STUDY REGARDING SOME REPRODUCTIVE ASPECTS OF BROODMARES FROM RĂDĂUŢI STUD FARM

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Abstract

This study aimed to analyze 16 broodmares of Rădăuţi stud farm, from Dahoman, El-Sbaa, Koheilan, Shagya, and Siglavy-Bagdady genealogical lines, in terms of age at first foaling and age of introducing to breeding, as well as the reproductive parameter service-period.

The results indicated that the age at first foaling, for the entire studied number of broodmares, had an average value of 2186.6±164.0 days, respectively 6.0±0.4 years; the absolute values were 1755 and 4200 days, respectively 4, 8, and 11.5 years, therefore, the variability of this character was high (28.1%). By removing from the calculations the broodmare Shagya LXII-3, which recorded the first mount after the age of 8 years, the mean was reduced to 2031.8±58.2 days (5.6±0.2 years), and the coefficient of variation for this character was reduced to 10.3%.

Regarding the age of introducing to reproduction, we revealed that the average value was 1714.8±104.1 days (4.7±0.3 years), and the absolute values were 1242 and 3041 days (3.4–8.3 years); the group also showed high variability for this character (24.3%). As in the case of age at first foaling, if Shagya LXII-3 broodmare was excluded from the calculation, the mean is 1626.4±56.9 days (4.5±0.2 years) and the variability is reduced to 14%.

The reproductive parameter service-period recorded the highest average value in case of the sixth foaling (235±90.4 days, with limits between 12-764 days) and the lowest after the eighth foaling (77.5±38.4 days, with limits between 11-221 days). The calculations indicated a very high variability of this character (98.3% in the third foaling-139.2% in the fourth foaling) showing that if the reproduction management of the Rădăuţi stud farm would suffer some changes, the final results regarding the reproductive activity of broodmares will be more favorable.

Key words: broodmare, reproduction, foaling, service-period

INTRODUCTION

The mare is a seasonal polyester animal, with a 21-day sexual cycle that varies between 10-34 days and which, in the northern hemisphere, manifests itself from March to June (in about 50% of them there is another the second season, between July and September); in the case of mares in the southern hemisphere, the sexual season takes place between August and December. The maximum point of fertility is influenced by the length of the day, by reducing the hormone melatonin triggering a cascade of hormonal activity that culminates in an ovarian activity. [2]

The age at which the mares are first calved is expected to occur in optimal conditions, taking into account the fact that Shagya Arabian mares must be bred around the age of 3.5-4 years and that Equus caballus species have an average gestation length of 340 days (the limits vary from 310 days to 412 days). [3, 4]

The age of introduction to reproduction is the difference between the date of the first mount and the date of birth. [6, 9] Although the genetic instinct begins at the age of 6-9 months, and sexual maturity sets in at about 15-18 months in mares, and 12 months in stallions, in mare's case the optimal age for introduction to breeding is 2.5-3 years for heavy and semi-gray horse breeds, 3-3.5 years for intermediate and 3.5-4 years for light breeds. [6]

The service-period represents the difference between the date of foaling and that of the subsequent fertile foaling. [6] Some opinions are against mounting mares in the first 10 days after they have calved, because the following situations can proceed: the uterus is not completely restored after the previous gestation, there is a risk of incomplete involution, the placenta and the amniotic liquid are still removed (which can trigger a uterine infection that negatively affects sperm motility) [1, 3]; moreover, it is not possible to know precisely whether the appearance of heat is accompanied by the maturity of the ovarian follicle and ovulation. Under these conditions, the gestation is installed in a proportion of 20–25% of the total amounts or inseminations performed in the first 10–15 days after foaling. [3] However, some sources in the literature recommend that mares should be inseminated on 8 days [7, 8] or 9 days after foaling. [5]

MATERIAL AND METHOD

The researched material consisted of 16 broodmares, from the 2000 Rădăuţi stud farm generation; they were promoted in the National Stud farm by the National Commission for evaluation and classification of purebred horses, and the information was taken from the ranking papers of 2003. The promotion was based on the results obtained after the qualification tests that are sustained in the Rădăuţi stud farm. These broodmares calved in 15.02.2000-27.12.2000 and were represented by Dahoman (2 heads), El-Sbaa (5 heads), Koheilan (1 head), Shagya 4 heads) and Siglavy-Bagdady (2 heads) genealogic bloodlines. The reason for their choice was that these broodmares had an extensive and long-lasting reproduction activity.

The selected broodmares were analyzed in terms of age at first foaling (the difference between the date of first foaling and mare's birth date), age of introduction to breeding (the difference between the date at first insemination and the mare's birth date), and service-period parameter (the difference between the date of foaling and the date of the fertile mount which succeeds it).

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 the coefficient of variation (V%).

RESULTS AND DISCUSSIONS

The data obtained about the age at first foaling was statistically processed and centralized in Table 1.

Table 1 Statistic data regarding age at first foaling of studied broodmares

Specification	Whole population		After first mount (first season)		After second mount (second season)	
	(days)	(years)	(days)	(years)	(days)	(years)
N	14	14	7	7	7	7
$\overline{X}$	2186.6	6.0	1963.1	5.4	2410.1	6.6
s^2	376386.2	2.8	3208.8	0.0	695739.5	5.2
s	613.5	1.7	56.6	0.2	834.1	2.3
$\pm s\overline{x}$	164.0	0.4	21.4	0.1	315.3	0.9
V%	28.1	28.1	2.9	2.9	34.6	34.6
MIN	1755.0	4.8	1911.0	5.2	1755.0	4.8
MAX	4200.0	11.5	2075.0	5.7	4200.0	11.5

The age at first foaling depends on the optimal functioning of the female genital tract, the neurohormonal balance of the mare, and the result of breeding (fertility level).

As the table 1 reveals, there were registered 7 gestations after the first insemination (43.75%), respectively in the first year/breeding season, another 7

gestations were identified for the first time in the second year after introduction to breeding, while 2 mares (12.5%) never have calved (El-Sbaa and Koheilan genealogical bloodline).

If we disregard the two mares, in which no foaling was recorded, the age at first foaling, for the entire studied flock, was on average 2186.6±164.0 days, respectively 6.0±0.4 years, with limits from 1755 to 4200 days, respectively 4.8 and 11.5 years. The variability of this character was high (28.1%) since the mare Shagya LXII-3 registered the first breed only after the age of 8 years. Eliminating this mare from the calculation, the mean was 2031.8±58.2 days (5.6±0.2 years), and the variability decreases to 10.3%, these values being normal.

If only mares that have registered a gestation from the first year of use for breeding 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.

In figure 1 are highlighted the absolute values and the average age at first foaling, for the whole studied population, where the minimum value was 1755 days, the maximum 4200 days, and the average was 2186.6 days.
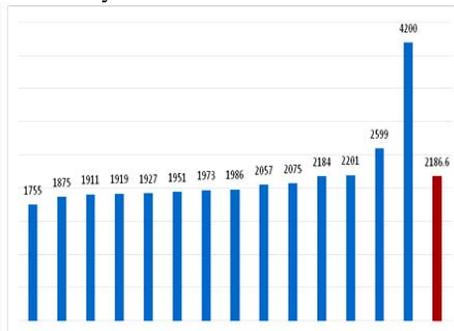

Fig. 1 Absolute values and the average age at first foaling (days)

Data regarding the age of introduction to reproduction were statistically processed and centralized in table 2.

Table 2 Statistical data of age at introduction to reproduction of the studied broodmares

Specification	Whole population (days)	Whole population (years)
N	16	16
$\overline{X}$	1714.8	4.7
s^2	173399.8	1.3
S	416.4	1.1
$\pm s\overline{x}$	104.1	0.3
V%	24.3	24.3
MIN	1242.0	3.4
MAX	3041.0	8.3

After analyzing the data on the age of introduction to reproduction, it was observed that this was achieved, 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 a high variability regarding this character (24.3%); the result was influenced by the fact that one of the mares (Shagya LXII-3) recorded her first breed at the age of over 8 years, while most were in this situation much earlier (4-5 years). If the mentioned mare was excluded from the calculation, the average value would be 1626.4±56.9 days (4.5±0.2 years), and the variability would be reduced to 14%.

Another noteworthy observation is that 81.25% were bred in the 2004 (43.75% or 7 mares) and 2005 seasons (37.50% or 6 mares); so, generally speaking, this happened at the age of 4-5 years, the other mares being introduced in the season in the season of 2003 (12.50%/2 heads), fewer than 4 years, respectively in the season of the year 2008 (6.25%/head), at an abnormal age (over 8 years).

In fig. 2 we can observe the average age of introducing to reproduction of each

genealogical line, where it is highlighted that the minimum was identified in the case of the Koheilan line (1247 days), and the maximum in the case of the Shagya line (1953.5 days). The maximum value was influenced by the late introduction to reproduction of the mare from Shagya LXII-3.

In table 3, the statistical data regarding the service-period parameter studied in the case of the analyzed herd are centralized.
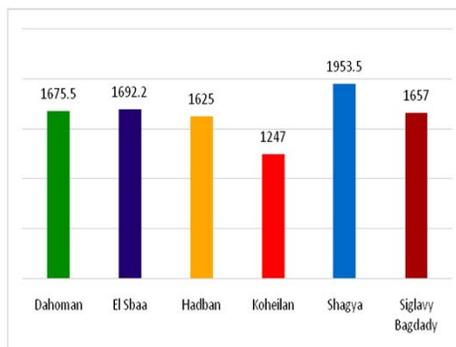

Fig. 2 Average age of introducing to reproduction of all genealogical lines

Table 3 Statistical data regarding the service-period parameter of studied broodmares

Specification	Service-period after foaling:						
	I	II	III	IV	V	VI	VII
N	12	12	12	12	10	9	8
$\overline{X}$	133.4	159.6	160.1	176.7	155.2	235.0	156.4
s^2	19435.5	26785.7	24764.8	60469.3	32006.8	73504.3	29391.7
S	139.4	163.7	157.4	245.9	178.9	271.1	171.4
$\pm s\overline{x}$	40.2	47.2	45.4	71.0	56.6	90.4	60.6
V%	104.5	102.6	98.3	139.2	115.3	115.4	109.6
MIN	7.0	8.0	13.0	13.0	13.0	12.0	13.0
MAX	463.0	396.0	411.0	783.0	438.0	764.0	474.0
	VIII	IX	X	XI	XII	XIII	XIV
N	6	4	3	2	1	1	1
$\overline{X}$	77.5	101.0	159.0	46	75	56	14
s^2	8833.5	15279.3	35692.0	-	-	-	-
S	94.0	123.6	188.9	-	-	-	-
$\pm s\overline{x}$	38.4	61.8	109.1	-	-	-	-
V%	121.3	122.4	118.8	-	-	-	-
MIN	11.0	6.0	43.0	44	-	-	-
MAX	221.0	271.0	377.0	48	-	-	-

The value of service-period parameter after the first foaling was calculated for 12 mares, and it resulted that the average value was 133.4±40.2 days, with limits from 7 to 463 days.

After the second foaling, the time until the next gestation was, on average, 159.6±47.2 days, with limits between 8 and 396 days.

After the third foaling, the SP had an average duration of 161.1±45.4 days, with limits from 13 to 411 days.

After the fourth foaling, the fertile breeding occurred after an average period of 176.7±71 days, with limits from 13 to 783 days; in this case, the maximum value represented the highest absolute value recorded in the calculations (Shagya LXII-7). Thus, the highest variability for this character was registered in this case, respectively 139.2%.

The value of the service period parameter corresponding to the fifth foaling had a

duration that ranged between 13 and 438 days, with an average value of 155.2±56.6 days.

In the case of the SP calculated for the sixth foaling, the highest average value of duration was recorded, respectively 235±90.4 days. The limits in this case were from 12 to 764 days.

After the seventh foaling, the SP had an average value of 156.4±60.6 days, the limits being between 13 and 474 days.

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 limits ranged from 11-221 days).

The value of this parameter calculated after the ninth foaling of 4 mares had an average value of 101±61.8 days (the limits ranged from 6-271 days); in this case, the minimum value coincided with the absolute minimum recorded in this study.

After the tenth foaling, the average duration of SP was 159±109.1 days (the limits ranged from 43-377 days - calculation made only for 3 mares).

The SP calculated after the eleventh foaling had an average value of 46 days (2 mares), the minimum and maximum values being close, respectively 44 and 48 days.

Only for El-Sbaa XII-38 mare were determined the SP length after the twelfth, thirteenth, and fourteenth foaling, respectively 75, 56 and 14 days.

The performed calculations indicated a very high variability of the group (98.3% at the third foaling and 139.2% at the fourth foaling).

Table 4 highlights the situation of the service period parameter in the case of the analyzed genealogical lines, within the Shagya Arabian breed, found in the Rădăuţi stud farm.

Table 4 Statistical data of SP parameter of Shagya Arabian genealogical lines

Specification	Dahoman	El-Sbaa	Hadban	Shagya	Siglavy-Bagdady
N	14	28	6	27	18
$\overline{X}$	89.5	103.0	184.8	215.6	154.8
s^2	10531.5	14318.1	24090.2	55819.9	32093.4
S	102.6	119.7	155.2	236.3	179.1
$\pm s\overline{x}$	27.4	22.6	63.4	45.5	42.2
V%	114.7	116.2	84.0	109.6	115.7
MIN	12.0	6.0	22.0	8.0	7.0
MAX	346.0	413.0	411.0	783.0	474.0

Depending on the genealogical lines of the mares, the average length of the service-period parameter ranged from 89±27.4 days (Dahoman bloodline) to 215.6±45.5 days (Shagya bloodline). The shortest duration of the SP was recorded in the case of the El-Sbaa bloodline (6 days), and the longest in the case of the Shagya bloodline (783 days), all other genealogical lines revealing quite similar limits (minimum values: Dahoman line 12 days, Hadban 22 days, Shagya 8 days, Siglavy-Bagdady 7 days; maximum values: 346 days, El-Sbaa 413 days, Hadban 411 days, Siglavy-Bagdady 474 days).

The coefficient of variability oscillated between extended limits (84.0% in the case of the Hadban genealogical line and 116.2% in the case of the El-Sbaa bloodline), indicating a very high variability of the service period character in the case of the studied population.

CONCLUSIONS

Following the study on the breeding activity performed on the 16 Shagya Arabian broodmares, from the 2000 generation, 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 the limits for this parameter ranged from 1242 to 3041 days (3.4–8.3 years), the group manifesting from this point of view a high variability (24.3%); this high difference between the limits was caused by the fact that the Shagya LXII-7 was introduced to breeding very late compared to rest of the population;

- the average age of mares at the first foaling was 2186.6±164.0 days, respectively 6.0±0.4 years; in this case, a low percentage of variability was registered (2.9%), the group being homogeneous in terms of the mentioned character;

- the service period parameter had an average value of 149±18.3 days, the absolute values oscillating within the limits of 6 and 783 days; the highest value of the coefficient of variability of the character, respectively 139.2%, was registered in the case of the fourth foaling because the mare Shagya LXII-7 marked an absolute value of 783 days of this parameter; the minimum value of 6 days for the service-period parameter was registered at the ninth foaling.

- regarding the genealogical lines, the average duration of the service-period parameter ranged between 89±27.4 days, the coefficient of variability oscillating between extended limits (84.0% for the Hadban line and 116.2% for the El-Sbaa line), which indicated a very high variability of the service-period character in the case of the studied population.

Finally, analyzing all these conclusions, it can be stated that the management of reproduction in the Rădăuţi stud farm falls within the limits allowed by the literature, if we exclude the exceptions by which the calculation of the coefficient of variability indicated high values (sowing and late foaling of some mothers from the herd). But if we include this kind of case the entire reproduction activity marks different results so it's desirable to apply better decisions for best situations.

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