RESEARCH REGARDING NUTRITIONAL QUALITY OF RABBIT MEAT (BELGIAN GIANT BREEDS)

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Abstract

The nutritional quality of rabbit meat is represented by the content of proteins (with high biological value due to the increased content of essential amino acids), lipids (rich in polyunsaturated fatty acids), minerals, vitamins and by the low content of uric acid, cholesterol and saturated fatty acids. The purpose of this research was to observe the nutritional quality of rabbit meat, taking as representative the biggest specialized breed for meat production. Biological material consisted of a number of 46 rabbits (15 males and 31 females) from Belgian Giant breed. There have been sampled different muscle groups (the muscles Cervicalis, Intercostalis, Longissimus Dorsi, Psoas major, Triceps Brachi, Biceps femoris, Semimembranosus) and the main edible offal (heart, liver, kidney). The content of proteins, lipids and water was determined using automatic analyzer Food Check (infrared spectrophotometer), the mineral substances by calcination and energy value and the amount of non-nitrogenous extractive substances, on the bases of standardized calculation formulas. The results obtained were statistically processed (comparative, depending on gender) by analysis of variance test (ANOVA) and insignificant differences have been observed for the majority analyzed samples, except for the kidneys where significant differences were found.

Key words: rabbit, meat, proteins, lipids, minerals

INTRODUCTION

Rabbit meat corresponds to the actual demands of consumers, being rich in proteins that have a high biological role, due to the high content in essential amino acids; it also contains a reduced quantity of lipids (especially cholesterol), and its nutritional quality is superior to other species because of the high content in monounsaturated and polyunsaturated fatty acids (especially ω3 and ω6, essential fatty acids, which have positive influences regarding the health state of human organism). The mineral substance content is as high (especially potassium, phosphorous, magnesium and sodium), asthe one in vitamins (especially B complex and liposoluble vitamins A and E). Another advantage of rabbit meat is its very low content in urate, being recommended even to people with gout.

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MATERIAL AND METHOD

In order to determine the nutritional quality of rabbit meat the biological material used was harvested from 46 Belgian Giant breed rabbits (15 males and 31 females). The rabbits had an average body weight of 11.5 kg being at the age of reproductive maturity (adults: 11-12 months). The amount of protein, fat and water were determined with an automatic meat analyzer Food Check (infrared spectrophotometer) and the ash procent by calcination. The results obtained were interpreted statistically. In this process, the first step consisted of common statistical estimators calculation-arithmetic mean ($\overline{X}$), standard deviation (s), variance (S^2) and coefficient of variation (V%), using the software algorithm. To test the statistical significance of differences between the studied characters we used the ANOVA Single Factor algorithm included in Microsoft Excel software package ($p>0.05$; $p<0.01$; $p<0.001$).

RESULTS AND DISCUSSION

Regarding the **protein** content, the highest values were observed in *Longissimus dorsi*

muscles from male rabbits (21.7%) and female rabbits (21.23%). The lowest mean values of the protein content were recorded in *Intercostal* muscles (18.4% at males and 16.65% at females) due to its high lipid content. The protein content recorded insignificant differences, excepting kidneys where were observed significant differences between sexes ($p<0.05$). The highest content of **lipids** was recorded in *Intercostal* muscles from females (18.1%), followed by males (16.95%). The same phenomenon was observed in *Cervical* muscles (table 1). Insignificant differences between genders were also found in the fat content.

Table 1 Proteins and lipids content of rabbit meat (Belgian Giant breed)

Components	Samples	Gender	$\overline{X} \pm s_{\overline{X}}$	S^2	V%	$\overline{X}_{min}$	$\overline{X}_{max}$
Proteins content %	*Intercostalis*	Females	16.65±0.35	0.25	2.97	16.3	17.0
		Males	18.40±1.70	5.78	13.07	16.7	20.1
	Cervicalis	Females	17.80±0.50	0.50	3.97	17.3	18.3
		Males	17.50±1.90	7.22	13.78	17.6	21.4
	Semimembranosus	Females	21.63±0.19	0.10	1.49	21.4	22.0
		Males	21.50±0.32	0.31	2.59	21.0	22.1
	Longissimus Dorsi	Females	21.23±0.58	1.00	4.72	20.1	22.0
		Males	21.70±0.23	0.16	1.84	21.3	22.1
	Psoas major	Females	21.28±0.24	0.34	2.75	20.50	21.80
		Males	21.23±0.31	0.39	2.94	20.40	21.81
	Biceps femoris	Females	20.86±0.38	0.443	3.190	20.30	21.60
		Males	20.30±0.50	0.50	3.48	19.8	20.84
	Triceps brachii	Females	21.55±0.15	0.05	0.98	21.4	21.7
		Males	21.55±0.05	0.01	0.33	21.5	21.6
	Heart	Females	20.40±0.30	0.18	2.08	20.1	20.7
		Males	20.50±0.10	0.02	0.69	20.4	20.6
	Liver	Females	20.85±0.13	0.07	1.27	20.6	21.2
		Males	20.33±0.49	0.72	4.18	19.5	21.2
	Kidney	Females	20.85±0.05[a]	0.01	0.34	20.8	20.9
		Males	19.65±0.15[b]	0.05	1.08	19.5	19.8
Lipid content %	*Intercostalis*	Females	18.1±2.41	34.48	64.07	9.9	19.3
		Males	16.95±7.55	11.41	62.99	9.4	24.5
	Cervicalis	Females	13.75±1.67	31.21	40.62	9.8	14.7
		Males	13.83±0.37	0.41	16.57	3.1	14.2
	Semimembranosus	Females	2.15±0.64	2.66	45.01	1.4	5.3
		Males	2.56±1.46	6.41	63.84	1.1	5.9
	Longissimus Dorsi	Females	2.5±1.2	18.73	23.16	1.5	4.7
		Males	2.13±0.9	2.94	54.75	1.3	4.7
	Psoas major	Females	2.75±1.143	6.845	69.76	1.9	5.6
		Males	1.69±0.519	0.81	4.5	1.1	2.9
	Biceps femoris	Females	3.55±0.677	0.845	25.89	2.9	4.2
		Males	3.4±0.2	0.08	8.32	3.2	3.6
	Triceps brachii	Females	2.65±0.9	8.97	45.85	2.2	9
		Males	2.47±2.05	8.41	32.76	6.8	10.9
	Heart	Females	6.05±0.33	0.05	3.51	4.9	6.2
		Males	6.15±0.05	0.01	0.99	7.1	7.2
	Liver	Females	5.61±0.56	1.57	20.23	4.26	7.6
		Males	7.2±0.5	0.5	6.80	4.6	9.9
	Kidney	Females	5.2±0.4	0.08	4.64	4.71	6.3
		Males	8.4±1.8	9.73	38.04	5.6	10.1

The **water content** had the highest mean values in *Psoas major* muscles from male rabbits (75.93%) and in *Longissimus dorsi* (75.03%) *Semimembranosus* muscles (75%) from female rabbits. The lowest mean values of the water content were recorded in *Intercostal* muscles (62.7%) and in *Cervical* muscles (65.65%) harvested from females, these mean quantities being reverse proportional with the determined values for lipids (table 2). After the statistical evaluation of water content were found insignificant differences between sexes.

Table 2 Water and ash content of rabbit meat (Belgian Giant breed)

Components	Samples	Gender	$\overline{X} \pm s_{\overline{X}}$	S^2	V%	$\overline{x}_{min}$	$\overline{x}_{max}$
Water content %	*Intercostalis*	Females	62.7±6.3	79.38	14.21	56.4	69
		Males	63.55±5.85	68.45	13.02	57.7	69.4
	Cervicalis	Females	65.65±2.35	11.05	5.06	63.3	68
		Males	67.55±6.45	83.21	13.50	61.1	74
	Semimembranosus	Females	75±0.71	1.51	1.64	74.1	76.4
		Males	74.7±1.126	3.81	2.61	72.7	76.6
	Longissimus Dorsi	Females	75.03±0.62	1.14	1.43	74.1	76.2
		Males	74.9±0.81	1.99	1.88	73.6	76.4
	Psoas major	Females	74.65±1.35	3.65	2.56	73.3	76
		Males	75.93±0.43	0.56	0.99	75.2	76.7
	Biceps femoris	Females	74.55±0.55	0.61	1.04	74	75.1
		Males	74.75±0.15	0.05	0.28	74.6	74.9
	Triceps brachii	Females	74.55±0.55	0.61	1.04	74	75.1
		Males	70.2±1.6	5.12	3.22	68.6	71.8
	Heart	Females	71.2±0.66	2.23	1.56	71.3	71.1
		Males	71.9±0.2	0.08	0.39	71.7	72.1
	Liver	Females	72.3±0.45	0.82	1.25	71.3	73.4
		Males	70.63±1.55	7.21	3.80	68.7	73.7
	Kidney	Females	72.2±0.1	0.02	0.19	72.1	72.3
		Males	69.8±1.1	2.42	2.23	68.7	70.9
Ash content %	*Intercostalis*	Females	1.01±0.07	0.92	0.2	1.01	1.11
		Males	1.05±0.19	0.42	0.56	1.01	1.21
	Cervicalis	Females	1.12±2.99	5.92	6.68	1.07	1.21
		Males	1.13±12.7	28.29	5.18	1.05	1.23
	Semimembranosus	Females	1.20±0.11	1.16	0.25	1.08	1.23
		Males	1.20±0.31	0.69	0.92	1.09	1.24
	Longissimus Dorsi	Females	1.20±0.1	1.36	0.3	1.14	1.22
		Males	1.21±0.3	0.9	1.19	1.12	1.26
	Psoas major	Females	1.141±0.19	1.94	0.42	1.051	1.223
		Males	1.168±0.19	0.42	0.56	1.031	1.213
	Biceps femoris	Females	1.198±0.19	2.54	0.42	1.113	1.207
		Males	1.187±12.65	28.29	5.18	1.051	1.231
	Triceps brachii	Females	1.21±0.06	0.65	0.14	1.11	1.26
		Males	1.21±0.41	0.92	1.21	1.14	1.29
	Heart	Females	1.13±1.79	3.91	5.36	1.02	1.21
		Males	1.14±2.81	6.28	8.96	1.01	1.22
	Liver	Females	1.09±1.07	2.39	3.24	1.04	1.15
		Males	1.12±1.5	3.36	4.68	1.05	1.19
	Kidney	Females	1.11±0.06	0.19	0.25	1.06	1.21
		Males	1.14±2.07	4.14	5.64	1.03	1.19

The **ash content** for the main analysed muscular groups varied from the lowest mean values of 1.01% in *Intercostal* muscles harvested from females to the highest mean values of 1.21% in *Triceps brachii* and in *Longissimus dorsi* muscles (table 1). In some scientific paper works that also determined the chemical composition of rabbit meat the values were similar to the ones obtained in the present paper. Thus, Pla M., 2008, determined an average of 21.3% protein for a group of rabbits fed with conventional feed and an average of 21.0% protein for a group of rabbits which have received organic feed. Kouba M. et al, 2008, determined an average of 22.06% protein and 1.30% lipids in a group of rabbits (Californian and New Zealand breed hybrids). Combes, S., 2005, noticed a percentage of 72.5±2.5% water, 21±1.5% proteins, 1.2± 0.1% minerals and 5.5±3.3% fats in the fresh rabbit meat, which is relatively unchanged as in other studies (Corino C., 2003; Combes S., 2005; Liste G. et al, 2010). The chemical composition variations are mainly different because of breed, nutrition and analyzed anatomical regions.

CONCLUSIONS

This study has the purpose to characterize the quality of rabbit meat (Belgian Giant breed) in the hope of improving the knowledge of consumers of any age to choose a healthy alternative and to have a diverse diet everyday. Nutrition plays a crucial role in man's health state; must be scientific, rational and balanced, adapted to the demands of each individual. To establish an optimal food intake it must be taken into account sensorial properties of food, nutritive values and their hedonistic quality. Therefore, given the evaluations presented in the current study, we strongly recommend the consumption of rabbit meat.

REFERENCES

[1] Corino C., Filetti F., Gambacorta M., Manchisi A., Magni S., Pastorelli G., Rossi R., Maiorano G., 2003: *Influence of dietary conjugated linoleic acids (CLA) and age at slaughtering on meat quality and intramuscular collagen in rabbits*, Meat Science, vol. 66, pg. 97-103.

[2] Combes Sylvie, 2004: *Valeur nutritionnelle de la viande de lapin*, INRA Prod. Anim., Vol. 17(5): pg. 373-383.

[3] Combes Sylvie and Dalle Zotte Antonella, 2005: *La viande de lapin: valeur nutritionnelle et particularités technologiques*. In Proc. 11 èmes Journées Recherche Cunicole, November, Paris, France, pg. 167-180.

[4] Kouba M., Benatmane F., Blochet J.E., Mourot J., 2008: *Effect of linseed diet on lipid oxidation, fatty acid composition of muscle, perirenalfat, and raw and cooked rabbit meat.* Meat Science, Vol. 80, pg. 829-834.

[5] Liste G., Villaroel M., Chacon G., Sanudo C., Olleta J.L., Garcia-Belenguer S., 2009: Effect of lairage duration on rabbit welfare and meat quality, Meat Science, Vol 82, pg. 71-76.

[6] Pla M., 2008: *A comparison of the carcass traits and meat quality of conventionally and organically produced rabbits*, Livestock Science, Vol. 115, pg. 1-12.