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CARCASS TRAITS OF PUREBRED AND CROSSBRED RABBITS

NOFAL R.Y., TOTH S., VIRAG G.Y.

Institute for Small Animal Research, P.O. 417, H-2101 GÖDÖLLÖ - Hungary

ABSTRACT : Carcass data on 80 rabbits representing four genetic groups and both sexes were analysed to determine the effects of straight and cross breeding on carcass traits. Genetic groups were New Zealand White (NZW), Californian (CA) and their reciprocal crosses (NZW x CA and CA x NZW). At 14-16 weeks of age live body weight at slaughter (after 24h fasting) averaged 2529, 2459, 2523 and 2569g ; and dressing percentages were 60.6, 60.5, 60.1 and 60.8 %, respectively. The genetic group effect was not significant for all traits except proportion of the fore-quarters, legs and giblets percentages which were higher in straightbreds than in crossbreds. Sex and genetic group x sex interaction were not significant for all traits except dressing percentage and fore-quarters percentage which increased in males while offals increased in females. Crossbred rabbits attained a suitable slaughter weight 1 week earlier than straightbred rabbits. Estimates of heterosis percentage in dressing percentage, fore-quarters, loin region, hind-quarters, head, liver, giblets and abdominal fat were -0.2, -4.0, +3.5, +1.2, +0.1, -6.0, -8.0 and -14.4 respectively.

RESUME : Caractéristiques des carcasses de lapins de races pures et des lapins croisés.
Les données provenant de 80 carcasses de lapins de 4 groupes génétiques des deux sexes ont été analysées pour déterminer les effets de l'élevage en race pure ou en croisement sur les caractéristiques des carcasses. Les 4 groupes génétiques utilisés sont les Néo-Zélandais blancs (NZW) les Californiens (CA) et leur croisements réciproques : NZW x CA et CA x NZW. Les poids vif moyen à l'abattage, à 14-16 semaines, après un jeûne de 24 heures, sont de 2529, 2459, 2523 et 2569g ; les rendements à l'abattage sont de 60,6 , 60,5 , 60,1 et 60,8 %, respectivement. Pour toutes les caractéristiques de la carcasse, l'effet du type génétique n'est pas significatif, excepté pour la proportion du quartier avant, le % des pattes et des abats qui sont plus élevés pour les races pures que pour les croisements. Pour toutes les caractéristiques, l'interaction entre le sexe et le groupe génétique x sexe n'est pas significative, excepté pour le rendement à l'abattage et pour le % des quartiers avant qui augmente chez les mâles tandis que les déchets augmentent chez les femelles. Les lapins issus de croisement atteignent le poids souhaité à l'abattage une semaine plus tôt que les lapins de race pure. Les taux d'hétérosis du rendement à l'abattage, des quartiers arrières, de la tête, du foie, des abats, et de la graisse abdominale sont estimés à -0,2, -4,0 , +3,5 , +1,2 , +0,1 , -0,6 , -0,8 et -14,4 respectivement.

INTRODUCTION

There is evidence of variation among rabbit breeds and their crosses for carcass traits (RAO *et al.*, 1978 ; LUKEFAHR *et al.*, 1983 ; JENSEN and TUXEN, 1986 : EL-QEN, 1988 ; RISTIC *et al.*, 1988 ; SALEH *et al.*, 1988 ; PARIGI-BINI *et al.*, 1993 ; SZENDRÖ *et al.*, 1994). Performances of rabbit breeds and their crosses for carcass characters have not been investigated in some countries till now, although application of commercial crossbreeding to improve carcass traits has showed a successful advantage in other countries in Europe. Slaughter value varies upon breed, nutrition, management conditions, body weight and some less important factors (RUDOLPH, 1988). Carcass traits have been analyzed at different ages by many investigators, but according to investigations by SZENDRÖ (1989) dressing percentage is not affected by age if rabbits are slaughtered at same body weight. Slaughter houses in Hungary do not accept rabbits lighter than 2.5 kg for slaughtering, therefore, rabbits in this experiment were slaughtered at 2.5-2.8 kg.

This study was conducted to evaluate carcass traits of four genetic groups of rabbits representing two breeds (NZW and CA) and their reciprocal crosses. In addition, sex and genetic groups by sex interaction among carcass characters was also examined.

MATERIAL AND METHODS

Twenty rabbits of each genetic group (66 NZW, 44 CA, 98 NZW x CA and 114 CA x NZW) were chosen randomly from the experimental animals that ranged between 2.5-2.8 kg live weight. The growing crossbred rabbits were slaughtered at 14-15 weeks of age and the purebred rabbits at 15-16 weeks of age, using recommended methods for slaughter (BLASCO *et al.*, 1993). Rabbits were weaned at 6 weeks of age and put in another cage after mixing with other litters (2 rabbits per cage) until slaughter. The animals were fed commercial pellets feed *ad libitum* which contained 17 % crude protein and 14.9 % crude fibre. Drinking water was available continuously from self drinkers. Rabbits were killed humanely following a 24h of fasting from feed only. Body weight before and after fasting, weight loss, blood, commercial skin, legs (distal part of fore and hind legs), head, offals (full gastrointestinal tract), liver, giblets (kidneys, heart,

Table 1 : Least-squares means and standard errors of carcass traits.

Traits	Genetic groups				Sex		Hete-rosis % (F1)
	NZW	CA	NZWxCA	CAxNZW	Male	Female	
No of rabbits	20	20	20	20	40	40	
Live weight, g (before fasting)	2654 ± 23	2604 ± 23	2637 ± 23	2694 ± 23	2646 ± 16	2648 ± 16	1.38
Live weight ,g (after 24h fasting)	2529 ± 29	2459 ± 29	2523 ± 29	2569 ± 29	2511 ± 20	2529 ± 20	2.08
Weight loss during 24h fasting %	4.72 ± 0.4	5.64 ± 0.4	4.33 ± 0.4	4.66 ± 0.4	5.1 ± 0.2	4.5 ± 0.2	-13.22
Blood %	3.24 ± 0.2	3.97 ± 0.2	3.61 ± 0.2	3.51 ± 0.2	3.51 ± 0.1	3.66 ± 0.1	-1.25
Distal part of fore and hind leg %	3.30 ± 0.1^{a}	3.28 ± 0.1^{a}	3.24 ± 0.1^{a}	2.97 ± 0.1^{b}	3.25 ± 0.0	3.15 ± 0.0	-5.62
Full gastrointestinal tract %	15.54 ± 0.4	16.06 ± 0.4	15.70 ± 0.4	15.27 ± 0.4	15.16 ± 0.3^{a}	16.12 ± 0.3^{b}	-2.00
Head %	5.52 ± 0.1	5.43 ± 0.1	5.60 ± 0.1	5.36 ± 0.1	5.48 ± 0.1	5.48 ± 0.1	0.09
Liver %	2.28 ± 0.1^{ab}	2.40 ± 0.1^{a}	2.18 ± 0.1^{b}	2.22 ± 0.1^{b}	2.31 ± 0.0	2.24 ± 0.0	-5.98
Kidneys + heart + lungs %	1.64 ± 0.0^{a}	1.61 ± 0.0^{ab}	1.51 ± 0.0^{bc}	1.48 ± 0.0^{c}	1.54 ± 0.0	1.58 ± 0.0	-8.0
Abdominal fat %	0.72 ± 0.1	0.81 ± 0.1	0.52 ± 0.1	0.79 ± 0.1	0.71 ± 0.1	0.72 ± 0.1	-14.37
Skin %	15.69 ± 0.3	15.50 ± 0.3	15.50 ± 0.3	15.13 ± 0.3	15.69 ± 0.2	15.22 ± 0.2	-1.80
Carcass %	50.46 ± 0.4	50.21 ± 0.4	50.25 ± 0.4	50.97 ± 0.4	50.96 ± 0.3^{a}	49.98 ± 0.3^{b}	0.55
Fore part %	15.09 ± 0.1^{a}	14.98 ± 0.1^{a}	14.39 ± 0.1^{b}	14.51 ± 0.1^{b}	15.00 ± 0.1^{a}	14.48 ± 0.1^{b}	-3.97
Loin part %	15.31 ± 0.2	15.07 ± 0.2	15.58 ± 0.2	15.87 ± 0.2	15.57 ± 0.2	15.34 ± 0.2	3.5
Hind part %	19.61 ± 0.2	19.82 ± 0.2	19.93 ± 0.2	19.96 ± 0.2	19.83 ± 0.1	19.83 ± 0.1	1.16
Carcass + head %	55.99 ± 0.4	55.65 ± 0.4	55.85 ± 0.4	56.33 ± 0.4	56.44 ± 0.3^{a}	55.46 ± 0.3^{b}	0.48
Dressing % *	60.64 ± 0.4	60.48 ± 0.4	60.07 ± 0.4	60.83 ± 0.4	61.00 ± 0.3^{a}	60.00 ± 0.3^{b}	-0.16
Hind + Loin %	34.29 ± 0.3	34.89 ± 0.3	35.51 ± 0.3	35.83 ± 0.3	35.40 ± 0.2	35.20 ± 0.2	1.05

Least-squares means ± S.E. having the same letter within each row are not significantly different (P≤0.01).

lungs), abdominal fat, carcass (hot carcass minus head and edible parts), fore-quarters, loin region and hind-quarters of carcass (cut points between 7th and 8th ribs and dorsal vertebras and between 6th and 7th lumbar vertebras, in the line of the thighs). Then ratios of single body parts to live weight were measured or calculated.

Dressing percentage was calculated as follows :

$$\text{Dressing \%} = \frac{\text{Carcass + head + liver + abdominal fat + giblets}}{\text{live weight after fasting}} \times 100$$

Statistical analysis :

The statistical analysis was performed by application of LSMLMW of HARVEY (1987). The following model was used :

$$Y_{ijk} = \mu + G_i + S_j + (GS)_{ij} + eijk$$

where :
Y_{ijk} = the observation on the ijkth rabbit
μ = overall mean
G_i = fixed effect of ith genetic group (i = 1,...4)
S_j = fixed effect of jth sex (j = 1 and 2)
$(GS)_{ij}$ = interaction between genetic group and sex
eijk = random error.

The heterosis estimates are in contrast with results of comparison of crossbred (NZW x CA and CA x NZW) *vs* purebred (NZW and CA) fryers. Heterosis percent was estimated by :

$$HF1 = (MF1 - MP)/MP \times 100$$

where MF1 = mean of first generation crosses and MP is the mid-parent value.

RESULTS AND DISCUSSION

Least-squares means of body weight at 12 weeks of age of NZW, CA, NZW x CA and CA x NZW were 2047, 2086, 2190 and 2084 g respectively, and differed significantly (P≤0.01). The differences among four genetic groups were not significant for preslaugther weight of rabbits before and after fasting. Live weight (after 24h fast) of four genetic groups averaged 2529, 2459, 2523 and 2569 g respectively (Table 1).

Ratios of single body parts are shown in Table 1. Dressing percentage based on hot carcass + head + liver + giblets (kidneys, heart, lungs) and abdominal fat weight divided by live weight after fasting were 60.6, 60.5, 60.1 and 60.8 % respectively. Crossbreeding did not improve the dressing percentage. Slightly lower values could be detected in the NZW x CA group due to their higher skin, legs and inedible offals

Table 2 : ANOVA of carcass traits.

S.O.V.	Genetic group (G)	Sex (S)	G x S	Residual
D.F.	*3*	*1*	*3*	*72*
M.S. :				
Body Weight 1	27833.6	137.8	3316.1	10776.5
Body Weight 2	41495.0	6215.0	4941.6	16930.0
Loss	6.3	6.5	1.8	3.3
Blood	1.8	0.5	0.3	0.9
Skin	1.1	4.5	0.9	1.3
Legs	0.4*	0.2	0.2	0.1
Offal	2.2	18.6*	1.6	2.7
Liver	0.2	0.1	0.0	0.1
Giblets	0.1*	0.0	0.1	0.0
Fat	0.3	0.0	0.3	0.2
Head	0.2	0.0	0.3	0.2
Carcass	2.4	19.2*	0.7	2.8
Fore part	2.4**	5.4**	0.4	0.4
Loin	2.4	1.0	0.9	1.0
Hind part	0.5	0.0	0.3	0.5
Carcass + head	1.6	19.2*	1.1	2.8
Dressing	2.0	20.2**	1.4	2.8
Hind + loin	4.2	0.9	2.2	1.9

Body weight 1 : before fasting ; Body weight 2 : after fasting ; * significant level P≤0.05 ; ** significant level P≤0.01. Remark : all traits as percent of live weight after fasting.

percentages. These results agree with ZELNIK and GRANAT (1974), JENSEN and TUXEN (1986), PARIGI-BINI *et al.* (1993) who slaughtered growing rabbits of similar weights, breeds and/or crosses. The differences among genetic groups were not significant (P>0.10) for carcass traits except fore-quarters, legs and giblets percentages (Table 2). These organ percentages were higher in purebreds than for crossbreds. The results are in agreement with the work of LUKEFAHR *et al* (1983) who confirmed that proportions of fore-quarters and loin cuts differed little between straightbreds and crossbreds. Proportion of the less valuable fore-quarters to body weight was observed to be 14.74 %, while that of the hind-quarters was 19.83 %. Proportion of the most valuable parts (loin region and hind-quarters) together amounted to 35.3 % of the carcass. The same result was reported for the Pannon White breed with a live weight before fasting that ranged between 2.6-2.7 kg as investigated by SZENDRÖ *et al.* (1994). It is difficult to compare these results objectively to other literature reports, because of the different methods of slaughter and evaluation.

The effect of sex (Table 1) and of genetic group x sex interaction were never significant (P>0.10) except for dressing percentage and the proportion of fore-quarters due to sex in carcass traits (Table 2). Dressing percentage and fore-quarters were higher in males than in female while offals were higher in females. Similar results were reported by RISTIC *et al* (1988). They found that at 2.8 kg (the final fattening weight), the fore-quarters and dressing percentage were improved in NZW and GG x (Russian x NZW) crossings where male animals were heavier than females in slaughter yield.

Most estimates of heterosis indicated that crossbreeding is associated with negative effect or has very little importance in improving carcass performance. The same results were shown by LUKEFAHR *et al.* (1983), SALEH *et al.* (1988) and BRUN and OUHAYOUN (1989). They found that heterosis was associated with little improvement in carcass performance of the crossbred rabbits.

CONCLUSION

No significant differences were observed among genetic groups in dressing percentage, but CA x NZW crossbred rabbits attained the highest one. Straightbreds were higher than crossbreds in the proportions of fore-quarters, legs and giblets but in other traits were similar. In dressing percentages as well as fore-quarters males gave better results than females, while females had a higher percentage of offals in comparison with males. Crossbred rabbits grew faster and attained a suitable weight for

slaughtering (2.5-2.8 kg) about one week earlier than purebred ones.

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