

EFFECT OF FIXED AND CONTINUOUS NON-GENETIC FACTORS ON CALF BIRTH WEIGHT*

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SUMMARY: Cattle reproduction is a highly important field and complex stage of production with large reserves of milk, meat, breeding cattle and by-products.

In scientific literature, fertility is generally assessed through age at first conception, gestation length, length of service period, calving interval, and calf birth weight.

Determination of the effect of particular non-genetic factors on the above traits is a vital step in cattle breeding and reproduction.

Calf weight is governed by both genetic and non-genetic factors. Among non-genetic factors, the fixed effects commonly evaluated are effects of breeding region, season of birth, calving season, year of birth, calf sex and their interactions, and continuous or regression effects include age at first conception or calving.

The effect of fixed and continuous non-genetic factors on calf birth weight was analysed in 1151 Simmental calves in three breeding regions, with the effect of breeding region, parity group, calf sex, and breeding region x calving season interaction being statistically very significant ($P < 0.01$). Birth weight was significantly ($P < 0.05$) affected by year of birth and calving season, whereas the fixed effect of birth season and the continuous effect of age at first conception were non-significant ($P > 0.05$).

The coefficient of determination (R^2) showing the level of variation in calf birth weight as explained by the effect of fixed and continuous non-genetic factors fitted in the model was 0.325.

Key words: Simmental breed, calf weight, fixed non-genetic effects, continuous non-genetic effects, coefficient of determination.

Introduction

Cattle reproduction is a very important research field and a highly complex stage of cattle production securing reserves of milk, meat, breeding herds and by-products. At the current level of development of agricultural production and animal science, the issue of milk and meat production is considered less serious than that of cattle reproduction management. Cattle reproduction physiology is a complex field affected by a range of endogenic and exogenic factors more intensely than any other stage of cattle production. Aenhelt et al. (1968) note that there is a cow productivity limit beyond which normal fertility cannot be maintained.

The effect of fixed and continuous non-genetic factors on reproductive traits and calf birth weight was studied by many national and foreign authors [6, 7, 8, 9, 3, 5, 12, 2, 10, 11, 4].

The objective of this study was to analyse data on the fertility of Simmental cows to determine and assess factors that affect variability of calf birth weight.

Material and Method

The effect of fixed (breeding region, calving season and birth, year of birth, calf sex and interaction breeding region x calving season) and continuous or regression environmental factors (age at first conception) on calf birth weight was evaluated in 1151 Simmental calves using the general linear model that ensured simultaneous analysis of differing effects, regardless of whether they were categorical or continuous in character. The general linear model involved the use of the least squares method for the evaluation of the effects and testing of the hypotheses, according to the following model:

$$y_{ijklmn} = \mu + R_i + P_j + Sc_k + Sb_l + Yb_m + S_n + RScik + b_1(x_{l-1}) + e_{ijklmn},$$

where

y_{ijklmn} - individual cow of the i -th rearing area, j -th parity group, k -th season of calving, l -th season of birth, m -th year of birth and n -th sex of calf,

μ - overall population mean under identical distribution of all classes of effects ($R, P, Sc, Sb, Yb, S, YbSb$),

i - fixed effect of the i -th rearing area (1-3),

j - fixed effect of the j -th parity group (1-5).

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This work was financed by the Ministry of Education and Science, Republic of Serbia, project TR 31086.

