

CONTRIBUTIONS TO STUDIES REGARDING THE MORPHOLOGICAL AND REPRODUCTION CHARACTERS OF SHAGYA ARABIANS HORSE BREED

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Abstract

The paper presents the results of a study accomplished in the Rădăuți stud farm, which aimed to analyze some morphological and reproductive aspects of Shagya Arabian horses. The selected population was represented by broodmares from 2000y generation, introduced in the reproductive herd until now. The average value of height was 159.188 ± 0.593 cm, the average of heart girth was 177.188 ± 1.013 cm, and the cannon perimeter was $18,594 \pm 0,184$ cm for the studied horses. Regarding the reproduction aspects, it was revealed that the studied parameters had the following average values: 4.7 ± 0.3 years for age of introduction to reproduction, 4.5 ± 0.2 years for the age at first foaling, 338.7 ± 0.9 days for the gestation length, 149 ± 18.3 days for the service-period parameter, 503 ± 19.9 days for the foaling-interval parameter, and 14.6 ± 1.2 years for the reproductive longevity of broodmares. The conclusion was that all data obtained fall within the normal limits specified by the literature.

Key words: broodmares, morphological, Rădăuți, reproductive, Shagya.

INTRODUCTION

The main purpose of a stud farm is to obtain high value descendants, which have to perpetuate and improve the characteristics of reproduction population.

The selection process of horses, involves high attention for the exterior traits of reproducing heads, aspect highlighted also in the ranking activity of horses, which tracks promoting only the individuals that gather a specific score for maintaining in the reproduction herd (Doliș et al., 2017).

Basically, the entire practice of a stud farm depends on the reproductive activity of this type of unit. Highly ranged performances regarding the reproduction are correlated with many aspects from the general management applied in the stud farm, like the professional and educational degree of the staff, but especially the feeding, care and shelter system of horses exploited for reproduction (Gordon, 2004).

It is a fact well known that compared to other species, the efficiency of reproduction activity of horses is lower. Thus, in normal condition,

the fecundity percent registered in their case is 65%, and the natality percent seldom exceeds 50%, but in stud farms, where rearing conditions are optimized, the first parameter can be more than 90%, and the second one 80-85% (Dumitrescu, 1986; Georgescu et al., 1990; Gilcă & Doliș, 2006; Mărginean et al., 2005; Velea et al., 1980).

Reduced values of these reproduction indices are the result of so-called physiological sterility, in which case the main culprit is precisely the man.

The study aimed to create an image as close as possible of the quality of reproduction horses and reproductive activity of this unit, based on analysis of data existing in the stud farm registers. Likewise, we considered it an opportunity to contribute to the development of breeding activity of Shagya Arabian horses.

MATERIALS AND METHODS

The biological material was represented by 16 broodmares from Shagya Arabian horse breed, from the 2000 generation, which were

promoted in the National Stud Farm, based on the results obtained at qualification tests, and also at ranking activity in 2003.

The mares were recorded as having a high reproductive activity (up to 17 years), which was able to offer enough data to accomplish a complex study, and apposite conclusions.

Regarding the morphological aspects, there were studied the 3 main body dimensions, which are followed in the ranking activities, like: height, heart girth and cannon perimeter. Based on this data, there were calculated also three body indices to reflect as clearly as possible the exterior traits of the analyzed horses (the massiveness index, which represents the ratio between the heart girth and the height; the bone index – the ratio between the cannon perimeter and the height; the dactyl-thorax index – the ratio between the cannon girth and the thoracic perimeter).

The necessary data for analyzing the 16 broodmares were taken from the stud farm's registers; based on this extract there were

calculated some reproductive indexes, like: the age at introducing to reproduction (the difference between data at first foaling and mare's birth), the age at first foaling (the difference between the date of first foaling and mare's birth), gestation length (the difference between date of foaling and date of prolific mount), service-period parameter (the difference between foaling date and the prolific mount after foaling), the foaling-interval (the difference between two successive foaling or the sum between SP and next gestation length).

RESULTS AND DISCUSSIONS

Data obtained after consulting the registers were centralized and also statistical interpreted in Table 1. The results showed that the average value of height was 159.188 ± 0.593 cm, the minimum value was 156 cm and the maximum 164 cm, revealing that this character is very homogenous for the whole studied population ($V\% = 1.49\%$).

Table 1. Data regarding several body dimensions and indexes on studied broodmares

Broodmare's identification name	Height (cm)	Heart girth (cm)	Cannon perimeter (cm)	Dactyl-thorax index (%)	Bone index (%)	Massiveness index (%)
0	1	2	3	4	5	6
425-EL-SBAA XII-35	161	180	19	10.56	11.8	111.8
426-EL-SBAA XII-37	159	176	19	10.8	11.95	110.69
428-SHAGYA LXII-3	163	180	17.5	9.72	10.74	110.43
429-SHAGYA LXII-6	164	179	17.5	9.78	10.67	109.15
430-SIGLAVY-BAGDADY XV-58	157	172	18	10.47	11.46	109.55
431-DAHOMAN XXXIX-51	156	183	19	10.38	12.18	117.31
432-EL-SBAA XII-42	158	174	19	10.92	12.03	110.13
433-HADBAN XXXV-17	159	182	19	10.44	11.95	114.47
434-SHAGYA LXII-7	161	184	19.5	10.6	12.11	114.29
435-SHAGYA LXII-8	162	177	18	10.17	11.11	109.26
436-EL-SBAA XII-38	158	180	20	11.11	12.66	113.92
437-EL-SBAA XII-36	158	173	18	10.4	11.39	109.49
438-KOHEILAN XXXIX-15	156	174	19	10.92	12.18	111.54
439-DAHOMAN XXXIX-53	158	176	18	10.23	11.39	111.39
440-HADBAN XXXV-18	158	171	18	10.53	11.39	108.23
441-SIGLAVY-BAGDADY XV-61	159	174	19	10.92	11.95	109.43
\bar{X}	159.188	177.188	18.594	10.496	11.685	111.317
var	5.629	16.429	0.541	0.156	0.301	6.184
s	2.373	4.053	0.735	0.395	0.549	2.487
$\pm s\bar{x}$	0.593	1.013	0.184	0.099	0.137	0.622
V%	1.490	2.288	3.954	3.764	4.698	2.234
MIN	156	171	17.5	9.722	10.671	108.228
MAX	164	184	20	11.111	12.658	117.308

The heart girth had limits of 171-184 cm, and an average value of 177.188 ± 1.013 cm showing that the studied population behaved as homogenous group ($V\%=2.288\%$). The cannon

circumference had an average value of 18.594 ± 0.184 cm (the absolute values were 17.5 and 20 cm) so this character is also highly homogenous.

Regarding the dactyl-thorax index the average value was $10.496 \pm 0.099\%$ (from 9.72-11.11%), the bone index was $11.685 \pm 0.137\%$ (the extreme values oscillated between 10.67-12.66%), and the massiveness index had an average value of $111.317 \pm 0.622\%$ (the limits were ranged between 108.23-117.31%).

These values were similar to those exposed in the literature, and they reflect the image of horses with fine and fine-robust conformation, with a medium body development, and smooth and strong bones, which fits the Shagya Arabian horse breed in the category of horse riding, and also light carriage breeds (Dolis et al., 2017; Georgescu, 1990; Gilca & Dolis, 2006; Marginean et al., 2005).

The data statistical processed showed that the parameter introduction to first mount had an average value of 1714.8 ± 104.1 days (4.7 ± 0.3 years), and the absolute limits ranged between 1242 and 3041 days (3.4-8.3 years); this result indicated a high variability of the character ($V\% = 24.3\%$). This percent was influenced by one of the broodmares (Shagya LXII-3) which recorded the first mount at the age of more than 8 years, while most of them recorded much earlier (at 4-5 years). Dispensing this mare, the average value decreases to 1626.4 ± 56.9 days (4.5 ± 0.2 years), which leads to the variability of 14%.

Another observation is that 81.25% of the studied broodmares were introduced to the first mount in 2000 and 2005, respectively 43.75% (7 heads) and 37.50 % (6 heads) - at the age of

4-5 years, the rest were included in the season of 2003 (12.50%/2 heads), at the age of approximately 4 years, respectively in the season of 2008 (6.25%/1 head), at an abnormal age, of more 8 years.

The data obtained are in the limits provided by the literature, which specify that young horses can be first introduced to breeding 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, 1986; Tănase & Nacu 2005; Ujică, 1981; Ujică, 1988; Velea et al., 1980).

Unlike the age of introduction to reproduction, which depends on the management of the stud farm, the age at first foaling is correlated to the physiological status of the genital organs of females, the hormonal and neuronal functioning of the mare, and the results of fecundity which is also very important.

For the studied population, 43.75% of the mares foaled after the first time breeding, respectively in the first year of the breeding season, another 43.75% in the second year, while 12.5% of them ever did (El-Sbaa XII-36 and Koheilan XXXIX-15). If we exclude these two mares, the age at the first foaling, for the whole studied population, was on average 2186.6 ± 164.0 days (or 6.0 ± 0.4 years) – the absolute limits ranged from 1755 to 4200 days or 4.8 and 11.5 years (Figure 1).

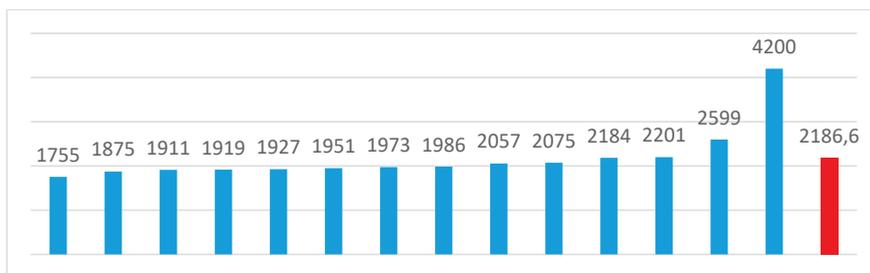


Figure 1. The absolute and average values of age at first foaling (days)

The variability for this character was high (28.1%) and, as in the case of age at first mating, was 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 $2031.8 \pm$

58.2 days (5.6 ± 0.2 years), and the variability decreases to 10.3%, which makes these values normal.

If there are taken into study only the mares which foaled from the first year of breeding use, 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%), and the group is homogeneous in terms of this character.

From the statistical processing of the data of gestation length, it is observed that on the whole population and taking into account all gestation lengths are completed with foaling; the average duration of gestation was 338.7 ± 0.9 days, the limits of absolute values were 313 and respectively 366 days (Figure 2).

The average length 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 late abortion, at 273 days, and was excluded. The limits were between 320 and 344 days, so 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 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 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.

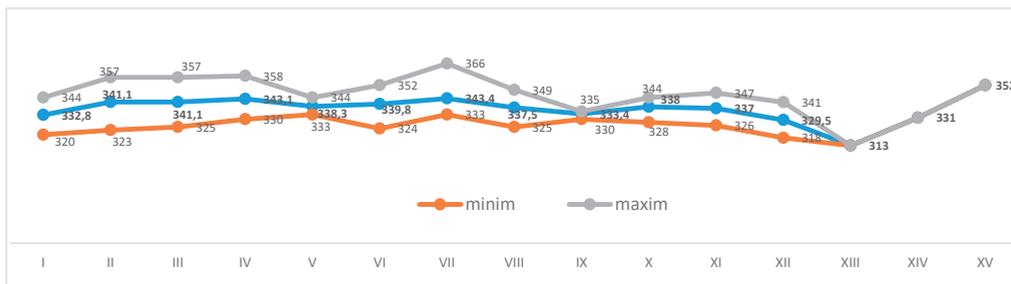


Figure 2. The dynamics of gestation length (days)

In the literature, the gestation length of mares is, on average, 11 months, with variations between 307 and 412 days.

The data on the service period were centralized and statistically processed (Figure 3).

From these data, it is observed that, in general, counting all foaling, 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%.

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 length of SP was recorded after the eighth foaling, calculated for 6 mares, respectively 77.5 ± 38.4 days. The absolute minimum of service-period parameter, recorded in this study, was 6 days after foaling.

The highest mean value of SP length 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%.

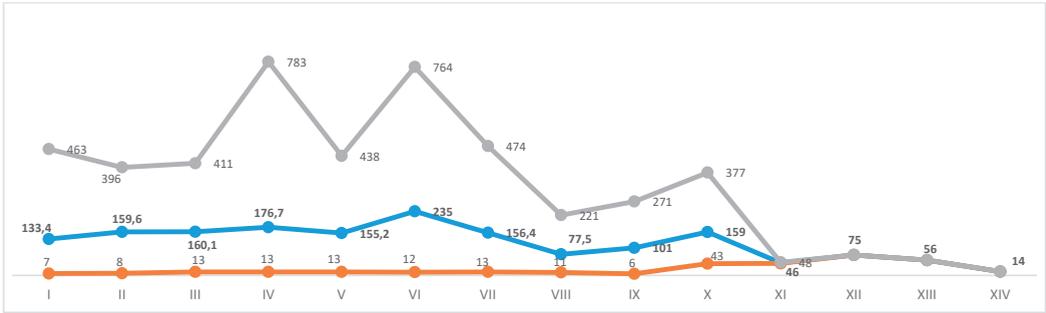


Figure 3. The dynamics of the service-period length (days)

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 (Figure 4).

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).

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.

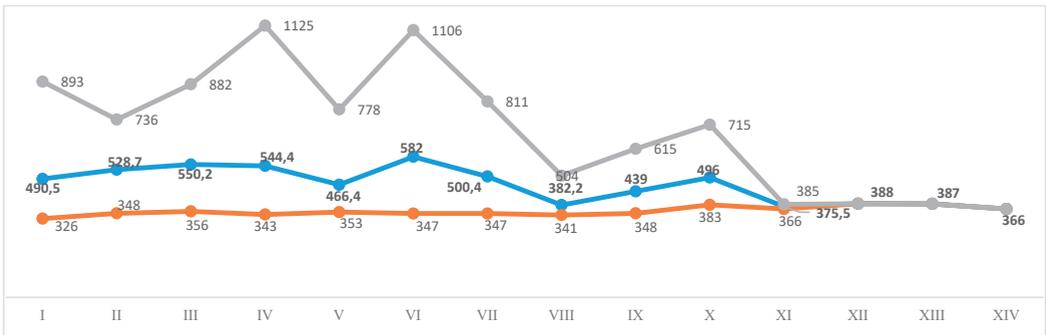


Figure 4. The dynamics of foaling-interval length (days)

The reproductive longevity of the studied broodmares was estimated based on the age they had at the last record in the reproduction registers, respectively breeding or foaling (Figure 5).

Thus, it was observed that for 75% of mares 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. For 25% of mares the last recorded breeding event was foaling. Of the 16 mares of the 2000y 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 foaling on 29.01.2020); El Sbaa XII-38 (last foaling 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%.

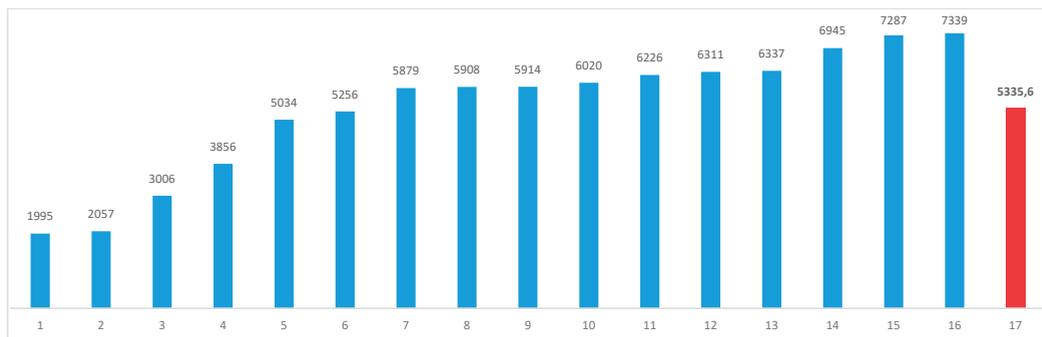


Figure 5. The reproductive longevity of broodmares (days)

CONCLUSIONS

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

- the mare's height had an average value of 159.188 ± 0.593 cm;
- the heart girth had an average value of $177,188 \pm 1,013$ cm;
- the cannon perimeter had an average value of 18.594 ± 0.184 cm;
- 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 important to maintain, respectively promote in the breeding herd of the stud farm only the best specimens, able to bring genetic progress. Also, it is very important to offer the best conditions of housing, food and horse care for the broodmares to be healthy and strong.

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