

MEAT QUALITY DIFFERENCES BETWEEN PUREBRED AND CROSSBRED NEW ZEALAND RABBITS

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Two experimental groups of rabbits were formed: group 1 – purebred New Zealand (NZ), group 2 – Hyplus hybrid and French Lop and New Zealand crossbreds ((HHxFL)xNZ). The rabbits were raised under the same feeding and housing condition. The rabbits have been fattened for on average 64 days. The purpose of the study was to analyze the meat quality of purebred and commercial crossbred rabbits. The physicochemical indicators of meat and content of fatty acids were determined at the Analytical Laboratory of the Institute of Animal Science of LVA. The analysis was carried out on samples of the *M. longissimus dorsi*. Lean meat analysis indicated that the content of myristoleic (C14:1) and heptadecenoic (C17:1) acids were significantly lower and those of linoleic (C18:2) and α -linolenic (C18:3) higher in the meat of (HHxFL)xNZ crossbred rabbits in comparison with purebred rabbits. The ratio of n-6/n-3 fatty acids in the crossbred group was 3.1% lower. Meat quality of crossbred rabbits was of higher value with lower fat content and higher quality of protein and intramuscular fat.

Key words: rabbit, purebred, crossbred, meat quality.

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INTRODUCTION

The world rabbit (*Oryctolagus cuniculus*) meat production is estimated to 1.8 million tons of carcasses (Lebas 2003). This production is still, however, limited to some countries such as Italy, France, Spain, Ukraine and China. Moreover, it represents a non negligible part of economy in some developing countries.

During the last years Lithuania is becoming more and more interested in rabbit breeding. However, the supply is not great and the needs of the

customer are not satisfied. This is what opens an opportunity for rabbit breeding to become a profitable business (Ribikauskiene & Jerešiusnas 2005).

One of the most suitable breeds for commercial breeding is the New Zealand White. Their average market weight at 70 days amounts to 1.9-2.1 kg (Kjær et al. 2000, Ozimba & Lukefahr 1991) and 2.9 kg weight is reached in 99 days (Kjær et al. 2000).

There is a tendency in the world to breed broiler rabbits Hyplus. They gain up to 2.3 and 2.7 kg

weight, respectively, in 70 and 84 day (Metzger 2004).

New Zealand White and Hyplus rabbits are used in commercial crossbreeding with different breeds. After having crossbred several different breeds we can get the effect of heterosis (Masoero 1982, Rochambeau 1988). However, it is proved that not every interbreeding and interlinear crossbreeding can be effective (Janusonis 2001).

Meat quality is affected by various genetic, nutritional and technological factors (Basso et al. 2006, Jukna & Kvietkutė 1998, Ribikauskienė et al. 2001). Meat tenderness is influenced by arrangement of intramuscular fat. When fat is found in the gaps of connective tissue, meat is more soft and tender. The amount of complete and incomplete protein in the muscles depends on the tryptophane and oxyproline ratio that indicates the quality of meat protein (Jukna & Jukna 2000, Stankevičius 1999, Stankevičius et al. 1998). Tryptophane is an indispensable amino acid found only in the protein of muscular tissue. There is no tryptophane in the connective tissue protein. Oxyproline is dispensable amino acid found only in the connective tissue protein. In practice, the indicator of the complete value of protein is the ratio of tryptophane and oxyproline. The more muscular tissue and the less connective tissue is found in meat, the higher is the value of meat because the content of complete protein is higher. From nutritional viewpoint, the most important indicator of fat quality is the composition of fatty acids and especially the content of polyunsaturated fatty acids (PUFA) in the meat (Gerbens et al. 2001, Mickevičius & Margelytė 1999, Sekmokienė 1999). Linoleic (C18:2) and linolenic (C18:3) acids are very important for the nutrition of humans as these acids are not synthesized in the human body.

Rabbit meat possesses a relatively high content of polyunsaturated fatty acids (Ouhayoun et al. 1987). The literature survey indicates that the best ratio of fatty acids n-6/n-3 in the ratio of adults is from 4:1 to 6:1 (Neuringer et al. 1988, Department of Health... 1994, Liutkevičius 2006).

The quality of rabbit meat has not been deeply investigated in Lithuania, so the purpose of study was to analyze the meat quality of purebred New Zealand rabbits and crossbreds (Hyplus x French Lop) x New Zealand White rabbits and also to determine how different genotypes bred in equal conditions might influence meat differences.

MATERIALS AND METHODS

The study was carried out in 2006. Two experimental groups of rabbits were formed: group 1 – purebred New Zealand (NZ) (n=8), group 2 – Hyplus hybrid and French Lop and New Zealand White crossbreds ((HHxFL)xNZ) (n=8). The rabbits were raised under the same feeding and housing condition. The animals were given complete compound feed and hay and water *ad libitum*. The fattening of rabbits started at an average weight of 1242 g and slaughtering was at 3147 g weight. The length of fattening was approximately 64 days.

The analysis was carried out on samples of the *M. Longissimus dorsi*. The physicochemical indicators of meat and content of fatty acids were determined at the Analytical Laboratory of the Institute of Animal Science of LVA. The ratio of fatty acid groups n-3 (C18:3, C22:5, C22:6) and n-6 (C18:2, C20:3, C20:4) was analyzed.

The research data were processed statistically and are presented as arithmetic mean and mean deviation. The differences were statistically significant at $P < 0.05$.

RESULTS AND DISCUSSION

The analysis of the meat quality of purebred and crossbred rabbits indicated significant differences in meat fat (Table 1). Purebred rabbit meat had 0.09% ($P < 0.025$) higher fatness than that of crossbred rabbits. There were more protein and dry matter in the meat but the differences were insignificant. pH – value of purebred rabbit meat was 0.7% lower than that of crossbred meat.

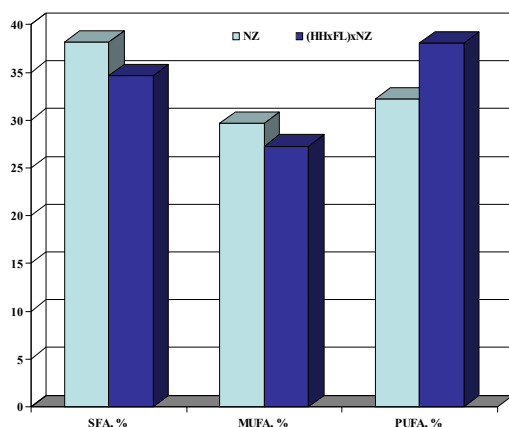
Table 1. Physical and chemical characteristics of meat

Item	Breed	
	NZ (control)	(HHxFL)xNZ (experimental)
Dry matter, %	24.04±0.37	23.55±0.17
Protein, %	22.35±0.28	21.94 ±0.17
Fat, %	0.53±0.02	0.44±0.03 b
Ash, %	1.02±0.03	1.05±0.01
Tryptophane, mg/100g	326.78±10.28	309.98±9.59
Oxyproline, mg/100g	57.87±3.82	50.85±3.91
Tryptophane: Oxyproline ratio	5.75±0.38	6.45±0.58
pH	5.68±0.04	5.72±0.04

Note. In this and other Tables ^aP < 0.05, ^bP < 0.025, ^cP < 0.01, ^dP < 0.005.

Table 2. Composition of fatty acids in meat lipids, %

Fatty acid	Breed	
	Control NZ	Experimental (HHxFL)xNZ
Saturated fatty acids (SFA):		
Myristic (C14:0)	2.61±0.25	2.14±0.13
Pentadecanoic (C 15:0)	0.58±0.04	0.47±0.01 a
Palmitic (C 16:0)	28.80±1.53	25.80±0.31
Heptadecanoic (C 17:0)	0.60±0.05	0.48 ±0.02
Stearic (C 18:0)	5.59±0.11	5.79±0.28
Monounsaturated fatty acids (MUFA):		
Myristoleic (C 14:1)	0.38±0.03	0.14±0.07 b
Pentadecenoic (C 15:1)	0.08±0.04	0.15±0.01
Palmitoleic (C16:1)	5.05±0.44	3.54±0.50
Heptadecenoic (C 17:1)	0.38±0.03	0.26±0.02 c
Oleic (C 18:1)	23.60±0.72	23.01±0.36
Eicosenoic (C 20:1)	0.16±0.01	0.18±0.01
Polyunsaturated fatty acids (PUFA):		
Linoleic (C 18:2)	26.28±0.55	30.98±0.88 d
α -linolenic (C 18:3)	4.24±0.14	5.23±0.19 c
Eicosatrienoic (C 20:3)	0.19±0.01	0.22±0.01
Arachidonic (C 20:4)	1.03±0.20	1.18±0.12
Docosapentaenic (C 22:5)	0.24±0.05	0.24±0.02
Docosahexaenoic (C 22:6)	0.21±0.03	0.22±0.02
n-6	4.68±0.16	5.68±0.18c
n-3	27.50±0.66	32.38±0.83d
n-6/n-3	5.88±0.06	5.70±0.05



However, meat acidity indicators in both groups were good and had on influence on meat quality. The content of complete and incomplete proteins in the meat is depended on the ratio of tryptophane and oxyproline that indicates the quality of meat protein. The biological value of (HHxFL)xNZ rabbit meat was higher in comparison with purebred New Zealand White rabbit meat and the ratio of tryptophane and oxyproline was 0.7 higher in crossbred meat.

Figure 1. Composition of fatty acids in meat lipids, %

Lower content of fatty acids and higher content of polyunsaturated and total unsaturated fatty acids was found in the crossbred rabbit meat (Table 2, Figure 1). The analysis of individual unsaturated fatty acids indicated that the contents of myristoleic and heptadecenoic acids were respectively 0.24 ($P < 0.025$) and 0.12% ($P < 0.01$) lower and those of linoleic and α -linolenic acid respectively 4.70 ($P < 0.005$) and 0.99 ($P < 0.01$) higher in the crossbred rabbit meat than in the purebred rabbit meat. Of all saturated fatty acids, the content of pentadecanoic acid was 0.11% ($P < 0.05$) lower in crossbred rabbit meat. Thus, the meat of crossbred rabbits contained less intramuscular fat and significantly higher content of valuable polyunsaturated fatty acids.

Literature data (Benardini et al. 1997) indicates that there is a low ratio of fatty acids n-6/n-3 in the intramuscular fat of rabbit meat. Our study showed that ratio of n-6/n-3 fatty acids met the recommended requirements in both group of rabbits (Liutkevičius 2006). The ratio of n-6/n-3 fatty acids in the crossbred group was 3.1% lower but this difference was statistically insignificant.

CONCLUSIONS

1. The content of fat, protein and fry matter were, respectively, by 0.1, 0.4 and 0.5% higher in the meat of purebred New Zealand rabbits if compared with (HHxFL)xNZ crossbred rabbits.
2. The content of myristoleic and heptadecenoic acids were significantly lower and those of linoleic and linolenic significantly higher in the meat of crossbred rabbits if compared with that of purebred rabbits.
3. The quality of crossbred rabbit meat was higher because it contained less fat and the quality of protein and intramuscular fat was higher too.

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