Genetic parameters of growth in vivo CT based and slaughter traits in Pannon white rabbits

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Introduction

In rabbit breeding Computer tomography (CT)-aided selection is exclusively applied at Kaposvár to improve the slaughter value of Pannon white rabbits. Its efficiency was described by Nagy *et al.* (2006) and by Gyovai *et al.* (2008). However the association between the criteria of the CT based selection and carcass traits were so far tested only indirectly (Szendrő et al. 2010). Objective of the present study was therefore to estimate the genetic correlation between the average daily gain, thigh muscle volume and the hind part percent (compared to the chilled carcass).

Materials and methods

The present analysis was based on data of Pannon White rabbits born between 2003 and 2009 at the rabbit farm of the University of Kaposvár. The analysis was based on the average daily gain (between the ages of 5 and 10 weeks) of all growing rabbits of this period. The CT scans were accomplished in 49 batches between 2004 February and 2010 January. The test slaughters were made in ten batches between 2007 December and 2009 September. Descriptive statistics are presented in table 1.

Table 1: Descriptive statistics for the traits

Trait	No. of records	Mean	S.D.
ADG	29435	43.2	6.68
TMV	4434	336	38.9
BWCT	4434	2612	238
HPP	557	31.7	0.97

ADG: average daily gain (g); TMV: thigh muscle volume (cm^3); BWCT: body weight at CT scan (g); HPP: hind part percent (%)

Details of population management are described by Gyovai et al. (2010), the methodology of the CT scans and details of the CT selection are given by Gyovai et al. (2008; 2010).
The daily gain, CT-based thigh muscle volume and hind part percent (compared to the chilled carcass) were evaluated with the REML and BLUP procedures in order to estimate genetic parameters. The applied softwares were PEST (Groeneveld 1990) and VCE 5 (Kovac and Groeneveld 2003.) The structures of the used models are given in Table 2.

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Table 2: Structure of multi-trait animal models

Factor	Type[a]	Level	Trait		
			ADG	TMV	HPP
year-month	F	62	x	x	x
animal	A	31402	x	x	x
litter	R	4407	x	x	x
body weight at CT-scan	C	1	–	x	–
sex	F	2	x	x	x
pixel	F	3	–	x	–

[a] Type of factors: F, fix factor; A, random factor with covariance matrix; R, random effect; C, covariable;

Results and discussion

Table 3: Estimate of heritabilities (diagonals) and genetic correlation coefficients (off-diagonals) Standard errors of estimates are given in brackets.

Trait	ADG	TMV	HPP
ADG	0.30 (0.01)	0.06 (0.06)	-0.08 (0.05)
TMV		0.19 (0.02)	0.59 (0.05)
HPP			0.59 (0.05)

Our estimestes of heritabilities for ADG were higher than that of Piles and Blasco (2003), Estany et al. (1992) and Lukefahr et al. (1996) and very similar with the value reported by Nagy *et al.* (2006) and Gyovai *et al.* (2008) in Pannon white rabbits. Heritability estimates were moderately low for TMV and high for HPP. There were no published genetic parameters to compare our results. A moderately strong and favourable genetic correlation coefficient was found between TMV and HPP. The selection on TVM thus also improves the HPP which was proved in a crossing experiment where the Pannon white genotype had the best performance for HPP (Szendro et al., 2010).

Table 4: Estimate of random litter effects (diagonals) Standard errors of estimates are given in brackets.

Trait	ADG	TMV	HPP
ADG	0.13 (0.01)		
TMV		0.12 (0.01)	
HPP			0.07 (0.03)

Literature estimates of common litter effect for ADG were moderately large 0.31-0.40 for other athors thus exceeding (Piles and Blasco, 2003; and Lukefahr et al., 1996) the results of this study which was very close to the estimated values of Estany et al. (1992). Estimates of common litter effect of weight of HPP was negligible which was expected because of its high heritability.

Conclusion

The results show that the CT based selection can efficiently improve thigh muscle volume and HPP as a correlated trait.

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