

Reproductive parameters of Thoroughbred mares reared in the national stud farm “Kabiyuk” in Bulgaria (Retrospective analysis)

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Abstract

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The reproductive parameters of 51 Thoroughbred mares were studied during the period 1997-2010. A total number of 270 oestrus and reproductive cycles were included in the analysis. Thoroughbred horses are only allowed to mate naturally by traditional hand method. As a source of information was used the zootechnical documentation of the national stud farm. It was established that the reproductive traits subject to the recent study varied in wide ranges - interval of foal heat (11.18 ± 2.40 - 31.00 ± 19.92 days) and foaling-to-conception (13.00 ± 3.00 - 57.00 ± 29.69 days), number of oestrus cycles (1.16 ± 0.38 - 1.87 ± 1.28), mating of mares (2.80 ± 0.83 - 3.89 ± 2.40) and total born foals (2-20) per year, duration of oestrus (21.00 ± 2.51 - 26.00 ± 7.07 days) and heat (3.00 ± 2.22 - 5.09 ± 1.95 days). The positive correlations were found between duration of oestrus cycle with number of matings per year and duration of heat, duration of heat and number of matings per year, foaling-to-conception interval with number of foals and foaling-to-conception interval and number of oestrus cycles per year.

Keywords: mare; Thoroughbred; reproductive parameters

Introduction

The process of reproduction in horse breeding goes hand in hand with the process of selection. In this aspect having a vital and healthy newborn foal is a success for every breeder and respectively for each breeding organization. On a worldwide scale the control of the reproductive process is carried through two main methods: by reporting the results of every breeding season and by tracking the parameters of every reproductive cycle completed with the birth of a healthy foal (Shulman et al., 2003; Hemberg et al., 2004; Allen et al., 2007; Bosh et al., 2009). These authors reported for increas-

ing rates of vital newborn foals (up to 80%) and they suggested that this might be due to the improved technologies – application of ultrasonography, good veterinary service and optimal rearing conditions for stallions and mares.

A subject of interest to many researchers was the conception rate on the first oestrus after foaling, as determination of pregnancy was carried out 14 to 16 days after mating (Blanchard et al., 2010; Blanchard et al., 2010a; Nath et al., 2010; Hanlon et al., 2012). Abortions were also of a great interest to many authors (Allen et al., 2007; Bosh et al., 2009), some of them reported 15–20% rate of pregnancy loss in most of the cases during the first 42 days of pregnancy (Moris & Allen, 2002). Fer-

tility rates and factors affecting the process of reproduction in Thoroughbred mares were also subject of many studies (Bruck et al., 1993; Kalita et al., 2010; Ali et al., 2014; Warriach et al., 2014; Charles, 2015). In the available recent sources, we could not find any detailed studies regarding oestrus, reproductive cycle, interval from foaling to the beginning of first postpartum oestrus and foaling-to-conception interval.

The aim of this study was to make retrospective analysis of numbers of oestrous cycles per year, duration of foal heat, foaling-to-conception interval, oestrus and heat of Thoroughbred mares reared in the national stud farm “Kabiyuk” in Bulgaria.

Material and Methods

The subject of this study was 51 Thoroughbred mares, bred in the national stud farm “Kabiyuk” in Bulgaria during of the period 1997–2010. A total number of 270 oestrus and reproductive cycles were included in the analysis.

The mares were bred by hand - a traditional mating method. Reproductive parameters such as: foaling heat (first oestrus after foaling), foaling-to-conception interval, number of oestrous per year, duration of oestrus and heat were analyzed. The total amount of mating per mare and total number of born foals per year also were recorded. As a source of information was used the database and the zootechnical documentation of the national stud farm.

Data were expressed in mean ± standard deviation (SD). The statistical analysis was performed with the statistical package Statistica, ver. 6.1. (Statsoft, Inc. 2002).

Results and Discussion

The reproductive parameters of Thoroughbred mares are presented in Table 1. As an indicator characterizing recovery

of the reproductive system after parturition, the interval from foaling to the beginning of first postpartum oestrus (foal heat) is one of the controlled reproductive traits in mares. The data present the variation of the mean values from 11.18±5.02 days to 31.0±19.92 days with minimal and maximal values 8 days and 69 days. The significant differences in the duration of the foal heat are probably due to the slow involution of the uterus during the cold winter months, the lack of signs in the mare’s behavior for the presence of oestrus during cold period or health problems. A study of the reproductive traits in two Bulgarian horse breeds (Karadzhev, 1997) reported that in 16.82% of the cases in Pleven mares and 7.01% of the cases in Danubian mares the interval from foaling to the end of first postpartum oestrus was over 92 days. A period of 18 to 20 days is considered as an optimal (normal) duration of that interval. In our research only the data received for 2010 does not fit into these optimal limits. From all 134 observed cases of foal heat, 16 mares (11.94%) were with extremely high values, and we find it difficult to explain the reason for that. The data for foaling-to-conception interval also varied widely, from minimal value of 13 days reported in 2005 and maximal of 57 days reported in 1998. The optimal duration of foaling-to-conception interval is considered again period of 18 to 20 days. In the recent study we estimated duration of the foaling-to-conception interval in the so-called optimal range only in 1999. In all 15 cases included in the study or 13.63% extremely long duration of foaling-to-conception interval was observed. According to us this is due to some organizational problems in the mating management in the stud farm. This high maximal values reported during some of the studied years, show that, part of the mares, were mated on the following breeding season after foaling. It might be so, due to the fact that in the studied period flat races were organized spontaneously more than in prepared in advance racing calendar. The economical state of the stud during the period might be another reason.

Table 1. Reproductive parameters of Thoroughbred mares bred in the national stud farm “Kabiyuk” in Bulgaria (mean±SD)

Year	Foal heat days		Foaling-to-conception interval days		Oestrus cycles per year number		Duration of oestrus days		Duration of heat days	
	n	mean±SD	n	mean±SD	n	mean±SD	n	mean±SD	n	mean±SD
1997	21	15.57±11.85	9	22.22±18.60	31	1.87±1.28	19	21.26±5.02	53	3.62±1.57
1998	9	14.44±6.83	2	57.00±29.69	27	1.66±1.20	10	22.80±6.51	67	4.23±2.19
1999	11	11.18±2.40	3	18.33±13.65	22	1.59±0.90	10	23.30±3.97	33	5.09±1.95
2004	4	18.00±12.78	4	36.25±36.06	6	1.66±0.81	2	26.00±7.07	9	3.77±1.71
2005	4	12.50±2.64	3	13.00±3.00	5	1.40±0.54		no data	17	3.76±2.35
2007	11	18.27±10.39	11	27.00±18.67	12	1.16±0.38	2	36.50±0.70	13	3.61±1.70
2008	12	17.33±7.61	12	25.66±13.59	14	1.28±0.46	7	21.00±2.51	18	3.00±2.22
2009	12	16.58±6.35	12	33.08±18.09	15	1.33±0.48	7	22.57±4.85	19	4.52±3.18
2010	11	31.00±19.92	11	36.00±26.13	16	1.56±0.62	3	21.33±11.23	24	4.50±2.50

The mating management of Thoroughbred horses is strictly regulated by international regulations for racing and breeding on a world scale. Based on that, the possibilities for establishing the oestrus followed by mating of the mare are limited in a period of 5 months, starting from February. Often due to the climate conditions of the calendar year, this period is shortened down to 3 months (from April to June). The data analysis showed a low number of oestrus in 2007 and 2008 (respectively 1.16 ± 0.38 and 1.28 ± 0.46). Higher number of oestrus is observed in 1997; 1998; 1999, 2004 and 2010 (respectively 1.87 ± 1.28 ; 1.66 ± 1.20 ; 1.59 ± 0.90 ; 1.66 and 1.56 ± 0.62).

The definition of oestrus cycle comes down to the period from the beginning of one oestrus to the beginning of the following or from the beginning of one ovulation to the next one. The mean duration for oestrus cycle in mares is known to be between 21 – 23 days. Karadzhov, 1997 defined the reproductive cycle as dependable of the individual features of the mares and characterized with great unevenness. The mean duration of oestrus cycle in different years in our study varied from 21.26 ± 5.02 to 36.50 ± 0.70 days. Karadzhov, 1997 explained the prolonged duration of this trait as a result of hormonal disbalance and health problems. Another reason for prolonged duration of the oestrus might be the lack of signs in the mare's behavior for the presence of oestrus especially during the cold winter months. The prolonged duration of the oestrus cycle observed in 14 cases in this research (16.27%) come as a conformation of our thesis (the duration of the oestrus varied between 41 days and 107.5 days).

The duration of heat is a highly variable trait dependable of the season, breed and the individual features of the mares. In this study the shorter duration of heat period was observed in 2008 – 3.00 ± 2.22 days and the longest in the 1999 – 5.09 ± 1.95 days. When analyzing the data for the minimal and maximal duration of the heat, all the cases with duration over 10 days were excluded. The minimal values were between 1 and 2 days and the maximal between 7 and 10 days. Of all 270 observed heats, 17 cases were with duration values higher than 10 days (between 11 days and 38 days), which expressed in per cent was 6.29% of the total heat's number. In Danubian and Pleven breed mares was reported prolonged heat duration, and as a reason for that the author suggests the presence of hormonal disbalance or occurrence of anaphrodisia during the winter months (Karadzhov, 1997). Too short heat duration the author explains with inadequate detection of mares in heat, which might be a reason first oestrus days not to be registered.

In Figure 1 are presented total number of animals, number of mating mares, average matings per mare and number of foals per year for the studied period. The mean num-

ber of matings per mare varied from 2.80 ± 0.83 in 2005 to 3.89 ± 2.40 in 2009. The minimal and maximal values observed for this trait was respectively 1 and 10 matings. When compared the average number of matings per mare with the number of born foals per year it was visible that these reproductive parameters did not corresponded with each other – with mean number of matings 2.91 ± 2.47 in 1997, there were 11 born foals in 1998. The number of born foals in 2005 was significantly low – just 5 foals with mean number of matings in the previous year 3.60 ± 1.89 .

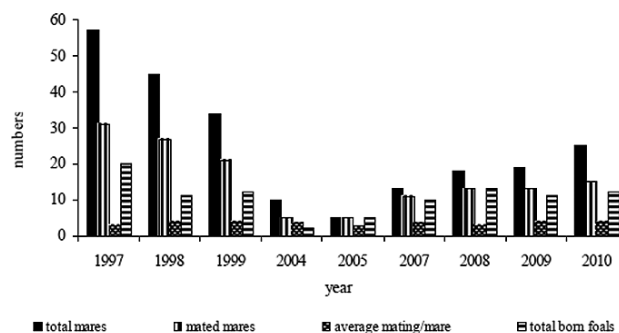


Fig. 1. Average mating/mare and total born foals/year of Thoroughbred mares bred in the national stud farm "Kabiyuk" during the period 1997–2010.

In this case we can affirm that the low number of foals is due to some gaps in the reproductive process in the stud, as well as some biological reasons that need to be examined. Comparing number of mated mares with number of foals, we established that in 2005 there was 100% fertility rate, but the number of mated mares was low – 5 animals. It is noticeable that number of foalings in 2008 (13 foals) was higher than the number of mated mares in 2007 (11 mares), a reason for that mismatch could be, that the date of mating for some mares was not duly registered and only the foaling was entered in the stud records. Based on the data for number of mated mares and number of foalings, we can conclude that the low reproductive efficiency during some of the studied years (1997-1999) is due to some organizational problems in the mating management in the stud.

The correlation analysis presented in Table 2, shows high positive correlation between duration of oestrus cycle and number of matings – $r_p = 0.9503$ ($P < 0.001$) and also between duration of foal heat and number of foals $r_p = 0.8313$ ($P < 0.001$). There is a moderate positive relationship between duration of oestrus and heat $r_p = 0.5770$ ($P < 0.01$) and duration of heat and number of matings $r_p = 0.5256$ ($P < 0.01$), as well as between foaling-to-conception interval and number of oestrous per year $r_p = 0.4109$ ($P < 0.05$). These de-

Table 2. Relationship between the studied traits of Thoroughbred mares bred in the national stud farm "Kabiyuk" during the period 1997–2010.

Traits	Foaling-to-conception interval	Oestrus cycles per year	Duration of oestrus	Duration of heat	Number of matings	Number of foals
foal heat	-0.249	-0.085	-0.135	-0.111	-0.115	0.831***
foaling-to-conception interval		0.410*	-0.004	-0.124	0.040	0.015
oestrous cycles per year			-0.065	-0.280	-0.148	0.012
duration of oestrus				0.577**	0.950***	-0.228
duration of heat					0.525**	-0.227
number of matings						-0.226

*(P < 0.01), **(P < 0.001), ***(P < 0.0001)

pendences are physiological conditioned as the long duration of oestrus is connected with extended heat period and more matings in this period.

Conclusion

The reproductive parameters of Thoroughbred mares bred in the national stud farm "Kabiyuk" during the period 1997–2010 vary in wide limits – interval of foal heat (11.18±2.40-31.00±19.92 days) and foaling-to-conception (13.00±3.00-57.00±29.69 days), number of oestrus cycles (1.16±0.38-1.87±1.28), mating of mares (2.80±0.83-3.89±2.40) and total born foals (2-20) per year, duration of oestrus (21.00±2.51-26.00±7.07 days) and heat (3.00±2.22-5.09±1.95 days).

The positive correlations were found between duration of oestrus cycle with number of matings per year and duration of heat, duration of heat and number of matings per year, foaling-to-conception interval with number of foals and foaling-to-conception interval and number of oestrus cycles per year.

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