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STUDY REGARDING SOME REPRODUCTIVE PARAMETERS IN SHAGYA ARABIAN MARES FROM RĂDĂUȚI STUD FARM

Claudia PÂNZARU, Ioan GÎLCĂ, Marius DOLIȘ, Răzvan RADU-RUSU, Roxana Nicoleta RAȚU, Mihaela IVANCIA

"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iași, 3, Mihail Sadoveanu Alley, Iaşi, Romania

Corresponding author email: panzaruclaudia1988@gmail.com

Abstract

The paper was based on analyzing 119 Shagya Arabian mares (Dahoman, El-Sbaa, Gazal, Hadban, Koheilan, Mersuch, Shagya and Siglavy-Bagdady bloodlines), reared in Rădăuți stud farm, between 1996-2016 years regarding fecundity percent, gestation length, abortion rate and foaling-interval parameters. The main purpose was to establish if the reproduction indices registered at females taken into study respect the limits indicated by the literature which can establish if the population can be included into the breeds` standard; the results showed that the fecundity percent had lower values than the literature describes and the foaling-interval exceeded the limits given by the literature, facts that reveal some aspects related to the reproduction process need to be reconsidered.

Key words*: Shagya, fecundity, gestation, abortion, foaling-interval.*

INTRODUCTION

This study had the purpose to analyze some reproduction parameters of Shagya Arabian mares, from Rădăuți stud farm and to establish if there are significant differences between genetic lines; also there was an opportunity to see if the breed can be found in the species standard regarding these parameters.

The Shagya Arabian horse breed had the famous Shagya stallion as a genitor which was paired with the oriental mares, not necessary Arabian in Mezohegyes stud farm (Hungary) in 1834. Gozlan stallion arrived in 1874 from Lipizza and 1885 is the year when Obayan was bought from Syria. In the beginning of 20th century the stud farm achieved two exceptional horses, Siglavy-Bagdady and Mersuch and between the World Wars, Poland provided Kuheylan Zaid and Germany Sven Hedin (renamed Kemir).

Also a multitude of stallions were imported from Egypt (Dulugeac, 2005).

The Rădăuți stud farm was set in 1792 to produce valuable horses for the Austrian army, as 1400 stallions, working horses, pregnant mares and foals were sent from Vășcăuți village to the 16 sections of Rădăuți stud farm. Barberino stallion and two Pure Arabian horses, Hussein and Manachi were the founders of this stock (Rădăuți stud farm registers 2016).

After the war ended, in 1919, the stud farm was rebuilt starting with Gazal, Siglavy-Bagdady I, Dahoman XXII and Shagya XV and 31 mares from different bloodlines. The first studbook was drafted in 1924, following to be brought descendants of El-Sbaa and Beck in 1936-1941. (Schipor, 2007)

Rădăuțistud farm currently (2019) holds 273 horsesplaced in its 3 sections: Rădăuți where the training livestock can be found, Mitoc (Frătăuții Noi village) where the breeding stock is and Brodina where the male youth is located. In 2019, the stock is represented by: 39 stallions breed for public mounting (35 are Shagya Arabian breed, 3 Semigreu Românesc, 1 Lipizzaner), 8 Shagya Arabian stallions, 57 Shagya Arabian mares, 21 young horses aged 0-6 months, 22 horses aged 6-12 months, 34 horses aged 12-24 months, 26 horses aged 24-36 months, 20 training horses (all Shagya Arabian breed), 3 sport and recreation (2 Shagya Arabian and 1 Romanian Sport Horse), 7 working horses and 36 Shagya Arabian horses for sale (Rădăuți stud farm registers 2016).

Regarding the fecundation and abortion rate in *Equus caballus* species, the literature indicates

that fecundation process (the fusion of male and female gametes followed by zygote formation and quick segmentation triggering) takes 12-16 hours and that the abortion can be noninfectious (abnormalities of the fetal annexes, neuro-hormonal, nutrition, traumas, genetic factors) or infectious (*Salmonella abortusequi* and rarely diplococcus, staphylococcus, *Sigella equirulis*, colibacillus) (Dumitrescu, 1986).

Fecundity percent is about 80-90% within the stud farms and 60-70% in other types of farms, depending on some conditions. The average fecundity level for Arabian is 90% and the breeding perspective follows reaching 95% (Vancea et al., 1980).

According to a study based on 1393 Thoroughbred mares reared in 22 stud farms from Newmarket, UK, 59.9% of the inseminated mares at 15 days after ovulation had a 94.8% fecundity percent. This value went to 89.7% by the 35th day and to 87.5% by the October pregnancy test. In 1983 the percent of mares which gave birth at term was 77% while in 1998 the registered value of this parameter was 82.7% (Morris et al., 2010).

In a study published in 2012 on equine abortion, stillbirth and neonatal mortality, the abortion was defined as the miscarriage before 300th day of gestation, the stillbirth was known as the delivery of a dead foal after 300 days of gestation and the neonatal mortality was the death of foals within seven days post-foaling (Marenzoni et al., 2012).

Likewise, another paper which had the objective to review the same subject described above, within the Animal Health Trust data, based on a 10 years timeframe revealed the diagnoses of 1252 fetuses and neonatal foals. The results showed that 38.8% of them were problems associated with the umbilical cord, 35.7% were related to comprising umbilical cord tension and only 3.1% were long cord/cervical pole ischaemia disorder. Values regarding other noninfectious causes of abortion or neonatal death were 6.0% for twinning, 13.7% for *intrapartum* stillbirth and 9.8% for placentitis (associated with infection – *E. coli* and *Streptococcus zooepidemicus*). The percent of neonatal infections not related to placentitis was 3.2% and cases of EHV-1 and EHV-4 were 6.5% (Smith et al., 2010).

The gestation length (the period of time between fecundation and birth) is 337-339 days for half-breeds (Velea et al., 1980) and 310-340 days for the rest of horse breeds (Dumitrescu, 1986) this parameter can be influenced by heredity, age of mares, sex of the product, conditions during the gestation etc.

The foaling-interval length (the period between two consecutive births) mentioned in the literature is about 337-338 days (Dumitrescu, 1986).

The results obtained in this study, regarding these reproductive parameters, showed that in Rădăuți stud farm this process is well mastered, but needs some improvement to increase several values related to some aspects. In stud farms, there's a constant need of developing the reproduction process, because their purpose is to provide high quality biological material while optimizing the process of obtaining it.

Shagya Arabian horse breed has abilities for riding, endurance, jumping over obstacles, but also hippo-therapy and recreation. Among the objectives of breed improvement, there are included: increasing body size, energetic capacity in gallop races, reproductive indices and constitutional resistance.

A study conducted between 1992-2003 on Dahoman, El-Sbaa, Gazal, Hadban, Koheilan, Mersuch, Shagya, Siglavy-Bagdady and Nedjari genetic bloodlines, composed of 8 batches of stallions and 9 batches of mares, had the purpose to analyze the objectives of amelioration; the paper indicated that at the time progress was already recorded on some indices and performances identified in gallop races. There was an increase in population average withers height on Gazal, El-Sbaa, Hadban and Nedjari genetic bloodlines and the thorax and cannon girth, were bigger at Gazal and Hadban genetic lines, compared to the average of the population. Regarding the performance obtained on the gallop race of 2400 m, males and females from Koheilan and Gazal bloodlines have achieved the best results (Manole et al., 2004).

MATERIALS AND METHODS

We studied 119 mares reared in Rădăuțistud farm, from Mersuch, El-Sbaa, Koheilan, Shagya, Siglavy-Bagdady, Dahoman, Hadban

and Gazal bloodlines, which started breeding in 1996.

In this paper, data retrieved from Rădăuți stud farm, by calculating the main estimators–descriptors (average, variance, standard deviation, standard error of average, coefficient of variation) for the genetic line level and by making interline comparisons, was made using the unifactorial ANOVA algorithm.

RESULTS AND DISCUSSIONS

From the Table 1 it can be observed that the minimum absolute fecundity percent for the studied mares was 0 for 50% of the 8 analyzed bloodlines. Regarding the average values, the fecundity percent was 55.96±6.93% (El-Sbaa bloodlines) 78.41±4.42% (Siglavy-Bagdady bloodline). Also, the females from Gazal genetic line were close to the average minimum percent (61.63±12.22%) but the Mersuch bloodline was identified as closest to the maximum average percent (75.76±8.32%).

Given the fact that the fecundity percent should be 80-90% (Velea et al., 1980)in stud farms and for Arabian breed 90% (according to the literature) it can be claim that the studied mares registered lower values than this limit, though the average percent of 78.41±4.42% identified at Siglavy-Bagdady bloodline showed that the standard threshold can be almost reached. The data obtained mark the existence of a series of problems regarding reproduction management or bad maintenance of mares that can cause the occurrence of these low values and catch the attention to an urgent rehabilitation.

Table 1. Fecundity analysis for the 8 bloodlines of Shagya Arabian breed (%)

Bloodline	$\bar{X}$	± St. Dev.	$\pm s_{\bar{x}}$	V%
Mersuch	75.76	31.14	8.32	41.101
El-Sbaa	55.96	28.94	6.92	51.727
Koheilan	69.40	26.69	6.31	38.466
Shagya	69.28	26.50	6.29	38.251
Siglavy-Bagdady	78.41	14.65	4.42	18.693
Dahoman	71.79	26.18	6.76	36.475
Hadban	72.24	21.41	5.72	29.644
Gazal	61.63	34.56	12.22	56.085

The Figure 1 shows that the average fecundity percent had the minimum value in case of Gazal bloodline (62.50%) and the maximum for Mersuch bloodline (79.03%), the second value being also in accordance with the literature (Morris et al., 2010).

For all analyzed genetic lines, the calculated coefficient of variation oscillated between 18.69-56.08%, indicating thus a high influence of individuality within the lines, on the fecundity level.

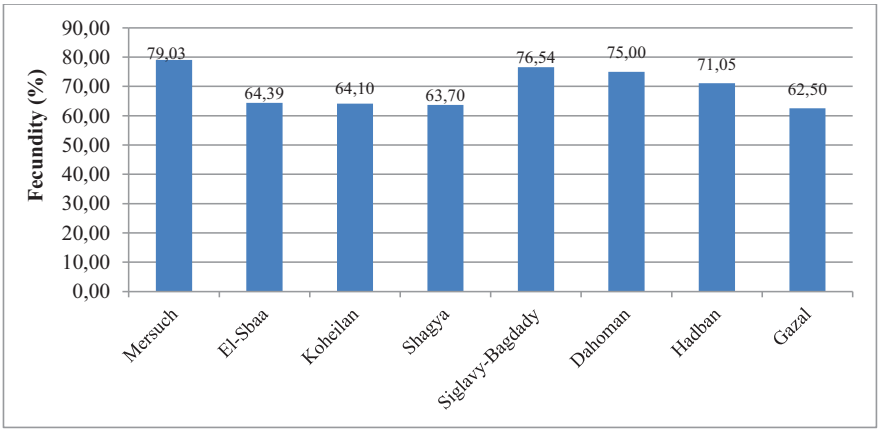

Figure 1. Average fecundity percent in studied mares (%)

The Table 2 reveals that the minimum absolute gestation length and the maximum absolute gestation length, were both found at Dahoman bloodline (300 and 361 days).
Regarding the average gestation length, this parameter was found between 336.2±2.55 days (Hadban mares) and 341.9±2.55 days (Gazalmares). Also, the females from other genetic lines were close to the average minimum length (Dahoman: 336.5±3.23 days and Mersuch: 336.6±2.88 days) or to the maximum limit (Shagya: 341.8±2.35 days).

Table 2. Gestation length of analyzed mares from the 8 bloodlines (days)

Bloodline	n	$\bar{X}$	± St. Dev.	$\pm s_{\bar{x}}$	V%	Min.	Max.
Mersuch	14	336.6	9.681	2.587	2.88	319	354
El-Sbaa	18	338.6	13.23	2.643	3.82	304	358
Koheilan	21	338.9	10.32	1.339	3.05	306	357
Shagya	18	341.8	8.029	1.892	2.35	322	355
Siglavy-Bagdady	11	337.7	9.52	2.870	2.82	319	354
Dahoman	15	336.5	10.88	2.808	3.23	300	361
Hadban	14	336.2	8.587	2.294	2.55	318	355
Gazal	8	341.9	8.717	3.082	2.55	325	360

The Figure 2 indicates that the average gestation length had the minimum value at Hadban bloodline and the maximum at Gazal, which was influenced probably by the reproduction management or by the sex of the product.
For all analyzed genetic lines, the calculated coefficient of variation oscillated between 2.35-3.82% and indicated a reduced influence of individuality within the lines regarding gestation length, revealing a homogeneous character.
However, using the variance analysis algorithm, the unifactorial variant, significant statistical differences were observed ($p<0.05$) between the average gestation length, found at Shagya and Dahoman bloodlines.

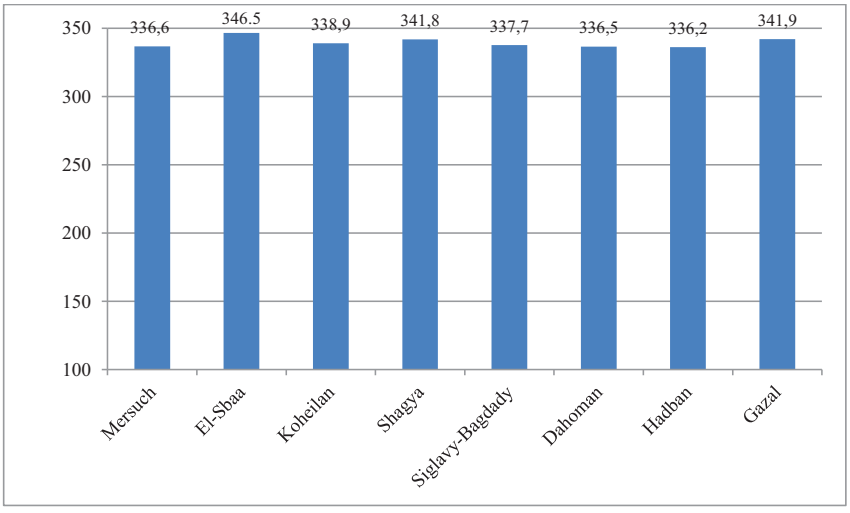

Figure 2. Average gestation length in studied mares (days)

The Table 3 indicates the abortion rate for all females analyzed from all the bloodlines of Shagya Arabian breed. The highest percent of abortion was registered at Hadban bloodline (11.12%) and the lowest at Gazal bloodline (0.00%). The maximum number of gestations was found at El-Sbaa bloodline (85) from which 92.94% ended up with a healthy foal (79 births) and the minimum number of gestations was registered at Gazal bloodline (25) but from which all of them ended with giving birth to a foal (100%).

Table 3. Abortion rate for all 8 bloodlines (%)

Bloodline	N	Number of gestations	Number of births	Abortion (%)
Mersuch	14	49	47	4.09
El-Sbaa	18	85	79	7.06
Koheilan	21	75	72	4.00
Shagya	18	79	74	6.33
Siglavy-Bagdady	11	62	61	1.62
Dahoman	15	75	71	5.34
Hadban	14	54	48	11.12
Gazal	8	25	25	0.00

The Table 4 shows that the individual value for foaling-interval registered a minimum at Siglavy-Bagdady bloodline (230 days) and a maximum at El-Sbaa (1376 days).
The average values oscillated between 409.0±59.13 days (Gazal bloodline) and 539.4±57.47days (Hadban bloodline).

There were not noticed high individual oscillations between bloodlines (the coefficients of variation registered close limits: 54.80-59.13%) indicating the analyzed characters were homogenous.

Table 4. Foaling interval values (days)

Bloodlines	n	$\bar{X}$	± St. Dev.	$\pm s_{\bar{x}}$	V%	Min.	Max.
Mersuch	14	412.1	225.87	60.36	54.80	340	721
El-Sbaa	18	468.1	275.90	65.03	58.94	257	1376
Koheilan	21	481.9	264.31	57.67	54.84	322	908
Shagya	18	526.1	298.79	70.42	56.79	344	1066
Siglavy-Bagdady	11	459.7	257.53	77.64	56.02	230	803
Dahoman	15	485.5	283.34	73.15	58.36	278	1092
Hadban	14	539.4	310.03	82.85	57.47	347	1154
Gazal	8	409.0	241.84	85.50	59.13	343	1051

The Figure 3 indicates that the minimum and the maximum value of foaling-interval parameter (409 and 539.4 days) exceeded the limits found in the literature (337-339 days).

This can occur because of the management of reproduction; however, it is preferable that this parameter be within the limits given by the literature to ensure obtaining one foal a year from each mare.

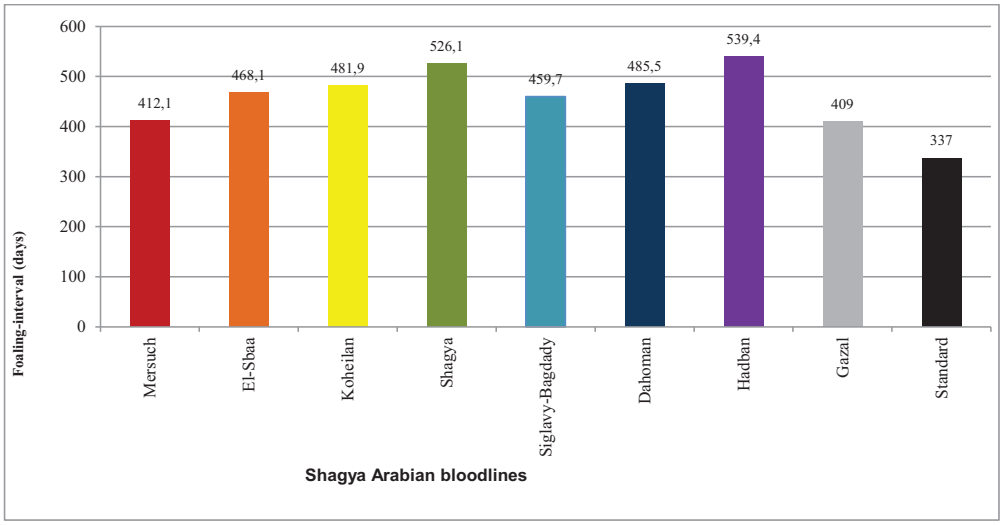

Figure 3. Average foaling-interval values in the studied mares (days)

CONCLUSIONS

The results revealed by this study showed that all the genetic bloodlines were at a lower level than the limits described by the literature for the fecundity percent; however, Siglavy-Bagdady, Mersuch, Hadban and Dahoman bloodlines registered average values close to 80% minimum percent found for this parameter. The coefficient of variation calculated for fecundity percent indicated a high influence of individuality within the genetic lines (18.69-56.08%) and, therefore, the need for selection to increase the values and to homogenize this trait.

Regarding the gestation length, the limits at half-blood breeds found in literature are between 337-339 days (Dumitrescu, 1986), so it can be claim that only El-Sbaa, Koheilan and Siglavy-Bagdady bloodlines had average values within this interval (338.6±3.82 days, 338.9±3.05 days and 337.7±2.82 days). The coefficient of variation calculated for this parameter indicated a homogeneous character (2.35-3.82%).

The abortion rate indicated the highest level of 11.12% at Hadban bloodline and surprisingly the lowest level of 0% in Gazal bloodline case; the other calculated values were placed between 1.62-7.06%, which are acceptable for this parameter.

Regarding the foaling-interval parameter, there were noticed very wide limits within bloodlines (230-1376 days); the average values calculated were placed between 409.0±59.13 days (Gazal bloodline) and 539.4±57.47days (Hadban bloodline) which indicated that they have exceeded the limits given by the literature (337-338 days) (Dumitrescu, 1986). The coefficients of variation registered values between 54.80-59.13%, which proves that the analyzed characters were heterogeneous, hence the need to control all factor involved in order to render homogeneity to this trait.

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