SLAUGHTER TRAITS AND MEAT QUALITY IN RELATION TO GENOTYPE FOR 90 DAYS OLD RABBITS

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Abstract - The study involved 144 carcasses of New Zealand White (NZW), Californian (CL) and Termond White (TW) rabbits. Sllaughter weights were, in the same order, 2276 , 2264 a,d 2488 g. The slaughter analysis and carcass dissection showed high slaughter values of the 3 rabbit genotypes under study. NZW, TW and CL rabbit carcasses contained 80.2, 80.6, and 82.0% meat, respectively. Carcass fatness was similar at 5.0 - 5.8%. Analyses of meat chemical composition and quality parameters (pH, water holding capacity, brightness and myoglobin content) confirmed the high quality of rabbit meat. No significant differences were found in the quality parameters of meat among the genotypes under study.

INTRODUCTION

Rabbits are primarily used for meat. Rabbit meat is counted among white meats, characterized by exquisite flavour and wholesomeness. juicy, easily digestible, and with high nutrient content, rabbit meat is willingly consumed, and even recommended in diets of the sick and children. It is held in high esteem due to the high biological value of its protein, high lecithin content and low fat and cholesterol contents (LEBAS *et al.*, 1992).

The growing production of slaughter rabbits in Poland under adequate commercial farm conditions requires proper breeding material. Most often these are pure breeds - New Zealand White, Termond White or Californian. The efforts to create specialized synthetic lines have so far not gone beyond the experimental stage. Therefore there is a need to undertake studies to determine the slaughter value and meat quality of different genotypes of rabbits, which would provide suitable material for slaughter rabbit production.

MATERIAL AND METHODS

The studies involved genotypes of purebred rabbits: New Zealand White (NZW), Californian (CL) and Termond White (TW). After fattening and 24-hour fasting, the rabbits were slaughtered at 90 days of age. A total of 144 rabbits were slaughtered, 48 in each breed, with equal proportions of sexes within each breed. Slaughter analysis was done according to the methodology by NIEDZWIADEK (1974).
The carcasses were cooled for 24 hours at 2-4°C, weighed and divided into 3 prime cuts:

fore part - cut at last rib level,
loin - cut at last lumbar vertebra level,
hind part - covering hind legs and the sacral region

The carcasses were dissected in detail to estimate the tissue content. Chemical analyses and quality parameters of the meat were done on samples from 48 carcasses in each breed group. Meat samples were prepared from the right leg.

The protein, fat and ash content were determined using the methodology by ZNANIECKI *et al.* (1974). Meat pH was measured 24 hours after slaughter using the potentiometric method. Myoglobin content was determined using Hernsey's method, at wavelength 512 nm. Meat brightness was measured using a leukometer (white filter).

Statistical calculations were done using the analysis of variance, assuming the following linear model:

$$Y_{ijk} = \mu + a_i + b_j + (ab)_{ij} + e_{ijk}$$

where

Y_{ijk} - observation of animal k of sex j from breed group i.
μ - mean value
a_i - effect of breed i
b_j - effect of sex j
$(ab)_{ij}$ - effects of breed x sex interaction
e_{ijk} - error

RESULTS

Analysis of variance showed that differences between the means for sexes were small and statistically insignificant. No statistically significant breed x sex interaction was proved. This shows that in the genotypes under discussion, the values of traits for particular sexes changed in same direction. Therefore the results are listed for genotypes, without accounting for the sexes.

Average body weight of rabbits after fattening at 90 days and after 24 h fasting was similar in NZW and CL rabbits, but the highest in the TW breed (Table 1). Hot carcass weights of NZW and CL were similar (1132-1123 g), and 1241 g in the TW breed. TW rabbit carcasses were 35.0 cm long. Carcass lengths of other breeds were smaller by 1.4 and 0.9 cm. Liver, heart, kidney and lung weights were similar. The yield of edible parts of the genotypes researched ranged from 54.6% in NZW to 55.5% in TW.

Table 1 : Results of rabbit slaughter analysis

Item	Genotypes					
	New Zealand White		Californian		Termond White	
	x	cv%	x	cv%	x	cv%
Body weight before slaughter (g)	2276^{A}	11.0	2264^{B}	10.9	2488^{AB}	10.5
Hot carcass weight (g)	1132^{C}	12.7	1123^{D}	13.5	1241^{CD}	12.8
Carcass length (cm)	33.6^{a}	5.4	34.1	3.7	35.0^{a}	3.1
Liver weight (g)	70^{E}	17.2	73^{b}	16.0	90^{Eb}	17.6
Heart. liver and lung weight (g)	40^{F}	12.3	45^{c}	13.6	51^{Fc}	13.6
Weight of edible parts. total (g)	1242^{G}	13.1	1240^{H}	12.7	1382^{GH}	12.3
Yield of edible parts - carcass + pluck (%)	54.6	-	54.8	-	55.5	-

Means with the same letters differ significantly (A. B - P<0.01. a. b - P<0.05)

The differences between means for the genotypes researched were highly significant between breeds TW, and NZW and CL for body weight before slaughter, hot carcass weight, and total weight of edible parts. Differences between TW and NZW were highly significant for liver, heart, kidney and lung weight, and significant between TW and CL for the same traits.

Variation of the traits was on a similar level in the genotypes under study. Liver weight showed the greatest variation (cv = 16.0 - 17.6%), carcass length the lowest (cv = 3.1 - 5.4%).

Carcass dissection showed that meat content of the fore part was similar for breeds NZW and CL, and the highest in breed TW (Table 2). Meat content of the loin was similar in breeds NZW and CL, and the highest in breed TW. Meat content of the hind part was the highest for all the genotypes under study. Musculature of the whole carcass was similar for breeds NZW and TW (80.2% and 80.6%), and higher for CL at 82.0%. Bone content of the fore and hind parts in the breeds under study was on a similar level, and ranged from 60 to 66 g in breed NZW and TW, and from 54 to 57 g in breed CL. In the whole carcass, the bone content was 12.5 and 12.3% for NZW and TW, and 11.5% for CL. Fat content varied greatly both for the cuts and breeds. In the whole carcass, the fat content was 5.8, 5.7% and 5.0% in NZW, TW and CL.

Differences observed between the means for the genotypes under study, as the analysis of variance showed, were statistically significant between breeds NZW and TW for meat content of the fore part, loin, hind part, and in the whole carcass. Significant differences between TW and CL, and between NZW and CL were found for the bone weight in the fore part and between TW and NZW for bone weight in the hind part and in the whole carcass. Differences between NZW and CL, and TW and CL were highly significant for fat content of the whole carcass.

Table 2 : Meat. bone and fat weight in the prime cuts and in the whole carcass (g)

Item	Genotypes					
	New Zealand White		Californian		Termond White	
	x	cv%	x	cv%	x	cv%
Meat weight (g)						
fore part	320[a]	15.3	328	14.5	356[a]	14.0
loin	213	16.2	215	17.3	228	17.6
hind part	348[b]	14.6	357	14.3	384[b]	12.6
whole carcass	881[c]	14.2	900	13.6	968[c]	13.0
(%)	80.2	-	82.0	-	80.6	-
Bone weight (g)						
fore part	61[d]	16.5	54[de]	14.1	64[e]	12.6
loin	18	15.0	17	16.3	18	15.9
hind part	60	13.2	57[f]	13.2	66[f]	10.2
whole carcass	139	15.8	128[g]	11.5	148[g]	10.7
(%)	12.5	-	11.5	-	12.3	-
Fat weight (g)						
fore part	27[h]	52.1	20[Ah]	52.4	31[A]	52.1
loin	25	59.4	24	52.0	27	52.0
hind part	14	43.1	10	47.8	11	56.2
whole carcass	66[B]	47.2	54[BC]	42.5	69[C]	45.9
(%)	5.8	-	5.0	-	5.7	-

Means with the same letters differ significantly (A.B - P<0.01. a.b - P<0.05)

Meat content of the cuts and of the whole carcass as well as bone weight were similar (cv = 10.2 - 17.6%). Fat content varied greatly (cv = 43.1 - 59.3%). Dry matter content (Table 3) in the genotypes under study was on a similar level (26.4 - 27.4%). Likewise, protein content slightly exceeded 21%. There were greater differences between breeds in respect to the fat content. Meat pH, 24 h after slaughter, was neutral, from 5.98 to 6.00. Myoglobin and its derivatives content of meat, which determine its colour, were on a similar level, between 35.95 and 36.44. As regards the other meat quality parameters in the genotypes under study, similar results were obtained for brightness and water-holding capacity.

Analysis of variance showed there were significant differences between means for breeds between NZW and TW, and CL and TW, but only for the fat content of meat.

Table 3 : Rabbit meat chemical composition and quality

Item	Genotypes					
	New Zealand White		Californian		Termond White	
	x	cv%	x	cv%	x	cv%
Dry matter (%)	26.76	5.72	27.41	4.75	26.41	5.12
Crude protein (%)	21.17	3.11	21.06	2.87	21.30	2.98
Fat (%)	2.63[a]	12.13	2.59[b]	11.13	3.75[ab]	12.43
Ash (%)	1.19	3.87	1.20	2.87	1.17	3.12
pH	6.00	1.03	6.00	1.08	5.98	1.01
Meat brightness	23.93	11.08	24.64	10.87	23.88	11.08
Water-holding capacity	23.93	11.08	24.64	10.87	23.88	11.08
Myoglobin	36.12	10.81	35.95	9.98	36.64	10.08

Means with the same letters differ significantly (a.b - P<0.05)

DISCUSSION

Three meat breeds were involved in the studies, New Zealand White, Californian and Termond White, as they are the most numerous pure breeds in the Polish rabbit population. Results of the slaughter analysis showed that carcasses weighing above 1100 g are obtained from NZW and CL rabbits slaughtered at about 2300 g body weight. NZW rabbits slaughtered at 2488 g body weight gave carcasses above 1240 g. The basic indicator of slaughter value - the yield of edible parts - was similar in NZW and CL and in line with the findings of PARILLO and VASENINA (1981), ZELNIK *et al.* (1980) and PARIGI-BINI *et al.* (1992). The yield of edible parts was higher by 0.8-0.9% in TW rabbits, which is in line with the findings of OKERMAN (1972) and MAERTENS (1992).

The loin and hind part had the greatest meatness of all the genotypes. Meat content of these cuts ranged from 81.2 to 83.4%. Meat content of the fore part was lower in NZW and TW, and higher by 2% in the CL breed. Meat content of the whole carcass was high - above 80% in NZW and TW and higher by 2% in CL. The higher meat content of CL rabbit carcasses results from lower bone content, since carcass fatness was on a similar level. So it must be concluded that Californian rabbits have a delicate skeleton which, with a low tendency for fatness, makes these carcasses high in meat. It must be stressed that NZW and TW rabbit carcasses also had a high meat content. Similar meat content characteristics are provided by _abecka and GARDZIELEWSKA (1990).

Some authors, including BEDNARZ (1974) say that the chemical composition of meat and its qualitative traits depend, amongst other things, on the genotype. The results obtained in this work do not confirm the conlcusions of the above authors, because the differences between the breeds were not confirmed statistically for the analysed traits, except for fat content of the meat. Neither were sex differences confirmed statistically. RUDOLPH *et al.* (1986) did not confirm statistically significant differences between the sexes and differences of traits which determine meat quality, either.

The results of the chemical analysis and of the meat qualitative parameters confirmed opinions about the high quality of rabbit meat, which was quoted by many authors [LABECKA (1990), POPEK (1993)].

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Schlachtmerkmale und Fleischqualität in Abchängigkeit von Genotypus der 90 Tagen Kaninchen - Das Versuchsmaterial bildeten 144 Schlachtkörper stammende von Kaninchen den Rassen: Neu-Zeländische Weiße (BN), Kalifornische (K) und Termondische Weiße (BT). Durchgeführte Schlachtkörperanlyze sowie Zerlegung des Schlachtkörpers zeigte hohe Schlachtaubeute und Schlachtkörperqualität den 3 untersuchten Rassen. Die Kaninchenschlachtkörper den Rassen "BN" und "BT" enthälten 80,2 und 80,6% Fleisch, der Rasse "K" - 82,0% Fleisch. Das Verfettungsgrad den Schlachtkörpern war ähnlich 5,0 - 5,8%. Untersuchungen den chemischen Zusammensetzung des Fleisches (pH, Wasserkapazität, Helligkeit sowie Mioglobingehalt) bestätigten hohe Qualität des Kaninchenfleisches. Es wurden keine signifikante unterschiede den Qualitätparameter des Fleisches zwischen den untersuchten Rassen festgestellt.