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COAT GREYING PROCESS IN OLD KLADRUBER HORSE

Barbora Hofmanová, Ivan Majzlík, Luboš Vostrý and Karel Mach
Czech University of Life Sciences in Prague, Kamýcká 129, 165 21 Prague 6, Czech Republic, e-mail: hofmanova@af.czu.cz

INTRODUCTION

Old Kladruber horse is the original Czech breed, included among the genetic resources of the Czech Republic, currently kept in two colour varieties – grey and black. The grey coat colour is a result of the progressive greying - the loss of pigment in hairs (Rieder et al., 2000). The speed and level of greying varies between different breeds, but also individuals within the same breed exhibit considerable variability.

OBJECTIVE

The aim of this study was to describe dynamics and to identify factors affecting greying process in Old Kladruber horses.

MATERIAL AND METHODS

- The data collection was carried out in grey variety of Old Kladruber breed in stud Kladruby nad Labem, Benice stud and others.
- 376 horses of both sexes and different age (1-21 years) were included in the study.
- Greying level (L) was measured using Minolta Spectrofotometer 2500D repeatedly in four consecutive years (2005-2008). Higher value of L means more grey („white“) coat colour.
- Each horse was measured at four body parts (neck, shoulder, belly and croup) – mean value was used for analysis.
- The GLM model of SAS was used to examine the influence of effects age, line, sex, year of evaluation and stud on greying level.
- Heritability of greying level was estimated using REML VCE 5 (Kovac et al., 2002).
- Several growth curves (Thornley and France, 2007) were used to describe dynamics of greying process at the population, fitting was performed by NONLIN procedure of SAS.

MODEL USED

$$L_{ijklm} = \mu + b_1 AGE_m + LINE_l + SEX_k + YEAR_j + STUD_i + rep + a + e_{ijklm}$$

where:
- μ – overall mean
- $b_1 AGE_m$ – fixed linear regression on age at evaluation (m = 1,2,…,21)
- $LINE_l$ – fixed effect of the line (l = 1, 2, 3, 4, 5, 6)
- SEX_k – fixed effect of the sex (k = 1, 2)
- $YEAR_j$ – fixed effect of the evaluation year (j = 2005, 2006, 2007, 2008)
- $STUD_i$ – fixed effect of the stud (i = 1, 2, 3, 4)
- **rep** – random effect of the permanent environment of the individual horse
- **a** – random effect of the individual horse
- e_{ijklm} – random residual effect of the individual horse

GROWTH CURVES USED

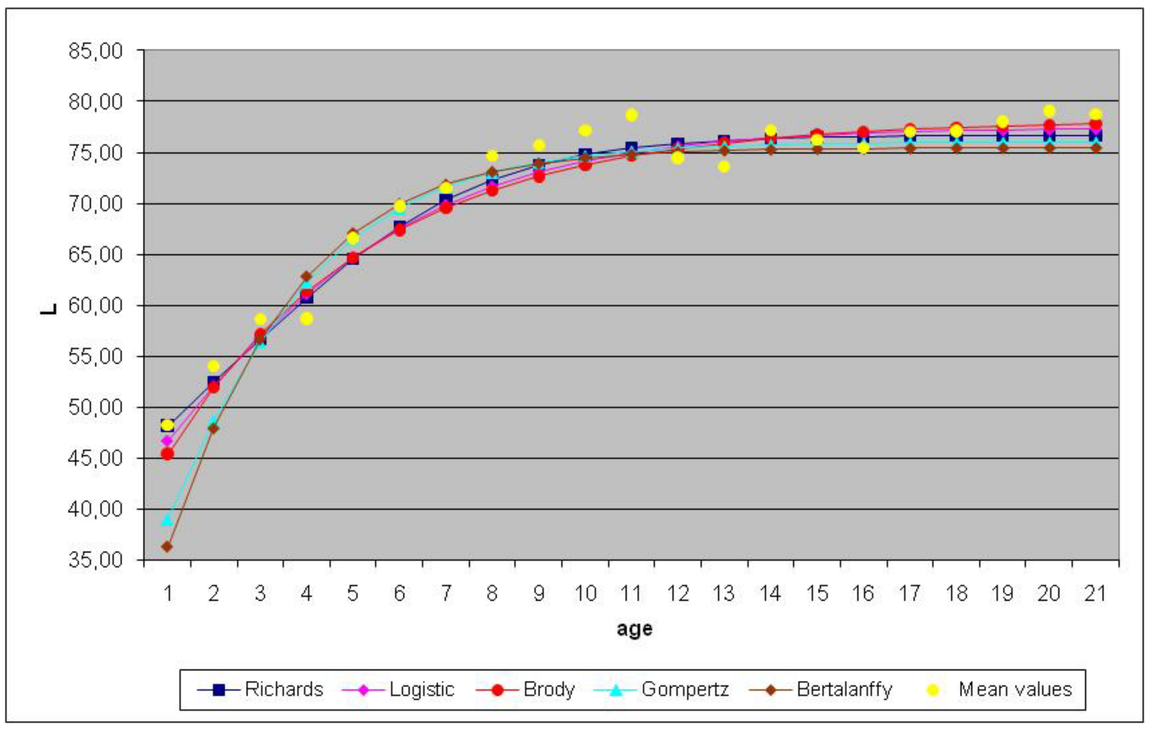
Brody	$L = a(1 - s \times e^{-k \times age})$
Logistic	$L = \frac{a}{1 + s \times e^{-k \times age}}$
Gompertz	$L = a \times e^{-e^{-k \times age}}$
Bertalanffy	$L = a\left(1 - \frac{e^{-k \times age}}{3}\right)^3$
Richards	$L = a(1 \pm s \times e^{-k \times age})^m$

a – asymptote; s – shape coefficient; k – growth rate;
m – parameter defining relative position of the inflection point

RESULTS

- Statistical significant effects in model used were:
  - **AGE** ($p < 0.0001$)
  - **SEX** ($p = 0.0312$) - higher level of greying in mares (L=65.26) compared to sires (L=63.05)
- The estimated heritability of greying level was $h^2 = 0.52 \pm 0.07$
- All the growth curves are characterized by high coefficients of determination ($R^2 > 0.96$) and comparable asymptotic values (final grey level).

Greying dynamics described by growth curves



CONCLUSION

- Results of this study are consistent with well known facts about loss of pigment in hairs with the age in grey horses (Sponenberg, 1996 and others).
- All the selected curves describe very well dynamics of greying at the population studied.
- Moderate value of heritability (h^2=0.52) suggests significant effect of heredity on greying level.
- Characteristics found for Old Kladruber population correspond with those obtained in Lipizzan horses (Curik et al., 2004).
- Further investigation of greying process can help to clarify the considerable variability in the speed and completeness of greying in the breed.

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