

Genetic parameters of growth and in vivo computerized tomography based carcass traits in Pannon White rabbits

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Abstract

Genetic parameters for average daily gain between the age of 5 and 10 weeks (ADG), the average cross-sectional area of the m. Longissimus dorsi (L) (between the 2nd–3rd and 4th–5th lumbar vertebrae-based on in vivo computerized tomography (CT)) and dressing out percentage (DoP) were estimated in a group of 28,686 Pannon White rabbits reared in 5044 litters and born between 2000 and 2003. Using multivariate animal models with Bayesian procedures, estimated heritabilities were moderate and moderately high for ADG, L and DoP (0.21 to 0.29, 0.25 to 0.42 and 0.19 to 0.71, respectively). Litter effects were moderate for ADG, L and DoP estimates (0.20 to 0.22, 0.10 to 0.18 and 0.09 to 0.30, respectively). Genetic correlation coefficient estimates between ADG and L and ADG and DoP were moderate and negative (−0.41 to −0.01, −0.70 to +0.10). A moderately high positive genetic correlation was found between L and DoP (0.13 to 0.83).

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1. Introduction

Most of the current rabbit breeding programmes are based on three-way crosses. The F_1 of two maternal lines is used as the female parent utilizing the expected positive heterosis in reproductive traits. The F_1 is then crossed with a paternal line. The rabbits produced by

the crossbred does are slaughtered for meat (Baselga, 2004). Paternal lines are selected either for average daily gain or for body weight at market time. The selection response on both traits is well documented (Lukefahr et al., 1996; McNitt and Lukefahr, 1996; Moura et al., 1997; Piles and Blasco, 2003).

Selection can also target dressing out percentage directly through progeny testing. Progeny testing is however costly and lengthens the generation interval. According to our knowledge it was only practised by Varewyck et al. (1986) and Szendrő et al. (1988). The

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utilization of X-ray computerized tomography (CT) to assess body composition *in vivo* opened up new possibilities (Skjervold et al., 1981). At the University of Kaposvár (Hungary), a special digital imaging centre was installed in 1990 utilizing CT for animal science and human diagnostics and research. CT-based selection in sheep is currently applied in the UK, Australia and New Zealand (Simm, 1987; Jones et al., 2002, 2004). Before 1999 there was no international precedent on the application of tomography in rabbits. The first stage of examination in Kaposvár aimed at selection for improved slaughter value of Pannon White rabbits. The determination was made of the sectional planes in which the CT data recorded are suitable for estimation. It was concluded that the correlations between the average cross section of the m. Longissimus dorsi and the carcass traits exceeded the level of 0.7 (Szendrő et al., 1992). The methods of using the CT system in rabbit research are summarised by Romvári et al. (1996). Preliminary results of CT-aided selection of Pannon White rabbits were reported by Szendrő et al. (1996). CT-based selection was re-started in 2000 and has been practised thereafter. Nevertheless, accurate genetic parameters are still to be determined for growth and carcass traits involved in this programme. As the structure of the accumulated data is highly unbalanced, the objective of the present study was to estimate genetic parameters for growth and CT-based carcass traits using Bayesian techniques.

2. Materials and methods

2.1. Foundation population

The development of the Pannon White rabbit population was initiated at University of Kaposvár in 1988. The first stage of the programme took place between 1988 and 1990. During this stage the population consisted of 100 New Zealand White does. The farm served as a test centre for a large and some surrounding stock farms evaluating the weight gain and dressing out percentage of their bucks through progeny testing. The does were inseminated entirely through AI. The local population at Kaposvár was improved using the semen from those bucks of other stock farms whose progeny showed the best

performance for average daily gain and dressing out percentage. During the second stage in 1991 New Zealand White rabbits were reciprocally crossed with Californian rabbits. The progeny of the crosses showing the best weight gain and dressing out percentage served as the basis for a new synthetic line. The third stage of the programme has been operational since 1992 and involves closed, within line mass selection. The size of this line is about 250 does and 60 bucks and it has been recognised as the Pannon White breed. Selection criteria for this breed are the average daily gain and carcass traits measured by CT. Mating of close relatives is avoided.

2.2. Population management and traits recorded

The present analysis was based on data from 28,686 Pannon White rabbits born between 2000 and 2003. The evaluated animals were reared in 5044 litters and the total number in the pedigree file was 30,524. The number of base animals was 149. Growing rabbits were housed in a closed rabbitry, in fattening cages (2–3 rabbits per cage). After weaning (35 days) they were fed a commercial pellet (16.3% crude protein, 15.2% crude fibre, and 10.6 MJ DE/kg). In winter the rabbitry was heated to a minimum temperature of 15–16 °C, while in the absence of air conditioning in the summer the temperature occasionally reached levels as high as 28 °C. The animals were weighed at 5 and 10 weeks of age, to calculate the average daily weight gain (ADG). Only rabbits showing higher body weight gain than the average for their kindling batch were selected for the CT measurements (Siemens Somatom S40 spiral scanner). The average performance of the selected group was 45.0 g for female and 47.6 g for male rabbits. Selected rabbits were placed into a plastic “container” that serves for restraining three animals without anaesthesia. On the topogram made from a lateral view the anatomical points of the CT scans (junction of the 2nd and 3rd and that of the 4th and 5th lumbar vertebrae) were marked. On the CT scans the m. Longissimus dorsi cross section was manually demarcated at the two locations and the muscle area was measured. The average of the two values is the so-called L value (L), expressed in cm². After reaching market age, some of the sibs of the CT scanned rabbits were sent for test slaughter to an

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