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Effect of herd, season and sex on the age of reaching fur maturity in chinchilla

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The aim of this study was to determine the effect of herd, birth season, slaughter season, and sex on the age of reaching a full maturity of fur in chinchilla. The data on 566 chinchillas (104 females and 462 males) slaughtered for pelt in the years 1997 to 2002 were collected from 4 farms. The linear model of fur maturity age in the analysis of variance included birth month, herd (farm), and sex as factors. The results showed that the age of animals at fur maturity (assumed to be the age at slaughter) averaged 284 days. Significant differences between the herds indicate that the conditions of housing and the system of breeding influenced this trait. The differences between males and females were not significant. The month of birth had a significant effect on the age of fur maturity: chinchillas born in October were the first to reach fur maturity (253 days), followed by chinchillas born from May to August and in November (275-279 days), while those born from January to April as well as in September and December were the latest (295-302 days). Chinchillas born in March were an exception to the general pattern: 51% of the animals reached fur maturity in the period from December to March (64.4% from December to April).

KEY WORDS: chinchilla / fur maturity age / seasonality

The rearing of chinchillas is a dynamically developing sector of animal production in Poland. As reported by Barabasz and Bieniek [2], the number of chinchilla farms in the country in 2002 was between 800 and 1000, with the average annual production of about 20 thousand pelts in total. The same authors estimated that the number of females in basic herds on the farms assessed for utility and breeding value totalled around 5000, most of them of standard variety. According to the List of chinchilla herds under the utility and breeding value assessment by the National Centre of Animal Breeding [12], 49 herds with 6313 females of standard and black velvet types were subject to assessment in the season 2006/2007. A herd had from 39 to 1000 females (135 on average). The structure of the herds is shown on the diagram in Figure 1.

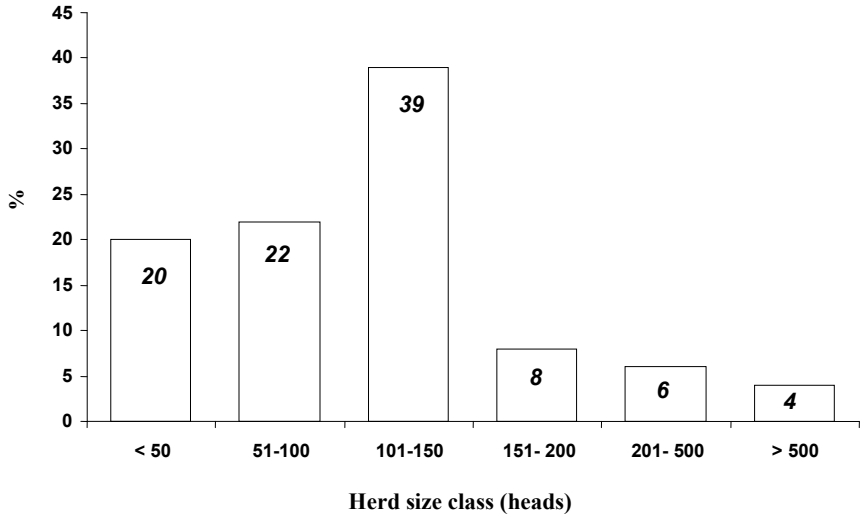

Fig. 1. Size distribution of chinchilla herds in Poland

As it can be seen from the diagram, herds with up to 150 females account for 81% of all 49 herds, hence they play a dominant part in the chinchilla breeding in Poland.

Due to the extremely dense and delicate fur with specific zonal colouring of hair, the rearing of chinchillas has become a source of considerable profits. The chinchilla hairs grow in bundles with a guard hair 24-30 mm long surrounded by about 75 shorter underfur hairs and with the own *arrector pili* muscle and sebaceous gland [6, 11].

As an economic activity, chinchilla breeding is subject to market rules, so an important consideration for the breeder is the economic aspect of production, especially the rearing profitability per female from the basic herd and the length of rearing period for the animals raised for pelt, because this translates into the profit per pelt achieved after subtracting the costs of its production.

Due to the steadily decreasing seasonality of chinchilla reproduction [4], the time of reaching a full maturity of pelt (characteristic of the highest quality pelts) falls in various seasons of the year. Although the quality of pelts obtained at different times is similar, the practical observations by the breeders show that the rearing season may have an impact on the fur maturation time in chinchillas.

The present study aimed at determining the effects of herd, birth season, and sex on the age at which chinchilla fur reaches full maturity.

Material and methods

For the purposes of this work, data were collected from four chinchilla-breeding farms in the Malopolskie and Kujawsko-Pomorskie Provinces. The respective farms were enco-

ded using the letters A, B, C and D. The data included birth date, slaughter date, colour type, and sex for each animal.

The study covered 566 chinchillas in total, including 104 females and 462 males, slaughtered for pelts in the years 1997-2002. Most chinchillas (555) were of standard type, the other (11) were black velvet. Only the animals whose age at slaughter did not exceed 365 days were considered in the study.

Statistical analysis of the data was carried out by using a linear model that included birth month, herd (farm), and sex of animals and the interaction farm x birth month. The model was described by the following formula:

$$y_{ijk} = \mu + b_i + f_j + s_k + (b \times f)_{ij} + e_{ijk}$$

where:

y_{ijk} – observed value of trait,
μ – general average,
b_i – effect of birth month i (i = 1, ..., 12),
f_j – effect of farm j (j = A, B, C, D),
s_k – effect of sex k (k = 1, 2),
$(b \times f)_{ij}$ – interaction farm x birth month,
e_{ijk} – random error.

The computations were performed using SAS software [8].

The significance of the effects produced by individual factors was examined by means of F test, and the significance of differences between the groups, by means of Duncan's multiple range test.

The results were tabulated and shown on diagrams.

Results and discussion

There were shown the data on the age at which chinchillas reached a full maturity of fur. The fur maturity age was assumed to be the age at slaughter.

Table 1
Average fur maturity age (age at slaughter) of chinchillas by farm

Farm	*n*	Age (days)	Standard deviation	Range (min – max)	Coefficient of variation (cv%)
A	284	282^{B}	30	193-361	11
B	111	264^{C}	33	228-356	12
C	110	284^{B}	24	232-353	8
D	61	318^{A}	41	183-363	13
Total/Average Ogółem/Średnie	566	287	32	183-363	11

Values within columns marked with different superscripts differ significantly (P<0.01)

The average age of chinchillas at fur maturity varied according to farm and ranged from 264 days (farm B) to 318 days (farm D), with the average for the four farms being 287 days. The two extreme values differed significantly from the values for farms A and C. Individual animals reached fur maturity between 183 and 363 days, with the lower values differing more than the higher ones, according to farm. The coefficient of variation (cv%) ranging from 8 to 13% indicates that the fur maturity age was uniform within a given farm.

As shown by the observations made at the data-gathering stage, the farm with the highest uniformity of fur maturity age in chinchillas (farm C) had a similar system of herd management to the other farms except that the rooms were equipped with a forced ventilation system which improved their microclimate. In addition, the animals of the basic herd were ensured very good conditions for reproduction. The weaners were kept in a separate room with temperature slightly lower than that for mothers with sucklings. Tombarkiewicz [9] recommends such an approach as one favouring a faster and more uniform maturation of fur in chinchillas. The bedding system of management on farm C, together with natural lighting supported by additional lighting when necessary, assured a general well-being of the animals. As reported by Tombarkiewicz at al. [10] and Felska at al. [5], such conditions lead to high breeding coefficients and an improvement in appetite, health state, and disease resistance. All the above-mentioned factors may have significantly contributed to a better uniformity of fur maturity age manifesting itself in its lower variation.

The next study factor was the sex of slaughtered animals. Table 2 shows the data on the distribution of the average slaughter age according to sex.

Table 2
Average fur maturity age (age at slaughter) of chinchillas by sex

Sex	*n*	Age (days)	Standard deviation	Range (min – max)	Coefficient of variation (cv%)
Female	104	285	37	203-362	13
Male	462	282	33	183-363	12
Total/Average	566	284	35	183-363	13

As it follows from the data, sex did not have any significant influence on chinchilla fur maturity age: females reached it having 285 days and males 282 days, with similar coefficients of variation (13 and 12%, respectively). However, the minimum values of the trait differed between the sexes, being 20 days lower for males (183 days) than for females.

The third factor, whose effect on fur maturity age was studied, was birth season (month). Table 3 shows the distribution of the average age of reaching fur maturity in chinchillas according to the month of birth.

Table 3
Average fur maturity age (age at slaughter) of chinchillas by birth month

Birth month	n	Age (days)	Standard deviation	Range (min – max)	Coefficient of variation (cv%)
1	19	295^{A}	26	260-361	9
2	27	301^{A}	35	249-363	12
3	88	288^{AB}	29	208-362	10
4	96	293^{A}	33	235-360	11
5	88	276^{B}	30	203-341	11
6	59	275^{B}	38	193-358	14
7	27	279^{B}	25	256-336	9
8	53	278^{B}	41	231-359	15
9	20	295^{A}	30	262-353	10
10	31	253^{C}	36	183-348	14
11	39	275^{B}	24	256-352	9
12	19	302^{A}	22	267-347	7
Total/Average	566	284	31	183-363	11

Values within columns marked with different superscripts differ significantly ($P<0.01$)

Birth month had a significant influence on the age of fur maturity. To make the interpretation of the data easier, the pattern emerging from Table 3 was presented in Figure 2 where three distinct groups of months can be identified. As follows from Table 3 and the diagram in Figure 2, fur maturity occurred at the latest time in chinchillas born from January to April and also in September and December (first group in Figure 2). In this case, the age of chinchillas at the time of reaching fur maturity was in the range of 295 to 302 days, and was significantly older than the age of chinchillas from the second group, i.e. the ones born from May to August and in November, whose age of fur maturity was between 275 and 279 days. The only exception was the animals from the first group born in March which did not significantly differ from the chinchillas from the second group. The third group shown on the diagram consisted of chinchillas born in October and reaching fur maturity already at the age of 253 days, significantly earlier than animals from the other two groups.

In general, two clearly distinct birth seasons resulting in varied age of fur maturity may be identified. These are the months from January to April for the oldest age, and the months from May to August with a significantly earlier age of reaching fur maturity. The influence of the fall months (September to December) is rather ambiguous: chinchillas born in September and December belong to the first group while those born in November belong to the second group. The group of animals born in October reached fur maturity the fastest.

The results obtained in this study do not fully correspond with the observations made by Rzewski [7] who stated that the animals born in the first half of the year reach fur maturity, i.e. slaughter age, relatively early, in the eighth month of life (ca. 240 days), while those from the second half-year attain it at the age of 10-11 months (300-330 days).

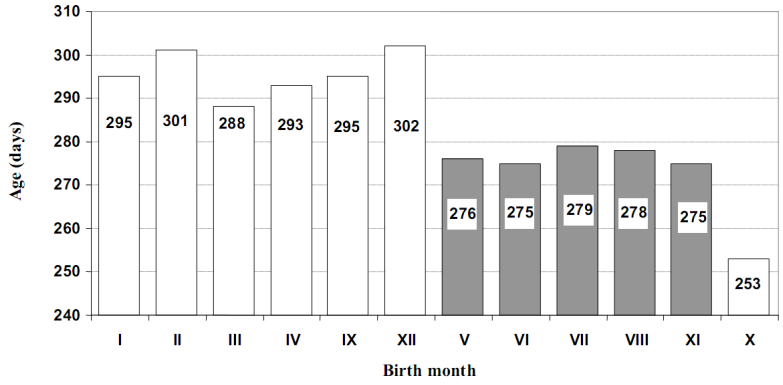

Fig. 2. Fur maturity age vs. birth month of chinchillas

In the present study, the average age of chinchillas born in the first four months of the year ranged between 288 and 301 days, so it was 1.5 months higher than the values reported for that season by Rzewski [7]. It points to the lengthening of the period of fur maturation. Looking at the ranges of fur maturity age shown in Table 3, however, it should be noticed that individuals attaining fur maturity at the age stated by Rzewski [7] can be found among chinchillas born in seven calendar months, but these are not exclusively the months of the first half-year. This suggests that there is a vast differentiation in the age of reaching fur maturity in the chinchilla population, but the trait could not be unequivocally connected with the season (month) of birth.

For chinchillas born in the months belonging to the second half-year, such as July, August, October and November, the fur maturity age determined in this study is earlier than the age stated by Rzewski [7].

Comparison of the fur maturity age in chinchillas born in the first half-year and the animals born in the second half-year indicates that there are no clear differences between the two groups. However, certain birth months, i.e. January, February, April, October and December, tend to delay the age of reaching fur maturity to over 290 days, i.e. to ca. 9.5 months.

According to Barabasz [1], chinchillas reach fur maturity at the age of 8-12 months, but his findings are over 25 years apart from Rzewski's [7] studies which were done in the 1970s. It should be considered that over this period many generations of chinchillas have been subject to systematic selection to improve their utility traits. Based on this one might hazard a guess that continuous improvement and the accompanying domestication--related changes noticeably limited seasonal variations in the age of reaching fur maturity and lengthened it at the same time. The gradual disappearance of seasonality in the time of fur maturation might be yet another manifestation of the domestication-related changes in the chinchillas grown nowadays. Bieniek at al. [4] revealed a considerable reduction in breeding seasonality occurring in chinchillas. Hence, one can assume that the domestication-related changes apply also to the process of fur maturation.

The present study showed that most chinchillas reached fur maturity in the period from December to March; the proportion was 51%. When April was taken into account, the rate rose to 64.4%. These findings correspond roughly with those of Barabasz and Jarosz [3] who reported that depending on microclimatic conditions in the rearing rooms chinchillas reached fur maturity in the period from November to mid-March or from mid-November to mid-February.

Based on the results of the study it was found that the average age of chinchillas at the time of reaching fur maturity (assumed to be the age at slaughter) was 287 days. Significant differences between the herds point to the influence of housing conditions and breeding system on this trait. No differences in the age of reaching fur maturity occurred between males and females, with the lowest age of reaching fur maturity being 183 days for males and 203 days for females.

Birth season was found to have an effect on fur maturity age. A significant effect was produced by birth month. Fur maturity occurred at the latest in chinchillas born from January to April and in September and December. In this group, the age of chinchillas at fur maturity ranged between 295 and 302 days, and was significantly older than the age of animals born in the months of May to August and in November, forming the second group in which it was in the range of 275 to 279 days. The only exception was chinchillas born in March, belonging to the first group, which did not differ significantly from the chinchillas of the second group. The third group consisted of chinchillas born in October, which reached fur maturity at the age of 253 days, significantly earlier than the two other groups.

To sum up, one can identify two clearly distinct birth seasons resulting in different times to reach fur maturity: the months from January to April with the corresponding oldest age of fur maturity, and the months from May to August with a significantly earlier age. Additionally, a differential effect of fall months from September to December is visible: chinchillas born in September and December belong to the first group, while ones born in November, to the second group. In the group of chinchillas born in October, fur maturity occurs at the fastest time. Most of chinchillas, 51%, reach fur maturity in the period from December to March (64.4% if April is included). The shortest time to reach fur maturity that occurred on one of the farms, may have been caused by keeping weaners at temperature which was lower than that in the room for mothers with sucklings.

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