement of Horse Breeds in Tunisia. The stewards of the racing society were tasked with enforcing these racing codes.

Race organization

The Racing Company concentrates on the horse racing industry. It serves pros, the general public and different stakeholders in this racing field. Its main advantage is the exclusive right to coordinate horse races across the country, focusing primarily on flat races. A racehorse's career typically begins at the age of 2.

Depending on the horse's abilities, health and performance, its career can last beyond 8 years (Société des courses hippiques de Tunis, 2011). Each racing season, the Racing Company organizes flat races for Arabian and Thoroughbred horses. These races are grouped into different categories, including Group races (GI - GII - GIII), Handicap races, Conditions races and Claiming races. The annual racing program, approved by the Ministry of Agriculture, categorizes horses based on their earnings and performance levels, with higher prize money races having more prestigious classifications.

CONCLUSION

The preservation and enhancement of equine breeds in Tunisia, particularly the Arabian and Barb horses, are crucial not only for maintaining the genetic diversity unique to these breeds but also for leveraging their significant economic potential.

Tunisia's rich history with horses, especially the Arabian breed, which dates back to the 7th century, underscores the cultural and historical significance of these animals. The Arabian horse is renowned for its speed, endurance and resilience in hot, dry climates, making it an integral part of Tunisia's equine heritage. Similarly, the Barb horse, originating from North Africa's Maghreb region, is celebrated for its agility and strength, attributes that have made it a valuable asset for riding and other equestrian activities.

To ensure the longevity and improvement of these breeds, a concerted effort from various stakeholders is essential. Researchers, breeders and governmental institutions need to collaborate closely to develop and implement strategies that effectively address the challenges facing these breeds. One of the key institutions in this regard is the National Foundation for the Improvement of the Equine Breed (FNARC), which has been instrumental in maintaining the genetic integrity and quality of the Arabian horse breed.

FNARC's efforts to align with the global standards set by the World Arabian Horse Organization (WAHO) highlight Tunisia's commitment to preserving its equine heritage. The maintenance of the Tunisian Arabian Stud Book by FNARC is a significant achievement, ensuring the purity and quality of the Arabian horse lineage. Moreover, the article calls for increased international recognition of these breeds. By promoting the Arabian and Barb horses on a global stage, Tunisia can enhance the visibility and value of these breeds, attracting attention from international breeders, researchers and equine enthusiasts.

This international recognition can open up new avenues for collaboration, funding and knowledge exchange, further bolstering the conservation and improvement efforts for these horses. Additionally, it can lead to increased demand for these breeds, thereby boosting the local economy through activities such as horse racing, tourism and breeding programs.

The economic potential of these breeds is substantial. The Arabian and Barb horses are not only important for recreational and competitive equestrian activities but also hold value in traditional agricultural practices and transportation, particularly in rural areas. By investing in the preservation and enhancement of these breeds, Tunisia can ensure that these horses continue to contribute to the country's cultural heritage and agricultural economy. Furthermore, the development of structured breeding programs, adherence to international standards and the implementation of conservation strategies can position Tunisia as a significant player in the global equine industry.

In conclusion, the preservation and enhancement of Tunisia's equine breeds require a multifaceted approach involving collaboration among researchers, breeders and governmental institutions. The Arabian and Barb horses, with their unique genetic diversity and economic potential, represent a valuable asset for Tunisia. By achieving greater international recognition and implementing effective conservation and improvement strategies, Tunisia can ensure the sustainability and growth of these breeds. This will not only contribute to the global equine biodiversity but also promote local economic development, preserving a vital part of Tunisia's cultural heritage for future generations.

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