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DOUBLE INSEMINATION OF COWS DURING ONE OESTRUS

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ABSTRACT

Data on insemination and reinsemination were collected from 1 643 Black and White (BW) cows with varied share of Holstein–Friesian (HF) genes, which belonged to the active population managed in five large–scale production farms in the Kujawsko–Pomorskie Province, Poland. A total number of 351 repeated inseminations were recorded, which amounted to 7.71% of all inseminations. The rates of non–return to oestrus after reinseminations were by 2.05% better in relation to single inseminations, however, an economical analysis led to a conclusion that double insemination does not produce economical benefits and can only be recommended in specific cases, e.g. with prolonged oestrus. Highly significant effect on non–return rates after inseminating once or twice was demonstrated for the factors of HF genes share, farm, milk yield, age at first calving, subsequent calving, and season of insemination.

Key words: cattle, dairy cows, insemination, reinsemination

INTRODUCTION

The outcome of cattle insemination depends on many factors, among which the most important are organizational issues, such as the number of cows per stockman, qualifications of the stockpeople, level of veterinary care, or skills and diligence of the inseminator. The breeder and the inseminator decide on the date of insemination. Many cows are inseminated during inappropriate period, since the oestrus may be overlooked or misestimated. In order to improve the effect of service, the insemination is repeated, which is called reinsemination. Reinsemination is done within 12–24 hours after the first insemination.

No extensive reports on this problem have been published in the Polish literature. In foreign works, both positive and negative opinions on reinsemination have been expressed. The studies on double insemination during one oestrus were begun by Wilcox and Pfau [10] in 1953. The authors did not recommend that repeated insemination should be applied to each cow in the herd. Instead, they suggested that only those cows should be reinseminated that got pregnant after 3 or more services and that had low conception rates in the past. During the 1950s, Jaśkowski [5] recommended inseminating twice or thrice in the following cases: cows with prolonged oestrus, cows whose onset of oestrus cannot be precisely determined, or in test–inseminations of the cows suspected of having reproductive tract diseases. Kuperschmid [7] demonstrated that non–return to oestrus rates after double inseminations were by 1.45% higher compared to those achieved from single services. After economical analysis the author concluded that repeated insemination during oestrus should be limited to the cases of apparent prolongation of the oestrous cycle. Bush *et al.* [after 7] demonstrated ovulation delay in the cows with prolonged oestrus, and recommended reinsemination in such cases. According to Dejneka [1], delayed ovulation may occur even in 10–30% of females at reproductive age, and then reinsemination should be applied. Graves *et al.* [3], who studied the effect of double insemination during oestrus on conception percentage in Jersey heifers and cows, observed little differences in this respect and, therefore, the authors did not recommend reinsemination.

The aim of this study was to evaluate an influence of genotype, farm, milk yield, age at first calving, subsequent calving, and the season of insemination on non–return to oestrus rates after inseminating once or twice. An effect of repeated insemination during the first, second, and third oestrus on its non–return rates after insemination and reinsemination was estimated in order to evaluate the usefulness of reinsemination.

MATERIALS AND METHODS

Data on insemination and reinsemination was collected from 1643 Black and White (BW) cows with varied share of Holstein–Friesian (HF) genes, which belonged to active population managed in five large–scale production farms (A, B, C, D, and E) in the Kujawsko–Pomorskie Province, Poland, during 1992–1997.

The analysis was based on the data from the following farm documentation: heifer–cows cards, barn notebooks, insemination cards, and additional inseminator's notes. Milk yield was determined basing on milk yield control tables T–1 and T–2 of the system SYMLEK archived in Regional Animal Breeding Station (OSHZ) in Bydgoszcz, Poland.

Basing on the data on single and double inseminations, the effects of inseminations were determined, which were calculated from non–return rates – after insemination and reinsemination during the first, second, and third oestrus.

Economical analysis was carried out towards profitability of reinsemination. The amounts obtained from additional calves (price of a calf = PLN 250) and those earned from shorter calving interval, assuming that each day of prolonged calving interval results in a loss of 8 kg of milk [8], were placed on the profit side of the account. The assumed price of the Extra class milk was PLN 1.05 per 1 l. On the loss side of the account, the expenses for the semen and additional insemination operations were placed, which were a total of PLN 25.

The effects of the following factors on non–return rates after single and repeated insemination were studied:

1. Genotype – BW x HF crossbreeds (12.5–50% HF, 50.1–75% HF, and > 75% HF).
2. Farm (A, B, C, D, E).
3. Yield (≤ 4000 kg FCM, 4001–5000 kg FCM, 5001–6000 kg FCM, and > 6000 kg FCM).
4. Age at first calving (< 764 days, 765–824 days, 825–885 days, 886–946 days, 947–1007 days, and > 1007 days).
5. Subsequent calving (I, II, III).
6. Year season of insemination (December–February, March–May, June–August, September–November).

The collected data were statistically processed using SAS/STAT software [9].

RESULTS AND DISCUSSION

Table 1 presents the results of insemination and reinsemination of cows during the 1st, 2nd, and 3rd oestrus. There were 352 double inseminations in total, which comprised 7.71% of all inseminations. The effect of non–return rate after repeated insemination was by 2.05% better than that obtained after one insemination. While analysing the number of single and double inseminations and the non–return in subsequent oestruses, 7.03% of double

inseminations were recorded in the first oestrus. Non–return rates after reinsemination were by 3.53% higher compared to single insemination. In the second oestrus, 6.42% of inseminations were repeated, and the non–return rate was by 4.32% higher than that obtained after one insemination. In the third oestrus, the number of double insemination was the highest, i.e. 11.42%. As a result of reinsemination during the 3rd oestrus, the non–return rate was only by 1.77% higher in relation to single inseminations. The non–return rate that is higher than 2.05% compared to that achieved through single insemination could justify the application of reinsemination, however, it is difficult to predict, what the result would have been if the reinseminated cows had been inseminated only once.

Table 1. Effect of single and double inseminations and the achieved non–return to oestrus rates

Insemination during:	Total number		AI2 [%]	Non–return rate [%] after:		Difference in non–return to oestrus rates between AI2 and AI1 [%]
	AI1	AI2		AI1	AI2	
1st oestrus	2559	180	7.03	55.91	59.44	3.53
2nd oestrus	1090	70	6.42	48.53	52.85	4.32
3rd oestrus	898	101	11.24	44.76	46.53	1.77
Total and mean values	4547	351	7.71	52.52	54.57	2.05

AI1 – single insemination.
AI2 – double insemination.

Graves *et al.* [3], who studied the effect of reinsemination on the conception rate in Jersey cows, recorded 51.3% of conceptions after a single insemination and 55.6% after repeated insemination (4.3%). According to Kuperschmiedt [7], in an area of activity of an artificial insemination station in Switzerland during 1983–1990, 1.55% of reinseminations were carried out, and the non–return rate was by 1.45% higher compared to that after single insemination. The author recommended the reinsemination only in the case of prolonged oestrus.

The highest number of repeated inseminations, 11.42%, was recorded in the third oestrus. This is probably due to the fact that the breeders of the high–yielding cows that had not conceived in two subsequent oestruses decided to re–inseminate the animals in order to improve, in their judgment, the chances of conception. It should be assumed that such low non–return rates after reinsemination in the 3rd oestrus are related to an increased number of cows in this group that are afflicted with reproduction diseases.

Table 2 compares the expenses incurred for reinsemination and the earnings resulting from obtaining additional calves and the shortening of calving interval. It was observed that in each case the costs of reinsemination exceed the resulting profits. The lowest difference between the costs and the income, PLN 470.80, was recorded for the reinsemination during the 2nd oestrus. From the economical point of view, the results demonstrated that reinsemination is an unprofitable measure.

Table 2. Results of profit–and–loss analysis of reinsemination

Reinsemination during:	Number of reinseminations	Cost of reinseminations [PLN]	Difference in non–return to oestrus rates between AI2 and AI1 [%]	Number of "additional" calvings after reinsemination	Income obtained [PLN]		
					from calves	from milk	total
1st oestrus	180	4500	3.53	6	1500	1058.4	2558.4
2nd oestrus	70	1750	4.32	3	750	592.2	1279.2
3rd oestrus	101	2525	1.77	2	500	352.8	852.8

The results of the analysis of variance (Table 3) indicate a statistically significant effect of HF genes percentage, farm, milk yield, age at first calving, subsequent calving, and year season of insemination on non–return rates after single and repeated insemination. For the cows with 12.5–50.0% HF, the non–return rates after reinseminations were by 10.24% lower in relation to single inseminations, whereas in the remaining two groups the difference was higher, by 4.52 and 1.86% respectively. Depending on the farm, the difference of non–return

rates between AI2x and AI1x ranged from –18.25 to +8.21%. In the farms where lower non–return rates after repeated insemination were recorded, reinsemination was probably applied to the cows that did not promise good fertility. For the cows of varied milk yield, the non–return rates after reinsemination in relation to single inseminations were by 3.81% higher only in cows of the lowest milk yield, up to 4000 kg FCM. The lowest difference in oestrus non–return rates after reinsemination in relation to single insemination, –11.24%, was recorded for the cows in the group of 5001–6000 kg FCM. The fact that reinsemination of higher–yielding cows did not produce positive effects may have resulted from the relationship between reproductive performance and milk yield. As a rule, an improved milk yield is accompanied by deteriorated reproduction performance [2, 4, 6].

Table 3. Effect of analysed factors on non–return rate after single and double inseminations

Factor	Factor level	Total number			Non–return rate [%] after		Difference in non–return to oestrus rates between AI2 and AI1 [%]	Significance of differences between groups
		AI1	AI2		AI1	AI2		
			n	%				
HF genes [%]	12.5–50	1564	184	11.76	56.97	46.73	–10.24	xx
	50.1–75	1700	113	6.64	52.11	56.63	4.52	
	> 75	1443	54	3.74	59.25	61.11	1.86	
Farm	A	2078	141	19.91	53.98	40.42	–13.56	xx
	B	195	32	2.86	65.12	46.87	–18.25	
	C	1115	79	3.80	53.81	62.02	8.21	
	D	611	25	12.82	56.46	64.00	7.54	
	E	708	74	12.11	64.83	62.16	–2.67	
Milk production [kg FCM]	≤ 4000	1210	134	11.07	59.59	63.40	3.81	xx
	4001–5000	994	90	9.05	60.46	60.00	–0.46	
	5001–6000	1221	73	5.97	57.74	46.50	–11.24	
	> 6000	1118	54	4.83	47.49	38.80	–8.69	
Age at first calving [days]	< 764	357	25	7.00	66.10	44.00	–22.10	xx
	764–824	1572	86	5.47	54.13	51.16	–2.97	
	825–885	1397	107	7.65	57.69	49.53	–8.16	
	886–946	791	70	8.84	54.74	54.28	–0.46	
	947–1007	280	25	8.92	49.64	56.00	6.36	
	> 1007	310	38	12.25	53.87	60.52	6.65	
Subsequent calving	1	1661	17	1.02	75.98	70.58	–5.4	xx
	2	2071	118	5.69	44.47	56.77	12.3	
	3	670	216	32.2	45.97	53.24	7.27	
Season	December – February	1211	91	8.03	57.80	73.62	15.82	xx
	March – May	1184	116	9.57	52.70	46.55	–6.15	
	June – August	1132	75	6.33	56.45	49.33	–7.12	
	September – November	1016	69	6.79	58.56	52.17	–6.39	

xx – $p \leq 0.01$.

Interesting are the results of oestrus non–return rates after inseminating once or twice in relation to the age at first calving. The non–return rates after repeated insemination compared to single insemination were by approx. 6% higher for the cows that calved for the first time at age 947–1007 days and over 1007 days. Re–inseminating of cows that had calved at a younger age did not bring positive results. Non–return rates after repeated insemination of the cows after the first calving were by 5.4% lower compared to those after single inseminations.

After the second and third calving, the difference was higher by 12.3 and 7.27% respectively. The analysis of the oestrus non–return in the cows inseminated in different seasons revealed that the cows inseminated during December–February, which were to calve during August–October, had by 15.82% higher non–return rates after reinsemination then after single insemination. In the remaining seasons of insemination, the difference was lower, ranging between –6.15 and –7.12%.

The results of this study confirm the results by Kuperschmiedt [7], who observed that reinsemination is the most efficient during the high season of insemination. This analysis demonstrated that occurrence of reinsemination intensified from March until May, whereas according to Kuperschmiedt [7], the number of reinseminations increased from October to February.

CONCLUSIONS

Reinsemination does not produce any measurable advantages from the point of view of the breeder's interests or expected improvement of overall reproductive performance of the inseminated cattle herd. Possible application of repeated insemination should be limited to cows with prolonged oestrus.

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