

Duration of estrus and estrous cycles in mares from Haflinger breed

Продължителност на еструса и половия цикъл при кобили от породата Хафлингер

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ABSTRACT

A study of the duration of oestrus and estrous cycles in mares from Haflinger breed (HB) and the influence of some factors was conducted. The records used for this study were from the breeding registers of the mares from the State Stud farm Kabiuk near Shumen, covering a period of 11 years (2009 to 2020). In the study were included 15 mares with 110 estruses and 22 estrous cycles. With the mares from Haflinger breed, the average duration of oestrus is 5.52 ± 0.26 days and the length of the estrous cycle is 24.21 ± 1.13 days. The year ($P < 0.001$), month ($P < 0.001$), season ($P < 0.05$), and length of the estrous cycle - the year of fertilization ($P < 0.05$) had reliable influence on the duration of oestrus. In Haflinger mares, the shortest estrus is in the middle and at the end of the breeding season (March: 4.39 ± 0.46 days, July: 3.33 ± 0.82 days). Its duration increases during the winter season and reaches its peak in the middle of spring (February: 5.96 ± 0.51 days, April: 8.37 ± 0.72 days).

Keywords: estrous cycles, estrus, Haflinger breed, mares, reproduction

РЕЗЮМЕ

Проведено е проучване за продължителността на еструса и половия цикъл при кобили от породата Хафлингер (ХП) и влиянието на някои фактори върху тях. Записите, използвани за това проучване, са от случните регистри на кобилите от ДП "Кабюк" край Шумен, обхващащи период от 11 години (2009 до 2020 г.). В изследването са включени 15 кобили със 110 еструса и 22 полови цикъла. При кобилите от породата Хафлингер средната продължителност на еструса е 5.52 ± 0.26 дни, а продължителността на половия цикъл – 24.21 ± 1.13 дни. Надеждно влияние върху продължителността на еструса има годината ($P < 0.001$), месецът ($P < 0.001$), сезонът ($P < 0.05$), а за продължителността на половия цикъл - годината на заплождане ($P < 0.05$). При кобилите Хафлингер най-краткият еструс е в средата и в края на случния сезон (март – 4.39 ± 0.46 дни и юли 3.33 ± 0.82 дни). Продължителността му се увеличава през зимния сезон и достига своя връх в средата на пролетния сезон (февруари – 5.96 ± 0.51 дни и април – 8.37 ± 0.72 дни).

Ключови думи: еструс, кобили, полов цикъл, порода Хафлингер, репродукция

INTRODUCTION

Horses are seasonally polyestrous animals. Their heat usually occurs in the spring; however, depending on the conditions of feeding, keeping and their purpose, it can also occur in winter and autumn (Bratanov, 1956; Morel, 2015; Popova, 2015). Ginter (1974) states that mares bred in northern latitudes breed from early May to October.

According to Bratanov (1956), the estrous of mares is in a very wide range - from 2 to 18 days, with an average of 5-7 days. Ovulation usually occurs at the end of it - on the 5th-6th day, after which the heat continues for another 1-2 days. The duration of the entire estrous cycle is 18-28 days, but can reach up to 40 days. According to Nikolov (2008), the average duration of the estrous cycle is 20-22 days. After birth, mares coming in foal heat on the 5th day (more often between the 7th and 12th day).

According to Hart et al. (1984), the requirement that horses have to be born on the first of January of a given year stimulates the demand for means to accelerate the onset of the natural breeding season in mares by about 3-4 months. In this regard, a number of authors have investigated the influence of hormonal drugs and other methods to stimulate the timely onset of the estrous cycle (Sharp and Ginther, 1975; Nett et al., 1976; Holtan et al., 1977; Lapin and Ginther, 1977; Freedman et al., 1979; Squires et al., 1979; Fitzgerald and McManus, 2000; Aurich, 2011).

The breed features in estrus and the estrous cycle and the influence of some atypical factors on them are poorly represented in the literature, for this reason, the aim of the research is to study them in the Haflinger breed.

MATERIALS AND METHODS

The study was conducted at the Kabiuk State Stud, near Shumen. The records from the pedigree books and the breeding registers for all mares used for breeding of the Haflinger breed (15 mares with 110 estrus and 22 estrous cycles) during the period of 2009-2020 were analyzed.

The duration of estrus and the estrous cycle were studied. The first indicator is reported in days from the date of the first signs of heat to the last coverage. A stallion was used to detect the mares in heat. The duration of the estrous cycle is recorded as the interval from the end of one estrus to the end of the next. The date of the last covering in it is accepted as the end of estrus. The estrous cycle was divided into 3 groups: up to 18 days (shortened), from 19 to 28 days (normal) and from 29 to 40 days (extended).

One-factor and multifactor analysis of variance were used to process the data and establish the influence of some factors on the studied traits, and the models had the following general form:

$$Y_{ijlm} = \mu + R_j + M_l + e_{jl} \quad (M1);$$

$$Y_{ijklm} = \mu + S_k + e_k \quad (M2),$$

where Y is the observation vector; μ - the total average constant; R_j , S_k and M_l - the fixed effects of the j-th year of observation (estrus: $n = 16$; estrous cycle: $n=8$); k-th observation season ($n=4$); l-th month of observations (estrus: $n=7$; estrous cycle: $n=6$); e - residual variant.

The statistical processing was done with the program SPSS 19.

RESULTS AND DISCUSSION

The course of the estrous cycle in mares is characterized by unevenness and uncertainty both in terms of periodicity and duration of heat. This is one of the reasons for their lower fertility (Nikolov, 2008).

According to the duration, Parvanov et al. (1999) differentiates in mares: a normal estrous cycle with duration of 22 days and estrus 5-7 days; a shortened cycle with up to 18 days with estrus 3 days; a prolonged cycle with over 28 days with estrus 10 days. In the present study the mean duration of an estrus, considering all estrus periods, in Haflinger mares is 5.52 ± 0.26 days with a variation from 2 to 15 days. Karadzhov (1997) also reported prolonged estrus duration of up to 25-27 days in Pleven and Danube breed mares. According to the author, the probable reasons for the long estrus

are the onset of winter anestrus (transition) or disturbed hormone metabolism. Very short estrus is also not natural and can be explained by the use of an insufficiently accurate method of detecting estrus mares, which may have failed to register the first days of estrus.

Estrus in mares is influenced by a number of factors. Table 1 examines the influence of some paratypic factors. In model 1(M1) and model 2 (M2), the influence of the year, month and season on the duration of estrus and estrous cycle was studied. In the present study the season ($P<0.05$), the month ($P<0.001$) and the year ($P<0.001$) had a significant effect on the duration of estrus (Table 1).

In the present study the shortest estrus was in the middle and at the end of the random campaign – March (4.39 ± 0.46 days) and July (3.33 ± 0.82 days) (Table 2).

According to Parvanov et al. (1999), it is longest in February-March (at the beginning of the season), while

in the following months it is shorter and more expressed. In May it is shortest and most pronounced. The biological breeding season of horses located in the northern hemisphere is from March to September. In the literature, it is reported that minimal ovarian activity occurs in late January and February (Palmer and Driancourt, 1983).

Voigt (2020) reports that in the Northern Hemisphere, spring and late autumn form more irregular periods of estrus cycle activity, representing transitions between two extremes (transitional phases). The first ovulation in the spring marks the beginning of the breeding season (Burkhardt, 2009). At the same time, fertility increases, because with shorter estrus, fertilization is better. In lactating mares, estrus varies from 2 to 13 days (average 5-7), while in non-lactating mares it is 8.2 days. According to the authors, early postpartum insemination is often associated with embryonic mortality or abortion, a stillbirth in which the placenta is retained.

Table 1. Influence of year, season and month on the duration of estrus and estrous cycle, F-criteria and degree of statistical significance

Factor	df	Estrus		df	Estrous cycle	
		M1	M2		M1	M2
Model						
Year	15	7.423***	-	7	4.172*	-
Season	2	-	4.483*	2	-	1.506
Month	6	5.108***	-	5	1.848	-

*** $P<0.001$; ** $P<0.01$; * $P<0.05$

Table 2. Duration of estrus during the different months of the year in mares from Haflinger breed, days

Month	n	LSM \pm SE*	Min	Max
January	6	4.67 \pm 1.19	2	7
February	24	5.96 \pm 0.51	2	15
March	26	4.39 \pm 0.46	2	10
April	14	8.37 \pm 0.72	4	12
May	14	5.94 \pm 0.63	3	7
June	18	5.97 \pm 0.55	3	12
July	8	3.33 \pm 0.82	2	5

* Least square mean \pm standard error

Maximum fertility is reached in the second and third estrus after parturition. Mares come into this period in normal condition and complete regression of the genitalia has occurred. If the mares do not breed during the first few estrus, they remain anestrous and infertile for a long time.

Table 3 examines the duration of estrus during the different seasons. The obtained results show that its duration increases during the winter season (6.33 ± 0.48 days) and reaches its peak in the middle of the spring season (4.59 ± 0.36 days). According to a study by Tekin et al. (1991), almost three quarters of Arabian and Haflinger mares have an estrus duration of 1-4 days, while the rest have a duration of 5-10 days. The extremely short duration of estrus is caused by the abrupt change from winter to spring environmental conditions in this area. According to the authors, the explanation for the reported long estrus duration could be the inadequate documentation of the data.

The reason for the absence of one, two, or more periods of estrus, especially in winter, is the so-called silent estrus, in which there are no clear signs. The age of the mare also plays a role (Karaivanov and Barzev, 1994).

In the present study, the mean length of the estrous cycle in Haflinger mares was 24.21 ± 1.13 days, ranging from 13 to 38 days. Figure 1 shows the ratios of estrus cycles by duration in Haflinger mares. In the same group of probands, an average duration of the estrous cycle of 18-24 days could be observed in 38.2% of Haflinger.

Figure 1 classifies the records for all reported estrous cycles, but in practice only the first 2 classes can be

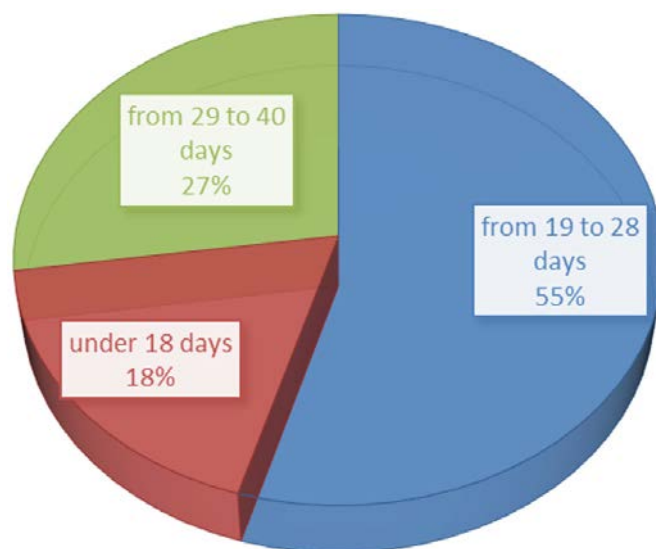


Figure 1. Ratio of estrous cycles in mares from Haflinger breed (in %)

considered normal. Estrous cycles lasting 29-40 days can be considered multiples of a normal estrous cycle, where quiet estrus is unlikely to be observed.

On the one hand, the reasons for the duration of the estrous cycle up to and over 40 days are due to the seasonal estrous cycle, and according to a number of authors (Kooistra and Ginther, 1975; Oxender et al., 1977; Hodge et al., 1982), anoestrus is observed during the winter and summer months. Also, the lack of ovulation control makes it impossible to determine the periods when mares cycle. For these reasons, the time between the end of one estrus and the end of the next was considered the duration of the estrous cycle.

Figure 1 shows that the estrous cycle considered normal, i.e. 19-28 days, is found in about 55% of records and the percentage of mares with prolonged estrous

Table 3. Duration of estrus during the different seasons in mares from Haflinger breed, days

Factor	n	LSM \pm SE*	Min	Max
Spring	54	4.59 \pm 0.36	2	12
Summer	26	4.77 \pm 0.52	2	12
Fall	-	-	-	-
Winter	30	6.33 \pm 0.48	2	12

* Least square mean \pm standard error

cycle, i.e. from 29 to 40 days, occurs in 27% of records. According to Karadzhev (1997), the group of prolonged sex estrous cycles probably includes cases of embryonic mortality and early abortions, which are impossible to explain.

In contrast to the duration of estrus, only the year ($P<0.05$) had a significant effect on the duration of the estrous cycle.

The estrus cycles which started in the spring have a normal duration and are the shortest as can be seen in Table 4. Aurich (2011) gave a duration of an estrous cycle in mares of 22 days with estrus of 5–7 days.

Table 4. Duration of the estrous cycle in different seasons in mares from Haflinger breed, days

Factor	n	LSM±SE	Min	Max
Spring	8	22.00±2.43	13	27
Winter	12	25.33±1.99	16	38

* Least square mean ± standard error

CONCLUSION

The breed features in estrus and the estrous cycle and the influence of some atypical factors on them are poorly represented in the literature. In mares of the Haflinger breed, the average duration of estrus is 5.52 ± 0.26 days and the duration of the estrus cycle is 24.21 ± 1.13 days. The duration of estrus is significantly influenced by season ($P<0.05$), calendar month ($P<0.001$) and year ($P<0.001$), but the duration of the estrous cycle is influenced by year only ($P<0.05$).

In Haflinger mares, estrus is shortest in the middle and at the end of the breeding season (March: 4.39 ± 0.46 days, July: 3.33 ± 0.82 days). The duration increases during the winter season and peaks in the middle of spring (February: 5.96 ± 0.51 days, April: 8.37 ± 0.72 days). The estrus cycles in Haflinger mares that begin in spring average at 22.00 ± 2.43 days and are the shortest and of normal duration.

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