ACTA VET. BRNO, 55, 1986: 293-303

SURVEY OF REPRODUCTIVE INDICES OF CROSSES OF THE BOHEMIAN PIED WITH AYRSHIRE CATTLE AND THE RED HOLSTEIN BREED

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Received October 3, 1985

Abstract

Brauner P.: Survey of Reproductive Indices of Crosses of the Bohemian Pied with Ayrshire Cattle and the Red Holstein Breed. Acta vet. Brno, 55, 1986: 293-303.

The average age at conception was the lowest in heifers of the Bohemian Pied X Red Holstein crosses (CR), followed by heifers of the Bohemian Pied cattle (C) and crosses of the Bohemian Pied X Ayrshire breed, i. e. 509.35, 521.09 and 522.72 days, respectively. The average age at the 1st calving was again the lowest in the CR crosses, followed by CA and C (789.76, 804.90 and 806.72 days, respectively). The CR crosses had the shortest pregnancy for the 1st till 3rd lactations (1st - 280.41, 2nd - 283.60 and 3rd - 286.60 days). The A.I. index (i. e. number of inseminations necessary for conception) for the 1st lactation was 1.66, 1.96 and 1.84 in the CR, CA and C groups, respectively; for the 2nd lactation it was 1.83, 1.61 and 2.17 in the CR, C and CA groups, respectively; for the 3rd lactation 1.87, 1.75 and 1.48 in CR, C and CA, respectively. The percentage of conceptions after the 1st insemination was 62.86 %, 48.84 % and 47.36 % in CR, C and CA, respectively, for the 1st lactation; 50.88 % in CR, 51.61 % in C and 47.92 % in CA for the 2nd lactation, and 54,84 % in CR, 62.50 % in C and 60.00 % in CA for the 3rd lactation. The interval in CR, C and CA was 58.73, 59.53 and 59.55 days, respectively, for the 1st lactation; for the 2nd lactation it was 54.75, 55,19 and 53.46 days in the CR, C and CA, respectively; for the 3rd lactation 62.09, 69.50 and 60.32 days in CR, C and CA, respectively. The length of the service period (SP) was 82.30, 93.30 and 93.78 days in CR, C and CA, respectively, for the 1st lactation; 83.88, 78.03 and 97.00 days in CR, C and CA for the 2nd lactation; and 92.65, 93.88 and 75.99 days in CR, C and CA for the 3rd lactation. The calving interval for the 1st lactation in CR, C and CA was 366.74, 381.23 and 382.76 days, respectively; for the 2nd lactation it was 369.26, 363,89 and 380.89 days in CR, C and CA; for the 3rd lactation 374.79, 387.42 and 365.17 days. Evaluations of reproductive indices of the individual breeding groups according to the sequence of lactations showed that they were the most favourable in group CR for the 1st lactation, whereas for the 2nd lactation it was group C and for the 3rd

lactation it was group CA. Within the individual groups in all the three lactations no significant differences in the reproductive indices were found. The overall fertility was found to be favourable.

Cattle crossing, Bohemian Pied, Ayrshire, Red Holstein, reproductive indices.

The source of reserves is, along with maintaining a good health condition of the animals, intentional crossing and selection of animals in which the characters required are above the average of the population. Crossings with foreign dairy breeds are done so that the genes with the characters required would immigrate into the genetic pool of Czechoslovak breeds in order to breed high-yielding cattle adapted to conditions of large-scale production.

The aim of the present study was to evaluate the reproductive indices of crosses of the Bohemian Pied X Red Holstein cattle and Ayrshire breeds as compared with the Bohemian cattle under field conditions of the University of Veterinary Science Training Farm in Nový Jičín.

The Holstein-Friesian breed ranks among the world's best milk-yielding cattle what has been the object of interest in many European countries. Many authors studied the reproductive indices. Suchánek and Nejezchleba (1976) reported that the average age at the 1st calving was 25 - 27 months (761 - 820 days). Also the age of daughters of Red Holstein bulls at calving was favourable - 27 months on average, i. e. by 25 days shorter than that of their Bohemian Pied herd mates. At the 1st calving the average age of CR 25 crosses (Suchánek et al. 1979) was 799 days, i. e. by 66 days earlier than that of their Bohemian Pied herd mates. Suchánek et al. (1979, 1981) further reported that the age of the Bohemian Pied X Holstein crosses (CR 25) was lower by about one month to 50 days than that of the Bohemian Pied cattle. Due to a quicker weight increment, Polášek and Suchánek (1973) found that the age of the CA crosses at the 1st calving was by 26.8 days lower than that of the Bohemian Pied Within the breeds the age of the CA crosses at calving was by 5 - 13 days lower (Suchánek 1980). The age of the CA crosses at the 1st calving was slightly lower, i. e. by 10 - 20 days as compared with their C herd mates (Suchánek et al. 1980).

Váchal et al. (1976) compared the length of pregnancy between mothers of the Bohemian Pied breed which was 286.3 days, and mothers of CR crosses which was shorter by 2.8 days ($P < 0.01$). Suchánek and Nejezchleba (1977) observed that pregnancy was by 0.5 - 1 day shorter in primiparas. With crosses the gravidity was shorter by 4.3 days in the F_1 generation of CR 50 and by 2.8 days in CR 25 as compared with the C herd mates where gravidity lasted for 289.1 days (Suchánek et al. 1977).

Polášek and Suchánek (1973) reported that the SP for the 1st lactation in Bohemian Pied cows and CA crosses was nearly the same, i. e. 95.1 and 98.4 days, respectively, the average calving interval being 387.4 and/or 385.7 days. They observed that the SP in CA crosses for the 2nd lactation was markedly shorter (98.8 days) than in the Bohemian Pied breed (108.9 days).

Suchánek (1974) found that the average calving interval in the CA crosses was 385 - 398 days. Ulrych and Suchánek (1977) reported that the average SP in CA crosses of the F_{110} generation in the 1st lactation was shorter as compared with crosses with a 50 % proportion of Ayrshire blood. Ulrych (1978) then investigated CA crosses from bulls imported from Canada with a good conception rate after the 1st insemination (57.4 - 58.5 %) and a favourable index of fertility (i. e. number of born calves per 100 cows) of 101.8 - 103.9 %. The advantage of the Bohemian Pied cattle in large-scale cow-houses, according to Suchánek et al. (1980), is a very good fertility expressed in the length of the SP (90.2 and/or 90.1 days) what is, however, connected with their low efficiency. Suchánek et al. (1984) suggested that the CA crosses have a stronger constitution than the C group in large-scale cow-houses which is manifested in better fertility indices (conception after the 1st insemination is by + 1.6 % higher, the length of the SP is by 4.4 days shorter). Suchánek et al. (1978) compared the CR 25 crosses with herd mates of the C breed and they found that the conception rate was better, the A.I. index being 1.23, i. e. by 0.34 lower than in the Bohemian Pied cows. According to Chrenek and Plesník (1975), crossing the Slovakian Pied cattle with bulls of the Red Pied Lowland breed did not affect fertility as compared with the Slovakian Pied breed. In the Slovakian Pied X Holstein-Friesian cattle Končar et al. (1979) proved significant differences in the interval between the 1st and 2nd calving.

Materials and methods

The study was carried out as a comparative experiment with three groups of cows: Bohemian Pied, Bohemian Pied X Red Holstein crosses with a 50 % blood proportion and Bohemian Pied X Ayrshire crosses with a blood proportion ranging between 25 % - - 53.25 %. The groups of animals selected for the investigations were constant, their number decreasing due to culling and continuing lactations. In order to maintain identic environmental conditions these groups were concentrated at the Ženklava farm. Late pregnant heifers and those in the 1st lactation were housed in the primigravida shed an those in the 2nd and 3rd lactations were transferred into a large-capacity cowbarn with stanchions and slatted draining well.

The differences among the groups were studied in the age at conception, at 1st calving and in the length of pregnancy before the 1st, 2nd and 3rd calving. The following reproductive indices were studied: insemination (A.I.) index, interval, calving interval and % or conceptions after the 1st insemination. In all the groups compared, the reproductive indices were studied according to the individual lactations. The data obtained were analyzed using common methods of variation statistics.

Results

The average age of the groups of heifers compared at conception (Tab. 1) was the lowest in the CR crosses (509.35 days), followed by group C (11.74 days more) and the CA crosses (13.37 days more). The average age at the 1st calving (Tab. 2) was again the lowest in the CR group (789.76 days); in group CA and C it was by 15.14 and 16.96 days more, respectively.

Table 1

Average age at conception of the compared groups of heifers expressed in days

Group	Number of animals	$\bar{x}$	SD	SEM	v %	F - test value	F - test significance	Groups compared	t - test value	t - test significance
CR	83	509.4	73.29	8.05	14.32			CR : C	0.72	-
C	64	521.1	83.74	10.43	16.02	0.51	-	CR : CA	1.01	-
CA	82	522.7	65.05	7.18	12.44			C : CA	0.13	-

Table 2

Average age at 1st calving expressed in days

CR	83	789.8	75.46	8.28	9.56			CR : C	1.27	-
C	64	806.7	85.08	10.63	10.55	1.22	-	CR : CA	1.39	-
CA	82	804.9	62.51	6.90	7.77			C : CA	0.15	-

The length of pregnancy (Tab. 3) in the heifers before the 1st calving was 280.41 days in the CR crosses; in the CA crosses and group C it was 1.77 and 5.22 days longer, respectively. The CR crosses had the shortest 2nd pregnancy (283.60 days); in the CA group and C group it was by 1.82 and 5.56 days longer, respectively. By the 3rd calving, the length of pregnancy was nearly the same in the individual groups. In the individual groups the length of pregnancy (Tab. 4) was as follows: in the CR crosses it was 280.41, 283.60 and 286.60 days for the 1st, 2nd and 3rd pregnancy, respectively; in group C it was 285.63 for the 1st pregnancy, 289.16 for the 2nd and merely 286.74 days for the 3rd; in the CA crosses the length of the 1st, 2nd and 3rd pregnancy was 282.18, 285.42 and 287.40 days, respectively.

Tab. 5 gives a survey of reproductive indices of the individual breeding groups according to the sequence of lactations. It is evident that the CR group has the most favourable reproductive indices for the 1st lactation. For the 2nd lactation

Table 3

Length of pregnancy in experimental breeding cows expressed in days

Group	Number of animals	$\bar{x}$	SD	SEM	v %	F - test value	F - test significance	Groups compared	t - test value	t - test significance
up to 1st calving										
CR	83	280.4	5.82	0.64	2.08			CR : C	4.57	++
C	64	285.6	7.93	0.99	2.78	13.05	++	CR : CA	1.48	-
CA	82	282.2	9.11	1.01	3.23			C : CA	2.38	+
up to 2nd calving										
CR	70	283.6	9.14	1.12	3.32			CR : C	3.02	++
C	43	289.2	9.42	1.44	3.26	4.63	++	CR : CA	1.08	-
CA	57	285.4	9.37	1.24	3.28			C : CA	1.95	-
up to 3rd calving										
CR	57	286.6	7.83	1.04	2.73			CR : C	0.08	-
C	31	286.7	7.16	1.29	2.50	0.15	-	CR : CA	0.52	-
CA	48	287.4	7.60	1.10	2.64			C : CA	0.38	-

+ $P < 0.05$ ++ $P < 0.01$

these indices are the best in group C and in the 3rd lactation for the CA crosses. Due to culling the number of animals decreased in the further lactations.

Tab. 6 gives the statistical analysis of reproductive indices according to the sequence of lactations within the breeding groups compared.

Discussion

Suchánek and Nejezchleba (1976), Suchánek (1978), Suchánek et al. (1979, 1981) and Váchal (1983) reported that the average age of the CR crosses at the 1st calving was shorter by 0.2 - 2.0 months than that of the herd mates of group C. The age of the CA crosses was slightly lower at the 1st calving; accordint to Suchánek and Ulrych (1976), Polášek and Suchánek (1973), Suchánek (1980) and Suchánek et al. (1980) the age at the 1st calving decreases by 5 - 20 days as compared with the herd mates of group C. The differences found in the present study were shorter by 16.96 days as compared with group C and the average age of the CA crosses at the 1st calving was found to be only 1.8 days less than that of the herd mates of group C.

Table 4

Length of pregnancy within the individual experimental groups expressed in days

Number of animals	Sequence of gravidity	$\bar{x}$	SD	SEM	v %	F - test value	F - test significance	Length of gravidity compared	t - test value	t - test significance
Group CR										
83	1	280.4	5.28	0.64	2.08			1 : 2	2.55	++
70	2	283.6	9.40	1.12	3.31	10.89	++	1 : 3	5.32	++
57	3	286.6	7.83	1.04	2.73			2 : 3	1.91	-
Group C										
64	1	285.6	7.93	0.99	2.78			1 : 2	2.08	+
43	2	289.2	9.42	1.44	3.26	4.21	+	1 : 3	0.66	-
31	3	286.7	7.16	1.29	2.50			2 : 3	1.19	-
Group CA										
82	1	282.2	9.11	1.01	3.23			1 : 2	2.02	+
57	2	285.4	9.37	1.24	3.28	5.63	++	1 : 3	3.32	++
48	3	287.4	7.60	1.11	2.64			2 : 3	1.16	+

+ $P < 0.05$ ++ $P < 0.01$

Table 5

Reproductive indices of the individual breeding groups according to sequence of lactations

	Group	Number of animals	Insemination index	Conception rate %	Interval days	SP days	Calving interval days
1st lactation	CR	70	1.66	62.86	58,73	82.30	366.74
	C	43	1.84	48.84	59.53	93.30	381.23
	CA	57	1.96	47.36	59.55	93.98	382.76
2nd lactation	CR	57	1.83	50.88	54.75	82.88	369.26
	C	31	1.61	51.61	55.19	78.03	363.89
	CA	48	2.17	47.92	53.46	97.00	380.98
3rd lactation	CR	31	1.87	54.84	62.09	92.65	374.79
	C	16	1.75	62.50	69.50	93.88	387.42
	CA	25	1.48	60.00	60.32	75.92	365.17

Table 6

Evaluation of reproductive indices according to the sequence of lactations within the breeding groups compared

Index	Group	Sequence of lactations	n	$\bar{x}$	Lactations compared	t - test value	t - test significance
Insemination index	CR	I	70	1.67	I : II	0.865	-
		II	57	1.84	I : III	0.893	-
		III	31	1.87	II : III	0.172	-
	C	I	43	1.84	I : II	0.942	-
		II	31	1.61	I : III	0.255	-
		III	16	1.75	II : III	0.482	-
	CA	I	57	1.96	I : II	0.807	-
		II	48	2.17	I : III	1.832	-
		III	25	1.48	II : III	2.330	+
Interval	CR	I	70	58.73	I : II	1.556	-
		II	57	54.75	I : III	0.917	-
		III	31	62.09	II : III	2.453	+
	C	I	43	59.53	I : II	1.360	-
		II	31	55.19	I : III	2.300	+
		III	16	69.50	II : III	2.823	++
	CA	I	57	59.55	I : II	1.810	-
		II	48	53.46	I : III	0.173	-
		III	25	60.32	II : III	1.885	-
SP	CR	I	70	82.30	I : II	0.075	-
		II	57	82.88	I : III	1.027	-
		III	31	92.65	II : III	1.006	-
	C	I	43	93.30	I : II	1.431	-
		II	31	78.03	I : III	0.040	-
		III	16	93.88	II : III	1.272	-
	CA	I	57	93.98	I : II	0.297	-
		II	48	97.00	II : III	1.713	-
		III	25	75.92	II : III	1.826	-
Length of calving interval	CR	I	70	366.75	I : II	0.333	-
		II	57	369.36	I : III	0.800	-
		I	29	374.79	II : III	0.602	-
	C	I	43	381.23	I : II	1.606	-
		II	31	363.87	I : III	0.374	-
		III	12	387.42	II : III	1.604	-
	CA	I	57	382.76	I : II	0.179	-
		II	48	380.98	I : III	1.515	-
		III	24	365.17	II : III	1.498	-

Index	Group	sequence of lactations	Mated	Conception after the 1st insemination	% of conceptions	Compar. of lactations	Test of the difference between two relative values	
							value	significance
Per cent of conceptions	CR	I	70	44	62.88	I : II	1.351	-
		III	57	29	50.88	I : III	0.759	-
		III	31	17	54.84	II : III	0.359	-
	C	I	43	21	48.84	I : II	0.235	-
		II	31	16	51.61	I : III	0.934	-
		III	16	10	62.50	II : III	0.712	-
	CA	I	57	27	47.36	I : II	0.057	-
		II	48	23	47.92	I : III	1.051	-
		III	25	15	60.00	II : III	0.982	-

\+ $P < 0.05$
++ $P < 0.01$

When comparing the results of Váchal et al. (1976), Suchánek and Nejezchleba (1977), Suchánek et al. (1977) who reported that gravidity in the CR crosses was shorter by 0.5 - 4.3 days as compared with herd mates of group C, also the present results showed that gravidity in the CR and CA crosses was shorter than that of group C. The shortened gravidity is favourable since it shortens the calving interval in dairy cows.

The attention which the authors devoted to the individual reproductive indices was different. Suchánek (1978) reported that the A.I. index in the CR crosses was lower (1.23) than in group C by 0.34. The values found in the present study are also lower in the CR crosses for the 2nd and 3rd lactations. In the CA crosses the value was lower only for the 3rd lactation as compared with group C. The values of the A.I. index ranged within the values given by Urban et al. (1979).

Ulrych (1978) found that the A.I. index in the CA crosses after the first insemination was 57.4 - 58.5 %. Suchánek et al. (1984) reported that the conception rate in the CA crosses was higher by 1.6 % than in group C. The conception rate in the groups investigated in the present study was the best in the CR crosses, whereas in groups C and CA it was considerably low. With regard to the values obtained, this index is favourable, especially for the 1st lactation in the CR crosses and in all the groups in the 2nd lactation.

Končar (1979) found a significant difference in the length of the interval between the 1st and 2nd calvings in the Slovakian Red Pied X Red Holstein crosses. In the groups compared in the present study, a significant difference in the length of the interval in the CR crosses was observed between the 2nd and 3rd lactations. The length of the interval found is favourable, with the exception of group C in the 3rd lactation.

Many authors analyzed the fertility on the basis of the length of the SP; Polášek and Suchánek (1973), Urban et al. (1979), Suchánek (1980), Suchánek and Božovský (1983) reported that the SP in the CA crosses was shorter by 3.3 - 10.1 days. In analyses of the groups of the present study, in none of the cases were the highest SP values reached as given by other authors.

Polášek and Suchánek (1973), Suchánek (1973) and Váchal (1983) analyzed the length of the calving interval which they found to be 365 - 393 days in the individual groups of crosses, the difference as compared with herd mates of group C being 7 - 18 days. The length of the calving interval can be evaluated as very good, in group C for the 1st and 3rd lactations, and in the CA crosses for the 2nd lactation as satisfactory, what is in accord with data given by Váchal (1983).

Studium reprodukčních ukazatelů kříženek českého strakatého skotu s plemenem ayrshirským a červeným holštýnským

Průměrný věk jalovic při zabřeznutí byl nejnižší u kříženek CR (509,35 dní), pak následovala skupina C (521,09 dní) a CA (522,72 dní). Průměrný věk při 1. otelení byl opět nejnižší ve skupině kříženek CR (789,76 dní), následovala skupina CA (804,90 dní) a C (806,72 dní). Nejkratší oělku gravidity na I. až III. laktaci měly kříženky CR (I. 280,41, II. 283,60, III. 286,60 dní). Na I. laktaci činil inseminační index u kříženek CR 1,66, u kříženek CA 1,96 a u skupiny C 1,84; na II. laktaci u CR 1,83, u C 1,61 a u CA 2,17; na III. laktaci u CR 1,87, u C 1,75 a u CA 1,48. Procento zabřeznutí po 1. inseminaci bylo u CR na I. laktaci 62,86 %, u C 48,84 % a u CA 47,36 %; na II. laktaci u CR 50,88 %, u C 51,61 % a u CA 47,92 %; na III. laktaci u CR 54,84 %, u C 62,50 % a u CA 60,00 %. Délka intervalu na I. laktaci byla zjištěna u CR 58,73, u C 59,53 a u CA 59,55 dní; na II. laktaci u CR 54,75, u C 55,19 a u CA 53,46 dní; na II. laktaci u Cr 62,09, u C 69,50 a u CA 60,32 dní. Délka SP na I. laktaci dosahovala u CR 82,30, u C 93,30 a u CA 93,78 dní; na II. laktaci u CR 83,88, u C 78,03 a u CA 97,00 dní; na III. laktaci u CR 92,65, u C 93,88 a u CA 75,99 dní. Mezidobí činilo na I. laktaci u CR 366,74, u C 381,23 a u CA 382,76 dní; na II. laktaci u CR 369,26, u C 363,89 a u CA 380,98 dní; na III. laktaci u CR 374,79, u C 387,42 a u CA 365,17 dní. Při zhodnocení reprodukčních ukazatelů jednotlivých plemenných skupin dle pořadí laktace jeví se nejpříznivěji tito ukazatelé u skupiny CR na I. laktaci, zatímco na II. laktaci se projevila lépe skupina C a na III. laktaci kříženky CA. V rámci skupin na všech třech laktacích však nebyly v reprodukčních ukazatelích zjištěny statisticky významné rozdíly. Celkově možno hodnotit reprodukční ukazatele jako příznivé.

Изучение показателей репродукции помесей чешского пятнистого племени и с айширским и красным гольштейнским племенами

Средний возраст нетелей при зачатии был самый низкий у помесей CR (509,35 суток), после следования группа C (521,09 суток) и CA (522,72 суток). Самый низкий возраст при первом отеле был в группе помесей CR (789,76 суток), следовали группы CA (804,90 суток) и C (806,72 суток). Самая короткая продолжительность в 1 - III лактации была у помесей CR (1 - 280,41, II - 283,60, III - 286,60 суток). Индекс осеменения в 1 лактации достигал у помесей CR 1,66, у помесей CA 1,96 и у группы C 1,84; в период II лактации у CR - 1,83, C - 1,61 и CA 2,17; в лактации у CR 1,87, C - 1,75 и CA - 1,48. Процент забеременения после 1 осеменения достигал у CR в 1 лактации 62,86%, у C - 48,84%, CA - 47,36%; во II лактации - CR - 50,88%, C - 51,61% и CA - 47,92%; в III лактации CR - 54,84%, C - 62,50% и CA - 60,00%. Продолжительность интервала в 1 лактации была определена у CR 58,73, C 59,53 и CA 59,55 суток, во II лактации у CR 54,75, C 55,19 и CA 53,46 суток; в III лактации - CR 62,09, C 69,50 и CA 60,32 суток. Продолжительность CP service period) в 1 лактации достигала у CR 82,30, C 93,30 и CA 93,78 суток; в период II лактации у CR 83,88, C 78,03 и CA 97,00 суток; в III лактации - у CR 92,65, C - 93,88 и CA 75,99 суток. Промежуточный период достигал в 1 лактации у CR 366,74, C - 381,23 и CA - 382,76 суток, во II лактации - у CR 369,26, C - 363,89 и CA 380,98 суток, в III лактации - CR 374,79, C - 387,42 и CA - 365,17 суток. В ходе оценки показателей репродукции отдельных племенных групп по порядку лактации самым благоприятным являются показатели у группы CR в 1 лактации, между тем как во II лактации лучше они у группы C и в III лактации у помесей CA. В группах во всех трех лактациях однако в показателях репродукции не было установлено статистически значимой разницы. В итоге можно показатели репродукции считать благоприятными.

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