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THE EFFECT OF LIVE WEIGHT ON THE CARCASS TRAITS AND THE CHEMICAL COMPOSITION OF MEAT OF PANNON WHITE RABBITS BETWEEN 2.2 AND 3.5 KG

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ABSTRACT : For 267 Pannon White growing rabbits of both sexes slaughtered at a body weight of 2.2-2.4, 2.4-2.6, 2.6-2.8, 2.8-3.0, 3.0-3.2, 3.2-3.4 and 3.4-3.5 kg, the average dressing percentage was 59.5, 60.7, 61.9, 62.2, 61.4, 62.4 and 62.1 % respectively. While the weight of live animals increased by about 50 % between 2.29 and 3.42 kg the change in the weight of blood (23 %), full gastrointestinal tract (26 %) and head (35 %) were the lowest, whereas the intermediate part (65 %), liver (82 %), skin (73 %), meat on hind legs (74 %), meat on the intermediate part (85 %) and perirenal fat (326 %) gained weight the most rapidly. 129 Pannon White rabbits were slaughtered between 2.2 and 3.5 kg live weight. The water, protein, fat and ash content of their meat was analyzed in the *M. longissimus dorsi* (LD), hind leg (HL) and *M. longissimus dorsi* + belly (LD + B). Water content averaged 74.8, 73.8 and 71.0 % in LD, HL and LD + B respectively, whereas protein, fat and ash content averaged 23.1, 22.1 and 21.7 %, 1.08, 3.24 and 6.39 %, 1.15, 1.09 and 1.04 % respectively, in the order of the meat parts listed above. Water content decreased and fat content increased with increasing weight (r = -0.47, -0.33 and -0.51, r = 0.38, 0.31 and 0.45 for water and fat contents of LD, HL and LD + B respectively). Protein and ash content did not change significantly with weight.

RESUME : Effet du poids vif sur les caractéristiques de la carcasse et la composition chimique de la viande de lapins Pannnon White pesant entre 2,2 et 3,5 kg.

Pour 267 lapins en croissance de génotype Pannon White, des deux sexes, abattus au poids vif de 2,2-2,4 ; 2,4-2,6 ; 2,6-2,8 ; 2,8-3,0 ; 3,0-3,2 ; 3,2-3,4 ; 3,4-3,5 kg, le rendement moyen à l'abattage a été de 59,5 - 60,7 - 61,9 - 62,2 - 61,4 - 62,4 et 62,1% respectivement. Alors que le poids vif des animaux augmente d'environ 50% entre 2,29 et 3,42 kg, les augmentations de poids du sang (23%), du tractus gastro-intestinal plein (26%), et de la tête (35%) ont été inférieures à celle du poids vif. A l'inverse, les augmentations de poids du râble (65%), du foie (72%), de la peau (73%), des muscles des pattes arrières ou du râble (74% et 85%) et surtout du gras périrénal (326%) ont été plus rapides que celle du poids vif. Par ailleurs, 129 lapins Pannon White ont été abattus entre 2,2 et 3,5 kg de poids vif. Les teneurs en eau, protéines, lipides et matières minérales ont été déterminées pour le muscle longissimus dorsi *(LD), les muscles d'une patte arrière (HL) et l'ensemble musculaire* longissimus dorsi + *paroi abdominale (LD + B). La teneur moyenne en eau est de 74,8 - 73,8 et 71,0% pour LD, HL et LD + B, tandis que les teneurs moyennes en protéines, lipides et minéraux des mêmes ensembles musculaires sont de 23,1 - 22,1 et 21,7 % ; 1,08 - 3,24 et 6,39% ; 1,15 - 1,09 et 1,04 respectivement. Quand le poids vif augmente, la teneur en eau diminue et la teneur en lipides augmente (r = -0,47, -0,33 et -0,51 ; r = +0,38 ; +0,31 et +0,45 pour l'eau et les lipides de LD, HL et LD + B, respectivement). Les teneurs en protéines et en matières minérales ne varient pas significativement avec le poids vif.*

INTRODUCTION

To improve quality, dressing percentage and the proportion of valuable body parts of growing rabbits need to be increased. Slaughter value varies according to breed, nutrition, keeping conditions, body weight and some less important factors (RUDOLPH, 1988). The effect of age and body weight on carcass traits has been analysed by SCHLOLAUT (1977), RAO *et al.* (1978), RUDOLPH and FISCHER (1979), VAREWYCK and BOUQUET (1982), MÖSCH *et al.* (1984), RISTIC (1988), PETERSEN *et al.* (1988), MAERTENS and DE GROOTE (1992), and RISTIC and ZIMMERMANN (1992). According to investigations by SZENDRŐ(1989), dressing percentage is not affected by age if rabbits are slaughtered at the same body weight, so it is the effect of body weight that dominates even in the case of slaughter at different ages.

It is difficult to compare research findings published in different sources of literature because results of trial slaughter refer to rabbits killed at different weights (ages) and by different methods. Such results are mainly suitable for drawing some general conclusions. BLASCO *et al.* (1993) have developed and recommend a uniform method of slaughter to eliminate the difficulties mentioned. In our experiment we used this method to investigate the slaughter value of Pannon White growing rabbits between 2.2 and 3.5 kg.

One way in which meat can be characterised is by its chemical composition. From the point of view of healthy human nutrition it is the protein, fat and cholesterol content of the meat that are of particular importance. Moisture is related to the tenderness of meat. Meat quality and the chemical composition of meat have only been given emphasis in the past few years.

The water, protein, fat and ash content of the hind leg and *M. longissimus dorsi* proved to be 72.6 and 74.6 %, 21.6 and 22.1 %, 4.5 and 2.1 %, 1.26 and 1.20 % respectively from the 9th to 13th week of age (2.07 and 3.07 kg); water content and ash content increased, while protein content did not change (PARIGI-BINI *et al.*, 1992). RUDOLPH and FISHER (1979) and MÖSCH *et al.* (1984) report on changes in the fat and protein content in the *M. longissimus dorsi* and the *M. biceps femoris* between the

ages of 86-100 and 56-98 days. MAERTENS and DE GROOTE (1992) revealed significant correlations of r = 0.93 and r = 0.38 between dry matter and fat content and between protein and fat content of carcass without fat deposits. The present experiment had the objective of evaluating changes in the water, protein, fat and ash content of the meat of Pannon White growing rabbits within a range of 2.2 to 3.5 kg live weight.

MATERIAL AND METHOD

The experimental animals were weaned at the age of 6 weeks. The rabbits were kept at the place of birth until slaughter. They were housed in flat-deck wire cages (5-6 rabbits per cage). The animals were fed commercial pellet *ad libitum* (CP: 16.5 %, CF: 15.5%). Drinking water was available continuously from self-drinkers.

267 Pannon White growing rabbits of both sexes (229 males and 38 females) originating from 177 litters were killed at different ages after 24 hours of fasting. Body weight before fasting and after fasting, weight loss, blood, commercial skin, extremities, head, full gastrointestinal tract, edible offal (liver, kidneys, heart, lungs, perirenal fat), reference carcass (hot carcass minus head, perirenal fat and edible offal), fore, intermediate and hind part of the carcass (cut points between 7th and 8th ribs and dorsal vertebrae and between 6th and 7th lumbar vertebrae, in the line of the thighs), hind leg (hind part without backbone) and meat covering the intermediate part and hind legs (filleted with a knife) were measured. Then ratios of single body parts were calculated. After slaughter, rabbits were grouped according to body weight before fasting into classes in graduations of 0.2 kg.

In the second half of the experiment 129 meat samples of both sexes (95 males and 38 females originating from 85 litters), (right *M. longissimus dorsi*/LD/, left *M. longissimus dorsi* with belly/LD+B/, dissected as the intermediate part and meat removed by knife from the hind leg /HL/) were sent to the laboratory for chemical analysis.

Chemical composition of the meat samples was determined by the following methods:

Water content of the meat samples was determined by HS 68-30/3-77 method drying to constant weight, the crude protein content by HS 68-30/4 method by KJEL-FOSS fast nitrogen determiner, the crude fat content by HS 68-30/65 with soxhlet extraction after hydrochloric acid digestion, and the crude ash content by ashing the samples at 550 °C for 3 hours (HS ISO 5984-692).

The following animal model was used to calculate the effect of weight and sex on carcass traits and chemical composition of meat:

$$Y_{ijk} = \mu + W_i + S_j + (WS)_{ij} + e_{ijk}$$

where

Y_{ijk} = the observation on the ijk-th rabbit,
μ = overall mean,
W_i = fixed effect of i-th weight group (1, 2...and 7),
S_j = fixed effect of j-th sex (1 and 2),
$(WS)_{ij}$ = interaction between weight and sex,
e_{ijk} = random error.

RESULTS AND DISCUSSION

Carcass traits

Weight averages for each body part are summarized in Table 1. Body weight measured before fasting increased by about 50 % during the period investigated. Compared to this, there were body parts showing a growth rate below average, average and above average. Increase in body weight measured after 24 hours of fasting, weight loss during 24 hours, kidneys+heart+lung w and fore part weight showed around average figures (45-55 %). Head weight, extremities weight, full gastrointestinal tract weight and hind legs weight were below average (23-35 %), while hot reference carcass weight (56 %), skin weight, liver weight, intermediate part weight and weight of meat on hind legs and intermediate part (65-79 %) and perirenal fat (326 %) were above average.

Attention should be drawn to the full gastrointestinal tract here, since its growth of 26 % falls far below average. Similarly to reports by OUHAYOUN (1984) stating that the allometric coefficient of the digestive tract changes drastically (from 1.13 to 0.46) at 650 g body weight, DELTORO and LOPEZ (1985) also detected a decrease to a similar extent, i.e. from 1.36 to 0.57 at the age of 6-7 weeks. As far as proportion of the digestive tract is concerned, a definite decrease was described by LEBAS (1975), RAO *et al.* (1978), PETERSEN *et al.* (1988), SZENDRŐ(1989) and PARIGI-BINI *et al.* (1992). This fact is definitely encouraging with respect to dressing percentage. Similarly, the declining proportion of head is also favourable, and is supported by other publications (RAO *et al.*, 1978; SZENDRŐ, 1989).

The main advantages are that the weight of reference carcass, intermediate part and meat on hind leg showed an above average increase (56, 65 and 74 % respectively).

Of the body parts growing at a rate above average, growth of perirenal fat (326 %) is the most remarkable. The fat content of rabbit meat of high body weight does not change markedly (PARIGI-BINI *et al.*, 1992; SZENDRŐ *et al.*, 1995). On the contrary the perirenal and scapular fat deposits increase abruptly with age. A rate of increase more than twice that of the previous data has been observed by PRUD'HON *et al.* (1970) after 106 days of age, RUDOLPH *et al.* (1986) at 57 and

Table 1 : The effect of live weight on carcass traits of Pannon rabbits (Mean ± SD)

	Carcass traits	Live weight, kg							Overall	Effect of		Difference between 2.29 and 3.42 kg	
		2.20-2.39	2.40-2.59	2.60-2.79	2.80-2.99	3.00-3.19	3.20-3.39	3.40-3.49		weight	sex	g	%
1.	No. of rabbits	19	23	73	78	42	20	12	267				
2.	Live weight, g (before fasting)	2288 45	2508 57	2723 55	2878 55	3065 59	3302 51	3423 27	**2846** 279	***	NS	1135	50
3.	Weight loss, g (during 24h fasting)	135	153	197	199	188	201	200	**187**			65	48
4.	Live weight, g (after 24h fasting)	2153 98	2355 74	2526 78	2679 80	2877 89	3101 64	3223 66	**2662** 272	***	NS	1070	50
5.	Skin weight, g	305 22	347 25	404 29	425 33	469 44	510 39	527 31	**421** 64	***	NS	222	73
6.	Head weight, g	121 9	132 9	143 13	148 9	156 10	158 9	163 8	**146** 14	***	NS	42	35
7.	Distal part of legs weight, g	78 8	83 8	85 9	91 7	98 8	98 7	100 6	**90** 10	***	NS	21	27
8.	Full gastrointestinal tract weight, g	350 40	356 38	372 48	379 38	401 41	419 32	440 43	**382** 47	***	NS	90	25
9.	Blood weight, g	82 32	82 28	75 15	82 28	84 16	88 16	101 14	**82** 23	***	NS	19	23
10.	Hot reference carcass weight, g (without head and edible parts)	1065 64	1192 47	1299 67	1387 44	1480 66	1618 43	1663 62	**1367** 156	***	*	598	56
11.	Liver weight, g	50.3 6.3	52.8 6.7	58.5 7.4	63.5 6.4	67.5 9.5	74.3 6.7	86.3 9.3	**62.7** 10.8	***	NS	36.0	72
12.	Kidneys+heart+lung weight, g	35.0 4.7	36.7 4.0	40.1 4.8	42.4 5.3	48.3 7.0	47.0 5.2	51.3 4.8	**42.5** 6.8	***	NS	16.3	47
13.	Perirenal fat weight, g	8.9 3.6	14.3 5.5	21.8 10.5	23.6 8.0	26.3 10.7	36.5 11.4	37.9 17.6	**23.2** 11.7	***	NS	29.0	326
14.	Fore part weight, g	323 24	349 15	387 23	414 18	444 25	485 21	505 22	**409** 50	***	NS	182	56
15.	Intermediate part weight, g	323 35	373 22	408 29	438 23	470 27	520 28	533 23	**432** 57	***	NS	210	65
16.	Hind part weight, g	400 26	443 25	484 32	517 21	547 33	597 24	610 36	**508** 59	***	NS	210	52
17.	Hind legs weight, g	374 23	416 23	458 30	487 20	485 68	490 99	504 104	**465** 59	***	NS	130	35
18.	Meat on intermediate part, g	215 26	251 18	274 28	295 23	335 45	384 47	397 46	**297** 55	***	*	182	85
19.	Meat on hind legs, g	280 24	322 21	342 25	365 18	412 59	477 69	485 73	**369** 65	***	NS	206	74

NS : non significant, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Table 2 : The effect of live weight on carcass traits of Pannon rabbits (Mean ± SD)

	Carcass traits	Live weight, kg							Overall	Effect of		Difference between
		2.20-2.39	2.40-2.59	2.60-2.79	2.80-2.99	3.00-3.19	3.20-3.39	3.40-3.49		weight	sex	2.29 and 3.42 kg
20.	Dressing percentage, % (without head and edible parts, 10/4x100)	49.5 1.5	50.6 1.5	51.4 1.9	51.8 1.5	51.1 2.8	52.2 1.9	61.6 1.7	**51.3** 2.0	NS	*	2.1
21.	Dressing percentage, % (with head, without edible parts)	55.1 2.0	56.3 1.4	57.1 2.1	57.3 1.7	56.5 3.1	57.3 0.9	56.7 1.8	**56.9** 2.1	NS	*	1.6
22.	Dressing percentage, % (without head, with edible parts)	53.9 1.9	55.1 1.5	56.2 1.9	6.6 1.5	56.0 2.9	57.3 1.0	57.0 1.6	**56.2** 2.1	NS	*	3.2
23.	Dressing percentage, % (with head and edible parts)	59.5 1.9	60.7 1.4	61.9 2.1	62.2 1.7	61.4 3.2	62.4 1.0	62.1 1.6	**61.7** 2.2	NS	*	2.6
24.	Ratio of fore part in live weight (LW), 17/4x100), %	15.0 0.9	14.8 0.7	15.3 0.7	15.5 0.7	15.3 0.9	15.6 0.5	15.7 0.6	**15.3** 0.8	NS	NS	0.7
25.	Ratio of intermediate part in LW (15/4x100)	15.0 1.3	15.9 0.8	16.1 0.9	16.4 0.8	16.2 1.1	16.8 0.9	16.5 0.7	**16.2** 1.0	**	NS	1.5
26.	Ratio of hind part in LW (16/4x100)	18.6 0.8	18.8 0.8	19.2 1.0	19.3 0.8	18.9 1.3	19.3 0.7	18.9 1.0	**19.1** 1.0	NS	NS	0.4
27.	Ratio of fore part in carcass (14/10x100), %	30.3 2.0	29.2 1.1	29.8 1.1	29.9 1.0	30.0 1.0	30.0 1.0	30.4 1.0	**29.9** 1.2	NS	NS	0.1
28.	Ratio of intermediate part in carcass (15/10x100), %	30.3 1.9	31.3 1.2	31.3 1.2	31.6 1.1	31.7 1.2	32.1 1.4	32.1 0.9	**31.5** 1.3	**	NS	1.8
29.	Ratio of hind part in carcass (16/10x100), %	37.5 1.2	37.1 1.2	37.2 1.2	37.3 1.1	36.9 1.1	36.9 1.1	36.7 1.0	**37.2** 1.1	NS	NS	-1.9
30.	Ratio of hind legs in carcass (17/10x100), %	35.1 1.0	34.9 1.2	35.2 21.1	35.2 1.0	32.9 4.8	30.0 6.0	30.3 6.1	**34.2** 3.3	*	NS	-4.8
31.	Ratio of meat on intermediate part in carcass (18/10x100), %	20.2 1.3	21.1 1.3	21.1 1.4	21.3 1.2	22.6 2.6	23.7 3.1	23.9 2.9	**21.7** 1.8	*	NS	3.7
32.	Ratio of meat on hind legs in carcass (19/10x100), %	26.3 1.5	26.1 1.6	26.3 1.5	26.3 1.5	27.8 2.9	29.5 3.6	29.2 3.2	**27.0** 2.0	*	NS	2.9

NS: non significant, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$; The highest values are underlined.

Table 3 : Change in water, crude protein, crude fat and crude ash content of the meat *(M. longissimus dorsi*, hind legs and *M. longissimus dorsi* + belly) of Pannon White growing rabbits between 2.2 and 3.5 kg (mean ± standard devision)

Live weight kg	*M. longissimus dorsi*					Hind legs					*M. longissimus dorsi* + belly				
	n	Water %	Protein %	Fat %	Ash %	n	Water %	Protein %	Fat %	Ash %	n	Water %	Protein %	Fat %	Ash %
2.20-2.29	6	75.3	23.0	0.73	1.15	7	74.6	22.4	2.50	1.16	7	71.8	21.6	5.76	1.06
		0.73	0.67	0.21	0.06		1.21	0.99	1.08	0.11		2.54	0.60	2.93	0.06
2.30-2.39	6	75.6	22.6	0.92	1.30	12	74.2	22.1	2.93	1.04	12	72.7	21.7	4.78	1.04
		0.33	0.35	0.35	0.00		0.62	0.66	0.78	0.10		1.23	0.67	1.54	0.10
2.40-2.49	8	74.8	23.2	1.10	1.14	9	74.3	22.4	2.41	1.12	9	72.3	22.0	4.77	1.09
		0.35	0.35	0.21	0.09		0.76	0.49	0.71	0.09		1.71	0.65	2.16	0.06
2.50-2.59	6	75.0	23.1	0.67	1.20	13	73.8	22.3	3.28	1.02	13	72.0	21.9	5.15	1.00
		0.44	0.56	0.21	-		0.44	0.35	0.56	0.07		0.93	0.67	1.25	0.04
2.60-2.69	2	74.9	23.3	0.90	1.10	10	73.8	22.5	2.93	1.10	10	71.5	22.0	5.69	0.99
		0.71	0.35	0.42	-		0.54	0.51	0.90	0.07		1.42	0.73	1.84	0.00
2.70-2.79	9	74.9	23.0	0.99	1.13	10	73.9	21.9	3.57	1.06	10	70.9	21.5	6.80	1.02
		0.47	0.42	0.45	0.10		0.69	0.68	0.83	0.06		1.31	0.64	1.95	0.05
2.80-2.89	11	74.7	23.4	1.15	1.18	11	73.6	22.1	3.74	1.12	11	70.4	21.7	6.63	1.06
		0.59	0.49	0.65	0.08		0.75	0.74	1.17	0.04		0.71	0.75	2.23	0.05
2.90-2.99	9	74.8	23.2	0.89	1.16	9	74.0	22.1	2.91	1.12	9	71.1	21.8	6.14	1.06
		0.39	0.45	0.27	0.10		0.99	0.30	1.00	0.07		0.59	0.59	0.79	0.05
3.00-3.09	10	75.0	23.0	0.95	1.17	10	74.5	21.9	2.61	1.15	10	70.8	21.5	6.74	1.06
		0.60	0.47	0.51	0.07		0.86	0.39	1.01	0.05		2.04	0.64	2.47	0.07
3.10-3.19	9	74.1	23.5	1.32	1.17	9	73.4	22.0	3.68	1.11	9	69.8	21.6	7.66	1.06
		0.56	0.39	0.30	0.05		1.19	0.34	1.35	0.08		1.93	0.55	2.29	0.07
3.20-3.29	10	74.7	23.0	1.26	1.14	10	73.7	22.1	3.28	1.08	10	70.1	21.7	7.33	1.04
		0.67	0.53	0.35	0.07		1.29	0.53	1.39	0.04		2.54	0.71	3.12	0.11
3.30-3.39	8	74.5	23.3	1.30	1.16	8	73.1	22.1	4.11	1.08	8	69.6	21.4	8.05	1.04
		0.57	0.39	0.19	0.11		0.62	0.64	0.96	0.08		1.78	0.86	2.60	0.09
3.40-3.49	11	74.2	23.5	1.32	1.11	11	73.2	22.0	3.93	1.08	11	69.4	21.5	8.21	1.01
		0.58	0.62	0.33	0.03		0.87	0.41	1.03	0.06		2.09	0.62	2.60	0.09
2.84	**105**	**74.8**	**23.2**	**1.08**	**1.15**	**129**	**73.8**	**22.1**	**3.24**	**1.09**	**129**	**71.0**	**21.7**	**6.39**	**1.04**
Effect of weight		*	NS	NS	NS		*	NS	*	*		*	NS	+	NS
sex		NS	NS	NS	NS		NS	NS	NS	NS		NS	NS	NS	NS

NS = non-significant, * $P < 0.05$, + $P < 0.1$

85 days of age, OUHAYOUN (1984) above 950 g and 2.100 g body weight and ROMVÁRI *et al.* (1993) above 2.500 g body weight. This change is unfavourable with respect to carcass quality.

Ratios of single body parts are shown in Table 2. The average dressing percentage calculated based on hot carcass weight only was 51.3 %. The values obtained when head and head + edible offal were also included proved to be greater by 5.6 % and 10.4 % (i.e. 56.9 % and 61.7 %) respectively. Compared to body weight measured after 24 hours of fasting, the proportion of the less valuable fore part proved to be 15.3 %, while that of the hind part (containing the most meat) was the highest (19.1 %). The proportion of the most valuable parts (intermediate and hind parts together) amounted to 68.7 % within the carcass. It is difficult to compare objectively these data to those available in the literature, due to the different methods of slaughter and calculation used. Nevertheless, these can without doubt be declared good performance results.

The proportion of single body parts does not increase parallel to body weight before fasting (Table 2). The lowest value was found in the 2.2-2.4 kg category, while the highest was usually detected in categories between 3.2 and 3.4 kg. With heavier rabbits (3.4-3.5 kg), however, a slightly declining tendency was observed.

Most authors (VAREWYCK and BOUQUET, 1982; MÖSCH *et al.*, 1984; RISTIC *et al.*, 1988; PETERSEN *et al.*, 1988; SZENDRŐ, 1989) agree that, in the case of growing rabbits, carcass yield improves considerably with age. However, as stated by RUDOLPH and FISCHER (1979), RAO *et al.* (1978) and PARIGI-BINI *et al.* (1992), the differences between groups become smaller in higher body weight categories. DELTORO and LOPEZ (1986) did not detect any significant changes from the age of 11 weeks (up to 20 weeks of age); in fact, dressing percentage even decreased during some weeks. As a further difficulty, reference should be made to changes in certain parts of the carcass. DELTORO and LOPEZ (1986) observed that while the proportion of the fore quarters (without extremities) within the carcass decreases steadily until the age of 5 weeks, and increases to a lesser extent later on, the proportions of the intermediate part and hind legs increase significantly until the age of 14 and 15 weeks respectively, and remain unchanged later on. This could be the explanation for the fact that fore, intermediate and hind parts reach their maximum proportion within the carcass at different body weights.

The effect of sex was significant in the case of hot reference carcass weight, meat on intermediate part and dressing percentage.

Chemical composition of meat

Data from the laboratory analyses were arranged according to body weight measured before slaughter of the rabbits. Based on the data for all the rabbits the averages for water, crude protein, crude fat and crude ash content of LD, LD + B and HL were calculated, and the averages and standard deviations for the parameters examined were calculated according to the weight categories established in increments of 100 g between 2.2 and 3.5 kg (Table 3).

Water

Average water content was highest in LD (74.8 %), followed by that of HL (73.8%) and LD + B (71.0 %). These results are in agreement with the data published by HOLMES *et al.* (1984), PANIC *et al.* (1989) and PARIGI-BINI *et al.* (1992) for HL and LD.

The standard deviations of LD and HL were similar. On the contrary, the variance of LD + B exceeded the variance of the other two meat parts considerably. The reason for this could be that the water content of LD differed greatly from that of B as shown by the difference of 3.8 % found between LD and LD + B. Considering that the weight of LD is higher than that of B, it can be supposed that the water content of B alone was around 65 %.

Depending on body weight, there was 1-2 % difference between the two extreme groups of 2.2-2.3 and 3.4-3.5 kg; meat contained less water in the case of larger bodied rabbits. A similar change in the carcass was observed by MAERTENS and DE GROOTE (1992), while a less significant change was reported by PARIGI-BINI *et al.* (1992) for HL + LD. The difference between the lowest and highest values appears similar (1.5 %) in the case of LD and HL, whereas the difference is approximately double in the case of LD + B, which suggests that body weight has the greatest influence on the water content of B.

The relationship between body weight and water content is shown by the weak or intermediate negative correlation values detected between these two traits (Table 4). Regarding the closeness of this relationship similar data have been published by MAERTENS and DE GROOTE (1992) based on examinations on whole carcass (with no fat deposit).

Protein

The average protein content of the three meat samples varied between 21.7 and 23.2 %. There was only one sample in which protein content remained below 20 % (Table 3). These data prove that rabbit meat is very rich in protein compared to the meat of other farm animals. In this respect LD is the most valuable part (23.2 %), but the protein content of HL is also high (22.1 %). PARIGI-BINI *et al.* (1992) found a difference of 0.5 % between the protein

content of LD and HL (*M. biceps femoris*), while the differences reported by MÖSCH *et al.* (1984) and RUDOLPH and FISCHER (1979) were 0.8-1.9 % and 1.1-1.2 % respectively.

The difference between the lowest and highest values fell by between 3.5 and 4.5 %. Our findings suggest that slaughter weight has no effect on protein content, and there is no detectable tendency, either positive or negative, in this respect (Table 3). Neither could PARIGI-BINI *et al.* (1992), for L + HL, or MAERTENS and DE GROOTE (1992), detect any significant relationship between protein content of these and age or body weight.

Fat

The average fat content of LD, HL and LD + B were 1.1, 3.2 and 6.4 % respectively. Values over 10 % were only found in some cases for LD + B (Table 3). For the fat content of LD 2.1 %, 1.4-1.6 % and 1.6-1.8 % have been reported by PARIGI-BINI *et al.* (1992), RUDOLPH and FISCHER (1979) and MÖSCH *et al.* (1984) respectively. The same authors reported 4.5, 4.3-5.0 and 3.5-4.6 % for HL, i.e. the *M. biceps femoris*, respectively, values which differ only slightly from our findings. These data give evidence that rabbit meat is low in fat compared to the meat of other farm animals. This statement is true despite the fact that HL contains 3 times and LD + B 6 times as much fat as LD on average. Presumably, the fat content of B is high, since a 6 times higher fat content was measured despite its lower weight compared to LD.

The fat content of LD is fairly stable. This varies between 0.2 and 2.9 %. Greater by far is the standard deviation in the case of HL, where the difference between the lowest and highest values is 6 %. In the case of LD + B the lowest value is similar (below 1 %) but the highest value is over 13 %.

The effect of body weight was greatest in the case of fat. Between 2.2 and 3.5 kg, fat content increased from 0.73 to 1.32 % in LD, from 2.5 to 3.9 % in HL and from 6.2 to 8.2 % in LD + B. The difference between the lowest and highest values proved to be 0.6, 1.7 and 3.4 % in the three types of meat (numbers given in the previous order). There was a weak correlation between body weight and fat content (r = 0.31-0.45, Table 4.). PARIGI-BINI *et al.* (1992) observed a significant increase (2.8 and 3.5 %) in the fat content of LD + HL between the weights of 2.07 and 3.07 kg (9 and 13 weeks of age). On the contrary, MAERTENS and DE GROOTE (1992) observed no significant relationship between body weight and the fat content of the carcass.

Our results are in agreement with our previous data and with the data published by other authors, indicating that with an increase in body weight it is the fat deposit (especially around the kidneys) which accumulates. Since there is little intramuscular fat in the meat of rabbits, meat also remains low in fat in larger-bodied animals.

Table 4 : Correlations between live weight and chemical parameters in *M. longissimus dorsi*, hind leg and *M. longissimus dorsi*+belly

Meat parts	Chemical parameters	n	r
M. longissimus dorsi	Water, %	105	-0.47
	Fat, %	105	0.33
Hind legs	Water, %	129	-0.33
	Fat, %	129	0.31
M. longissimus dorsi + belly	Water, %	129	-0.51
	Fat, %	129	0.45

Ash

The average ash content of LD (1.15 %) exceeded that of HL (1.08 %) and LD + B (1.05 %) by approximately 0.1 % (Table 3). Disregarding this difference the standard deviation of the trait was the same and the values did not change by the influence of body weight. PARIGI-BINI *et al.* (1992) reported values of 1.26 and 1.20 % for the ash content of HL and LD. In their experiment ash content decreased significantly (1.27 and 1.18 %) between the ages of 9 and 13 weeks (2.07 and 3.07 kg). RUDOLPH and FISCHER (1979) found no difference between the ash content of LD and *M. biceps femoris* (1.2-1.3 %). MAERTENS and DE GROOTE (1992) detected a correlation of r = 0.45 between body weight and the ash content of the carcass.

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