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The effects of inbreeding on service period and pregnancy length in Holsteins and Czech Fleckviehs after the first calving

Abstract

The effects of inbreeding level on service period (SP) and pregnancy length (PL) were monitored in Holstein and Czech Fleckvieh after the first calving. The levels of inbreeding (F_X) ranged from 1.25 to 25 %. SP and PL of inbred cows were compared with their outbred equals – half-sisters, sharing the same sire (n = 1824) and their first calving happened in the same farm and at the same time (± 3 month). Database with the number of 631 810 animals (year of calving 1985–2004) was used for analyses. Inbred cows were grouped according to F_x coefficient (1.5-2.3 %; 3.0-5.0 %; 8.0-12.5 %; 25 %). The GLM with fixed effects (the breed, breeding value of the sire and monitored individual for milk production, year of calving, age at first calving) was applied to all data. The effect of inbreeding depression on SP was more pronounced at higher levels of inbreeding (+2.81; +3.35; +4.53; +8.23 d, respectively according to above mentioned F_x groups) but non-significant. Differences in PL (+0.3; +0.32; -0.08 and 1.68 d) were not significant either. Average value of PL for inbred animals was 0.43 d higher. The correlation coefficient was +0.023 for SP and +0.0658 for PL. The F_x coefficient increasing by 1 % extends the SP by 0.22 day and PL by 0.063 day. There was a higher variability of SP and PL in inbred cows. The length of calving interval between the first and second lactation is affected more by SP than PL.

Key Words**:** inbreeding, inbreeding depression, service period, pregnancy length, Czech Fleckvieh cattle, Holstein cattle

Zusammenfassung

Titel des Arbeit: **Der Einfluss von Inzucht auf die Länge der Serviceperiode und die Trächtigkeitsdauer bei Kühen der Rassen Holstein und Tschechisches Fleckvieh nach der ersten Kalbung**

Bei Erstlingskühen der Rassen Tschechisches Fleckvieh und Holstein wurde die Wirkung des Inzuchtgrades auf die Merkmale „Länge der Serviceperiode“ und „Trächtigkeitsdauer“ untersucht. Der Inzuchtgrad variierte zwischen 1,25 und 25%. Die Länge der Serviceperiode und die Trächtigkeitsdauer der Inzuchtkühe wurden mit denen ihrer Nichtinzucht-Halbschwestern verglichen (n=1824). Bei den Halbschwestern handelte es sich um Zeit- und Stallgefährtinnen.

Es wurden 631 810 Kühe, die in den Jahren 1985–2004 geboren wurden, erfasst. Die Inzuchtkühe wurden nach dem Inzuchtkoeffizienten (F_x) in vier Gruppen geteilt (1,5-2,3%; 3,0-5,0%; 8,0-12,5%; 25%). Die Auswertung erfolgte mit dem Programm PROC GLM of SAS®. Fixe Effekte waren die Rasse, der Zuchtwert des Vaters für Milchleistung, der Zuchtwert der Kuh, das Geburtsjahr und das Alter bei der ersten Kalbung.

Im Ergebnis der Untersuchungen hatten Inzuchtkühe eine verlängerte Serviceperiode, die mit Erhöhung des Inzuchtgrades stieg (+2,81; +3,35; +4,53; +8,23 Tage). Die Differenz zwischen Inzucht- und Nichtinzucht-Kühen betrug bei der Trächtigkeitsdauer +0,3; +0,32; -0,08 und 1,68 Tage. Sie war jedoch nicht statistisch gesichert. Eine Erhöhung des Inzuchtkoeffizienten um 1% (Regressionskoeffizient) ergab eine Verlängerung der Serviceperiode und der Trächtigkeitsdauer von 0,22 und 0,063 Tagen. Die Zwischenkalbezeit (zwischen der ersten und zweiten Laktation) wurde mehr von der Länge der Serviceperiode beeinflusst als von der Trächtigkeitsdauer.

Schlüsselwörter: Inzucht, Inzuchtdepression, Serviceperiode, Trächtigkeitsdauer, Kühe der Rasse Tschechisches Fleckvieh, Kühe der Rasse Holstein

Introduction

Inbreeding is consider one of the most important factors affecting the genetic structure and performance of breeding population (BIEDERMANN et al. 2003, 2004) Inbreeding has been studied as a specific question in small populations (KALLWEIT and BAULAIN, 2001; WOKAC, 2003; KHAN et al., 2007) and a general problem of breeding work (FREYER et al., 2005; PIRCHNER, 2004). SMITH et al. (1998) stated that the increasing of inbreeding coefficient (F_x) per 1 % increased age at the first calving by +0.55, prolonged the first calving interval by +0.31 d and reduced the productive life by 6 days. CASSELL et al. (2003) found out in Holstein livestock in the USA that the F_x increasing of 1 % extended service period of 0.15 d. However, this increase was evaluated as non-significant. HERMAS et al (1987) studied impacts of different inbreeding levels within the interval F_x 0-25.3 %. This experiment was carried out in Guersey cattle. The authors concluded that due to the inbreeding increase of 1% service period elongated of 2.3 day. Deterioration of reproduction traits was traced by WALL et al. (2005), who mentioned the increase of the calving interval of 2.8 day at 10% inbreeding level. The impact of inbreeding on reproduction traits in Slovak Fleckvieh livestock has been studied by BELLÉR et al. (1974). F_x coefficient level was 12.5%. The experimental and control group achieved the same values for the age at the first calving. Beside, the length of the calving interval in inbred animals was shorter (423 days) than in outbred cows (459 days). MIKŠÍK et al. (1978) calculated a significant evidential gravidity decrease of the pregnancy length after the first insemination with inbred mate, where the pregnancy dropped of 6.9 %. However, there was no difference in insemination index between inbred and outbred cows. Beside, the authors draw attention to the fact that fertility is considerably affected by different external factors. AHMAD et al. (1973) advert to non-significant shortening of reproduction traits. Authors calculated decrease in the age at first calving (1.2 d) and shortening of the first calving interval (1.1 d) with the increase F_x of 1 %. THOMPSON et al. (2000 a, 2000 b) evaluated the impact of inbreeding in Holstein and Jersey livestock. Inbred cows with F_x > 10% showed increasing in the age at first calving of 25 days in Jerseys and 26 days in Holsteins. Female fertility in Holsteins measured by length of service period studied HOESCHELE (1991). She evaluated the service period prolongation of 2.6 d for F_x = 25 %. Some of the above mentioned authors assess service period and pregnancy length as one trait – the calving interval. The aim of this work was to evaluate the impact of inbreeding level on service period and pregnancy length in cows after the first calving separately. This method allows a more analytical consideration of performance.

Materials and methods

In this work, data included cows calved in years 1985-2004 at farms in the Czech Republic. Processing of breeding values data and monitoring of reproduction traits was finished toward June 2005. Calculations were performed on 631 810 Holstein and Czech Fleckvieh cows. For the proper comparison each inbred cow (the range of F_x coefficient 1.5-25%) was assigned to at least one outbred equal (1.824 equals in sum). Inbred cows with their outbred equals were matched on characteristics such as (1) identical father, (2) first calving interval occurs in the same farm and (3) first calving happened in the same year and period (± 5 months). Inbred cows and their matched

outbred equals were subsequently divided according to the inbreeding coefficient of inbred cows into four groups (F_x= 1.5-2.3%, F_x= 3.0-5.0%, F_x= 8.0-12.5%, F_x= 25.0%). The level of inbreeding – inbreeding coefficient F_x was calculated as follows (WRIGHT, 1922)

$$\mathbf{F_x = \Sigma\ 0.5^{n+ń+1}(1+F_a)}$$

Σ = sum over all path through to common ancestor
n = the number of generations from the sire to the common ancestor
n´ = the number of generations from the dam to the common ancestor
F_a = the inbreeding coefficient of the common ancestor

Data were analysed using PROC GLM of SAS®. The effects of inbreeding and other factors were estimated from the model as follows:

$$Y_{ijklmn} = \mu + I_i + B_j + BVS_k + BVM_l + CY_m + \mathrm{CAg_n} + e_{ijklmn}$$

Y_{ijklmn} = corrected value of the reproduction trait
μ = mean value
I = F_x coefficient level (1=25.0 %; 2=8.0-12.5 %; 3=3.0-5.0 %; 4=1.5-2.3 %)
B = breed (Holstein cattle; Czech Fleckvieh cattle)
BVS = breeding value of the sire for milk production (≤400; 401-800; 801≥)
BVM = breeding value of the monitored individual for milk production (≤ 1; 1-250; 251≥)
CY = year of calving (till year 1997; 1998-2000; 2001-2004)
CA= age at first calving /in months/ (≤ 25.0; 25.1-27.0; 27.1≥)
e = residual error.

Calculations were processed for inbred cows and outbred equals separately. A following comparison of average values between outbred and inbred groups of the same F_x level has been made.

Results and Discussion

Variability in service period across the used effects and groups of inbred and outbred cows is mentioned in Tables 1 and 2.
There is obvious the significant difference between Holstein and Czech Fleckvieh in the length of service period. Similarly, the length of service period differs among groups defined by breeding values for milk production of sire or monitored individual. Some of these differences were significant on p≤0.01. It corresponds to generally known correlations, where the increase of milk efficiency leads to deterioration in reproductive performance. There is an evident increase of the service period for inbred animals in comparison of the outbred ones (Tab. 3).

Table 1
Variability in service period of inbred cows after first calving– allocated into groups according to the level of inbreeding - for each model effect separately (days) (Variabilität der Länge der Serviceperiode der Inzuchtkühe nach erster Kalbung – gegliedert nach Inzuchtgrad und Untersuchungsmodellen)

Effects		F_x = 1,5 – 2,3% LSM±SE	F_x = 3,0 – 5,0% LSM±SE	F_x = 8,0–12,5% LSM±SE	F_x = 25,0% LSM±SE	All animals LSM±SE
F_x	1					126,16±6,89
	2					116,06±6,93
	3					119,91±3,81
	4					117,03±5,92
	p					n.s.
Breed	1	126,67±5,65	131,80±4,71	133,94±10,24	126,62±10,33	131,02±3,42
	2	76,63±20,74	105,63±7,99	94,39±14,88	130,21±12,01	108,56±5,66
	p	1-2*	1-2*	1-2*	n.s.	1-2*
BVS	1	93,41±13,20	103,60±8,03	94,37±15,70	114,28±13,53	106,77±5,13
	2	102,35±14,15	114,47±7,20	118,64±14,20	131,46±13,84	119,71±5,31
	3	109,20±13,82	138,08±7,46	129,47±15,13	139,51±16,45	132,89±5,45
	p	n.s.	1-3** 2-3**	n.s.	n.s.	1-3** 2-3**
BVM	1	94,71±14,302	118,40±7,05	127,71±16,16	115,95±12,08	117,00±5,10
	2	85,84±12,72	108,62±6,92	106,62±14,49	141,93±12,80	112,51±4,92
	3	124,41±13,78	129,11±6,54	108,16±13,99	127,38±18,03	129,86±5,10
	p	2-3**	2-3*	n.s.	n.s.	2-3**
CY	1	94,80±13,60	125,83±6,79	119,96±12,34	119,58±10,20	119,22±4,56
	2	118,00±12,00	116,51±5,74	105,84±15,76	127,89±18,76	121,51±4,87
	3	92,16±14,91	113,80±7,50	117,08±15,00	137,77±15,69	118,64±5,57
	p	n.s.	n.s.	n.s.	n.s.	n.s.
CA	1	94,19±14,36	110,50±7,17	110,72±13,77	113,79±19,15	111,78±5,38
	2	109,58±13,33	112,28±6,59	110,58±15,91	130,86±11,99	118,87±4,93
	3	110,59±13,62	123,20±6,86	109,19±16,22	126,05±13,86	121,99±5,36
	4	92,25±16,06	128,87±8,72	126,17±17,60	142,96±14,14	126,52±6,04
	p	n.s.	n.s.	n.s.	n.s.	n.s.

* $p \leq 0.05$; ** $p \leq 0.01$; n.s. = non significant

Table 2
Variability in service period of outbred cows after first calving– allocated into groups according to the level of inbreeding of their inbred equals - for each model effect separately (days) (Variabilität der Länge der Serviceperiode der Nicht-Inzuchtkühe nach erster Kalbung – gegliedert nachUntersuchungsmodellen)

Effects		F_x = 1,5 – 2,3% LSM±SE	F_x = 3,0 – 5,0 % LSM±SE	F_x = 8,0 – 12,5% LSM±SE	F_x 25,0% LSM±SE	All animals LSM±SE
Breed	1	124,33±4,64	124,60±4,03	116,41±7,67	113,33±7,58	121,99±2,47
	2	100,98±16,58	119,28±6,64	101,12±11,31	104,86±8,39	114,17±4,31
	p	n.s.	n.s.	n.s.	n.s.	n.s.
BVS	1	108,15±10,63	114,33±6,61	117,01±10,51	107,51±9,68	113,81±4,03
	2	104,98±11,24	122,48±5,98	104,91±10,21	104,13±9,99	115,34±3,99
	3	124,84±11,99	129,01±6,21	104,38±11,97	115,65±11,83	125,10±4,27
	p	n.s.	n.s.	n.s.	n.s.	n.s.
BVM	1	99,08±11,94	118,38±5,77	102,84±12,35	97,42±9,54	109,68±4,06
	2	114,66±10,24	112,79±5,51	87,17±11,53	114,70±7,36	113,16±3,59
	3	124,23±11,20	134,64±5,62	136,28±9,70	115,16±13,64	131,40±3,96
	p		1-3* 2-3**	1-3* 2-3**		1-3** 2-3**
CY	1	104,49±10,86	124,18±5,33	129,37±9,82	111,02±8,15	120,59±3,48
	2	115,81±9,57	121,08±4,80	118,38±10,75	122,81±12,34	120,73±3,49
	3	117,68±12,11	120,55±6,33	78,55±11,06	93,44±11,90	112,93±4,35
	p	n.s.	n.s.	1-3** 2-3**	n.s.	n.s.
CA	1	123,95±11,89	125,49±6,40	116,41±11,35	113,08±11,84	124,12±4,42
	2	108,06±10,07	122,21±5,05	109,80±11,69	120,39±8,93	119,75±3,52
	3	116,74±10,63	119,07±5,69	111,64±11,15	111,46±10,76	117,43±3,93
	4	101,87±13,83	120,98±7,93	97,20±12,76	91,44±12,25	111,02±5,16
	p	n.s.	n.s.	n.s.	2-4*	1-4*

* $p \leq 0.05$; ** $p \leq 0.01$; n.s. = non significant

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Table 3
Service period for inbred and outbred cows after first calving (days) (Länge der Serviceperiode der Inzucht- und Nichtinzucht-Kühe nach erster Kalbung)

	F_x (%)	1,5-2,3	3,0-5,0	8,0-12,5	25,0	all animals
Inbred cows	n	138	340	81	89	648
	Y_{ijklmn}	126,94	130,69	122,47	119,56	127,34
	R^2	0,1791	0,1383	0,1273	0,1173	0,1034
	V_x	47,23	46,47	52,34	48,78	47,67
Outbred equals	n	138	340	81	89	648
	Y_{ijklmn}	124,13	127,34	117,94	111,33	123,28
	R^2	0,1833	0,084	0,2312	0,1482	0,0954
	V_x	38,23	38,69	39,05	36,5	38,51
Differences (inbred - outbred)		**2,81**	**3,35**	**4,53**	**8,23**	**4,06**

This change is represented in Figure 1. The lowest increase was recorded for the lowest F_x coefficients (+2.81 day) and the highest difference between inbred and outbred cows was at Fx = 25 % (+8.23 day). However, this increase of service period was not significant. The mentioned differences correspond to the subsequently calculated values of correlation and regression coefficients. There was assessed a very low positive correlation between Fx and differences in service period; r = 0.023. The regression coefficient was byx = 0.22 day (where x = coefficient Fx in %, y = difference in service period between inbred and outbred cows – in days). The Fx coefficient increasing by 1 % extends the service period by 0.22 day.

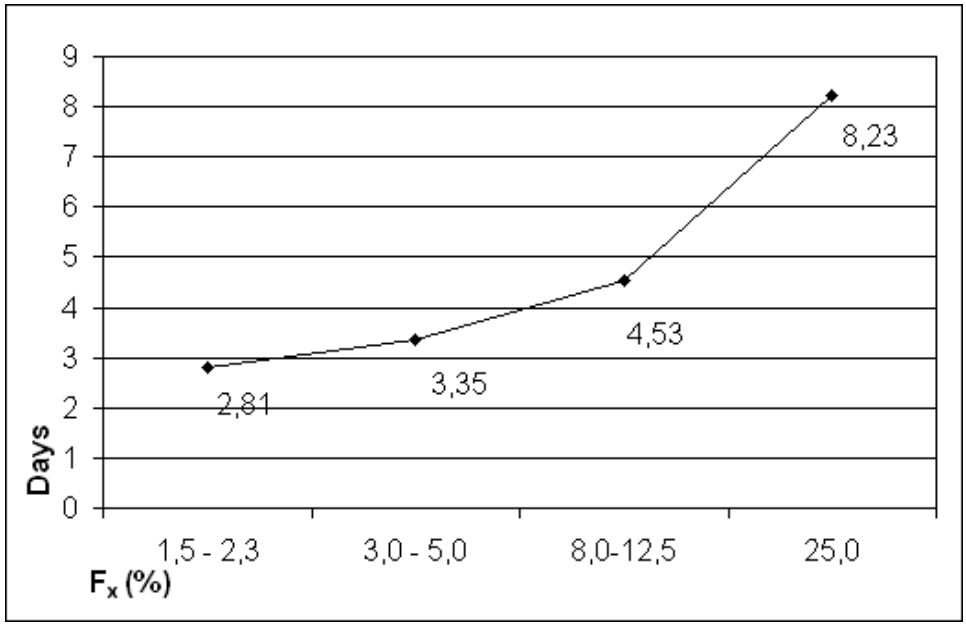

Fig. 1: Effect of inbreeding on service period. Differences in service period between inbred and outbred cows after first calving (days) (Inzuchteffekte bei der Länge der Serviceperiode. Unterschiede in der Länge der Serviceperiode zwischen den Inzucht- und Nichtinzucht-Kühen nach erster Kalbung)

Variability of pregnancy length across the used effects and groups of inbred and outbred cows is mentioned in Tables 4 and 5. There are obvious the significant differences between Holsteins and Czech Fleckviehs in the length of pregnancy. However, the other effects, including Fx levels are not significant.

Table 4
Variability in pregnancy length of inbred cows after first calving– allocated into groups according to the level of inbreeding - for each model effect separately (days) (Variabilität in der Trächtigkeitsdauer bei Inzuchtkühen nach erster Kalbung - gegliedert nach Inzuchtgrad und Untersuchungsmodellen)

Effects		F_x = 1,5 – 2,3% LSM±SE	F_x = 3,0 – 5,0% LSM±SE	F_x = 8,0–12,5% LSM±SE	F_x = 25,0% LSM±SE	All animals LSM±SE
F_x	1					283,99±0,69
	2					283,37±0,64
	3					282,77±0,37
	4					282,80±0,60
	p					n.s.
Breed	1	279,88±0,55	280,23±0,42	280,35±0,79	280,76±1,12	280,56±0,33
	2	285,28±2,01	285,44±0,77	285,20±1,17	286,21±1,26	285,91±0,55
	p	1-2**	1-2**	1-2**	1-2**	1-2**
BVS	1	281,50±1,24	283,09±0,61	282,20±1,12	282,38±1,50	283,33±0,44
	2	283,49±1,42	282,43±0,73	284,07±1,15	284,57±1,58	282,98±0,55
	3	282,75±1,26	283,00±0,69	282,04±1,30	283,51±1,61	283,38±0,50
	p	n.s.	n.s.	n.s.	n.s.	n.s.
BVM	1	281,76±1,34	283,49±0,65	281,16±1,34	284,27±1,30	283,37±0,49
	2	282,64±1,23	282,52±0,71	282,71±1,38	284,10±1,41	283,06±0,48
	3	283,35±1,30	282,50±0,62	284,44±1,01	282,09±1,90	283,27±0,48
	p	n.s.	n.s.	n.s.	n.s.	n.s.
CY	1	283,64±1,28	284,04±0,65	283,56±0,97	285,38±1,03	284,40±0,41
	2	281,84±1,26	282,26±0,58	280,99±1,34	280,91±2,02	282,61±0,50
	3	282,27±1,39	282,22±0,70	283,76±1,30	284,17±1,78	282,69±0,53
	p	n.s.	1-2* 1-3*	n.s.	1-2*	1-2** 1-3**
CA	1	281,62±1,38	283,14±0,69	282,19±1,42	282,71±1,98	282,87±0,53
	2	284,43±1,27	282,40±0,64	281,70±1,39	284,87±1,23	283,62±0,47
	3	282,46±1,38	282,09±0,64	284,46±0,99	281,92±1,47	282,69±0,52
	4	281,81±1,54	283,71±0,87	282,72±1,36	284,46±1,63	283,74±0,60
	p	1-2*	n.s.	n.s.	n.s.	n.s

* $p \leq 0.05$; ** $p \leq 0.01$; n.s. = non significant

Table 5
Variability in pregnancy of outbred cows after first calving– allocated into groups according to the level of inbreeding of their inbred equals - for each model effect separately (days) (Variabilität bei der Trächtigkeitsdauer der Nichtinzucht-Kühe nach erster Kalbung – gegliedert nach dem Inzuchtgrad der Halbgeschwister der Inzuchtkühe und Untersuchungsmodellen)

Effects		F_x = 1,5 – 2,3% LSM±SE	F_x = 3,0 – 5,0 % LSM±SE	F_x = 8,0 – 12,5% LSM±SE	F_x = 25,0% LSM±SE	All animals LSM±SE
Breed	1	279,93±0,46	280,17±0,36	280,35±0,79	281,17±1,11	280,27±0,25
	2	286,31±1,66	285,33±0,65	285,20±1,17	282,94±1,23	285,07±0,46
	p	1-2**	1-2**	1-2*	n.s.	1-2**
BVS	1	284,18±1,08	283,34±0,55	282,20±1,12	280,13±1,49	282,88±0,40
	2	283,37±1,16	283,17±0,62	284,07±1,14	284,31±1,62	283,33±0,45
	3	281,81±1,21	281,75±0,61	282,04±1,30	281,74±1,57	281,80±0,45
	p	n.s.	n.s.	1-2*	1-2*	2-3*
BVN	1	282,04±1,23	282,38±0,57	281,16±1,34	283,07±1,39	282,08±0,43
	2	281,71±1,05	283,36±0,55	282,71±1,38	283,68±1,21	282,73±0,39
	3	285,61±1,15	282,52±0,58	284,44±1,01	279,43±2,08	283,20±0,44
	p	1-3* 2-3**	n.s.	n.s.	n.s.	n.s.
CY	1	284,35±1,06	283,26±0,52	283,56±0,97	283,68±1,17	283,41±0,36
	2	282,55±1,02	282,73±0,49	280,99±1,34	281,94±1,87	282,30±0,39
	3	282,47±1,19	282,27±0,60	283,76±1,30	280,56±1,91	282,29±0,45
	p	n.s.	n.s.	n.s.	n.s.	1-2* 1-3*
CA	1	281,54±1,31	282,91±0,69	282,19±1,42	280,11±1,67	281,88±0,52
	2	283,01±0,97	282,16±0,48	281,70±1,39	281,33±1,40	282,13±0,36
	3	283,57±1,06	282,37±0,52	284,46±0,99	283,31±1,66	283,03±0,39
	4	284,36±1,35	283,57±0,81	282,72±1,36	283,50±1,58	283,64±0,55
	p	n.s.	n.s.	n.s.	n.s.	1-4* 2-4*

* $p \leq 0.05$; ** $p \leq 0.01$; n.s. = non significant

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There is a small and non-significant increase in the pregnancy length for inbred animals in comparison with outbred equals (Tab. 6 and Fig. 2). The differences are higher for groups with a higher Fx. The highest difference 1.68 d is for Fx=25% (non-significant). The mentioned differences correspond to the subsequently calculated values of correlation and regression coefficients. There was assessed a very low positive correlation between Fx and differences in pregnancy length r = +0.0658. The regression coefficient was b_{yx} = 0.063 day (where x = coefficient Fx in %, y = difference in pregnancy length between inbred and outbred cows in days). The Fx coefficient increasing by 1 % extends the pregnancy length by 0.063 day.

Table 6
Pregnancy length for inbred and outbred cows after first calving (days) (Trächtigkeitsdauer von Inzucht- und Nichtinzucht-Kühen nach erster Kalbung)

	F_x (%)	1,5-2,3	3,0-5,0	8,0-12,5	25,0	All animals
Inbred cows	n	127	321	82	77	607
	Y_{ijklmn}	280,45	281,1	282,82	284,75	281,66
	R^2	0,1436	0,1794	0,3091	0,3227	0,2091
	V_x	1,99	1,98	2,01	1,97	1,99
Outbred equals	n	127	321	82	77	607
	Y_{ijklmn}	280,15	280,78	282,9	283,08	281,23
	R^2	0,2714	0,2686	0,296	0,2484	0,2341
	V_x	1,6	1,63	1,76	1,94	1,7
Differences (inbred - outbred)		**0,3**	**0,32**	**-0,08**	**1,68**	**0,43**

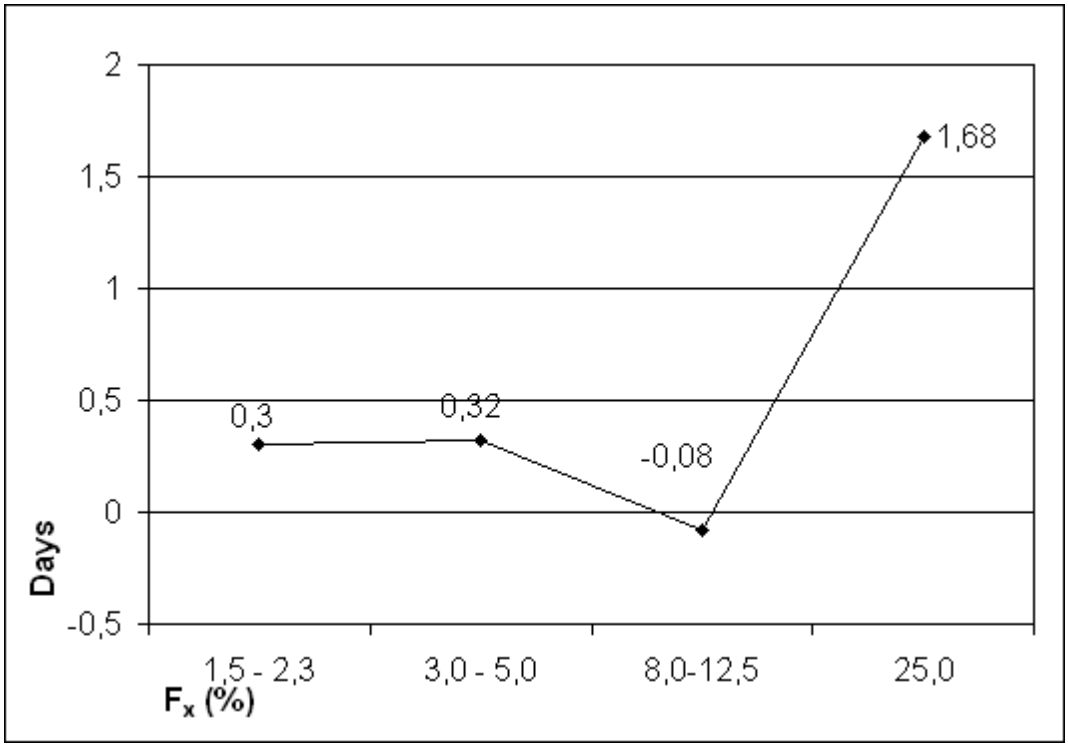

Fig. 2: Effect of inbreeding on pregnancy length. Differences in pregnancy length between inbred and outbred cows (days) (Inzuchteinfluss bei der Trächtigkeitsdauer. Unterschiede in der Trächtigkeitsdauer zwischen Inzucht- und Nichtinzucht-Kühen)

The above-mentioned values of regression and correlation analyses of service period and pregnancy length are in accordance with the findings of other authors. Very similar results were published by CASSELL et al (2003), who mentioned that an increase of Fx coefficient by 1 % corresponding to 0.15 day of inbred depression for service period. HOESCHELE (1991) indicated the increase of service period of 2.6 of the day for Fx = 25.0 %. Partly higher regression calculated HERMAS et al. (1987), who mentioned increasing of service period by +1.4 day for 1% increasing of Fx. Anyway, also these authors evaluated increasing of service period for inbred animals as non-significant.

In this work, no significant depressive effects of inbreeding on service period and pregnancy length were detected. The increase in service period (2.81; 3.35; 4.53 and 8.23 day) and in pregnancy length (0.3; 0.32; -0.08 and 1.68 day) was recorded for inbred animal groups according to the levels of inbreeding coefficient (1.5-2.3 %; 3.0-5.0 %; 8.0-12.5 % and 25.0 %, respectively according to values of traits). The level of inbreeding coefficient corresponds to the increase of service period (+4.06 day) and pregnancy length (+0.43 day) for all animals. Estimates of depression per 1 % of increase in inbreeding were +0.22 d for service period and +0.063 d for pregnancy length. There were assessed low positive correlations between depression and the reproductive traits. Service period and pregnancy length were affected positively by breeding value of the sire for milk production, breeding value of the monitored individual for milk production and breed. We have found out a higher variability (Vx) of service period and pregnancy length in inbred animals than in outbred ones. We can conclude that differences in length of the first calving interval between outbred and inbred cows are affected more by service period than pregnancy length.

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