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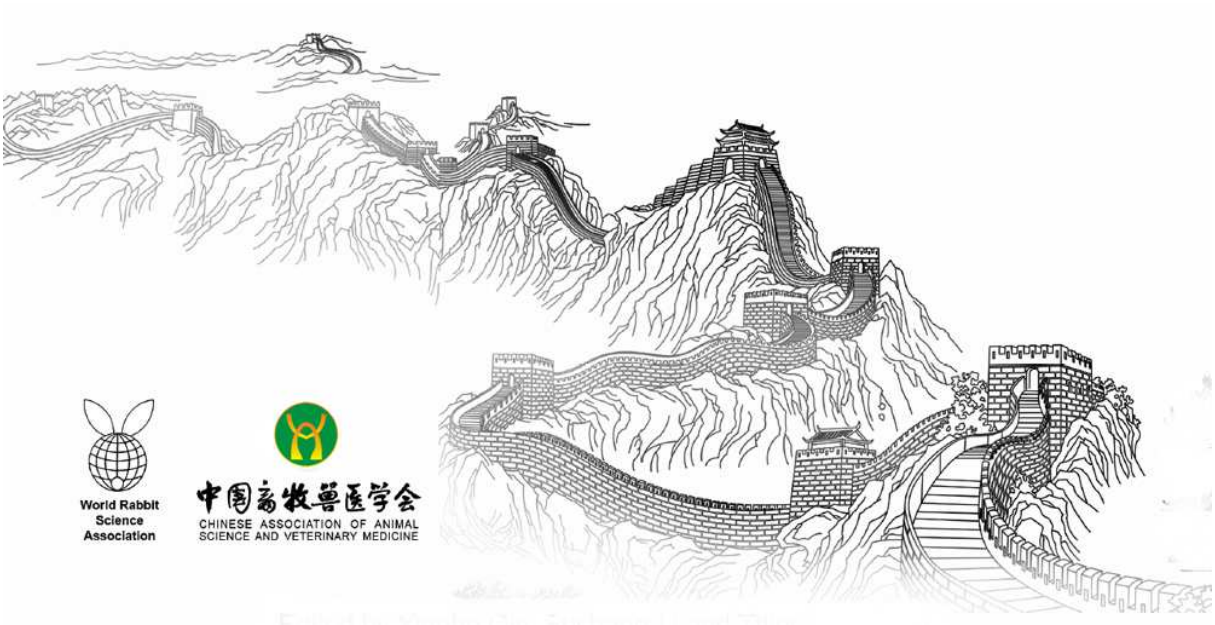

EFFECT OF SLAUGHTERING AGE ON SOME CHEMICAL TRAITS OF TWO RABBIT MUSCLES

Li Hongjun [1], He Zhifei [1], Liu Yana [1], Liu Shijian [1]*, Qin Yinghe [2], Ying Liu [3], Mao Hongjie [3], Tao Xiaoqi [1], Yan Yingka [4], Yang Chendou [4], Pang Shumei [4]

1 College of Food Science, Southwest University, Chongqing 400715, China
2 China Agricultural University, Beijing 1000000,China
3 Chongqing Aaxingji Foodstuffs Co.,Ltd, Chongqing 400000,China
4 China Kangda Foodstuffs Co.,Ltd, Qingdao 266431, China
*Correspondence author: Hongjun Li, College of Food Science, Southwest University, Chongqing 400715, China. Email: 983362225@qq.com,Tel./Fax: +86 23 68252990

ABSTRACT

The present study was undertaken to evaluate the effect of slaughter age (60, 70 and 90 days) on fatty acid profile, cholesterol content, moisture content, crude protein, ash content and intramuscular fat of rabbit meat in two muscles: *longissimus dorsi* (LD) and *hind leg* (HL). Thirty rabbits from a Kangda synthetic line which is the first Chinese line with independent intellectual property rights were used in the experiment. Crude protein of rabbit meat was not significantly affected by age at slaughter. Meat from rabbits slaughtered at 70 days of age presented the best fatty acid profile and a low level of total cholesterol, because they had the highest PUFA content and ratio to SFA, as well as the lowest intramuscular fat.

***Keywords*:** Rabbits; Fatty acid composition; Cholesterol; Chemical traits

INTRODUCTION

Currently, rabbit meat is considered a function food and become increasingly popular in the world. Rabbit meat has high content of protein and essential amino-acid levels (EAA). In addition, rabbit meat also has many positive dietetic properties, for example a relatively low fat content, low cholesterol levels, high content of polyunsaturated fatty acids (PUFA) and a very low n-6/n-3 ratio which are associated with human coronary heart disease (Castellini and Dal Bosco, 1998; Dalle Zotte, 2002; Enser et al. 1996). In recent years, the production of rabbit meat has increased considerably in the world (Ramirez et al. 2004; Hernandez et al. 2000). In 2010, the production of rabbit meat in the World was 167,687,1t. China (668,980 t), Italy (255,420 t), Spain (667,61 t), France (516,652 t) are principal rabbit meat producers and consumers in the world (FAOSTAT, 2010). In these countries, rabbit meat has a great market potential and plays an important role in domestic economy.
The objective of this work is to evaluate differences in cholesterol content, chemical and fatty acid composition of rabbit meat (longissimus dorsi-LD and hind leg-HL) at different slaughtering age (60, 70 and 90 days).

MATERIAL AND METHODS

Experimental animals

Rabbits from a Kangda synthetic line which is the first Chinese line with independent intellectual property rights were used in the experiment. This line was formed by crossing France origin and America origin, created by mating commercial crossbred rabbits. A total of 30 rabbits of three different ages, 60, 70 and 90 days old, were taken from farms located in Qingdao, China. After weaning at 35 days of age, animals were reared in collective cages with two rabbits per cage and fed with a commercial diet on their company's own. Sex was taken at random.

Following electro-stunning, rabbits were hoisted by the legs and killed by cutting the carotid arteries and jugular veins. After removing the skin, the feet and internal organs, samples of *Longissimus dorsi* (LD) and *hind leg* (HL) were chopped into 1cm thick pieces and triturated until a homogeneous mixture was achieved. These samples were packaged, frozen and stored at -18 °C for chemical analyses.

Chemical analyses
For chemical analyses, moisture content was determined on 5 g of samples of two different muscles from each animal as weight loss. Crude protein content was assessed by the Kjeldhal method and intramuscular fat by Soxhlet extraction with Petroleum ether. Ash content was determined by calcination of 5 g of sample at 550 °C to constant weight.

Fatty acids and cholesterol determination
Fatty acid methyl esters (FAME) of total lipids were prepared as described by Papadomichelakis et al. (2010). Gas chromatograph analysis was performed on an Agilen Technology system 6890N equipped with a HP-88 capillary column. Operating conditions were: a helium flow rate of 1ml/min, a FID detector at 280°C, a split-splitless injector at 260 °C.The split ratio used was 1:30. The oven temperature was held at 140°C for 5 min, increased to 240 °C at 4 °C / min and retention time at that temperature was 15 min. The individual fatty acids were identified by comparing retention times with standard fatty acids. The results were expressed as a percentage of the sum of the total fatty acids determined.

Statistical analyses
Data were analyzed by one-way ANOVA using the SPSS statistical package (version 16.0). The level of statistical significance was set at $P < 0.05$ and the differences were tested using Duncan's multiple range test. Data were then submitted to analysis of variance, involving age, muscles, and their interactions.

RESULTS AND DISCUSSION

Chemical analyses
Table1 shows the main chemical composition expressed by group. The chemical composition of *hind leg* and *longissimus dorsi* of rabbits were markedly affected by age. Rabbits from 70 days group had lower intramuscular fat content, cholesterol content, but their moisture content and ash content was higher. Crude protein content did not differ significantly among ages and muscles.
Rabbits at 70 day of age are very popular in market as a consequence of the consumers' point of view. Usually, rabbit meat is commercialized as a whole carcass, therefore a high fat store content is not satisfying (Ramirez et al. 2004).

Table 1：Chemical composition in *hind leg* and *longissimus dorsi* of rabbits slaughter at 60, 70 and 90 days of age (means±S.E.)

	Hind leg			***Longissimus dorsi***		
days	**60**	**70**	**90**	**60**	**70**	**90**
Moisture（g/100g meat)	77.18^{a}±0.71	77.37^{a}±0.32	76.40^{b}±0.36	76.04^{b}±0.29	76.93^{a}±0.64	75.64^{b}±0.28
Crude protein（g/100g meat)	22.23^{a}±1.33	21.44^{a}±0.95	22.14^{a}±1.42	22.46^{a}±2.18	23.08^{a}±0.47	23.87^{a}±0.45
Ash（g/100g meat)	0.87^{c}±0.12	1.17^{a}±0.08	1.00^{b}±0.09	0.77^{b}±0.16	1.11^{a}±0.10	1.02^{a}±0.09
Intramuscular fat（g/100g meat)	1.15^{b}±0.10	0.66^{b}±0.06	1.76^{a}±0.54	0.88^{a}±0.14	0.37^{b}±0.13	1.01^{a}±0.23
Cholesterol（mg/100g meat)	24.00^{b}±0.69	21.68^{b}±1.09	37.00^{a}±3.42	15.92^{b}±1.68	14.30^{b}±0.15	37.56^{a}±2.04

a, b, c for the same muscle with different superscripts differ at P＜0.05; post-hoc Duncan's test

Fatty acid composition
Table 2 shows the relative percentage of the fatty acids of the meat in *hind leg* and *longissimus dorsi* for the three ages. Although the percentages of saturated fatty acids (SFA), monounsaturated fatty acids (MUFA)

and polyunsaturated fatty acids (PUFA) were relatively constant between slaughter ages, the main fatty acids were PUFA and SFA compared to MUFA.

Table 2： Fatty acid composition in *hind leg* and *longissimus dorsi* of rabbits slaughter at 60, 70 and 90 days of age (means±S.E.)

	hind leg			*longissimus dorsi*		
	60	70	90	60	70	90
C8:0	0.23^{a}±0.006	0.30^{a}±0.18	0.20^{a}±0.02	0.27^{a}±0.02	0.42^{a}±0.25	0.24^{a}±0.04
C10:0	0.10^{a}±0.03	0.22^{a}±0.07	0.11^{a}±0.03	0.17^{a}±0.0016	0.30^{b}±0.03	0.15^{a}±0.04
C14:0	0.36^{a}±0.04	0.68^{b}±0.14	0.91^{c}±0.23	0.28^{a}±0.10	0.59^{b}±0.01	0.97^{c}±0.06
C15:0	0.12^{a}±0.06	0.42^{b}±0.006	0.34^{b}±0.16	0.11^{a}±0,01	0.41^{b}±0.04	0.39^{b}±0.01
C16:0	17.54^{a}±0.62	17.41^{a}±3.50	18.98^{a}±1.19	16.36^{a}±0.51	15.66^{a}±4.72	18.03^{a}±0.49
C16:1	0.78^{a}±0.12	0.84^{a}±0.03	1.23^{a}±0.39	0.36^{a}±0.20	0.77^{a}±0.14	0.92^{a}±0.34
C17:0	0.52^{a}±0.06	0.63^{b}±0.003	0.57^{ab}±0.007	0.56^{a}±0.05	0.64^{a}±0.007	0.54^{a}±0.01
C18:0	8.05^{a}±0.41	7.03^{a}±2.14	7.97^{a}±0.51	8.13^{a}±0.83	7.36^{a}±0.61	7.46^{a}±0.52
C18:1	11.00^{a}±0.67	12.62^{a}±1.38	13.77^{a}±2.64	10.79^{a}±0.31	11.27^{a}±2.78	14.09^{a}±2.40
C18:2n-6c,9c	25.11^{a}±1.56	25.32^{a}±6.08	25.30^{a}±1.46	21.06^{a}±1.03	19.91^{a}±6.97	21.82^{a}±2.05
C18:3n w-3/a-LNA	1.33^{a}±0.24	1.72^{a}±0.50	1.62^{a}±0.27	0.97^{a}±0.08	1.07^{a}±0.06	1.38^{b}±0.25
C20:2n-11c,14c	0.62^{a}±0.12	0.59^{a}±0.02	0.50^{a}±0.01	0.66^{a}±0.19	0.58^{a}±0.14	0.44^{a}±0.008
C20:3n w-6	1.80±0.34	1.03±0.41	0.98±0.24	1.91^{a}±0.15	1.06^{a}±0.45	1.01^{a}±0.03
C22:0	1.33^{a}±0.60	0.33^{b}±0.16	0.63^{b}±0.04	0.70^{a}±0.04	0.24^{b}±0.06	0.56^{c}±0.0045
C22:1n-9c	7.20^{a}±1.19	6.82^{a}±1.73	6.63^{a}±1.74	9.41^{a}±0.68	6.77^{a}±2.72	7.68^{a}±2.16
C24:1n-15c	2.04^{a}±0.26	1.26^{a}±0.28	1.77^{a}±0.38	2.44^{a}±0.28	1.42^{a}±0.44	1.80^{a}±0.39
∑SFA	28.25^{a}±0.48	27.02^{a}±6.30	29.71^{a}±1.02	26.57^{a}±0.32	22.94^{a}±8.90	28.34^{a}±0.05
∑MUFA	21.02^{a}±0.66	21.54^{a}±5.36	23.40^{a}±1.20	23.00^{a}±0.29	18.12^{a}±5.78	24.55^{a}±1.56
∑PUFA	28.86^{a}±0.16	28.66^{a}±6.73	28.40^{a}±2.11	24.60^{a}±1.15	22.68^{a}±6.85	24.65^{a}±2.27
P/S	1.02^{a}±0.01	1.06^{a}±0.22	0.95^{a}±0.07	0.93^{a}±0.03	1.03^{a}±0.20	0.87^{a}±0.08

a, b, c for the same muscle with different superscripts differ at $P<0.05$; post-hoc Duncan's test

CONCLUSIONS

As to chemical composition, age at slaughter (from 60 to 90 days) did not dramatically modify moisture and crude protein in the rabbit meat. According to the content of intramuscular fat and cholesterol, rabbit meat can be considered lean and shows a low level of total cholesterol in comparison with other usual meats consumed by people. The HL muscle presented better nutritional quality than the LD muscle, as a result of a higher PUFA percentage and PUFA/SFA ratio.
In the present study, the best rabbit meat quality was obtained from Kangda synthetic line slaughtered at 70 days of age with significantly higher PUFA contents and PUFA/SFA ratios and a lower level of total fat and cholesterol which were more compatible with good health and nutrition of consumers.

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