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EFFECT OF MATING AND WHELPING DATES ON THE NUMBER OF PUPS IN MINK

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ABSTRACT

The study was aimed at an analysis of the effect that mating and whelping terms might have on the number of offspring of mink. Two primary reproduction-related traits were analysed: the number of born pups and the number of raised, or weaned, pups. More than 3600 litters were analysed over three years. The females were distributed into four groups depending on the date of mating, and into four other groups in respect to whelping date. The analysis of variance demonstrated a statistically significant effect of the date of the first mating, as well as the birth date of the offspring, on the number of born and raised pups. The highest mean numbers of born and raised pups was observed for the females mated within the first term (until 5 March). Minimally lower values were achieved by those mated within the third term, and slightly lower by those mated within the second term. Definitely the lowest values, for the number of both born and raised pups, were found for the females that had been first mated within the fourth term (after 15 March). The highest number of born and raised pups was recorded for the females that gave birth within the first whelping term (until 25 April), slightly fewer within the second and third terms, then within the third term. Categorically the least numerous litters were observed for the females that whelped within the fourth term (after 5 May). Such regularity was found for all the mating terms. In the analysed farm, over 80% females were first mated already in the first or second term (until 9 March). This had a very positive effect on the whelping dates. More than 82% of females whelped within the first and second whelping terms (until 30 April). On average, 5.2 pups were born, and 4.4 were raised within these terms.

Key words: mink, mating term, whelping term, prolificacy.

INTRODUCTION

The effectiveness of mink farming very much depends on reproduction performance. This in Poland has not been satisfactory, the average number of weaned pups ranging between 2.2 and 5.9 [12] depending on the herd. The country's average for the year 2000 was 3.4 pups per female of the breeding stock. This implies that many farms have a great potential in this respect and the breeding performance may still be improved with only an increased number of weaned young. High auction prices [20] have been encouraging for the breeders to enlarge their stocks of mink. Mink reproduction issues have been the subject of a number of papers, either published in Poland or worldwide. The following factors that influence mink prolificacy were analysed: female's age [2, 23], body condition, dates and number of copulations [1, 2, 8, 19, 22], effect of selection [10, 13, 14], effect of genetic groups and colour varieties [3, 6, 11, 17, 21], as well as other unidentified impacts [7, 16, 18, 23]. The date of the first mating, and related reproduction performance, is the factor that attracts the interest of breeders most. Selection may alter some reproduction indices, however the parameters of reproduction-related traits have a low heritability [18, 21]. The literature lacks information that would associate the term of the first mating of female minks with either dates of whelping or litter size.

Considering the above aspects, the studies were undertaken that aimed at the analysis of the effect of mating term and whelping date on the number of young minks.

MATERIALS AND METHODS

The studies on the effect of mating term and whelping term of standard mink where carried out on a breeding farm located in central Poland. The farm was well equipped for brood-stock animals breeding and offspring raising. Two primary reproduction-related traits were analysed: the number of born pups and the number of raised pups. A total of 3600 litters were studied over 3 years. Only those females were considered that had parented; the documentation was complete only in such cases. For each of the analysed traits, arithmetic means and coefficients of variability were calculated, and three-way analysis of variance was performed according to the model that included constant effects: female's date of birth, date of the first mating and date of whelping.

In respect to the date of first mating, the following 4 groups of females were distinguished:

I – mating until 5 March,
II – mating between 6 and 9 March,
III – mating between 10 and 15 March,
IV – mating on 16 March and later.
Also 4 groups of females were made out in respect to the offspring date of birth:

1 – born until 25 April,
2 – born between 26 and 30 April,
3 – born between 1 and 5 May,
4 – born on 6 May and later.

While classifying the females according to their date of birth, another 4-degree scale was applied, identical to that applied to offspring date of birth.

RESULTS AND DISCUSSION

The analyses of variance demonstrated a statistically significant effect of the first mating date and offspring birth date on the number of born and raised pups. No significant effect, on the other hand, was found for the female's date of birth; for this reason the analysed traits are not discussed in respect to female's date of birth in the remaining part of this paper. Tables 1 and 2 present arithmetic means and coefficients of variability for the number of born and raised pups, considering the classification in relation to the date of the first mating and the offspring birth date. In order to better depict the means of the analysed traits, Fig. 1 and 2 additionally represent the means in the form of graphs, considering the same classification. The highest means of born and raised pups were achieved by the females mating within the first term (until 5 March). Minimally lower values were for those mated within the 3rd term, and slightly lower for those mated within the 2nd term. Definitely the lowest values of the number of both born and raised pups were achieved for the females mated for the first time within the 4th term (past 15 March). Basing on the presented results, one can observe that mating should be carried out on a mink farm during the first half of March. In our latitude, mink copulation season begins early March, when

the day becomes about 2 hours longer than the 8-hour-long winter day [8, 9]. As a result of the gradually increasing light stimulus, hypothalamus releases gonadoliberin *FSH-LH-RH*, which stimulates the front part of hypophysis to secrete follitropin *FSH*, the hormone that influences intensive growth of ovarian follicles [4]. Mature ovarian (Graafian) follicles secret estrogens, which in certain concentration cause the oestrus [9]. The oestrus stage in minks is continuous in character, and — unless the ovulation is provoked by mating or hormonally — may take from a few to about 20 days. During this time, ovarian follicles continuously grow, mature, and disappear from the surface of an ovary [9]. According to Jarosz [8, 9], the most maturing vesicles can be observed between 10 and 20 March, which explains the fact that the females mated during this term yield the most numerous litters. The females whose oestrus begins in early March may have a few, 2-4 subcycles in the ovarian follicles growth, or — if mated — also in the ovulations of the follicles, while the females that show the oestrus symptoms after 20 March do not display the multiple subcycles in the growth of the ovarian follicles. The results indicate quite univocally that the mating carried out until 15 March positively influence the number of pups. In contrast, the females that had been mated later gave birth and raised fewer offspring. According to the analysis of the relation between the birth date and number of born and raised pups, large differences occurred between the individual terms. The most born and raised pups were found for those females which bred during the first term (until 25 April), fewer in the second, then in the third. Definitely the least numerous litters were recorded for the females that whelped in the fourth term (after 5 May). Such regularity was observed for all the terms of mating. The breeder has a limited control over the date when minks start mating, and actually no influence on the duration of the pregnancy, and consequently on the date of whelping. Obviously, the date of whelping to a large extent depends on the date of mating. Both the previous and the latter dates result from the animal's genetics [18]. The analysis of the papers [9] and [15] demonstrate that the most positive for mink are so called average durations of pregnancy. The studies by Sulik and Felska [22] demonstrated that the females with 53-54 days of gestation produced the most numerous litters. As a rule, it has been recognised that the minks mated earlier have a longer gestation. Conversely, the pregnancy is shorter in the minks that mated later. Both the previous and the latter cases are considered adverse, influencing litter size negatively. Mink's pregnancy duration may considerably vary [15], in the wide range from 36 to 85 days, most frequently 45-55 days, and to a large extent depends on the date of mating [5]. Females inseminated the soonest have the longest gestation, while those fertilised the latest — have the shortest [15], therefore whelping season is usually less extended in time than mating season [5]. Duration of pregnancy also depends on the body weight of the female, besides mating date. Too large the body weight postpones the implantation of the embryos, which results in longer gestation [9, 19]. This study of the mating and whelping dates was carried out on the farm which belongs to the leading ones in Poland. Its reproduction performance of minks can be classified as very good in comparison with the country's average [12, 21]. The correctness of the mating and breeding practice can be illustrated with the fact that more than 80% of the females conceived for the first time already in the term I or II (until 9 March). This had a very positive effect on the dates of whelping. Consequently, over 82% of females gave birth in the dates 1 and 2 (until 30 April). The average number of born and raised pups exceeded 5.2 and 4.4 respectively during those terms. The dates of mating and whelping belong to this group of traits that are referred to as quantitative. They depend on both genetic and environmental factors. As each quantitative trait, they may undergo changes resulting from selection. The repeatability of oestrus belongs to the traits that are medium-heritable [18], therefore it is subject to selection. The traits can be shaped in the stock through a competent breeding practice. The existing genetic variability offers a starting point for selection. In the studied stock of minks, the phenotypic variability was assessed in the form of coefficients of variability (Tables 1 and 2) of the numbers of born and raised pups. The coefficients of variability for the born pups ranged from 36 to 62%, whilst ranging between 37 and 75% for the raised pups. Present phenotypic variability finds its roots in the genetic and environmental factors that influence the traits. Genetic variability facilitates the selection of individuals for the most desired traits, thus enabling the achievement of breeding progress.

Table 1. Statistical description of the number of born pups in relation to the mating term and whelping term (n – number of litters, $\bar{x}$ – arithmetic means, v – coefficients of variability in %)

Term of whelping	Measures of variability	Term of mating				
		I	II	III	IV	total
1	n	689	288	106	2	1085
	$\bar{x}$	5.84	5.86	5.72	4.50	5.83
	v	38.96	37.47	33.06	25.00	38.06
2	n	742	793	340	19	1894
	$\bar{x}$	5.11	5.11	5.55	4.74	5.22
	v	43.78	41.95	39.24	53.02	42.30
3	n	133	212	194	9	548
	$\bar{x}$	4.70	4.49	4.81	4.44	4.66
	v	50.38	50.60	46.78	64.80	49.29
4	n	32	35	16	4	87
	$\bar{x}$	3.94	3.31	4.06	3.50	3.69
	v	52.74	62.51	65.76	36.89	58.48
Total	n	1596	1328	656	34	3614
	$\bar{x}$	5.37	5.18	5.32	4.50	5.28
	v	42.91	43.47	41.41	55.05	42.99

Table 2. Statistical description of the number of raised pups in relation to the mating term and whelping term (n – number of litters, $\bar{x}$ – arithmetic means, v – coefficients of variability in %)

Term of whelping	Measures of variability	Term of mating				
		I	II	III	IV	total
1	n	689	288	106	2	1085
	$\bar{x}$	4.83	5.03	5.09	4.00	4.91
	v	50.68	44.35	37.13	25	47.74
2	n	742	793	340	19	1894
	$\bar{x}$	4.50	4.35	4.67	4.16	4.46
	v	50.58	51.24	45.78	52.09	50.07
3	n	133	212	194	9	548
	$\bar{x}$	3.99	3.72	4.15	3.44	3.94
	v	57.92	63.74	56.24	68.34	59.52
4	n	32	35	16	4	87
	$\bar{x}$	3.41	2.83	3.13	3.00	3.10
	v	64.02	70.67	75.50	54.43	70.10
Total	n	1596	1328	656	34	3614
	$\bar{x}$	4.58	4.36	4.55	3.82	4.48
	v	51.72	52.73	48.26	57.80	51.63

Fig. 1. Mean number of born pups in relation to mating term (I – IV) and whelping term (1–4)

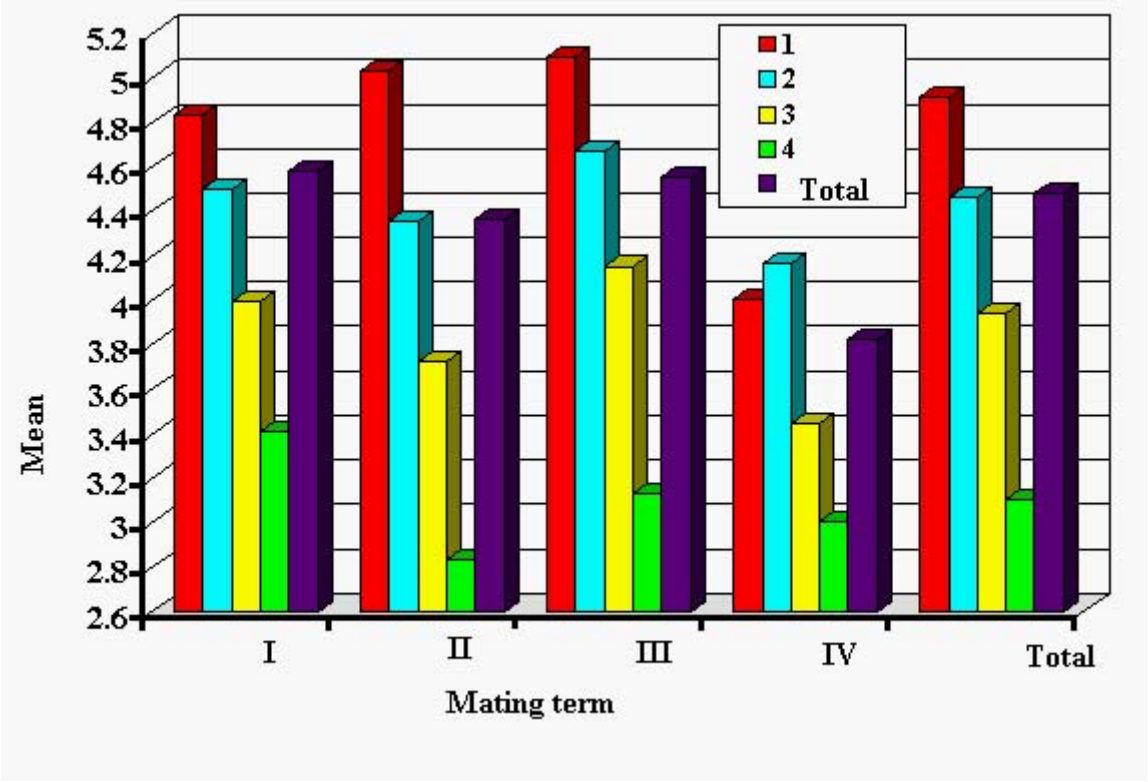
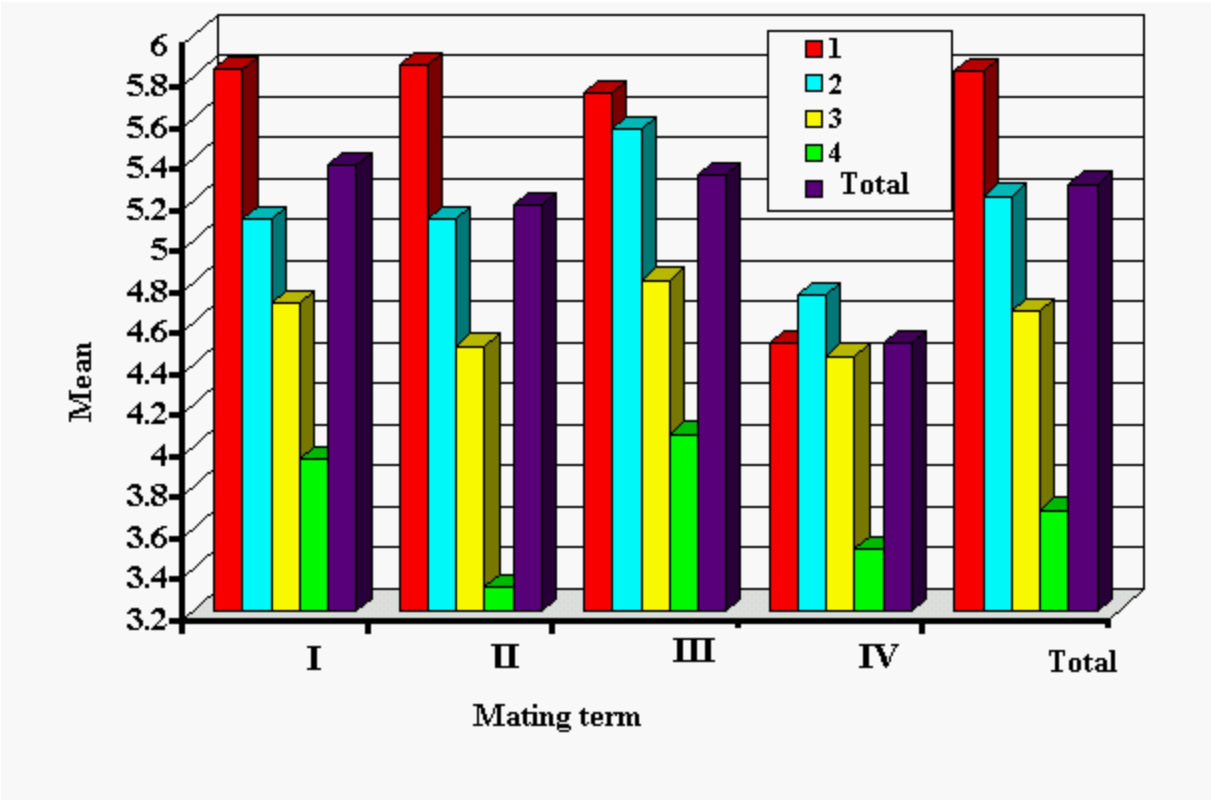


Fig. 2. Mean number of raised pups in relation to mating term (I – IV) and whelping term (1–4)



CONCLUSIONS

1. The terms of mating and whelping were found to have statistically significant effect of the number of born and weaned pups.
2. The highest mean numbers of born and weaned pups were found for the females mating within the first term (until 5 March). Definitely the lowest values, both for the number of born and weaned offspring were observed in the females mated for the first time within the 4th term (after 15 March).
3. The most born and weaned pups were recorded for the females that gave birth within the first term (until 25 April), slightly fewer were in the second and the third term, then within the third. Definitely the least numerous litters were observed for the females that gave birth within the 4th term (after 5 May).
4. On the analysed farm, over 80% of the females were for the first time mated already within the term I or II (until 9 March). This had a very positive effect on the whelping dates. More than 82% of the females whelped within the term 1 or 2 (until 30 April).

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