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Faculty of Animal Science, University of Kaposvár, H-7400 Kaposvár, Guba S. u. 40, Hungary

Szendro@mail.atk.u-kaposvar.hu

SELECTION OF PANNON WHITE RABBITS BASED ON COMPUTERISED TOMOGRAPHY

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Faculty of Animal Science, University of Kaposvár, H-7400 Kaposvár,
Guba S. u. 40, Hungary
Szendro@mail.atk.u-kaposvar.hu

ABSTRACT

This presentation reviews the selection procedure performed in the last years. From the population (n=12871) with 42.1 g/day average body weight gain between 5 and 10 weeks of age, the rabbits with higher daily weight gain (females: 45.0 g/day /n=1748/, males: 47.6 g/day /n=1179/) were chosen, thereafter CT (computerised tomography) scanning was performed at 10.5 weeks of age. Based on the scans located between the 2^{nd} and 3^{rd}, as well as between the 4^{th} and 5^{th} lumbar vertebrae, the cross-sectional area of the *m. Longissimus dorsi* was measured and the average of the two values was calculated (L value). A linear regression equation between the body weight and L-value was developed, and rabbits with the highest values above the regression line were selected. The L value of the selected animals exceeded the population average by 1 and 1.8 cm^2 in female and male rabbits, respectively. Evaluated with REML the heritability (h^2) and common litter effect (c^2) of L-value were 0.41 (0.03) and 0.12 (0.01) respectively. Applying BLUP genetic merit of L-value showed an increasing trend for the whole investigation period.

Key words: rabbits, Pannon White, selection, computerised tomography, weight gain.

INTRODUCTION

The two main directions of rabbit selection for productivity aim to improve either the prolificacy (female lines) or the growth rate (male lines). In the first case mainly the litter size, while in the second case the weight gain is regarded as the most important trait. The advanced technology existing at the University of Kaposvár provides the possibility of using computerised tomography (CT) for the selection of growing rabbits.

The methods rendered possible and the possibilities ensured by CT have been described by ROMVÁRI *et al.* (1996). The efficiency of the CT-aided selection in the improvement of the carcass traits has also been reported (ROMVÁRI, 1996; SZENDRO *et al.*, 1996). This paper gives a brief overview of the work re-started after an intermission of several years with the aim to improve the carcass traits of Pannon White rabbits.

MATERIAL AND METHODS

The selection is performed on Pannon White rabbits at the rabbit farm of the University of Kaposvár.

Growing rabbits were kept in a closed rabbit house, in fattening cages (2-3 rabbits per cage). After weaning at 5 weeks of age they were fed a commercial pelleted diet. In the winter the rabbit house 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 daily weight gain. Rabbits showing the best weight gain were subjected to CT examination (Siemens Somatom S40 spiral scanner) at 10.5 weeks of age. Rabbits were placed in a plastic "container" that serves for restraining three animals without anaesthesia (Figure 1). On the topogram made from lateral view (Figure 2) the anatomical points of the CT scans (junction of the 2^{nd} and 3^{rd} and that of the 4^{th} and 5^{th} lumbar vertebrae) were marked (Figure 3). On the CT scans the *m. Longissimus dorsi* cross section was manually demarcated at the two locations and the muscle area was determined (Figure 4). The average of the two values is the so-called L-value, expressed in cm^2. In previous experiments SZENDRO *et al*., (1992) found correlation (≈0.7) between the dressing out percentage and the surface of the *m. Longissimus dorsi*.

CT examination of rabbits

Figure 1 Position of the 3 rabbits in a container during CT examination

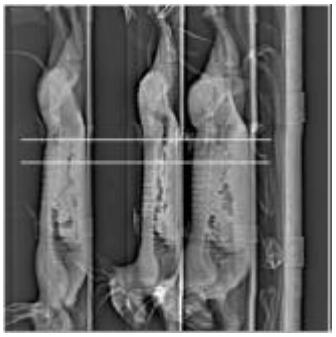

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Figure 2 The anatomical points of the CT scans are marked on the lateral view of the topogram

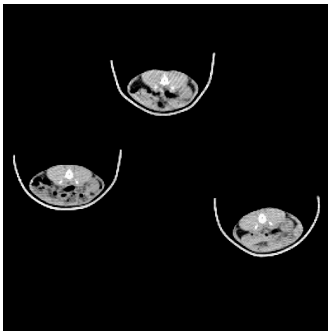

Figure 3 The CT scans of the 3 rabbits before enlarging the single pictures.

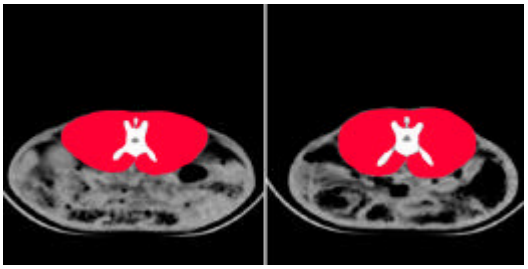

Figure 4.The surface of m. Longissimus dorsi is measured on the junction of the 2nd and 3rd (left) and that of the 4th and 5th (right) lumbar vertebrae.

In each examination procedure, the regression line of the L-value of the whole population on body weight was determined. Animals located the farthest from this regression line in the positive direction (Figure 5) were selected, since they had the highest cross-sectional area of *m. Longissimus dorsi* independently of the body weight; and this trait is in positive correlation to carcass traits. On the basis of the individual relative L-values (distance from the regression line) the mean value for full and half-sibs was also calculated. When selecting the best individuals, the average performance of the groups of relatives was also taken into consideration besides the individual value.

Moreover the CT-based L-values together with the available slaughter data (n=561 at the age of 12 weeks) were evaluated with the REML and BLUP procedures in order to estimate genetic parameters and breeding values. From the slaughter data the dressing out percentage was chosen to be analysed. The applied softwares were PEST (GROENEVELD *et al*., 1990) and VCE 4 (GROENEVELD and GARCIA-CORTES, 1998). Using a bivariate animal model authors considered the sex (2 levels), year-season (6 levels) and batch (35 levels) effects as fixed effects, body weight at CT-scans (L-value) and slaughter weight (dressing out percentage) as covariates, whilst common litter effects and additive genetic effects were treated as random effects. The evaluated animals were reared in 1479 litters and the total number in the pedigree file was 4898, from which the number of base animals was 163.

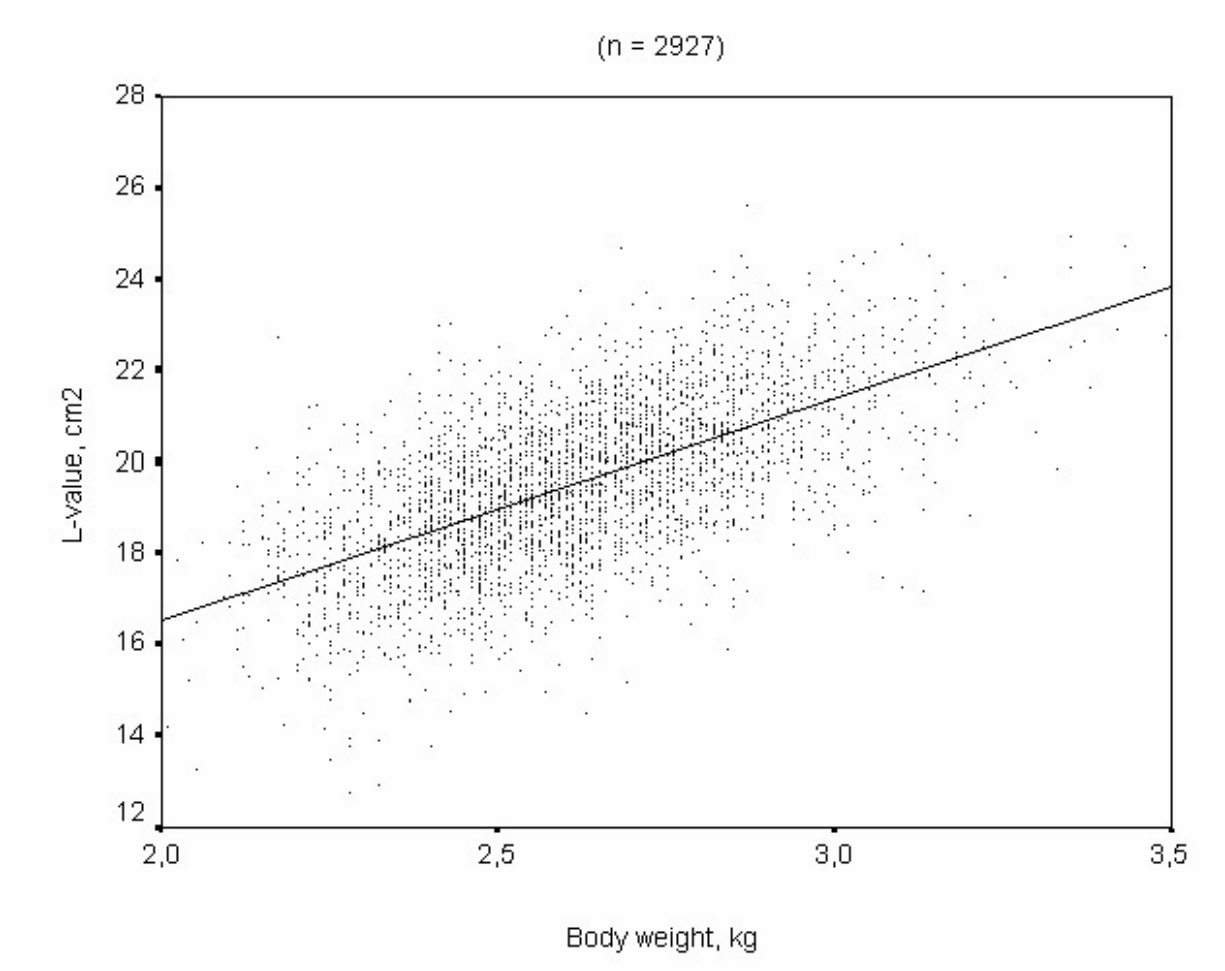

Figure 5. Regression of L-value on body weight.

RESULTS AND DISCUSSION

The selection of growing rabbits was performed in a two-step procedure. The first was the daily weight gain between 5 and 10 weeks of age, and the next one was the L-value obtained from the CT scanning.

Only rabbits showing body weight gain higher than the average were selected for the CT measurements. The average daily weight gain of the non-selected population was 42.1 g (n=12871) while that of the selected group for CT scanning was 45.0 g for female (n=1748) and 47.6 g for male rabbits (n=1179).
The average of L-values of the rabbits examined by CT was 19.5 cm^2 (n=2927) and that of the selected group for breeding purpose was 20.5 cm^2 for females (n=645) and 21.3 cm^2 for males (n=226). According to our selection program, 27.2% and 18.3% of female and male rabbits were chosen for CT examination and 36.9% and 19.2% on the basis

their L-values for breeding animals. Calculated for the base population, 10.0% of females and 3.5% of males are selected for breeding.

Genetic parameters of the L-value and dressing out percentage are provided in Table 1.

Table 1. Estimates of heritabilitiy (h^2), common litter effects (c^2) (diagonals) and genetic correlation (off-diagonals). Standard errors of estimates are given in brackets.

Trait	L-value	Dressing out percentage
L-value	**0.41 (0.03)**; 0.12 (0.01)	0.45 (0.08)
Dressing out percentage		**0.79 (0.04)**; 0.16 (0.04)

It has to be noted that as the number of slaughtered animals was small the high heritability estimate for dressing out percentage should be viewed with caution. Nevertheless the h^2 and c^2 values of the L-value make efficient CT-based selection possible, which due to the favourable genetic correlation with dressing out percentage also improves the slaughter traits (as dressing out percentage and weight of *m. Longissimus dorsi*).

It was demonstrated earlier that in rabbits with higher L-values not only the *m. Longissimus dorsi* but also the meat weight on the hind legs was higher (SZENDRO *et al.*, 1992). The results of a divergent selection experiment has shown that selection was effective (SZENDRO *et al.*, 1996). The effectiveness of our selection work was confirmed by a CT-based experiment comparing different genotypes. The weight of *m. Longissimus dorsi* was the highest in purebred Pannon White (PW) rabbits and a significant decrease was found in direction to Hyplus (H) does mated by PW bucks, PW does inseminated by H males and the progenies of H parents (METZGER *et al.*, 2004). The highest dressing out percentage was found in the group of rabbits originated from the early matured H female line and the CT selected PW bucks.

The averages of relative L-values (differences between the L-values of selected animals and the regression equation) were 1.49, 1.29 and 2.01 cm^2 in the years of 2001, 2002 and 2003, respectively. Similarly breeding values (BLUP) of the scanned animals born in the years of 2001, 2002, 2003 averaged 0.1196, 0.3506, and 0.7844, respectively. All of the results show that the selection based on CT measurement could be a good way to improve the carcass traits.

ACKNOWLEDGEMENTS

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