Genealogical lines of breeding mares as biological resources of a thoroughbred horse breed bred in the Stavropol Krai

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Abstract. Tribal horse breeding is one of the priority areas of livestock in the Stavropol Territory. The article provides an analysis of the population of purebred horse breeding mares bred in the leading farms of the Stavropol Territory (OOO “SKHP Svobodnyi trud”, OOO “SKHP Novomarevskoe”, FGUP “Rassvet-Stavropole”). An assessment of the mares of the pedigree core of purebred horse breed showed that their genealogical structure is represented by 12 lines. It should be noted that the 5 lines of Norsen Dancer, Native Dancer, Nazrullah, Fairway and Tern-Tu go back to the same ancestor – the Falaris line, which is 82.6 % of the total number of breeding mares. The data obtained correspond to the general trend that is observed in the global structure of purebred horse breed. An analysis of the genealogical lines of the pedigree nucleus of purebred horse mares in the Stavropol Krai revealed their optimal linear and age structure. A zootechnical assessment showed that according to measurements and indices, the mares of the farms analyzed correspond to the breed standard. The research results can be recommended as educational material for students and undergraduates of universities studying in the areas of preparation of zootechnical profile.

1. Introduction
At present, a development strategy has been developed for horse breeding in the Russian Federation until 2025, which provides for stable development of the industry, preservation and improvement of the gene pool of farmed breeds and, as a result, increased competitiveness both in the domestic and world markets [1].

The interest in horse breeding in the Stavropol Krai is not accidental: it is a traditional historically established livestock industry. The priority link in the industry, of course, is breeding horse breeding. In the Stavropol Territory, breeding horse breeding is represented by the following breeds: Arab, Akhal-Teke, Karachai and thoroughbred horse. The total number of breeding horses at the beginning of 2019 is 918 goals, including 309 mares. The most numerous is purebred horse breed.

Thoroughbred or English thoroughbred is an international horse breed. In the process of historical development of a purebred horse breed, several genealogical lines of world significance have developed. They evolve in constant interaction with each other, and the livestock structure is constantly changing. Proper tracking of these processes is necessary for effective breeding [2, 3].
At present, almost all breeding stock of purebred horse breeds in Russia is represented by horses born in North America or having North American roots. A feature of horse breeding along the lines is the fact that all modern horses of purebred riding breed are the descendants of a relatively small number of outstanding manufacturers – the founders of the lines. At all times, there were six to seven lines that were common in all countries with developed purebred horse breeding, and along with them, lines of local significance developed in each country [4, 5].

Breeding work in horse breeding is a complex, multi-stage and multi-faceted process. In recent years, DNA technologies have been widely introduced in many sectors of animal husbandry, and horse breeding is no exception [6]. To achieve their goals, breeders use various animal selection techniques. However, the main ones in pedigree horse breeding are: individual selection, breeding along the lines, assessment of stallions-producers and mares. For example, the basis for the selection of mares in the reproducing composition are materials of valuation, which is carried out in accordance with the requirements of the current instruction. With such a comprehensive assessment, the following principles are maintained – detail and rigorous determination of the breeding value of horses.

When selecting young mares for reproducing composition, first of all, they assess their constitutional strength, the degree of severity of the female type, preferring mares to relatively long, low on their legs, wide pelvis and deep chest. Particular attention is paid to the selection of severity in mares such as the male line to which it belongs, and the qualities of its ancestor. Selection in this direction is important for maintaining, successfully maintaining and improving lines. Recruiting homogeneous groups of mares within the farm in terms of working capacity, type and exterior greatly helps the breeder and simplifies the work of selecting parental pairs.

A line is a related group of animals, dating back to one high-value stallion-producer. The task of breeding along the lines is the rapid dissemination, consolidation and improvement of the valuable qualities of the ancestor of the line, which is achieved by the widespread use of this group of animals in reproduction.

The uterine family is a related group of animals that goes back to one valuable mare. The principles of work with the uterine families are the same as with the lines, but they are complicated due to the infertility of the mares.

The purpose of the research is to analyze the population of mares and characterize their genealogical lines as biological resources of a thoroughbred horse breed in the Stavropol Krai.

2. Methods and materials

The object of research was pedigree mares (n = 86) of purebred horse breed bred in pedigree farms of the Stavropol Territory (OOO “SKHP Svobodnyi trud”, OOO “SKHP Novomarevskoe”, FGUP “Rassvet-Stavropole”).

A genealogical assessment of tribal mares was carried out by comparing the pedigrees to the fourth or more series of ancestors. All the studied livestock was characterized by the linear structure and severity of breeding characteristics: height at the withers, girth of the chest and metacarpus. Based on the measurements, the physique indices were calculated: chest circumference and bony. Biometric data processing was performed using the Microsoft Excel 2007 software package.

Information sources of research: statements of results of scoring of pedigree horses, state pedigree books of thoroughbred horses, data from the KONI-3 information retrieval system.

3. Results

An analysis of the genealogical structure and zootechnical assessment of purebred horse mares was carried out in three leading pedigree farms of the Stavropol Territory (OOO “SKHP Svobodnyi trud” has the status of a pedigree plant, and OOO “SKHP Novomarevskoe” and FGUP “Rassvet-Stavropole” have the status of a pedigree reproducer for breeding horses of the English thoroughbred riding breed) [7, 8].

The producing composition of mares OOO “SKHP Svobodnyi trud” (31 heads) is represented by 8 lines (Table 1).
Table 1. Distribution of mares OOO “skhp svobodnyi trud” by their linear accessory to direct men’s lines

| Line          | Quantity | % to total |
|---------------|----------|------------|
| Norsen Dancer | 11       | 35.5       |
| Native Dancer | 8        | 25.8       |
| Nazrullah     | 6        | 19.4       |
| Ribo          | 2        | 6.5        |
| Tern-Tu       | 1        | 3.2        |
| Fairway       | 1        | 3.2        |
| Dark Ronald   | 1        | 3.2        |
| Prens Roza    | 1        | 3.2        |
| Total         | 31       | 100        |

The ancestors of the lines of Northern Danser, Native Dancer, Nazrullah, Tern-tu and Fairway are direct descendants of Falaris and they account for 87.1 % of the total number of tribal mares. The most common and numerous is the Northern Dancer line – 11 heads (35.5 %). The Northern Dancer line is widely represented in Europe and the USA.

The Native Dancer line is represented by eight breeding mares – 25.8 % of the total number of mares.

The Nazrullah line is represented by six breeding mares – 19.4 % of the total number of the breeding core. The Nazrullah line is mainly developed through the descendants of the Red Year, Never Band and Gray Sovrin, producing in Europe and the USA. Representatives of the Nazrullah line in Russia are such stallions as Al Batal, the Observation Post and Ballyol Boy, who is considered the best Russian producer in recent years.

Only two mares (6.5 %) are in the Ribot line. 1 head falls on the mares of the Tern-Tu, Dark Ronald, Prens Rosa and Fairway lines. The progressive Turn-Tu line every day significantly enhances its influence. In Europe, this line developed through representatives of the branch of Sir Gaylord, while in the USA, representatives of the branch of Hale Tu Rizna dominated. If we talk about Russia, then the Turn-Tu line exists thanks to the efforts of two imported manufacturers – Bali Dancer and Triple Bak. In (OOO “SKHP Svobodnyi trud”), the representative of the Turn-to line is the mare Beauty Trick, born in 2011 from Hat Trick and Seuss Wei.

A small number of Fairway descendants produce in the United States and Europe, but the quality of the offspring is still inferior to representatives of other lines. In Russia, the Fairway line was represented by the well-known “Irish” Ivory Tower. Mare Discography, born 1996 from Grim (grandson of Ivory Tower) and Daugava is the only representative of the Fairway line in the household.

The producing composition of mares OOO “SKHP Novomarevskoe” is represented by 7 lines (Table 2).

The ancestors of the lines of Northern Danser, Native Dancer and Nazrullah are direct descendants of Falaris, their share is 83.4 %. The most common and numerous is the Northern Dancer line – 17 heads (56.7 %), born mainly in the USA, Ireland, Great Britain and Germany.

The Nazrullah line is represented by 5 heads (16.7 %). The representatives of the Native Dancer line account for 3 heads (10.0 %).

Blandford’s line is represented by two breeding mares: the Golden Diadem and the Ideal Style, born in 2013 from the production stallion Imonzo (Monzun – Ai Gow Bai), which he currently produces in this farm. His father, Monzun, is the most famous successor to the Blandford line at this stage of breed development.
Table 2. Distribution of mares ooo “skhp novomarevskoe” by their linear accessories to direct men’s lines

| Line             | Quantity | % to total |
|------------------|----------|------------|
| Norsen Dancer    | 17       | 56.7       |
| Nazrullah        | 5        | 16.7       |
| Native Dancer    | 3        | 10.0       |
| Blendford        | 2        | 6.7        |
| Tourbillon       | 1        | 3.3        |
| Dark Ronald      | 1        | 3.3        |
| Men O Uora       | 1        | 3.3        |
| Total            | 30       | 100        |

1 head falls on the mares of the lines of Turbillon, Dark Ronald and Men O Uora.

The manufacturing composition of mares FGUP “Rassvet-Stavropole” is represented by 5 lines (table 3). The ancestors of the lines of Northern Dancer, Native Dancer and Nazrullah are direct descendants of Falaris, their share is 76 %. The most common and numerous is the Native Dancer line – 10 heads (40 %). This line continues to maintain its influence, thanks to manufacturers in different countries.

The Northern Dancer line is represented by 6 breeding mares, which is 24 % of the total number of breeding mares. I would especially like to note the five breeding mares of the American line Men O Uora, they account for 20 % of the total number of mares. These are the half-siblings of Hekt (born in 2006), Russian woman (born in 2008), Galaxy of Dawn (born in 2009) and Demantica (born in 2010), received from a stallion of Altibra and Egyptian woman (born in 2014) from Tamerlane.

Table 3. Distribution of mares fgup “rassvet-stavropole” according to their linear affiliation to direct male lines

| Line             | Quantity | % to total |
|------------------|----------|------------|
| Native Dancer    | 10       | 40         |
| Norsen Dancer    | 6        | 24         |
| Men O Uora       | 5        | 20         |
| Nazrullah        | 3        | 12         |
| Giperiona        | 1        | 4          |
| Total            | 25       | 100        |

The story of the Man O O War small line is interesting and instructive in that many hippologies indicate that Man O O War was one of the most brilliant horses ever to compete in the USA. With 21 appearances, he was the first 20 times, set five world and four local records, winning at distances from 1000 to 3200 m. Maine War entered the history of the United States by the fact that he is the father of the only representative of America who won the Big National Liverpool Steeples – the most difficult steeplechase in the world.

Mares, representatives of the Nazrullah line – 3 heads (12 %). These are the breeding mares of Yevpatoriya (born 2004) from Fabus, Nakhichivian (born 2012) from Hai Tork and Rizhka (born 2005) from the Belvedere stallion (Al Batal – Grazia). Stallion Belvedere was the winner of prizes in Moscow, them. Budyonn and the Champions Cup in 1999 in Pyatigorsk. His father Al Batal (born in 1987, USA) is the son of the famous Blushing Groom.

The Sky Aur tribal mare (born 2001) in a straight male line goes back to the stallion Hyperion (born 1930) from the famous Gainsborough and Selena.

In total, we studied 86 breeding mares in the three leading farms of the region. It was established that the mares of the pedigree core of a thoroughbred horse breed are represented by 12 lines. It should be noted that 5 lines (Northern Dancer, Native Dancer, Nazrullah, Fairway and Tern-Tu) go back to the same ancestor – the Falaris line, which is 82.6 % of the total number of breeding mares.

The line of Falaris is spread through his sons: Pharos, Fairway, Cyclus and Faramond. The most distant branch was Faros, which, thanks to its best successor, Nearko, gave the lines of Northern Dancer, Nazrullah and Tern-Tu.
After studying the distribution of breeding mares according to their linear affiliation, it was found that the lines of Norsen Dancer (39.5%), Native Dancer (24.4%) and Nazrullah (16.3%) were widely distributed in the breeding plants of the Stavropol Krai.

The most branched is the breeding core of OOO “SKHP Svobodnyi trud”, it is represented by 8 lines, OOO “SKHP Novomarevskoe” – 7 lines, and in FGUP “Rassvet-Stavropole” - 5 lines. Each line in the breed is individual, both in qualitative and quantitative composition. In general, one can trace the following pattern: in all three studied farms there are breeding mares of the lines: Northern Dancer, Native Dancer and Nazrulla in different quantitative and percentage terms. The Maine Ouar line accounts for 6.9% of the total number of breeding mares. At 2.3% each line comes from Blandford, Ribot, and Dark Ronald.

A feature of the pedigree core of OOO “SKHP Svobodnyi trud” is the presence of the mares of the following lines: Fairway, Tern-Tu, Prenza Rosa. The LLC SHP Novomaryevskoye has mares of the Blandford and Turbillon lines, and the Federal State Unitary Enterprise Dawn-Stavropol Territory has Hyperion lines.

Great importance in breeding is given to the age structure of the breeding stock. The data obtained indicate that the average age of breeding mares in LLC “SHP Free Labor” is 11.4 years. The highest percentage falls on mares of middle age (b. 2006–2011) – 64.5%. Young mares aged 5 to 7 years (inclusive) – 16.2%. Breeding mares of 14 years and older – 6 goals, which is 19.3% of the uterine stock.

In OOO “SKHP Novomarevskoe” the largest number are middle-aged mares – 18 goals (60.1%). Young mares aged 6 to 7 years (inclusive) – 7 goals (23.3%). Older breeding mares – 5 goals, which is 16.6% of the uterine stock. The total number of breeding mares in this farm was 30 animals, the average age was 10 years.

Breeding stock of FGUP “Rassvet-Stavropole” is represented by 25 heads, while the average age of breeding mares is 10.6 years. Analyzing these indicators, we see that 40% of the total number of mares are young mares aged 5 to 9 years. Breeding mares aged 9 to 15 years accounted for 36%, old mares – only 24%.

Thus, the average age of the studied breeding stock ranged from 10.0 to 11.4 years. In the studied farms, the lion's share of the pedigree core is made up of pedigreed mares born in 2006–2011. So, in OOO “SKHP Svobodnyi trud” and OOO “SKHP Novomarevskoe” their number was 64.5 and 60.1%, respectively, and in FGUP “Rassvet-Stavropole” – 36%.

One of the stages of our work was a comparative zootechnical characterization of the mares of the pedigree core of purebred horse breed in the leading farms of the Stavropol Territory (table 4).

Breeding mares of OOO “SKHP Svobodnyi trud” in height at the withers are superior to mares from OOO “SKHP Novomarevskoe” by 1.5 cm and FGUP “Rassvet-Stavropole” by 2.7 cm (p> 0.90).

### Table 4. Average measurements and indices of the breeding kernel of the mares of the purebred upper breed in the leading breeding farms of the stavropol krai

| Indicators                  | OOO “SKHP Svobodnyi trud” | OOO “SKHP Novomarevskoe” | FGUP “Rassvet-Stavropole” |
|-----------------------------|----------------------------|--------------------------|---------------------------|
|                             | n=31                       | n=30                     | n=25                      |
| Height at the withers       | 162.9±0.47                 | 161.4±0.51               | 160.2±0.94                |
| Chest circumference         | 186.9±0.80                 | 194.9±1.22               | 188.7±1.25               |
| Metacarpal circumference    | 20.6±0.13                  | 21.0±0.17                | 21.0±0.16                |
| Chest circumference         | 114.7                      | 120.8                    | 117.8                    |
| Bone                        | 12.6                       | 13.0                     | 13.1                     |

In terms of chest girth, the best indices of the breeding mares of OOO “SKHP Novomarevskoe” were 194.9 versus 186.9 cm (p> 0.999) in OOO “SKHP Svobodnyi trud” and 188.7 cm (p> 0.99) in FGUP “Rassvet-Stavropole.”
The differences between the average metacarpals are not significant and are approximately at the same level of 20.6–21.0 cm.

The chest girth index for the studied breeding mares ranges from 114.7–120.8 %, and the bony index is 12.6–13.1 %, which gives us the right to confirm the constitutional strength of these horses.

4. Conclusion

Thus, the analysis of the genealogical lines of the pedigree nucleus of purebred horse mares in the Stavropol Territory revealed their optimal linear and age structure, which is explained by the purposeful work of breeders and chief specialists of leading pedigree farms.

A zootechnical assessment showed that according to measurements and indices, the mares of the farms analyzed correspond to the breed standard.

The results can be used in further research, practical work of livestock breeding farmers and individuals involved in breeding thoroughbred horses. The research results can be recommended as educational material for universities of zootechnical profile.

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