STUDY REGARDING THE REPRODUCTION ACTIVITY OF SHAGYA ARABIAN BROODMARES FROM RĂDĂUȚI STUD FARM

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Abstract
This paper represents a case study on some aspects of reproductive activity, carried out within the Rădăuţi stud farm, Romania. Specifically, the results obtained were followed and analyzed, from the broodmare population of the 2000s generation, from the moment of their promotion in the reproduction herd of the stud farm, and after taking the qualification tests until now. Thus, we observed that on average: the age of introduction to reproduction was 1714.8±104.1 days (4.7±0.3 years); the age at first foaling was 1626.4±56.9 days (4.5±0.2 years); the gestation length was 338.7±0.9 days; service-period parameter was 149±18.3 days; foaling-interval parameter was 503±19.9 days; the reproductive longevity of the studied broodmares was 5335.6±429.2 days (14.6±1.2 years). Regarding the obtained data we confirm that the biological material studied presents reproduction aspects results within the limits specified by the literature.

Key words: reproduction, foaling-interval, gestation, longevity, broodmares

INTRODUCTION

Given that the main purpose of a stud farm is to obtain high-value products that perpetuate and improve the number of horses, it goes without saying that the place occupied by activities related to the breeding segment. The results obtained in the breeding activity of a stud reflect practically the entire activity of that stud, because the achievement of superior results, from the point of view of reproduction, is dependent on many other aspects related to the general management applied in the stud (feeding, shelter and horse care, the professionalism and education of the staff employed etc.).

It is known that, compared to other species of domestic animals, the efficiency of horse breeding is much lower. Thus, under normal conditions, its fertility is on average 65%, and the birth rate rarely exceeds 50%. On the other hand, in stud farms, where the growing conditions are close to optimal, fertility can sometimes exceed 90% and birth rate 80-85% (Dumitrescu I. 1986; Doliș M.G., Gavrilaș A., 2008; Gîlcă I., Doliș M.G., 2006; Mărginean et al., 2005; 2012; Moldoveanu et al., 1961; Pânzaru C. et al., 2019; Tănase D., Nacu Gh., 2005; Velea C. et al., 1980).

The low values obtained for these reproductive indices are usually the result of so-called physiological sterility, for which the main culprit, in most cases, is the man.

Through this paper we propose, based on the analysis of the existing data in the records of the stud, to create a more realistic picture of the breeding activity in this unit, with positive and negative aspects, from which certain conclusions can be drawn and, thus, to be able to make a small contribution to the best progress of the activity of future breeding of Shagya Arabian horses, from Rădăuți Stud Farm.

MATERIAL AND METHOD

The object of the research was a group of 16 mares, belonging to 5 genealogical bloodlines of the Shagya Arab breed (El-Sbaa, Siglavy-Bagdady, Koheilan, Hadban, Shagya, and Dahoman genealogical bloodlines), from the 2000s generation, which was promoted in the National Stud, broodmares category, by the National Commission for the evaluation and classification of Purebred horses, based on the results obtained after taking the qualification tests and the credit rating works from 2003 (table 1).

Table 1

The biological material studied

Nr. Crt.	Name	Birthdate	Nr. Crt.	Name	Birthdate
1	El-Sbaa XII-35	15.02.2000	9	El-Sbaa XII-38	06.04.2000
2	El-Sbaa XII-36	15.02.2000	10	Shagya LXII-7	29.04.2000
3	Siglavy-Bagdady XV-58	16.02.2000	11	Hadban XXXV-17	15.07.2000
4	Koheilan XXXIX-15	18.02.2000	12	El-Sbaa XII-42	19.08.2000
5	Shagya LXII-3	19.02.2000	13	Dahoman XXXIX-51	04.12.2000
6	Shagya LXII-8	23.05.2000	14	Siglavy-Bagdady XV-61	06.12.2000
7	El-Sbaa XII-37	25.02.2000	15	Dahoman XXXIX-53	08.12.2000
8	Shagya LXII-6	07.03.2000	16	Hadban XXXV-18	27.12.2000
1	El-Sbaa XII-35	15.02.2000	9	El-Sbaa XII-38	06.04.2000
2	El-Sbaa XII-36	15.02.2000	10	Shagya LXII-7	29.04.2000
3	Siglavy-Bagdady XV-58	16.02.2000	11	Hadban XXXV-17	15.07.2000
4	Koheilan XXXIX-15	18.02.2000	12	El-Sbaa XII-42	19.08.2000
5	Shagya LXII-3	19.02.2000	13	Dahoman XXXIX-51	04.12.2000
6	Shagya LXII-8	23.05.2000	14	Siglavy- Bagdady XV-61	06.12.2000
7	El-Sbaa XII-37	25.02.2000	15	Dahoman XXXIX-53	08.12.2000
8	Shagya LXII-6	07.03.2000	16	Hadban XXXV-18	27.12.2000

We chose this population starting from the consideration that the selected broodmares had a long period of reproductive activity (up to 17 years), which could provide sufficient data for a complex study.

The data necessary for the analysis of the breeding activity were collected from the stud records, respectively from: Genealogical Register, Register of broodmares, Ranking Tables, Monthly and Annual Reproductive Situations etc.

The breeding activity of the mares was mainly analyzed based on the reproductive indices, as follows:

- the age of introduction to reproduction (the difference between the date of first breeding and the date of birth);

- the age at first foaling (the difference between the date of first foaling and the date of birth);

- gestation length (the difference between the date of foaling and the date of the related fertile foaling);

- SP – service-period parameter (the difference between the date of foaling and the date of fertile breeding after foaling);

- FI – foaling-interval (the difference between the dates of two successive foalings or the sum between SP and the next gestation length).

Data were statistically processed using the arithmetic mean ($\overline{x}$), variance (s^2), standard deviation (standard deviation of individual values - s), standard deviation of the mean ($\pm s\overline{x}$), and also the coefficient of variation (V%).

RESULTS AND DISCUSSION

From the records of the stud farm, based on the data regarding the birth and the first breeding, it was possible to determine the age of introduction to reproduction of the mares studied.

Following the statistical processing of these data, it was observed that the introduction of mares for breeding was done, on average at the age of 1714.8±104.1 days (4.7±0.3 years), with limits between 1242 and 3041 days (3.4-8.3 years), the group manifesting from this point of view a high variability (24, 3%).

High variability is given by the fact that one of the broodmares (Shagya LXII-3) recorded the first breed at the age of over 8 years, while most recorded this much earlier (at 4-5 years). If the mentioned mare were not taken into account, the average would be 1626.4±56.9 days (4.5±0.2 years), the variability decreasing to 14%.

Another observation is the fact that, of the 16 mares born in 2000, the majority (81.25%) were introduced to breeding activity in the seasons of 2000 and 2005, respectively 43.75% (7 heads) and 37.50 % (6 heads), so, generally, at age 4-5 years, the rest being introduced in the season in the season of 2003 (12.50%/2 heads), at the age of fewer than 4 years,

respectively in the season of 2008 (6.25%/1 head), at an abnormal age, over 8 years.

Depending on the bloodline (fig. 1), the age at the first mount varied, on average, from 1247 days (Koheilan) to 1953.5 days (Shagya).

The data obtained in this study fall within the limits provided in the literature, which specify that young horses can be used for the first mount when they have achieved at least 75% of adult development, respectively the age of 2½-3 years in heavy breeds, 3-3½ years for intermediate breeds and 3½-4 years for light breeds (Dumitrescu I., 1986; Doliş M.G., Gavrilaş A., 2006; Tănase D., Nacu Gh., 2005; Ujică V., 1981; Ujică V., 1988;Velea C., 1980).

Fig. 1. The average age of introduction to reproduction (days) of genealogical bloodlines

Unlike the age of introduction to reproduction, which is largely dependent on the organization of reproductive activity, the age at first calving is mainly dependent on the proper functioning of the female genital tract, the neurohormonal balance of the mare, and the result of breeding, respectively of fecundity.

In the case of the studied population, 7 mares (43.75%) foaled after the first breeding, respectively from the first year/breeding season, another 7 mares foaled for the first time in the second year after introduction to breeding, while 2 mares (12.5%) never calved (El-Sbaa XII-36; Koheilan XXXIX-15).

If we disregard the two mares, which did not register foalings, the age at the first foaling, for the entire studied herd, was on average 2186.6±164.0 days, respectively 6.0±0.4 years, with limits between 1755 and 4200 days, respectively 4.8 and 11.5 years (fig. 2). The variability for this character was high (28.1%) and, as in the case of age at first mating, was mainly due to the mare Shagya LXII-3, which, as seen, recorded the first mating only after the age of 8. Eliminating this mare from the calculation, the average reaches 2031.8±58.2 days (5.6±0.2 years), and the variability decreases to 10.3%, these values being normal.

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If only mares, which foaled from the first year of breeding use, are taken into account, the age at first foaling is reduced, on average, to 1963.1±21.4 days (5.4±0.1 years), which is a desirable value in any stud farm. In this case, the variability is small (2.9%), the group being homogeneous in terms of this character.
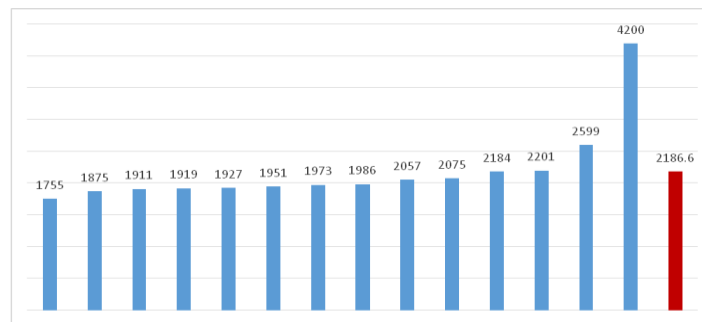

Fig. 2. The absolute and average values of age at first foaling (days)

From the statistical processing of the data on the gestation length, it is observed that on the entire herd studied and taking into account all gestation lengths completed with calving; the average duration of gestation was 338.7±0.9 days, the limits of absolute values were 313 and respectively 366 days (fig. 3).
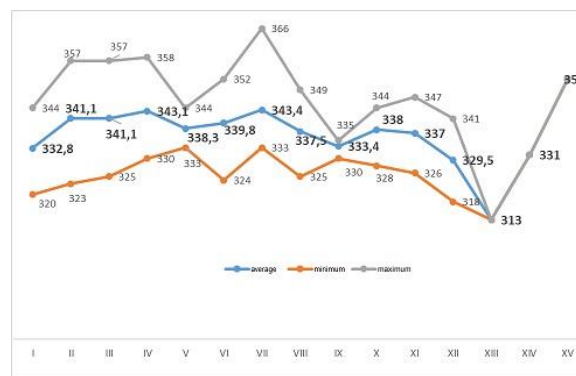

Fig. 3 The dynamics of gestation length (days)

The average duration of the first gestation was 332.8±5.2 days, calculated for 13 mares, as the gestation of the Dahoman mare XXXIX-51 ended with a late abortion, at 273 days, and was not taken into account. The limits were between 320 and 344 days, the group studied being homogeneous from this point of view (V%=2.4).

In the case of the second gestation, for 11 mares, the average was 341.1±3 days, with limits between 323 and 357 days. Also, in the case of this second gestation there was a case of abortion, which occurred on the

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291st day and was not taken into account (Shagya LXII-3). The average of the third gestation, calculated for 12 mares, was 341.1±2.7 days, with limits between 325 and 357 days.

The duration of the fourth gestation the average value was 343.1±2.4 days, which was calculated for 11 mares. The absolute values ranged between 330 and 358 days, the group being homogeneous from this point of view (V%=2.3). The mare El-Sbaa XII-35 during the fourth gestation was aborted at 267 days, so it was excluded from the calculation.

The fifth gestation had an average duration of 338.3±1.2 days, with limits between 333 and 344 days. Of the 12 mares left pregnant in this case, one (Hadban XXXV-17) had an abortion at 255 days, not being considered.

The sixth and seventh gestations with an average of 329.5 days, were available for just 2 broodmares (328 and 344 days).

The 13th, 14th, and 15th gestations were recorded in the case of a single mare (El-Sbaa XII-38) and lasted between 313 and 352 days.

Depending on the genealogical bloodline of mares (fig. 4), the average gestation length ranged between 334.9±3.3 days (Dahoman) and 341±1.4 days (Shagya). The shortest gestation length was recorded at the El-Sbaa bloodline (313 days), and the longest at the Dahoman bloodline (366 days).
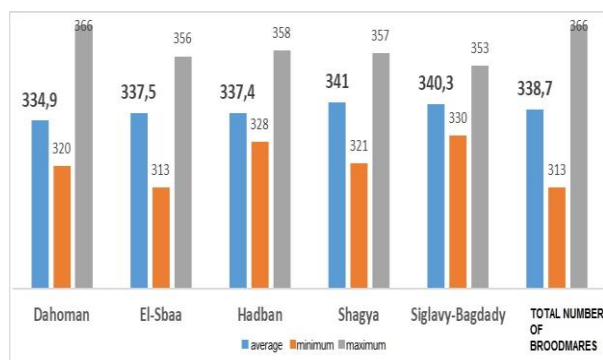

Fig. 4. Gestation length of genealogical bloodlines (days)

In the literature, the gestation length of mares is, on average, 11 months, with variations between 307 and 412 days (Doliș M.G., Gavrilaș A., 2006; Pânzaru C., et al., 2017; Ujică V., 1981; 1988).

The data on the service period were centralized and statistically processed (fig. 5).

From these data, it is observed that, in general, counting all foalings, respectively fertile amounts, SP in the studied population had an average value of 149±18.3 days, the absolute values oscillating in very wide limits, between 6 and 783, which also determined a very high variability of the character, between 84 and 139.2% (fig. 5 and 6).
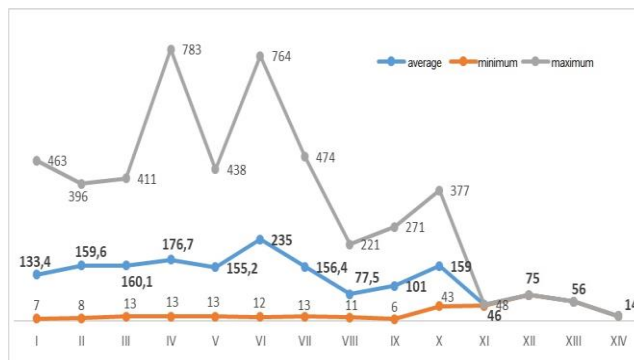
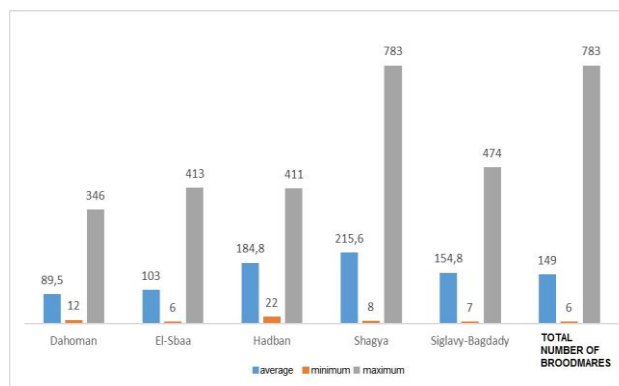Fig. 5 The dynamics of the service-period parameter (days)

Fig. 6 The service-period length of genealogical lines (days)

In the calculations, the fourth gestation was completed with late abortion (Dahoman XXXIX-51, El-Sbaa XII-35, Hadban XXXV-17, Shagya LXII-3) but they were assimilated as normal gestations.

The lowest value of the average duration of SP was recorded after the eighth foaling, calculated for 6 mares, respectively 77.5±38.4 days. The absolute minimum of SP, recorded in this study, was 6 days after foaling.

The highest mean value of SP duration was recorded after the sixth foaling, respectively 235±90.4 days. The absolute maximum was recorded after the fourth foaling, 783 days (Shagya LXII-7). In this case, after the fourth foaling, the highest variability of the character was registered, respectively 139.2%.

Depending on the pedigree of mares, the average length of service ranged from 89±27.4 days (Dahoman) to 215.6±45.5 days (Shagya). The shortest duration of the SP was recorded at the El-Sbaa bloodline (6 days), and the longest at the Shagya bloodline (783 days).

Counting all the intervals between foaling (89), at the level of the entire population the FI had an average value of 503±19.9 days and absolute values that ranged between 326 and 1125 days (fig. 7 and 8).

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The absolute minimum for this character was registered in the population studied in the case of the first FI, respectively the one registered between the first and the second foaling (326 days).

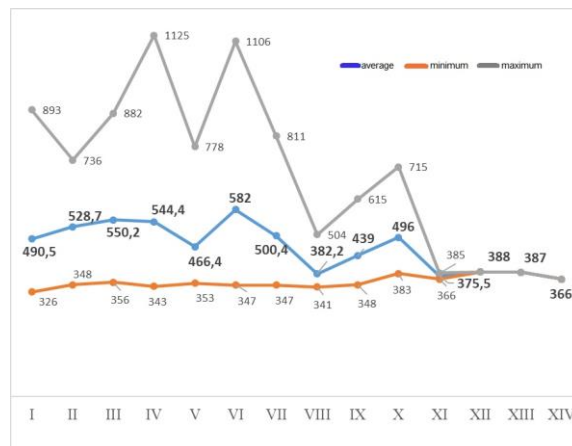The absolute maximum in this study was recorded in the case of the fourth FI (1125 days).

Fig. 7. The dynamics of foaling-interval parameter (days)
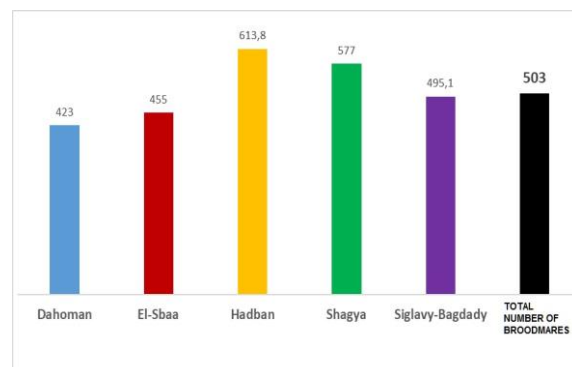

Fig. 8. The average values of foaling-interval parameter of the genealogical bloodlines (days)

The variability of this character in the population was generally high (18.1-46.4%).

The calculations did not take into account the 4 abortions, mentioned above, from the mares Dahoman XXXIX-51, El-Sbaa XII-35, Hadban XXXV-17 and Shagya LXII-3.

Depending on the bloodlines of mares, the mean foaling-interval ranged from 423±31.4 days (Dahoman) to 613.8±63.7 days (Hadban). The shortest duration of the FI was recorded at the Dahoman bloodline (326 days), and the longest at the Shagya bloodline (1125 days).

The reproductive longevity of the studied mares was estimated based on the age they had at the last record in the reproduction registers, respectively breeding or foaling (fig. 9 and 10).
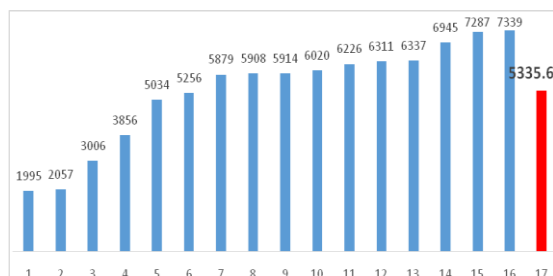

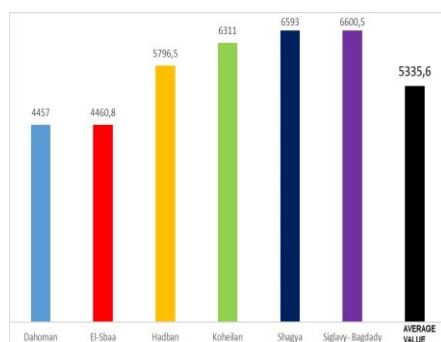Fig. 9 Reproductive longevity of broodmares (days)

Fig. 10 Reproductive longevity of broodmares from all genealogical lines (days)

Thus, it was observed that in 12 mares (75%) the last breeding event recorded in the records was a insemination, namely a non-fertile one, after which the mare was excluded from the breeding nucleus, on the occasion of the first classification. In 4 other mares (25%) the last recorded breeding event was calving. Of the 16 mares of the 2000 generation, taken into the study, three are still active in the stud farm. These are:

- Shagya XII-7 (last mounted on 05.05.2019 - non-pregnant);
- Siglavy Bagday XV-58 (last childbirth on 29.01.2020);
- El Sbaa XII-38 (last calving 10.05.2020).

Statistical data processing shows that the reproductive longevity of the mares studied was on average 5335.6±429.2 days (14.6±1.2 years), with limits of 1995 and 7339 days (5.5 and 20,1 years). The variability of this character in the studied population was high, of 32%.

Depending on the genealogical bloodline of mares, the highest average reproductive longevity (6600.5 days/18.1 years) was recorded on the Siglavy-Bagdady line, and the lowest (4457 days/12.2 years) on the Dahoman line.

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CONCLUSIONS

Following the study on the breeding activity carried out on the 16 mares of the Shagya Arab breed from the 2000 generation, promoted in the herd of the Rădăuți Stud Farm, the following conclusions were drawn:

- the average age of introduction to reproduction of mares was 1626.4±56.9 days, respectively 4.5±0.2 years;

- the average age of mares at the first foaling was 2186.6±164.0 days, respectively 6.0±0.4 years;

- the average gestation length of broodmares was 338.7±0.9 days, the limits of the absolute values registered to be 313, respectively 366 days;

- the service period had an average value of 149±18.3 days, the absolute values oscillating in the limits of 6 and 783 days;

- the foaling-interval was on average 503±19.9 days, the absolute values recorded ranged between 326 and 1125 days;

- the reproductive longevity was on average 5335.6±29.2 days (14.6±1.2 years), with limits of 1995 and 7339 days (5.5 and 20.1 years).

Given the conclusions drawn during this study, it is recommended to ensure all conditions (food, shelter, care) to ensure the best results in breeding activity. Also, it is important to maintain, respectively promote in the breeding herd of the stud farm only the best specimens, able to bring genetic progress.

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