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The effect of one-week intensive feed restriction and age on the carcass composition and meat quality of growing rabbits

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ABSTRACT: The effect of one-week intensive feed restriction on the carcass characteristics, meat tenderness, cooking loss, and muscle fibre characteristics of growing rabbits was evaluated. Weaned rabbits (35 days) were divided into three groups: rabbits fed *ad libitum* (ADL), rabbits fed 50 g (R50), and rabbits fed 65 g (R65) of feed per animal per day in days 42–49 of age. Dressing out percentage was lower (–1.3% and –2.3% for R50 and R65, respectively) in restricted rabbits ($P \leq 0.001$) but increased with age ($P \leq 0.001$). Cooking loss significantly increased in restricted rabbits. A significant interaction between feeding regime and age was observed in the number of type αR muscle fibres, the highest number ($P \leq 0.05$) was observed in the ADL rabbits (114.5) at 49 days, and the lowest was found in the R50 group at 70 days of age (25.0). Feed restriction increased the percentage of αW glycolytic fibres ($P \leq 0.01$). A significant negative correlation was found between cooking loss and the cross sectional area of αW fibres (–0.486) and αR (–0.325). It could be concluded that one-week intensive feed restriction did not have a negative effect on meat tenderness and cooking loss, despite the fact that it affected muscle fibre type distribution.

Keywords: dressing out percentage; limited feed intake; meat tenderness; muscle fibre characteristics; rabbit

INTRODUCTION

Recently, feed restriction has been used to prevent digestive disorders in animals during the post-weaning period (Gondret et al. 2000; Di Meo et al. 2007; Gidenne et al. 2012). Feed restriction in growing rabbits enhances feed efficiency (Di Meo et al. 2007; Gidenne et al. 2009, 2012) and reduces carcass fat (Gondret et al. 2000; Tumova et al. 2003, 2007). The effect of feed restriction depends on the timing of its beginning, its duration, and its intensity.

Restricted feed intake influences the growth of rabbits. Average daily weight gain decreases during feed restriction (Gondret et al. 2000, 2009), but the following realimentation period induces compensatory growth (Tumova et al. 2002), which is important for the slaughter weight of rabbits. In addition to influencing growth, feed restriction can affect carcass characteristics, of which dressing out percentage is the most important trait. The effects of feed restriction on dressing out percentage in rabbits are inconsistent. Perrier and Ouhayoun (1996) described higher dressing out percentages in rabbits under greater feed restriction intensity than in rabbits with moderate restriction or those fed *ad libitum* (ADL). In contrast, Larzul et al. (2004) and Gidenne et al. (2009) reported a lower dressing out percentage in restricted rabbits in comparison with those fed *ad libitum*.

The quality of meat is influenced by numerous factors including feeding regime which plays an important role (Chodova et al. 2014). Tenderness is one of the most important meat quality characteristics to consumers, and it depends on the amount of connective tissue and the myofibrillar structure of the muscles, which indicates the onset

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of *rigor mortis* and changes the characteristics of meat maturation (Pla et al. 1998). The results of the effect of feed restriction on meat tenderness are not well known; only Carrilho et al. (2009) reported no significant variation between rabbits with different fibre contents in their diets.

Feed restriction is one of the *ante mortem* conditions that can also affect morphological, physiological, and biochemical muscle characteristics (Gondret et al. 2000). Feed restriction supports the oxidative metabolic pathway and increases the number of oxidative muscle fibres in cattle (Seideman and Crouse 1986), pigs (Solomon et al. 1988), and lambs (Solomon and Lynch 1988). However, Gondret et al. (2000) and Dalle Zotte et al. (2005) observed that feed restriction followed by unlimited feeding management in rabbits induces increased glycolytic metabolism, which reduces the percentage of oxidative muscle fibres. Conversely, feed restriction does not change the cross sectional area (Dalle Zotte and Ouhayoun 1998; Gondret et al. 2000). Furthermore, there is limited information about the changes in muscle fibre characteristics during restriction and the realimentation period. Therefore, the aim of the present study was to evaluate the effect of one week of different intensities of feed restriction on the carcass traits, meat tenderness, and muscle fibre characteristics of growing rabbits.

MATERIAL AND METHODS

Animals and experimental design. An experiment using 198 Hyplus rabbits from the weaning age of 35 days to 70 days of age was carried out. The experiment was approved by the Ethics Committee of the Central Commission for Animal Welfare at the Ministry of Agriculture of the Czech Republic. Rabbits were housed in cages (3 rabbits per cage) with a floor density of 0.16 m^2 per rabbit, and the average initial live weight of each group was balanced. Rabbits were divided into three experimental groups ($n = 66$; male and female ratio 1 : 1): rabbits fed *ad libitum* (ADL), restricted rabbits with reduced feed of 50 g per rabbit per day in days 42–49 of age (R50), and rabbits fed 65 g of feed per rabbit per day in days 42–49 of age (R65). Rabbits were fed *ad libitum* before and following the period of feed restriction, and water was available *ad libitum* throughout the experiment. The commercial pelleted diet for growing rabbits contained 17.1% crude protein, 20.7% crude fibre, and 2.8% ether extract. The detailed composition of the diet was shown in a previous study of Tumova et al. (2016). Animals were kept under controlled environmental conditions (temperature 15–17°C, relative humidity 55–60%, lighting regime 12 light : 12 darkness).

Slaughter traits. Changes in carcass composition were evaluated at weekly intervals from the end of feed restriction at 49 days of age, and eight rabbits from each group of similar weight were selected for slaughter. The carcass analysis was carried out according to Blasco and Ouhayoun (1996). Carcasses with the head but without the blood, skin, genitals, bladder, gastrointestinal tract, distal portion of the legs, thoracic cage organs, liver, kidneys, perirenal fat were weighed to determine the hot carcass weight. The dressing out percentage was calculated by dividing the hot carcass weight by the live weight, and the carcass was then cut to separate the hind part composed of the loin and hind legs using the methods of Blasco and Ouhayoun (1996). For loin determination, the carcass was cut between the last thoracic and the first lumbar vertebra following the prolongation of the 12th rib. When cutting the thoracic wall and the second section between the 6th and 7th lumbar vertebrae, the abdominal wall was cut transversally to the vertebral column. The second cut was used to divide the loin and the hind legs, and the percentage of the hind legs and loin was calculated. The perirenal fat percentage was evaluated using the method of Blasco and Ouhayoun (1996).

Instrumental meat quality. Meat tenderness was determined by the Warner-Bratzler shear test in the *musculus longissimus lumborum* (MLL). The right part of the MLL was dissected and frozen to –20°C, and the samples were later defrosted at 4°C for 24 h. Samples of the MLL were packaged in plastic bags with zip ties and were heated in a water bath at 75°C for 1 h. Meat samples were cut into 2 × 1 cm^2 cuboids with the cuts running parallel to the muscle fibres. Tenderness was measured using an Instron Model 3342 (Instron, Norwood, USA) with a Warner-Bratzler shear blade with a triangular hole. The load cell was 20 N with a crosshead speed of 100 mm/min and a sampling rate of 20 points/s. The maximum shear force (N) was determined. In addition to tenderness, the cooking loss was calculated from the difference between the weights of the raw and cooked samples.

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Histochemical analysis. The muscle fibre characteristics from the left part of the MLL were analyzed. Samples were collected immediately after slaughter and frozen in 2-methylbutane cooled by liquid nitrogen (–156°C) and stored at –80°C until the histochemical analysis. The cross sections (12-μm thickness) from each sample were then cut with a Leica CM 1850 cryostat (Leica Microsystems Nussloch GmbH, Nussloch, Germany) at –20°C. The staining for myofibrillar ATPase was performed following alkaline preincubation according to the methodology of Brooke and Kaiser (1970). The fibres were typed, in accordance with the nomenclature of Ashmore and Doerr (1971), as βR (red and slow twitch fibre), αR (red and fast twitch fibre) or αW (white and fast twitch fibre). The muscle fibre characteristics, the number of muscle fibres per 1 mm^2, and the fibre cross-sectional area (CSA) were determined with NIS Elements AR 3.1 software (Nikon, Tokyo, Japan), and the distribution of the fibre types was subsequently calculated.

Statistical analysis. Data were processed by two-way ANOVA (with an interaction between group and age) using the GLM procedure of SAS (Statistical Analysis System, Version 9.1.3, 2003). The limit of significance was set at $P \leq 0.05$.

RESULTS

The results of the carcass analysis are given in Table 1. The live weight of the slaughtered rabbits represents the mean weight of the rabbits at the age of the slaughter analysis, and carcass weight was affected by a significant interaction of group and age. The highest carcass weight ($P \leq 0.05$) was observed in the ADL rabbits at 70 days of age. At the end of feed restriction (day 49), there were no differences in carcass weight among the groups indicating that there was no effect of feed restriction intensity on this parameter. Carcass weight did not differ during the time to slaughter that followed till 70 days of age. However, the carcass weight at the end of the experiment was significantly lower in the restricted rabbits.

The dressing out percentage was not significantly affected by the interaction of group and age, but both of the restricted groups had numerically lower dressing out percentages at 63 and 70 days of age,

Table 1. Effect of feed restriction on the carcass characteristics of broiler rabbits

Group	Age (days)	Live weight (g)	Carcass weight (g)	Dressing out (%)	Hind part (%)	Loin (%)	Perirenal fat (%)
ADL	49	1624	799^{f}	56.9	37.9	14.8	0.88
	56	2237	1124^{e}	58.4	33.0	15.9	1.47
	63	2526	1342^{cd}	59.5	35.8	16.2	1.61
	70	2915	1572^{a}	60.6	36.7	16.5	2.07
R50	49	1660	820^{f}	56.1	36.3	16.5	0.44
	56	2294	1127^{e}	58.3	32.6	15.9	1.07
	63	2501	1288^{d}	58.6	36.3	16.1	1.47
	70	2713	1413^{bc}	59.3	37.7	16.3	1.90
R65	49	1751	833^{f}	54.8	35.6	15.9	0.48
	56	2271	1131^{e}	58.2	33.3	14.8	1.00
	63	2510	1264^{d}	57.7	35.4	16.3	1.73
	70	2744	1440^{b}	59.3	37.1	16.1	1.82
SEM		44.98	26.57	0.19	0.27	0.16	0.06
Significance							
Group		ns	ns	***	ns	ns	**
Age		***	***	***	***	ns	***
Group × Age		ns	*	ns	ns	ns	ns

ADL = *ad libitum*, R50 = 50 g of feed per rabbit per day, R65 = 65 g of feed per rabbit per day, SEM = standard error of the mean, ns = non significant

$^{a–f}P \leq 0.05$

*$P \leq 0.05$, **$P \leq 0.01$, ***$P \leq 0.001$

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respectively, compared to the ADL rabbits. The hind legs percentage significantly increased with age ($P \leq 0.001$), except at 56 days, and it was not affected by feeding regime. The loin percentage was not affected by any of the monitored factors.

Feed restriction decreased ($P \leq 0.01$) the percentage of perirenal fat at not only the end of the restriction, but during the entire realimentation period. As expected, perirenal fat increased with age ($P \leq 0.001$). However, no significant interaction of feeding regime and age was found (Table 1).

The results for the physical characteristics of the meat of the MLL are given in Table 2. Instrumental meat tenderness was significantly ($P \leq 0.001$) decreased at 70 days of age. The effect of feeding regime on shear force was not significant. Cooking loss was significantly increased ($P \leq 0.001$) in restricted rabbits and was decreased ($P \leq 0.001$) with age (Table 2).

The muscle fibre characteristics of the MLL are provided in Table 3; only the number of αR muscle fibres per 1 mm^2 was significantly affected by the interaction between group and age ($P \leq 0.05$). The highest number of αR fibres was found in the group fed *ad libitum* at 49 days of age, while the restricted groups had lower numbers of these muscle fibres at this age. In addition, there was no effect of feed restriction intensity on this characteristic. The lowest number αR muscle fibres was found in the R50 group at 70 days of age compared to the ADL group, while the R65 group did not differ from the other groups. The number of muscle fibres βR ($P \leq 0.05$), αR ($P \leq 0.001$), and αW ($P \leq 0.001$) was significantly decreased with age, which is related to the increasing muscle fibre area.

Table 2. Effect of feed restriction on tenderness and cooking loss in broiler rabbits

Group	Age (days)	F max (N)	Cooking loss (%)
ADL	49	40.8	36.3
	56	51.3	35.3
	63	44.1	29.9
	70	36.6	27.9
R50	49	50.4	37.8
	56	47.9	36.7
	63	51.3	32.8
	70	40.5	29.9
R65	49	46.5	36.2
	56	48.7	36.5
	63	53.0	33.7
	70	35.5	29.8
SEM		1.00	0.38
Significance			
Group		ns	***
Age		***	***
Group × Age		ns	ns

ADL = *ad libitum*, R50 = 50 g of feed per rabbit per day, R65 = 65 g of feed per rabbit per day, F max = maximal shear force, SEM = standard error of the mean, ns = non significant
*$P \leq 0.05$, **$P \leq 0.01$, ***$P \leq 0.001$

The CSA depends on the type of muscle fibre. Glycolytic fibres (αW) are the most represented in the MLL and had the largest CSA while oxidative muscle fibres (αR and βR) had smaller and similar CSA sizes. The total area of the βR, αR, and αW muscle fibres was not significantly affected by feed restriction or by the interaction of group and age. The CSAs of all of the muscle fibre types significantly grew with increasing age (βR: $P \leq 0.05$; αR: $P \leq 0.001$; αW: $P \leq 0.001$).

The distribution of the fibre types was not affected by the interaction of group and age. The percentage of βR muscle fibres was not affected by any of the monitored factors, but the proportion of αR and αW muscle fibres was significantly affected by feeding management. It is evident that the percentage of αR fibres was significantly higher ($P \leq 0.010$) in the rabbits fed *ad libitum* while the lowest proportion was found in the R65 group. The restricted rabbits had significantly higher percentages of glycolytic fibres (αW), and the results show that the restricted groups, especially group R65 under milder restriction, increased their proportion of αW muscle fibres to the exclusion of αR muscle fibres. The distribution of αR and αW muscle fibres was significantly ($P \leq 0.001$) affected by age; at the end of the restriction period, the percentage of αR fibres was the highest and the percentage of αW fibres was the lowest in comparison with the following period (Table 3).

The relationship among muscle fibre characteristics, shear force, and cooking loss can be expressed by correlations, and Table 4 shows the Pearson's correlation coefficients. There was a positive correlation between shear force and cooking loss ($P \leq 0.001$). No correlations were detected between shear force and muscle fibre characteristics. On the other hand, a negative correlation was observed between cooking loss and the CSA of the αR ($P \leq 0.01$) and αW ($P \leq 0.001$) muscle fibres. Weaker

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Table 3. Effect of feed restriction on the muscle fibre characteristics of the *musculus longissimus lumborum*

Group	Age (days)	Number of muscle fibres per 1 mm^2			Fibre cross-sectional area (μm^2)			Fibre type distribution (%)		
		βR	αR	αW	βR	αR	αW	βR	αR	αW
ADL	49	18.0	114.5^{a}	365.0	1065	1023	1685	3.69	23.6	72.8
	56	9.2	42.5^{def}	297.5	1275	1077	2267	1.97	12.2	85.9
	63	10.0	45.5^{def}	293.0	1077	1236	2319	2.79	13.4	83.8
	70	8.5	48.0^{cde}	303.5	1057	1156	2398	2.55	13.1	84.3
R50	49	15.0	82.5^{b}	384.0	852	792	1684	2.82	17.2	79.9
	56	9.5	54.0^{cd}	370.5	1122	890	1822	2.16	12.3	85.6
	63	9.0	48.5^{cde}	280.0	1215	1128	2409	2.71	14.1	83.2
	70	7.5	25.0^{f}	249.0	1301	1321	2692	2.48	9.0	88.6
R65	49	11.5	68.0^{bc}	369.0	951	1009	1759	2.53	15.2	82.3
	56	9.5	43.5^{def}	351.0	1127	915	1875	2.35	10.7	87.0
	63	6.5	31.5^{ef}	256.4	1478	1364	2690	2.78	11.7	85.6
	70	6.0	34.5^{def}	273.5	1429	1244	2533	1.82	11.3	86.9
SEM		0.89	3.24	8.11	43.62	34.28	62.91	0.20	0.57	0.62
Significance										
Group		ns	ns	ns	ns	ns	ns	ns	**	**
Age		*	***	***	*	***	***	ns	***	***
Group × Age		ns	*	ns	ns	ns	ns	ns	ns	ns

ADL = *ad libitum*, R50 = 50 g of feed per rabbit per day, R65 = 65 g of feed per rabbit per day, SEM = standard error of the mean, ns = non significant

$^{a–f}P \le 0.05$

$^{*}P \le 0.05$, $^{**}P \le 0.01$, $^{***}P \le 0.001$

correlations were also observed between cooking loss and the distribution of αR ($P \le 0.05$) and αW ($P \le 0.05$) fibres (Table 4).

DISCUSSION

In the present experiment, the interactions between group and age in carcass weight were detected. Significant differences in carcass weight between *ad libitum* and restricted rabbits were found at the end of experiment at 70 days of age. These results corresponded with the data of Gondret et al. (2000) who detected lower carcass weight in restricted rabbits, but contrasted with those of Tumova et al. (2003) and Oliveira et al. (2012), who did not find differences between ADL and restricted groups. These inconsistent results might be related to different methods of feed restriction or its experimental timing.

Table 4. Pearson's correlation coefficients between tenderness, cooking loss, and muscle fibre characteristics of the *musculus longissimus lumborum*

	F max (N)	Cooking loss (%)
Cooking loss (%)	0.454***	
CSA type βR (μm^2)	–0.068	–0.207
CSA type αR (μm^2)	–0.095	–0.325**
CSA type αW (μm^2)	–0.104	–0.486***
βR percentage (%)	0.021	0.051
αR percentage (%)	–0.031	0.245*
αW percentage (%)	0.021	–0.240*

F max = maximal shear force, CSA = fibre cross sectional area

$^{*}P \le 0.05$, $^{**}P \le 0.01$, $^{***}P \le 0.001$

The dressing out percentage is one of the most important carcass characteristics. The interactions of feeding regime and age were not observed in the present study, but the dressing out percentage was significantly lower in restricted rabbits (–1.3% and –2.3% for R50 and R65, respectively). Similarly with our results, Gondret et al. (2000), Larzul et al. (2004), and Gidenne et al. (2009) reported significantly lower dressing out percentages in rabbits subjected to moderate restriction. Decreasing dressing out percentages in rabbits under moderate feed restriction may be related to insufficient compensatory growth and the subsequently lower

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slaughter weight of the restricted rabbits or to an increase in the relative weight of their digestive tracts (Gidenne et al. 2009). In contrast with the results of the present study, Perrier and Ouhayoun (1996), Tumova et al. (2003), and Metzger et al. (2011) did not detect differences between restricted rabbits and those fed *ad libitum*. The results indicate that the intensity and duration of feed restriction affects dressing out percentage, so more research is still needed.

The hind legs percentage in our experiment was not affected by feeding regime which agrees with Perrier and Ouhayoun (1996) or Tumova et al. (2006). Also loin percentage was not affected by any monitored factors and corresponds with Tumova et al. (2006), who applied feed restriction with similar intensity at the same age as in our experiment. These authors also either applied feed restriction later (from 56 days of age) or for a longer period, and they found lower loin percentages in restricted rabbits. A lower percentage of MLL, which is the main muscle of the loin, was observed by Dalle Zotte and Ouhayoun (1998) in qualitatively restricted rabbits. The inconsistent results between our experiment and the literature are probably related to the different start times and durations of feed restriction. When feed restriction is started later, rabbits have lower loin percentages, and this can be associated with growth allometry when the loin matures later than the thigh (Pascual et al. 2008).

The perirenal fat percentage was not affected by the interaction of group and age. However, in the present study both restricted groups had lower (–19.2% and –16.6% for R50 and R65, respectively) percentage of perirenal fat. Similar results were observed by Gondret et al. (2000), Larzul et al. (2004), and Tumova et al. (2006, 2007). It seems that restricted rabbits did not receive enough energy from their feed, so *de novo* lipogenesis in the extramuscular tissues was limited, and the restricted rabbits had lower perirenal fat percentages. Furthermore, Gidenne et al. (2012) observed a negative relationship between the amount of perirenal fat and the level of feed intake, hence the lower perirenal fat percentage in the restricted rabbits.

Instrumental meat tenderness determined by maximum shear force was not affected by the interaction between group and age or by feeding regime in the present experiment. This result is supported by the data of Pla et al. (1998) and Carrilho et al. (2009). On the other hand, Larzul et al. (2004) found significantly lower meat tenderness in restricted rabbits compared to the group fed *ad libitum*. From our results it appears that more tender meat can be produced in older rabbits because of a higher amount of intramuscular fat, which is one of the characteristics affecting meat tenderness. Pla et al. (1998) stated that the determination of tenderness is very complex and involves elements of muscle structure, muscle composition and *post-mortem* biochemical changes.

A one-week intensive feed restriction increased cooking loss, which is in line with the findings of Pla et al. (1998) who observed that rabbits with lower live weight had higher cooking loss than the heavier ones, which is also evident from the results of our experiment. One reason for the greater cooking loss in younger rabbits can be higher water content in the meat (Pla et al. 1998).

Interaction between group and age was found in the number of αR muscle fibres. At the end of restriction period both groups with limited feed intake had lower values than the ADL rabbits. R50 rabbits with more intensive feed restriction had the lowest number of αR muscle fibres at 70 days of age. The authors who have studied the effect of feed restriction on muscle fibre characteristics in rabbits have not included the number of individual muscle fibre types, so our results cannot be compared with the data from the literature.

Feed restriction and also interaction between group and age did not affect the CSA of the βR, αR, and αW muscle fibres. The results of our experiment are consistent with those of Dalle Zotte and Ouhayoun (1998) and Gondret et al. (2000) who found no differences between the fibre cross sectional areas of the individual types of muscle fibres in the restricted rabbits and in those fed *ad libitum*. Gondret et al. (2000) showed that muscle fibre area is correlated with live weight rather than age.

Regarding the percentage of muscle fibre type, the interaction of group and age was not detected; however, feed restriction changed the percentage of αR and αW muscle fibres. The proportion of αW muscle fibres increased to the exclusion of αR muscle fibres in restricted rabbits. In agreement with our results, Gondret et al. (2000) detected a reduction in the distribution of the oxidative muscle fibres, αR and βR, in the MLL in restricted rabbits compared with the *ad libitum* control.

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However, these authors did not find any differences in the distribution of fibre types between rabbits under feed restriction and the *ad libitum* group, but they applied feed restriction at the intensity of 70% of ADL from 11 weeks of age. The reduction of αR muscle fibres may have a negative effect on the juiciness of the meat, which is determined by the intramuscular fat content near the oxidative muscle fibres (Picard et al. 2002); these data are consistent with the higher cooking loss in restricted rabbits. In the present study, the highest percentage of αR fibres and the lowest percentage of αW fibres at the end of the restriction period in comparison with the following period was observed. This corresponds with the results of Dalle Zotte et al. (2005) who stated that young rabbits have mainly muscle fibres of αR type in MLL. Type αR can change to muscle fibres of type αW with advancing age.

A positive correlation between shear force and cooking loss observed in the present study indicated that the loin became tenderer as cooking loss decreased, which is in agreement with Hofmann (1987). No correlations between shear force and muscle fibre characteristics were observed and these results are in agreement with Orzechowska et al. (2008) in pigs and Chriki et al. (2013) in bulls and cows. Negative correlations between cooking loss and the CSA of the αR and αW muscle fibres were detected which indicated that the smaller fast-twitch fibre area in rabbits increased the amount of meat lost due to cooking that contains these types of fibres. However, Ozawa et al. (2000) did not find the correlation between CSA and cooking loss in steers.

In the current study, the results of weaker correlations between cooking loss and the distribution of αR and αW fibres suggest that the increase in the percentage of the glycolytic muscle fibres and the decrease in the percentage of αR muscle fibres is related to the decrease in cooking loss. Positive correlations between cooking loss and αR percentage were also observed by Ozawa et al. (2000) in steers, but Waritthitham et al. (2010) did not find any correlations between the percentage of any muscle fibre type and cooking loss. Higher cooking loss in muscles with a higher percentage of αR fibres can be caused by a greater amount of intramuscular fat near the oxidative muscle fibres (Picard et al. 2002). Meat with a higher percentage of fat likely experienced greater cooking loss due to the percentage of fat lost during cooking.

CONCLUSION

The results of this study showed that one week of intensive restriction implemented one week after weaning decreased carcass weight, dressing out percentage, perirenal fat, and cooking loss at 70 days of age. However, there was no effect on meat tenderness or the CSA of muscle fibres. Feed restriction increased the percentage of glycolytic αW muscle fibres to the exclusion of αR fibres, mainly in the R65 group, which was under milder restriction than the R50 group. The higher percentage of glycolytic αW muscle fibres supports the higher cooking loss observed in restricted rabbits. Feed restriction intensity did not affect the muscle fibre characteristics or meat tenderness. The study brought some new data concerning the effect of short feed restriction on meat quality; however, further research is needed.

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