THE EFFECT OF DIET FAT TYPE ON CARCASS COMPOSITION AND MEAT QUALITY IN RABBITS

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Abstract - Three group of does were fed with three experimental diets (A, V and C) during gestation and lactation. Their offspring was also fed with their respective diets from weaning to slaughter. C was a standard commercial diet, V had a 9.9% of vegetal fat, and A had a 11.4% of animal fat. Sixty animals of each group were slaughtered at 9 weeks of age. Only rabbits between the liveweight interval of 1.75 and 2.25kg were slaughtered. The rabbits came from a commercial three way cross. Diets with A and V had a better food conversion rate, a lower drip loss percentage, and a dressing out percentage substantially better than diet C. Carcass colour seems not to be affected by the diet, but rabbits fed with diet V showed a substantially less pale meat. Differences in the three colour parameters were found for the three diets for carcass fat colour. pH measured in m. *L. dorsi* and *B. femoris* were slightly higher for diets A and V. Protein content and moisture percentage of the meat of a hind leg was almost the same for the three diets. Water holding capacity (WHC) and WHC of cooked meat of rabbits fed with diets A and V were higher, and cooking losses were substantially lower than rabbits fed with the control diet. Fat content of the meat of a hind leg was much higher in animals fed with diets A and V.

INTRODUCTION

The addition of animal or vegetable fat to rabbit diets is interesting from an economical point of view, since they are inexpensive sources of energy. Diets containing a high percentage of fat produce an higher growth rate and a lower food conversion ratio (CASTELLINI and BATTAGLINI, 1992; FERNÁNDEZ *et al.*, 1994). However it is needed a high fibre content in the diet (FERNANDEZ *et al.*, 1994). Besides, some technical factors related to the fragility of the pellets also limit the amount of fat that can be added.

Little work has been done to know the effect of high contents of fat in the diet on carcass composition (OUHAYOUN *et al.*, 1986), but there is no available information of this effect on rabbit meat quality. The relationship established in recent times between consumption of animal fat and heart diseases has given a considerable unpopularity to animal fät in carcasses. It would be interesting to know the effect of adding animal fat to the diet on carcass composition and meat quality. As some types of fat are more digestible, lower quantities of vegetable fat in the food may produce the same effect that higher quantities of animal fat (FERNÁNDEZ *et al.*, 1994). The aim of this paper is to examine the effect of two diets with a different fat type on rabbit carcass composition and meat quality.

MATERIALS AND METHODS

Animals

Three group of does were fed with three experimental diets (A, V and C), during gestation and lactation. Their offspring was also fed with their respective diets from weaning to slaughter. C was a standard commercial diet, V had a 9.9% of vegetal fat (soya bean meal), and A had a 11.4% of animal (FGAF) fat (table 1 shows the diet composition). Food consumption per cage was calculated from weaning to slaughter. Sixty animals of each group were slaughtered at 9 weeks of age at the abattoir placed in the farm and the carcasses were stored at 3°C for 24 hours. Only rabbits between the liveweight interval of 1.75 and 2.25kg were slaughtered. The rabbits come from a commercial three way cross.

Traits measured

Food conversion rate (FCR) was estimated as food consumption per cage divided by the sum of the liveweight of the animals in the cage. The carcasses were measured and retailed according to the norms of the World Rabbit Scientific Association (WRSA) (BLASCO *et al.*, 1993). The following variables were measured LW: Liveweight, HCW: Hot carcass weight, CCW: Chilled carcass weight, DP: Dressing out percentage

Table 1 : Composition and chemical analysis of diets (g/100g fresh matter basis)

	Diet C	Diet V	Diet A
Ingredients			
Barley	35	20	20
Soya 44%	12	-	18
Soya full-fat	-	24	-
Lucerne hay	50	50	50
Soya oil	-	2.5	-
Commercial tallow	-	-	8.5
D--Metionine	0.1	0.1	0.1
Calcium dihydrogen phosphate	2.3	2.8	2.8
Mineral/vitamin supplement[2]	0.2	0.2	0.2
Salt	0.4	0.4	0.4
Chemical analysis			
Dry matter (DM)	92.2	92.7	92.9
Ash	10.2	10.6	10.6
Crude protein (CP)	18.0	19.8	19.0
Digestible protein (DP)	13.0	15.1	14.0
Ether extract (EE)	2.6	9.9	11.7
Crude fibre (CF)	16.6	17.0	16.6
Gross energy (MJ/Kg DM)	17.8	19.4	19.8
Digestible energy (MJ/Kg DM)(DE)	11.0	12.4	12.2
DE/DP (KJ/g)	84.6	82.1	87.1

[1] all diets contains 100 ppm antioxidant and 66 ppm robenidine.
[2] contains (gKg^{-1}):thiamin, 0.25; riboflavin 1.5; calcium pantphenate, 5; pyridoxine, 0.1; nicotine acid, 12.5; vitamin A, 2; vitamin D, 0.1; vitamin E, 15; vitamin K, 0.5; vitamin B_{12} 0.006; chlorine chloride, 100; $MgSO_4.H_2O$ 7.5; ZnO, 30; $FeSO_4.7H_2O$, 20; $CuSO_4.5H_2O$, 3; KI, 0.5; $CoCl_2.6H_2O$, 0.2; Na_2SeO_3 0.03; BHT antioxidant, 0.2.

(CCW/LW), DLP: Drip loss percentage (HCW-CCW/HCW), DFaW: Dissectible fat weight was the sum of the weight of the Scapular, Inguinal and Perirenal deposits.

A hind leg was separated and dissected to determine its meat/bone ratio (M/B), and its chemical composition: FaP: Fat percentage by Soxtec method (AOAC, 1990), PP: Protein percentage, by Kjeldahl method (AOAC, 1990) and MP: Moisture percentage by desiccation at 102°C (AOAC, 1990).

Colour was measured with a CR-300 Minolta Chromameter which gives the L*, a* , b* parameters (CIE, 1976). Measurements were taken on the carcass surface of the *Longissimus dorsi* muscle at the level of the 4th lumbar vertebra, on the meat of the 7th lumbar vertebra section of the *Longissimus* muscle and on the perirenal fat. Muscular pH of the *B. femoris* (pHBf) and pH of the *Longissimus dorsi*(pHLd) at the level of the 5th lumbar vertebra was also measured.

Electrical conductivity (EC) was measured on the *Longissimus,* at the level of the 5th lumbar vertebra. Water holding capacity (WHC) of *m. Longissimus* was measured according to the GRAU and HAMM technique (HAMM, 1986) and was expressed as the ratio (x100) of muscle area to total area. Cooking loss (CL) was determined by cooking an *m. Longissimus* in an electric oven at 200 °C during 30 min, and weighing it 30 min later. WHC of cooked meat of *m. Longissimus* (WHCc) was the WHC of 300±5 mg of muscle cooked as described before.

Statistical analyses

Least square means were computed by using the GLM procedure of the SAS package (SAS, 1990), in a model that included diet, sex and the interaction as fixed effects. Weaning weight was a covariate in growth analyses, liveweight was a covariate for analyzing dressing out percentages, and carcass weight was a covariate in the analyses of the carcass.

RESULTS AND DISCUSSION

Table 2 shows the growth and carcass traits of the three groups of rabbits. The liveweight in table 2 is the liveweight of slaughtered animals, and it is the same for the three groups because of the weights interval used to select animals for slaughter. However, food conversion rate was calculated with all available animals and not only with the rabbits that were slaughtered. Diets with a higher fat content had a better food conversion rate, as expected (PARTRIDGE *et al.,* 1986; CASTELLINI and BATTAGLINI, 1992). Dressing out percentage of rabbits fed with the control diet was similar to the DP found in other experiments with rabbits of similar weight (OZIMBA and LUKEFAHR, 1991), but for rabbits under fatter diets (A and V) it was substantially better, which agrees with the results of SANTOMA *et al.* (1987). Drip loss percentage was lower for rabbits under diets A and V.

Rabbits fed with a high fat content in the diet had heavier fat depots in the carcass, as was before observed by OUHAYOUN *et al.* (1986). The diet A produced carcasses with a little more fat than carcasses of rabbits fed with

Table 2 : Growth and carcass trait of three groups of rabbits fed with different type of diets (A, V and C)

	V	A	C	s.e.
LW	2006	2015	2001	22
FCR	2.7 a	2.6 a	3.1 b	0.06
DLP	2.2 a	2.5 a	3.3 b	0.11
DP	56.8 a	57.1 a	55.5 b	0.27
DFaW	5.6 a	6.0 b	3.7 c	0.13
M/B	4.38 a	4.14 b	4.51 a	0.07

FCR: Food Conversion Rate, LW: Liveweight, HCW: Hot carcass weight, CCW: Chilled carcass weight, DP: Dressing out percentage (CCW/LW), DLP: Drip loss percentage HCW-CCW /HCW), DFaW: Dissectible fat weight, M/B: Meat to Bone ratio.

Means in the same line with different letter are statistically different at P<0.05

fat of vegetable origin (diet V). Meat/Bone ratio of the hind leg is a reasonably good estimator of meat/bone ratio of the carcass (BLASCO *et al.*, 1993). The differences in meat/bone ratio of the hind leg were small, but both diets had a lower ratios than the control animals.

Table 3 shows colour parameters of the carcass, measured on the *L.dorsi* muscle, and colour parameters of perirenal fat and *L.dorsi* meat. Carcass colour seems not to be affected by the diet, with the exception of a slightly lower luminosity, probably due to small differences in fat content under the subcutaneous fascia. Animals fed with diet V showed a substantially less pale meat, although L* and H* were the same for the three diets. Clear differences in the three colour parameters were found for the three diets, showing that the fat origin substantially affected perirenal fat colour. The perirenal fat of animals fed with diet V had a lower lightness and a softer tact, which agrees with the results of OUHAYOUN *et al.* (1987). Control diet animals had the most coloured perirenal fat.

Table 3 : Colour parameters (L*,C*,H*) of Carcass on the m. *L. dorsi*, perirenal fat and *L.dorsi* meat of three groups of rabbits fed with different type of diets (A, V and C)

	Carcass			Pfat			Meat		
	L*	C*	H*	L*	C*	H*	L*	C*	H*
V	53.3 a	2.7	-13.9	64.0a	5.5a	51.3a	51.9	5.2a	41.3
A	54.9ab	2.5	-2.6	70.0b	4.3b	47.0b	52.0	4.4b	39.7
C	55.5 b	2.5	-4.3	69.4b	7.7c	42.5c	51.8	4.4b	39.8
s.e.	0.30	0.16	0.45	0.40	0.29	0.93	0.29	0.17	1.40

Means in the same column with different letter are statistically different at P<0.05

Table 4 shows the meat quality traits measured in m. *L. dorsi* and *B. femoris*. Both pH are slightly higher for diets A and V. Protein content and moisture percentage of the meat of a hind leg is almost the same for the three diets. Water holding capacity of rabbits fed with diets A and V was a 10% higher than WHC of the control line, which agrees with their lower drip loss. Cooking looses were substantially lower for animals fed with high fat content diets, mainly for rabbits fed with the diet V. Cooked meat of control animals was less juicy than rabbits fed with diets A and V. Fat content of the meat of a hind leg (table 4) was much higher in animals fed with diets A and V. Fat content of the meat has proved to be an important meat quality factor in other species (see, for example, BARTON-GADE *et al.*, 1988). The general pattern is that meat quality of rabbits fed with diets containing a high amount of fat is better than meat quality of rabbits fed with commercial standard diets, at least in parameters related to juiciness, cooking losses and intramuscular fat content. Whether consumers could notice all these differences is a matter of further research.

Table 4. Meat quality traits measured in m. L. dorsi, B. femoris and hind leg of three groups of rabbits fed with different type of diets (A, V and C).

	L. dorsi					B. femoris	Hind leg		
	WHC	CL	WHCC	EC	pHLd	pHBf	MP	PP	FaP
V	33.4a	23.4a	16.5a	3.35	5.70a	5.83a	72.4a	20.2a	4.45a
A	33.7a	28.5b	17.9b	3.32a	5.76b	5.85a	72.8a	20.4a	4.78b
C	30.3b	34.0c	19.1c	4.24b	5.66c	5.76b	73.9b	20.9b	3.30c
s.e.	0.45	1.02	0.42	0.11	0.015	0.017	0.14	0.09	0.10

WHC: Water holding capacity of the *L. dorsi*. CL: Cooking loss of the *L. dorsi*. WHCC: WHC of cooked meat of the *L. dorsi*. pHBf: pH of the *B. femoris*. pHLd: pH of the *L. dorsi*(pHLD) at the level of the 5th lumbar vertebra. FaP: Fat percentage of the hind leg. PP: Protein percentage of the hind leg. MP: Moisture percentage of the hind leg.

Means in the same column with different letter are statistically different at P<0.05

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