

**THE ANALYSIS OF REPRODUCTION INDICES IN THE
TRANSYLVANIAN HALF-HEAVY HORSE BREED IN
BECLEAN STUD FARM**

**ANALIZA UNOR INDICI REPRODUCTIVI LA SEMIGREUL
DE TRANSILVANIA DIN HERGHELIA BECLEAN**

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The values of the main reproduction indices for the Transylvanian half-heavy horse material from Beclean stud farm are presented and analysed in this paper. The analysis is based on the data obtained from the evidence of the reproduction activity of 126 mother mares, data recorded in the period between 2000 and 2006. The most significant indices have been rated, as the number of cycles/gestation, the number of matings/gestation, service-period (SP), gestation period (GP) and the period between bringing forth. The studied indices have been determined based on the number of bringing forth, on genealogical lines and on the entire population and according to the male stud used for mating. The connection between the puerperal period and the main reproduction indices has also been estimated. The average values of the analysed reproduction indices show a normal evolution of the reproduction function for the Transylvanian half-heavy mother mares, a value that can be highlighted by creating some absolute accordance between the biological requests of this breed and the technological conditions which are provided for them.

Key words: Transylvanian half-heavy breed, reproduction indices.

Introduction

The literature provides us certain and precise data regarding the reproduction indices for the horse breed (3, 4, 5, 6). The research in this domain has proved that the birth rate and the fertility for the horse breeds are lower comparing to other animals from the farm, due to the morpho-physiological features typical for this breed as well as to the biological reproduction potential, both for females and males.

Materials and Methods

The research took place at Beclean stud-farm, during the years 2000-2006, on a number of 126 mother mares.

Based on the initial information obtained from the livestock evidence, regarding the reproduction activity in this stud-farm, the most significant reproduction indices have

been elaborated, as the number of cycles/gestation, the number of mating/gestation, service-period (SP), gestation period (GP) and the period between foalings, as well as the phenotypic correlations between the duration of the puerperal period and the determined indices. The mentioned indices have been estimated for a year, on genealogical lines, foaling and taking into consideration the entire horse population.

Results and Discussions

The average values of the reproduction indices for the Transylvanian half-heavy mother mares recorded on a total number of foalings are of 1.73 heat cycles/gestation, 5.81 mating/gestation, SP duration of 210.32 days and a gestation duration of 34.67 days. The time between foalings was 555.99 days.

The number of heat cycles/gestation varies from one foaling to another, which proves that the environment factors have a strong influence on this parameter, its highest value being 2.5 cycles/gestation at the first foaling.

The number of mating/gestation varies obviously from one foaling to another, noticing the existence of straight connection between the number of estral cycles and this parameter.

The duration of a gestation is quite constant during the reproductive life, its average value being of 345.67 days, varying between 351.35 days recorded at the 4th gestation and 337.67 days at the 6th gestation.

The service-period has values between 315.89 days at the second gestation and 127.20 days at the 7th gestation. The maximum value of this parameter reached at the second gestation is due to the saturation of both gestation and lactation of the mother body, which is in a fully ageing process.

The time between foalings – mainly influenced by the service-period – has a similar evolution as the service-period, varying between 665.11 days at the second foaling and 458.91 days at the 9th foaling and over.

The estimates regarding the variability of the analysed indices are within normal parameters, the highest variability being recorded during the service-period and the lowest during the gestation, which all prove the influence of the environment, being also genetically determined while the number of heat cycles and mating/gestation, service-period and the time between foalings are all influenced almost exclusively by the environment, without any important genetic determination.

In what concerns the yearly dynamics of the reproduction indices (Table 1) we can notice that they vary from one year to another, so the number of heat cycles and mating/gestation number in the year 2000-2001 reaches the lowest value, while the service-period records the highest value in 2003-2004 and the lowest during 2005-2006. The duration of the gestation is mainly constant during the 6 years and the foaling interval has a simultaneous evolution with the SP, the highest value being recorded during the years 2003-2004, and the lowest value during 2005-2006.

The differences of these reproductive indices during a year are mainly due to more factors that differ from one year to another, as for example the social deficiency, the technological deficiency and so on.

Table 1

The reproduction indices according to foaling

Reproduction	Foaling	n	X±SEM	s ²	SD	V%
The number of heat cycles	I	22	2.50±0.21	0.93	0.96	38.54
	II	19	2.47±0.28	1.49	1.22	49.27
	III	19	1.47±0.21	0.82	0.90	61.40
	IV	20	1.20±0.12	0.27	0.52	43.60
	V	12	1.25±0.13	0.20	0.45	36.18
	VI	12	1.58±0.29	0.99	1	62.92
	VII	10	1.10±0.10	0.10	0.32	28.75
	VIII	6	2.0±0.37	0.80	0.89	44.72
	IX and over	6	1.17±0.17	0.17	0.41	34.99
Total	126	1.73±0.09	1.00	1.00	57.76	
The number of mating	I	22	8.82±1.07	25.39	5.04	57.15
	II	19	9.32±1.45	39.67	6.30	67.61
	III	19	5.21±0.76	10.95	3.31	63.52
	IV	20	3.85±0.51	5.29	2.3	59.75
	V	12	3.50±0.47	2.64	1.62	46.39
	VI	12	4.33±0.86	8.97	2.99	69.11
	VII	10	3.30±0.5	2.46	1.57	47.49
	VIII	6	6.33±1.33	10.67	3.27	51.57
	IX and over	6	3.33±0.56	1.87	1.37	40.99
Total	126	5.81±0.40	19.72	4.44	76.45	
Service period	I	22	-	-	-	-
	II	19	315.89±52.88	53133.88	230.51	72.97
	III	19	179.95±38.76	28551.61	168.97	93.90
	IV	20	168.15±50.41	50824.98	225.44	134.07
	V	12	127.67±58.28	40760.79	201.89	158.14
	VI	12	257.75±83.83	84335.27	290.41	113.00
	VII	10	127.20±46.78	21885.51	147.94	116.30
	VIII	6	270.33±111.55	74659.47	273.24	101.07
	IX and over	6	263.17±154.2	142672.97	377.72	143.53
Total	104	210.32±22.82	54137.40	232.67	110.63	
The duration of the gestation	I	22	345.68±3.30	240.13	15.50	4.48
	II	19	349.21±4.60	402.73	20.07	5.75
	III	19	345.21±2.24	95.51	9.77	2.83
	IV	20	351.35±4.73	446.77	21.14	6.02
	V	12	343.42±3.60	155.54	12.47	3.63
	VI	12	337.67±3.13	117.88	10.86	3.22
	VII	10	342.9±2.72	73.88	8.6	2.51
	VIII	6	340.33±1.76	18.67	4.32	1.27
	IX and over	6	347.5±5.21	162.7	12.76	3.67
Total	126	345.67±1.36	232.51	15.25	4.41	
The time between foalings	I	22	-	-	-	-
	II	198	665.11±53.56	54503.21	233.46	35.10
	III	19	525.16±37.86	27238.70	165.04	31.43
	IV	20	519.95±50.61	51221.00	226.32	43.57
	V	12	471.08±55.48	36939.72	192.20	40.80
	VI	12	594.67±85.25	87218.24	295.33	49.66
	VII	10	470.10±48.21	23241.43	152.45	32.43
	VIII	6	610.67±111.78	74963.47	273.79	44.84
	IX and over	6	458.91±26.68	89693.89	299.49	62.10
Total	104	555.99±22.86	54353.52	233.14	41.93	

From the analysis of the data regarding the reproduction indices on genealogical lines (Table 3) we can notice the obvious differences between the genealogical lines inside the Transylvanian half-heavy breed. Therefore, regarding the number of cycles/gestation related to the average population value of 1.74 cycles/gestation on genealogical lines, the average values reach between 1.20 cycles/gestation for the Fariseu line and 2.42 cycles/gestation for the Bun Venit (Welcome) line.

Table 2

The dynamics of the reproduction indices for the Transylvanian half-heavy breed

The reproductive indices	Year	n	X±SEM	s²	SD	V%
The number of heat periods	2000-2001	25	1.52±0.18	0.84	0.92	60.42
	2001-2002	19	1.89±0.29	1.54	1.24	65.58
	2002-2003	25	1.76±0.18	0.77	0.88	49.97
	2003-2004	13	2.15±0.25	0.81	0.90	41.73
	2004-2005	26	1.62±0.21	1.13	1.0	65.69
	2005-2006	18	1.67±0.23	0.94	0.97	58.21
	2000-2006	126	1.73±0.09	1.00	1.00	57.76
The number of matings	2000-2001	25	4.28±0.67	11.29	3.36	78.52
	2001-2002	19	5.63±0.84	13.36	3.65	64.9
	2002-2003	25	4.8±0.52	6.75	2.6	54.13
	2003-2004	13	7.62±1.03	13.76	3.71	48.70
	2004-2005	26	7.54±1.27	41.78	6.46	85.74
	2005-2006	18	5.72±1.11	22.21	4.71	82.36
	2000-2006	126	5.81±0.40	19.72	4.44	76.45
Service-period	2000-2001	25	196.5±59.47	70738.89	265.97	135.35
	2001-2002	19	149.12 ±35.73	21702.36	147.43	98.9
	2002-2003	25	204.00±45.37	41173.37	202.91	99.47
	2003-2004	13	288.08±79.43	75717.36	275.17	95.52
	2004-2005	26	281.25±50.38	60906.37	246.79	87.75
	2005-2006	19	93.42±60.77	44315.90	210.51	225.35
	2000-2006	104	210.32±22.82	54137.40	232.67	110.63
The duration of the gestation	2000-2001	25	340.36±2.11	2661.76	110.91	10.53
	2001-2002	19	339.47±2.15	87.93	9.38	2.76
	2002-2003	25	344.2±1.89	88.89	9.43	2.74
	2003-2004	13	353.38±6.73	589.42	24.28	6.87
	2004-2005	26	349.46±3.65	346.90	18.63	5.33
	2005-2006	18	350.44±3.57	229.56	15.15	4.32
	2000-2006	126	345.67±1.36	232.51	15.25	4.41
The foaling interval	2000-2001	25	520.15±64.41	82978.56	288.06	55.38
	2001-2002	19	487.00±36.30	22400.13	36.30	30.73
	2002-2003	25	550.35±45.67	41710.98	204.29	37.11
	2003-2004	13	638.92±79.15	75179.54	274.19	42.91
	2004-2005	26	630.88±50.05	60127.68	245.21	38.87
	2005-2006	18	443.83±61.23	44984.15	211.80	47.63
	2000-2006	104	555.99±22.86	54353.52	233.14	41.93

Except for the Bolid line where the average value of this parameter was 1.37 cycles/gestation, in the other lines it reaches an average number of cycles/gestation similar to the average value recorded by the entire population. Similar aspects can also be traced when it comes to the number of mating number/gestation, related to the average value recorded by the population of 5.81 mating/gestation, the lowest values being recorded for the Fariseu and Bolid lines, 3.80 and 3.87 mating/gestation, respectively and the highest for the Bun Venit line, 10.28

mating/gestation; and regarding the service period related to the average value of the population of 160.45 days, the lowest values being recorded for the Bolid and Fariseu lines, of 65.00 and 90.40 days, respectively and the highest values for the Bun Venit line, of 274.28 days and the Belga 40 line of 251.33 days.

Table 3

The average values and the variability of the reproduction indices on genealogical lines

The reproduction indices	The line	n	X±SEM	s ²	SD	V%
The number of gestation periods	SATELIT	31	1.74±0.185	1.064	1.031	59.25
	BUN VENIT	7	2.42±0.396	1.102	1.049	43.34
	SULTAN	24	1.75±0.242	1.413	1.188	67.88
	BOLID	8	1.37±0.263	0.553	0.744	54.10
	BELGA 40	13	1.76±2.280	1.025	1.012	57.50
	IZVIN	13	1.76±0.280	1.025	1.012	57.50
	HAI	12	1.66±0.224	0.606	0.778	46.86
	TRANDAFIR	14	1.78±0.280	1.104	1.050	58.98
	FARISEU	5	1.20±0.199	0.200	0.447	37.25
	TOTAL	127	1.74±0.088	1.019	1.009	57.98
The number of matings/gestation	SATELIT	31	5.16±0.568	10.373	3.220	62.40
	BUN VENIT	7	10.28±1.621	18.404	4.290	41.73
	SULTAN	24	6.45± 1.044	26.172	5.115	79.30
	BOLID	8	3.87±0.894	6.410	2.531	65.40
	BELGA 40	13	5.15±0.963	12.057	3.472	67.37
	IZVIN	13	6.69±0.454	2.685	1.638	24.48
	HAI	12	5.16±0.767	7.060	2.657	51.49
	TRANDAFIR	14	6.07±0.748	7.840	2.800	46.12
	FARISEU	5	3.80±0.799	3.200	1.788	47.05
	TOTAL	127	5.81±0.338	14.519	3.810	65.57
Service period	SATELIT	31	153.16±35.819	39763.873	199.408	130.19
	BUN VENIT	7	274.28±99.882	69795.571	264.188	96.32
	SULTAN	24	172.00±48.768	57059.304	238.870	138.87
	BOLID	8	65.00±35.557	10111.714	100.557	154.70
	BELGA 40	13	251.33±81.120	78961.70	281.001	111.80
	IZVIN	13	103.22±48.898	21519.440	146.695	142.11
	HAI	12	175.41±66.160	52523.901	229.180	130.65
	TRANDAFIR	14	171.35±53.642	40292.555	200.730	117.14
	FARISEU	5	90.40±48.949	11979.800	109.452	121.07
	TOTAL	127	160.45±18.880	44911.660	211.920	132.07
The duration of the gestation	SATELIT	31	342.74±1.984	122.064	11.048	3.22
	BUN VENIT	7	353.14±12.893	1163.143	34.104	9.66
	SULTAN	24	341.58±3.306	262.343	16.197	4.74
	BOLID	8	346.25±1.666	22.214	4.713	1.36
	BELGA 40	13	347.76±3.095	124.533	11.159	3.20
	IZVIN	13	350.38±0.277	525.425	22.922	6.54
	HAI	12	341.75±2.977	106.390	10.314	3.02
	TRANDAFIR	14	351.50±3.521	173.653	13.177	3.74
	FARISEU	5	339.20±2.922	42.700	6.534	1.92
	TOTAL	127	345.34±1.379	241.990	15.550	4.50
The time between foalings	SATELIT	31	473.12±41.395	53107.05	230.449	48.70
	BUN VENIT	7	627.42±154.240	166436.58	407.966	76.58
	SULTAN	24	440.12±65.468	102827.85	320.667	72.85
	BOLID	8	411.25±35.062	9832.5	99.158	24.11
	BELGA 40	13	542.75±103.746	129153.48	359.379	66.21
	IZVIN	13	451.44±54.819	27046.287	164.457	36.42
	HAI	12	432.66±94.821	107888.06	328.463	75.91
	TRANDAFIR	14	474.42±72.337	73271.653	270.687	57.05
	FARISEU	5	429.60±49.875	12437.300	111.522	25.95
	TOTAL	127	450.84±25.019	78862.670	280.820	62.28

The differences of genealogical lines regarding the duration of the gestation are low and non-significant and compared to the average value of the entire population of 345.34 days, they are situated between 339.20 days in the Fariseu line and 353.14 days in the Bun Venit line. The time between foalings was determined mainly by the duration of the service period and presents its highest value in the Bun Venit line 582.71 days and the lowest of 429.60 days in the Fariseu line.

The differences recorded by the reproduction indices on genealogical lines can be due to a series of genetic factors or to the environment, as it is the degree of family relationship between the individuals who mate, the general and special genetic combination, the frequency of the anovulative heat and the embryo abortion, the observation in time of the heat periods, the fertile ability of the seminal materials and so on.

Table 4

The reproduction indices related to the stud used for mating

The reproduction indices	The line	n	$\bar{X} \pm \text{SEM}$	s^2	SD	V%
The number of cycles/ gestation	HIBRID	25	212±023	136	1.17	55.01
	H AidAM	27	141±0.15	0.64	0.80	56.63
	JABOU	45	189±0.16	1.19	1.09	57.80
	KAJAN	22	159±0.18	0.73	0.85	53.68
	TUNEL	6	1.17±0.16	0.17	0.41	34.99
	TOTAL	125	1.74±0.08	1.02	1.01	57.98
The number of matings/ gestation	HIBRID	25	7.20±1.07	28.67	5.35	74.36
	H AidAM	27	3.78±0.18	0.83	0.91	24.16
	JABOU	45	6.29±0.51	11.60	3.41	54.15
	KAJAN	22	6.59±0.56	6.78	2.60	39.50
	TUNEL	6	3.50±0.72	3.10	1.76	50.31
	TOTAL	125	5.81±0.34	14.52	3.81	65.57
Service period	HIBRID	25	154.28±39.33	38672.38	196.65	127.46
	H AidAM	27	115.19±34.58	32287.16	179.69	156.00
	JABOU	45	204.42±34.09	52308.43	228.71	111.88
	KAJAN	22	179.45±51.90	59263.59	243.44	135.66
	TUNEL	5	176±2.11	22.3	4.72	32.17
	TOTAL	124	160.45±18.88	44911.66	211.92	132.07
The duration of the gestation	HIBRID	25	348.76±3.22	258.61	16.08	4.61
	H AidAM	27	337.81±2.16	126.23	11.24	3.33
	JABOU	45	343.31±1.83	149.90	12.24	5.57
	KAJAN	22	354.59±4.73	491.40	22.17	6.25
	TUNEL	6	345.50±2.25	30.30	5.50	1.59
	TOTAL	125	345.34±1.38	241.99	15.55	4.50
The time between foalings	HIBRID	25	403.16±61.16	93500.06	305.78	75.85
	H AidAM	27	391.59±49.59	66397.79	257.68	65.80
	JABOU	45	516.64±40.56	74036.19	272.10	52.67
	KAJAN	22	487.77±65.85	95389.33	308.85	63.32
	TUNEL	5	361.60±60.30	34.3	8.575	2.37
	TOTAL	125	450.84±25.02	78862.67	280.82	62.28

We consider that it is highly recommended to observe carefully these factors and especially the degree of family relationships between the mating individuals.

The analysis of the data regarding the reproduction indices presented by the mother mares according to the main stud they have mated with (Table 4) show that there are obvious differences between all the analysed indices. Therefore, the average

value of the number of cycles/gestation is situated between 1.7 in the case of the Tunel stud and 2.12 cycles/gestation in the case of the Hybrid stud; the number of matings/gestation is between 3.50 in the case of the Tunel stud and 7.20 in the Hybrid stud; the service-period is between 17.60 days in the case of the Tunel stud and 204.42 days for the Jabou stud; the duration of the gestation is situated between 337.81 days in the Kajan stud and the time between foalings is between 361.60 days in the case of the Tunel stud and 516.64 days in the Jabou stud.

According to the average value recorded for all the reproduction indices which reflect the fertility ability of the reproductive individual, with the best results in the group of mother mares of the Tunel stud, followed by the Haidam stud and the Jabou stud and the lowest results are typical for the Hybrid stud and the Kajan stud.

The correlation between the puerperal period and the main reproduction indices has also been assessed, observing a number of 102 mother mares, grouped on different categories: 60 pregnant mother mares in the season when they were foaling and 42 plain mares in the season when were foaling.

The relationship between the puerperal period and the number of heat cycles regarding the entire stud farm is positive and distinctively significant, the correlation coefficient being of 0.28.

The correlation between the puerperal period and the service-period, both in the 60 pregnant mother mares in the foaling season and for the 42 plain mares in the foaling season, as well as for the entire horse population is positive and highly significant, situation which can also be encountered in the case of the correlation between the puerperal period and the foaling interval.

Table 5

The correlation between the puerperal period and the main reproduction indices

The correlation between the puerperal period (foaling-mating) and	Pregnant mare mothers in the foaling season 60 mares			Plain mares in the foaling season 42 mares			The total number of mares 102 mares		
	r ± sr	t		r ± sr	t		r ± sr	t	
The number of heat cycles	-0.12 ± 0.13	0.43	non-signif	-0.31 ± 0.14	2.06	+	0.28 ± 0.09	2.89	++
The service - period	0.73 ± 0.06	8.22	+++	0.99 ± 0.00	36.15	+++	0.99 ± 0.00	94.40	+++
The duration of the gestation	-0.17 ± 0.13	1.35	non-signif	-0.18 ± 0.15	1.17	non-signif	-0.03 ± 0.10	0.32	non-signif
The foaling interval	0.65 ± 0.08	6.47	+++	0.98 ± 0.01	31.23	+++	0.99 ± 0.00	81.84	+++

The relationship between the puerperal period and the duration of the gestation always was negative and non-significant, the correlation parameter recording a value of -0.17 in the case of the plain mares in the foaling season and of -0.03 in the case of the entire horse population.

Conclusions

1. The reproduction indices in the Transylvanian half-heavy horse breed analysed in their dynamics during their life are situated within the normal parameters typical for this breed;

2. The analysis of the reproduction indices reveal differences mainly caused by the influence of the environment, factors which have changed from one year to another;

3. The duration of the gestation is weekly influenced by the environment but it is strongly influenced by the genetic factors while the number of heat cycles and of matings/gestation, the service-period and the time between foalings are strongly influenced by the environment and weakly influenced by the genetic factors.

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În lucrare sunt prezentate și analizate valorile principalilor indici reproductivi la materialul cabalin Semigreu de Transilvania din Herghelia Beclean, stabilite pe baza datelor din evidență a activității de reproducție a 126 iepe mame, înregistrate în perioada 2000-2006. S-au calculat cei mai semnificativi indici de reproducție, respectiv numărul de cicluri/gestație, numărul montelor/gestație, service-periodul (SP), durata gestației (DG) și intervalul între fătări. Indicii analizați s-au determinat pe fătări, pe linii genealogice și pe întreaga populație și în funcție de armăsarul utilizat la montă. S-a calculat de asemenea, corelația dintre perioada puerperală și principalii indici de reproducție. Valorile medii ale indicilor de reproducție analizați evidențiază o evoluție normală a funcției de reproducție la iepele Semigreu de Transilvania, valoare ce poate fi pusă în evidență prin realizarea unor concordanțe depline între cerințele biologice ale rasei și condițiile tehnologice asigurate.

Cuvinte cheie: Semigreu de Transilvania, indici reproductivi.