
DOCTORAL THESIS ABSTRACT

Keywords: Shagya Arabian, horses, morphology, reproduction, dynamics

Over time, the importance of *Equus caballus* species was valued through the multitude of uses granted to it since ancient times. Initially, the horse was a food source for nomadic Asian nations from the Northern Black Sea, who began to tame and then use horses for riding and sleigh traction about 6.000 years ago.

A well-known aspect in the practice of horse breeding is that the best results appear when man researches, understands, and applies the strategies to satisfy the needs of horses, for them to develop properly, be in good health and express their potential at the upper limits. Because in the case of this species the external features, the functional type and the zoeconomical skills are strongly correlated and the energetic potential is expressed in their physical abilities, it is necessary to know the morphological parameters, taking into account the importance of the breeding process, through which genetic progress is obtained.

Regarding these aspects, the current paper aims to study the morphological and reproductive parameters of the Shagya Arabian horse breed, within the Rădăuți stud farm, Suceava county, which has a valuable population of national and international importance, in order to highlight the dynamics of the two aspects addressed. This important unit of quality biological material production, has demonstrated such a mastery in fulfilling the objectives related to the standard of the perpetuated breed; the potential of the stud farm from all matters draws attention to the multiplication of the number of specialized works allocated to the Shagya Arabian breed, reared in uncertain conditions in Romania. In addition, the novelty of the thesis was that it represented an opportunity to highlight the fact that Rădăuți stud farm is the right place for this breed's development, as well as the occasion to detail its history that may form the basis of a complex monography.

In the first part, a brief presentation of the Arabian Shagya breed was introduced, as a subject of the 1st Chapter (history, origin, and presentation of the genealogical bloodlines of the Shagya Arabian breed, including the existing individuals in the Rădăuți stud farm, conservation, improvement, and promotion of the breed in the world - brief presentation of the Pure Arabian horse breed, as the foundation bloodstock of Shagya Arabian, and there were also detailed the physical characteristics, and abilities of this breed).

In the 2nd Chapter, it was revealed the history of the Rădăuți stud farm, in Suceava County, the unit where the doctoral thesis research was performed, and the presentation of the current structure, along with original pictures attesting to the richness of the study.

Starting with the 3rd Chapter, the theme of the paper was deepened, starting with the description of the morphological and reproductive parameters of the horses; regarding the morphological ones, the appreciation of the horses' exterior was presented, taking into account the body development, the body shape, the morphological type, the overall harmony, the types of constitution, and also the condition of the horse, followed by the description of colors and color peculiarities, as well as the genetics responsible in this case, as component and important parts in the analysis of horses' exterior; in addition, there were given details related to reproduction (breeding peculiarities, breeding, sexual reflexes), followed by mares' parameters description (characteristics of the sexual cycle, duration, and diagnosis of gestation, service-period and foaling-interval indexes, and also it was interesting to compare the existing genealogical bloodlines, and to create graphs that highlight as transparently as possible the results obtained in the study), as well as those of the stallions (their evaluation regarding the exterior and sexual behavior, collection and examination of semen).

The second part was allocated to personal research, where in the 4th Chapter were presented the purpose and objectives of the paper, and then the biological material was described, consisting of broodmares and stallions (regarding the analysis of body dimensions and body indices, as well as of the reproduction parameters for these two categories of horses from the Rădăuți stud farm); the females were analyzed in terms of the reproductive group of each year from 1989-2018, and the component genealogical bloodlines (Dahoman, Siglavy-Bagdady, Koheilan, El-Sbaa, Shagya, Gazal, Hadban, and Mersuch), and the 47 public mount stallions were studied to establish the morphological parameters, extracted from the classification sheets of public mount stallions (from the following genealogical bloodlines: Dahoman, Hadban, Gazal, El-Sbaa, Mersuch, Koheilan, Shagya, and Siglavy-Bagdady). The next section described biometric methods under study, where the used ranking methodology was presented, and also the horse exterior appreciation methods and the body indexes (for revealing correctly the horses' exterior). Statistical data and the plan of personal research was the subject of the last subchapter.

In the 5th Chapter, where the results regarding the evolution of the morphological parameters of the Shagya Arabian horse population, from the Rădăuți stud farm, was presented, starting with the analysis of the average values of height, thoracic, and cannon perimeters of broodmares, recorded in each year of the period and for every bloodline. Then were calculated and compared to literature the body indices that represented the herds registered every year. The same morphological aspects and indices were analyzed for public mount stallions, but only in terms of genealogical bloodlines; finally, the comparison between the sexes was made to reveal the sexual dimorphism of the horses' exterior. The reason why these body dimensions were tracked was represented by the fact that they are used in the ranking activity, and the calculated body indexes express very well the true aspect of the equines.

To achieve this purpose, the study included the average values of Shagya Arabian broodmares height, registered in 1989-2018; the results revealed that this parameter had values between 154.30 ± 0.261 cm (2012) and 154.80 ± 0.258 cm (2002 and 1994). Thus, it could be stated that the average height, in this case, represents a very homogeneous character ($V\%=1.1-1.36\%$). Regarding the average values of the height of genealogical bloodlines analyzed, the minimum was calculated for Koheilan bloodline (156.70 ± 0.069 cm), and the maximum for El-Sbaa bloodline (159.90 ± 0.102 cm); the character was homogeneous from this point of view ($V\%=0.21-0.42\%$).

Analyzing the situation of the average values of the thoracic perimeter, calculated on the herds included in the mentioned period, it emerged that the minimum value was registered in 1992 (176.20 ± 0.885 cm), and the maximum in 1989 (177.10 ± 0.777 cm); in terms of studying the coefficient of variation, the character can be considered as very homogeneous ($V\%=2.93-3.21\%$). Regarding the genealogical bloodlines, the average dimensions were between 180.10 ± 0.151 cm (Shagya bloodline) and 180.80 ± 0.153 cm (Mersuch bloodline). Carrying out an interlinear comparison to establish the extremes, it was noticed that the minimum value of the average thoracic perimeter was 178.50 cm (Hadban, Dahoman, Shagya, Siglavy-Bagdady, and El-Sbaa genealogical bloodlines), and the maximum was 182.3 cm (Mersuch bloodline).

Regarding the cannon perimeter of broodmares, it revealed that the average values were 18.70 ± 0.19 cm (year 1998) to 18.90 ± 0.70 cm (year 1989). For the whole period, the coefficient of variation was between 1.02-3.71%, which underlines low degree of individuality in each case, regarding this parameter, character which can be considered very homogeneous. The analysis of the average values of the cannon perimeter of broodmares according to the genealogical bloodlines, showed that its average was between 18.00 ± 0.112 cm (Mersuch) and 18.80 ± 0.096 cm (El-Sbaa). In all the studied cases, the coefficient of variation oscillated between 2.81-3.73%, indicating a reduced

influence of individuality of the cannon perimeter in each studied genealogical bloodlines and therefore the homogeneity of this character.

The situation of the body indices calculated for the Shagya Arabian broodmares indicated that the minimum value of the massiveness index was registered in 2017 (110.08%), and the maximum in 1990 (115.62%); for the bone index, there was a gradual decrease over time, which indicated that the maximum value was identified in 1996 (12.79%) and the minimum in 2015 (11.12%). Regarding the dactyl-thoracic index, the minimum calculated value was registered in 2015 (9.96%), and the maximum in 2016 (11.21%). All this defines exactly the slightly massified constitution of the Shagya Arabian, which was created precisely to surpass the fine one of the Purebred Arabian horses.

Regarding the public mount stallions analyzed in terms of height, it was possible to study the average values of this parameter for this category of horses, in terms of genealogical bloodlines; the results revealed that the minimum calculated value was recorded for the Hadban bloodline (157.66 ± 1.21 cm), and the maximum was reported for the Koheilan bloodline (161.22 ± 0.84 cm). The value of the coefficient of variation ranged between 0.99-2.32%, indicating the low individuality within each bloodline on the average height.

The analysis of the average values of the thoracic perimeter for the genealogical bloodlines representing the public mount stallions of the Shagya Arabian breed, revealed that the average limits were situated between 177.25 ± 4.09 cm (Mersuch bloodline) and 183.33 ± 1.83 cm (Koheilan). The value of the coefficient of variation ranged between 1.30-3.99%, so this character was homogeneous.

Regarding the average values of the cannon perimeter, calculated on genealogical bloodlines, it was observed that the limits of this parameter were ranged between 18.50 ± 0.77 cm (Gazal bloodline) and 19.16 ± 0.31 cm (Koheilan), framing the analyzed stallions as characteristic of this breed. The value of the coefficient of variation ranged between 2.88-4.80%, so the character was considered very homogeneous in this case as well.

Regarding the situation of the average values of massiveness index, it was observed that the analyzed stallions are specific to the category of horses which have a fine and fine-robust constitution, as it was between 105.55-120.25%, with an average of 113.21%; the bone index was 10.84-12.82%, values that include the analyzed stallions galloping horses class. Regarding the dactyl-thoracic index (the ratio between the cannon and thoracic perimeter), the values were 9.77-11.56% and the average was 10.43%; this aspect highlights the image of animals with a massive conformation compared to Purebred Arabian.

Comparing the average values of broodmares and public mount stallions, in terms of the massiveness index, bone index, and dactyl-thoracic index, it was revealed that the highest value was identified in males (113.21%) and that the broodmares were very close to it (113.06%). Regarding the bone index, there was a difference in broodmares' favor (+0.12%), but in the case of the dactyl-thoracic index, stallions had a higher percentage again (+0.56%).

The 6th Chapter had as subject the results regarding the personal research of reproduction parameters of Shagya Arabian horses, from Rădăuți stud farm, and it was divided into two subchapters for each category (broodmares and stallions). For the first one were calculated the average values of gestation length (regarding the population of every years and also every genealogical bloodline), fecundity percent, natality percent, foaling-interval parameter, abortion rate and number of unviable foals (all these parameters were analyzed through the matter of the whole group of every studied year of the 1989-2018). Regarding the stallions from 2000-2015, included in the analysis, the number of the foals of each sire had, during the reproductive activity in Rădăuți stud farm.

Analyzing the reproductive activity, there was revealed that the minimum average gestation length of broodmares (days) was calculated in 2004 (331.27 ± 0.30 days) and the maximum in 2008 (340.48 ± 0.62 days). Regarding all genealogical bloodlines, the coefficient of variation oscillated between 0.55-2.50%, indicating that this character is very homogeneous. The average gestation length of genealogical bloodlines of Shagya Arabian horse breed revealed that the minimum limit was calculated for Hadban (328.20 ± 0.415 days) and the maximum was recorded for El-Sbaa (337.19 ± 0.788 days); this aspect shows that the females were within the normal limits, for all the genealogical bloodlines which were analyzed in this study. According to the analysis of data obtained, the coefficient of variation was between 0.69-1.44%, which indicates a low influence of individuality within each genealogical bloodline, in terms of the average gestation length of the studied broodmares; therefore, this character was very homogeneous.

Regarding the fertility percent, the results revealed limits between 59.67-95.12% (in 2015 and 2016 respectively), and the birth rate was 46.15-90.69%, with an average of 67.60%. The foaling-interval parameter had an average value of 489.32 days and limits between 409.01-531.36 days, higher than is specified in the literature. Regarding the abortion rate, the minimum was 0% in 33.33% of the studied years and the maximum value was identified in 2002 (12.90%); regarding the non-viable products obtained, it was noted that in 8 years of the 30 years analyzed, this indicator was 0%, the maximum being registered in 1993 (13.33%).

Regarding the stallions analyzed for reproductive activity, it was observed that some males, did not produce any foal and the others were registered as it follows: the Dahoman genealogical bloodline is represented only by the Dahoman XXXIX sire, which produced 99 foals from the beginning of the breeding activity; the Hadban bloodline (in which 64 foals were produced) has as stallion successors of the bloodline Hadban XXXV and Hadban XXXVII; the Gazal bloodline (has a total of 14 products) has as representatives Gazal XVII and Gazal XVIII; the Koheilan bloodline (in which 78 foals were produced) is represented by the Koheilan XXXIX, Koheilan XL, and Koheilan XLII stallions; the Shagya bloodline (has a total of 89 foals) has as continuing stallions Shagya LXII, Shagya LXIII, and Shagya LXIV; the El-Sbaa bloodline (total foals: 73) has as representatives El-Sbaa XII and El-Sbaa XV; the Mersuch bloodline (49 foals) is represented only by the Mersuch XXV stallion; the Siglavy-Bagdady genealogical bloodline (108 products) has as successor stallions Siglavy-Bagdady XV and Siglavy-Bagdady XVII.