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The profit of the slaughterhouses realized in the course of CT-aided selection of rabbits

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ABSTRACT

One of the Hungarian rabbit breeding sector's characteristics is that almost all purchased rabbits are exported while their local commerce is minimal. Meat production is one parameter of meat quality which is continuously gaining importance. Improving the meat production of the Pannon White rabbits began in 1992 with the application of Computer Tomography (CT). The objective of the present study was to examine the efficiency of the CT-aided selection from the viewpoint of the slaughterhouses. Analysis of profitability was made using the data of our previous trials taking into account the price obtained for the whole carcass or for the meat fillet. Supposing the same price of Pannon White (P) and Hycole (H) rabbits (trial 1.) marketing the whole carcasses or the meat fillet products resulted in 19 HUF/kg and 43 HUF/kg extra incomes for the Pannon White rabbits. Supposing a slaughter weight of 2.7 kg this value is 51 and 116 HUF per individual. Comparing P×P and P×H genotypes (trial 2) the advantage of the P×P rabbits was 38 HUF/rabbit and 78 HUF/rabbit for whole carcass or the meat fillet product. Comparing the second generation of the divergent selection for thigh muscle volume (trial 3) after 10 generations marketing the whole carcass or the meat fillet product results 68 and 216 HUF extra income per individual (average body weight 2.7 kg) at the slaughterhouse. Supposing the annual slaughter of one million rabbit as a result of the CT-aided selection can increase the profit of the slaughterhouse with 80–100 million HUF. It can be concluded that the selection based on CT data is highly advantageous for the slaughterhouses because they obtain more lean meat from a CT selected rabbit having the same body weight (ie. for which the slaughterhouse paid the same price) which results in a substantial extra income. Thus it would be worth for the slaughterhouses to pay higher price for these animals and share their extra profit with the producer. (Exchange rate between EURO and HUF is about 260–270.)
(Keywords: rabbit, CT-aided selection, meat production, profit)

INTRODUCTION

One of the Hungarian rabbit breeding sector's characteristics is that almost all carcasses are exported while their local commerce is minimal. This explains the fact that contrary to our relatively low production Hungary is the largest rabbit exporter in Europe. In Hungary there are six recognized rabbit breeding organizations although most large scale rabbit farms use Hycole hybrids while Pannon White rabbit breed takes the second place. The rabbits produced in Hungary are slaughtered at two abattoirs owned by Olívia Ltd at Lajosmizse and by Tetrabbit Ltd at Baja, respectively (*Máté,* 2009). Both slaughter-houses process several million rabbits annually thus they have an interest of increasing

meat yield. More than half of the slaughtered rabbits are sold as dissected. Therefore the abattoirs have interest also to increase the percentage and weight of the premium cuts (loin, thigh). Selection for dressing out percentage is not common in rabbit breeding because the trait cannot be measured on live rabbits therefore it could only be determined by progeny test (*Varewick et al.,* 1986; *Szendrő et al.,* 1988). The CT operated at the Kaposvár University makes it possible to determine the meat yield of the rabbits in vivo and to use the data for selection (*Romvári et al.,* 1996). The selection is carried out in two steps. During the first stage the rabbits having the best average daily gains are selected. At the second stage these animals are scanned by CT and only the rabbits having the highest meat yield are chosen for breeding animals.

Between 1992 and 2004 the selection criterion was the cross sectional area of the *M. longissimus dorsi* (at the junction of the 2nd and 3rd and that of the 4th and 5th lumbar vertebrae, the so called L-value). The L-value had a moderately high phenotypic correlation (r=0.7) with the dressing out percentage (*Szendrő et al.,* 1992). Hoping to increase the efficiency of the selection the selection criterion was changed to the thigh muscle volume in 2005. The CT scans (pictures) were adjusted to take 10 mm thick imaginary slices, from the thigh muscle with total overlapping (slice: 10 mm) providing direct volumetric information. Because the hind legs contain substantially larger amount of muscle than the loin a quicker improvement was expected even in the case of lower efficiency (*Szendrő et al.,* 2008). *Nagy et al.* (2009) reported a phenotypic correlation of 0.45 between the thigh muscle volume and dressing out percentage. The efficiency of the selection was justified by the annual selection response of 1 g average daily gain and 4 cm^3 thigh muscle volume (*Gyovai et al.,* 2008). The objective of this study was to analyze the usefulness of the selection based on CT data from the viewpoint of slaughterhouses.

MATERIALS AND METHODS

The profitability analysis of the CT-aided selection (extra income of the slaughterhouse) was made using the data of our previous experiments taking into account the price of the whole carcass and that of the meat fillet. The prices used for calculation were the following: whole carcass 980 HUF/kg, loin fillet (*M. longissimus dorsi*) 3200 HUF/kg, thigh fillet 2100 HUF/kg, carcass without the loin and thigh fillets 450 HUF/kg. Using these prices the income from the slaughtered rabbits were calculated using 1 kg live rabbit as a unit of measurement taking into account whether the rabbit meat was sold as whole carcass or as meat fillet. The calculations were made related to a hypothetical rabbit weighing 2.7 kg and also for 1,000,000 slaughter rabbits. In 2004 *Metzger et al.* (2006) conducted an experiment comparing Pannon White (P) and Hycole (H) genotypes. The data of the following crossing combinations were compared: P×P, P×H, H×P, H×H. In the experiment carried out in 2007 the following genotypes were used: Pannon White (P), maternal line (A), large sized sire line (N), coloured line (S), Hycole terminal sire line (H). The Pannon White does were inseminated with the spemen of all five genotypes (*Szendrő et al.,* 2010). The slaughter data were evaluated of the following crossing combinations: P×P, P×A, P×H, P×N, P×S. The data of the third trial came from a divergent selection experiment (*Szendrő et al.,* 2008). In this experiment during two generations the Pannon White rabbits were selected with the help of CT to increase and to decrease the thigh muscle volume and the animals showing the highest and lowest values were kept as breeding animals. Experimental data were recorded using Windows Office Excel. The data were evaluated by one factor analysis of variance applying SPSS 10.0 software package. (Exchange rate between EURO and HUF is about 260–270.)

RESULTS AND DISCUSSION

Slaughter data and the extra income of the first experiment are presented in *Table 1.* From the results the efficiency of the selection is obvious and the superiority of the P×P rabbit can be seen not only from the slaughter data but also from the income compared to other genotypes. According to our data compared to the H×H rabbits the carcass of the P×P and crossed (P×H, H×P) rabbits can be sold obtaining on average 19 and 9 HUF/kg additional income, respectively. In case of marketing meat fillet the extra income of the abattoir for the same genotypes is 43 and 21.5 HUF/kg, respectively, or 116 and 58 HUF/slaughter rabbit weighing 2.7 kg, respectively.

Slaughtering one million rabbits annually the difference between the H×H and P×P genotypes is 116 million HUF which is the additional value of the meat of the selected rabbits.

Table 1

Profitability analysis of the experiment conducted in 2004

	Crossing combinations				SE	P
	P×P	P×H	H×P	H×H		
n (1)	60	59	60	52		
Live weight prior to slaughter, g (2)	2644^{a}	2758^{b}	2616^{a}	2671^{a}	12.8	P<0.001
Chilled carcass weight , g	1604^{b}	1652^{c}	1555^{a}	1569^{ab}	7.96	P<0.001
Dressing out percentage, %	60.7^{c}	59.9^{b}	59.5^{b}	58.7^{a}	0.12	P<0.001
Weight of the loin fillet, g	158^{b}	161^{b}	147^{a}	143^{a}	1.29	P<0.001
Loin fillet, % (compared to live weight)	5.97^{c}	5.84^{c}	5.60^{b}	5.34^{a}	0.04	P<0.001
Weight of the thigh fillet, g	365	364	345	342		
Thigh fillet, % (compared to live weight)	13.8^{c}	13.2^{b}	13.2^{b}	12.8^{a}	0.05	P<0.001
Weight of the carcass without the loin and thigh fillets, g	1082^{a}	1127^{b}	1064^{a}	1085^{a}	5.45	P<0.001
Value of the live rabbit HUF (375 HUF/kg)	992^{a}	1034^{b}	981^{a}	1002^{a}	4.80	P<0.001
Value of the chilled carcass, HUF (980 HUF/kg) (3)	1572^{b}	1619^{c}	1524^{a}	1538^{ab}	7.81	P<0.001
Value of the loin fillet, HUF (3200 HUF/kg) (4)	504^{b}	515^{b}	469^{a}	458^{a}	4.14	P<0.001
Value of the thigh fillet, HUF (2100 HUF/kg) (5)	766^{b}	764^{b}	724^{a}	717^{a}	4.43	P<0.001
Value of the carcass without the loin and thigh fillets, HUF (450 HUF/kg) (6)	487^{a}	507^{b}	479^{a}	488^{a}	2.45	
Income related to 1 kg live rabbit, HUF/kg						
Marketing the whole carcass, HUF/kg (3/2)	595^{c}	587^{b}	583^{b}	576^{a}	1.20	P<0.001
Difference compared to the H×H genotype (HUF/kg)	+19	+11	+7	0		
Marketing meat fillet, HUF/kg (4+5+6/2)	665^{c}	648^{b}	639^{b}	622^{a}	2.17	P<0.001
Difference compared to the H×H genotype (HUF/kg)	+43	+26	+17	0		

The results of the experiment conducted in 2007 are provided in *Table 2*. Compared to the P×H group slaughter performance and the income related to 1 kg live weight improved for all crossing combinations. Calculating for the whole carcass the P×N and P×P genotypes realized a higher income by 8 and 14 HUF/kg. In case of meat fillet these differences further increased to 12 and 29 HUF/kg, respectively. Relating these results to a slaughter rabbit weighing 2.7 kg the extra income for these genotypes are 32.4 HUF and 78.3 HUF, respectively which supposing 1,000,000 rabbits leads to 32 and 78 million HUF additional income.

Compared to the first experiment an important difference was that in the second trial in all groups the CT-selected Pannon White does were inseminated with the sperm of other rabbit genotypes that decreased the detectable differences among the groups. It has to be noted that compared to the P×H the large sized sire line selected at Kaposvár University (P×N) gave more favourable results. This genotype is continuously being selected with the use of CT therefore the observed difference might have increased since then.

Table 2

Profitability analysis of the experiment conducted in 2007

	Crossing combinations					SE	P
	P×P	P×H	P×N	P×A	P×S		
n (1)	31	28	31	31	30		
Live weight prior to slaughter, g (2)	2659^{a}	2933^{c}	2803^{b}	2701^{ab}	2674^{a}	21.4	<0.001
Chilled carcass weight, g	1602^{a}	1725^{b}	1676^{ab}	1611^{a}	1600^{a}	13.4	0.008
Dressing out percentage, %	60.3	58.9	59.7	59.6	59.8	0.15	0.088
Weight of the loin fillet, g	197	201	198	196	191	2.11	0.658
Loin fillet, % (compared to live weight)	7.41^{c}	6.87^{a}	7.03^{ab}	7.26^{bc}	7.12^{abc}	0.05	0.012
Weight of the thigh fillet, g	382^{ab}	407^{c}	396^{bc}	376^{a}	368^{a}	3.29	0.001
Thigh fillet, % (compared to live weight)	14.4^{c}	13.9^{ab}	14.1^{bc}	13.9^{ab}	13.8^{a}	0.05	<0.001
Weight of the carcass without the loin and thigh fillets, g	1023^{a}	1117^{c}	1082^{bc}	1040^{ab}	1041^{ab}	8.58	0.003
Value of the live rabbit HUF (375 HUF/kg)	997^{a}	1100^{c}	1051^{b}	1013^{ab}	1003^{a}	8.01	<0.001
Value of the chilled carcass, HUF (980 HUF/kg) (3)	1570^{a}	1691^{b}	1642^{ab}	1579^{a}	1568^{a}	13.2	0.008
Value of the loin fillet, HUF (3200 HUF/kg) (4)	631	644	634	627	611	6.77	0.661
Value of the thigh fillet, HUF (2100 HUF/kg) (5)	802^{ab}	855^{c}	832^{bc}	789^{a}	773^{a}	6.90	0.001
Value of the carcass without the loin and thigh fillets, HUF (450 HUF/kg) (6)	460^{a}	503^{c}	487^{bc}	468^{ab}	468^{ab}	3.86	0.003
Income related to 1 kg live rabbit, HUF/kg							
Marketing the whole carcass, HUF/kg (3/2)	591	577	585	584	586	1.49	0.085
Difference compared to the P×H-genotype (HUF/kg)	+14	-	+8	+7	+9		
Marketing meat fillet, HUF/kg (4+5+6/2)	712^{b}	683^{a}	695^{a}	698^{ab}	692^{a}	2.50	0.006
Difference compared to the P×H-genotype (HUF/kg)	+29	-	+12	+15	+9		

The divergent selection for thigh muscle volume resulted a 1.1% difference in the dressing out percentage and 1.2% difference in the thigh muscle fillet compared to the live weight (*Table 3*). The difference between the groups was 10 and 32 HUF/kg for the whole carcass and meat fillet, respectively (*Table 3*). This is equivalent of an additional income of 2.5 and 8.0 HUF/kg per generation for whole carcass and for meat fillet, respectively. Supposing the same selection response after 10 generations the slaughterhouses can realize an additional income of 25 and 80 HUF, respectively. Considering 2.7 kg slaughter weight these values are 67.5 and 216 HUF/rabbit. Supposing 1,000,000 slaughtered rabbits annually the extra profit of the slaughterhouse are 67.5 and 216 million HUF. Becasue the Pannon White and the large size sire line rabbits are selected with the aid of the CT since 1992 and 2005, respectively, the ten generation long interval cannot be considered to be exaggerated.

Table 3

Profitability analysis of the divergent selection experiment

	Divergent selection		**SE**	**P**
	Negative	**Positive**		
n (1)	24	24		
Live weight prior to slaughter, g (2)	2454	2445	29.6	0.881
Chilled carcass weight, g	1444	1462	21.2	0.682
Dressing out percentage, %	58,7	59,8	0.30	0.086
Weight of the loin fillet, g	137	142	2.69	0.358
Loin fillet, % (compared to live weight)	5,56	5,81	0.08	0.135
Weight of the thigh fillet, g	327	355	6.15	0.019
Thigh fillet, % (compared to live weight)	13,3	14,5	0.16	<0.001
Weight of the carcass without the loin and thigh fillets, g	981	965	13.7	0.570
Value of the live rabbit HUF (375 HUF/kg)	920	917	11.1	0.881
Value of the chilled carcass, HUF (980 HUF/kg) (3)	1415	1432	20.7	0.684
Value of the loin fillet, HUF (3200 HUF/kg) (4)	438	454	8.61	0.354
Value of the thigh fillet, HUF (2100 HUF/kg) (5)	686	745	12.9	0.019
Value of the carcass without the loin and thigh fillets, HUF (450 HUF/kg) (6)	441	434	6.16	0.570
Income related **to 1 kg live rabbit, HUF/kg**				
Marketing the whole carcass, HUF/kg (3/2)	576	586	2.98	0.088
Difference compared to the MM-genotype (HUF/kg)	-	+10		
Marketing meat fillet, HUF/kg (4+5+6/2)	636	668	5.55	0.003
Difference compared to the MM-genotype (HUF/kg)	-	+32		

CONCLUSIONS

The selection based on CT data is highly advantageous for the slaughterhouses because they obtain more lean meat from a CT selected rabbit having the same body weight (ie. for which the slaughterhouse paid the same price) which may result 100 million HUF extra income. Thus it would be worth for the slaughterhouses to pay higher price for these animals and share their extra profit with the producer to induce the use of Pannon White rabbits and their crosses. Subsidizing the CT investigation would quickly return as

the progeny of the selected rabbits (having higher meat yield) would be transported to slaughterhouses. Selection for meat production is also advantageous for the producer as these rabbits have better feed conversion ratio.

REFERENCES

Gyovai, P., Nagy, I., Gerencsér, Zs., Metzger, Sz., Radnai, I., Szendrő, Zs. (2008). Genetic parameters and trends of the thigh muscle volume in Pannon White rabbits. 9th World Rabbit Congress, Verona, 115-119.

Máté Cs. (2009). A nyúltermelésünk aktuális kérdései. 21. Nyúltenyésztési Tudományos Nap. Kaposvár, 1-4.

Metzger. Sz., Odermatt. M., Szendrő. Zs., Mohaupt. M., Romvári. R., Makai. A., Biró-Németh. E., Sipos. L., Radnai. I., Horn. P. (2006). The study of the carcass traits of different rabbit genotypes. World Rabbit Sci., 14. 107-114.

Nagy, I., Gyovai, P., Gerencsér, Zs., Matics, Zs., Radnai, I., Biróné Németh, E., Szendrő, Zs. (2009). Genetic parameters of carcass traits in Pannon White rabbit population (in Hung.). 21. Hungarian Conference on Rabbit Production. Kaposvár, 73-77.

Romvári, R., Milisits, G., Szendrő, Zs., Sorensen, P. (1996). Non invasive method to study the body composition of rabbits by X-ray computerised tomography. World Rabbit Sci., 4. 219-224.

Szendrő, Zs., Ballay, A., Ráczkevy, S., Bíróné Németh, E. (1988). Progeny test on station in Hungary. 4th World Rabbit Congress. Budapest, Proc. Gen., 289-293.

Szendrő, Zs., Horn, P., Kövér, Gy., Berényi, E., Radnai, I., Biróné Németh, E. (1992). In vivo measurement of carcass traits of meat type rabbits by X-ray computerised tomography. J. Appl. Rabbit Res., 15. 1576-1582.

Szendrő, Zs., Matics, Zs., Gerencsér, Zs., Nagy, I., Lengyel, M., Horn, P., Dalle Zotte, A. (2010). Effect of dam and sire genotypes on productive and carcass traits of rabbits. J. Anim. Sci., 88. 533-543.

Szendrő, Zs., Metzger, Sz., Romvári, R., Szabó, A., Locsmándi, L., Petrási, Zs., Nagy, I., Nagy, Z., Biróné Németh, E., Radnai, I., Matics, Zs., Horn, P. (2008). Effect of divergent slection based on CT measured hind leg muscle volume in rabbits. 9th World Rabbit Congress. Verona, 249-253.

Varewick, H., Bouquet, Y., Van Zeveren, A. (1986). A progeny test for carcass quality in meat rabbits. Arch. Geflügelk., 50. 1. 26-31.

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