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INFLUENCE OF THE MALE RABBIT CASTRATION ON MEAT QUALITY. 1/. PERFORMANCES DURING FATTENING PERIOD AND CARCASS QUALITY

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ABSTRACT

Influence of an early castration on performances of male rabbits slaughtered at different ages was studied. A total of 150 male rabbits were castrated at 1 week of age and slaughtered at 14, 17 or 20 weeks in comparison with 150 entire males and 150 females slaughtered at the same age. Individual growth and group feed intake were measured from weaning (36 d) to slaughter age. Growth rate and feed intake were not significantly affected by sex before 14 weeks. From 14 until 20 weeks of age entire male growth rate was significantly lower than that of the 2 other groups. The live weight of castrated males was lower than that of females at 17 and 20 weeks of age. The sexual type does not influence the dressing percentage which vary from 58,3% at 14 weeks to 61,4% at 20 weeks. Whatever the age, the entire males had a lower carcass adiposity than the 2 other sexes. At 20 weeks of age, castrated males were significantly fatter than females : 6.78% kidney fat in the carcass *vs* 5.84%. The percentage of bone to muscle of the hindleg decreased between week 14 (13.4) and week 17 and then stabilises to approximately 12.4.

INTRODUCTION

Ways to improve the quality of rabbit meat are limited. The most efficient is the age at slaughter, and therefore the degree of maturity of the meat. Recently, in France, some breeders produced high quality rabbits which were slaughtered at about 90 days of age and housed in collective pens. The increase of the slaughter age creates however new problems such as aggressive behaviours after the puberty, and males castration may be a solution. Besides this behavioural effect, castration has also some effects on growth performances and meat characteristics on most animals (LIRETTE *et al*, 1984; DESMOULIN *et al*; 1990; BONNEAU *et al*., 1996).

The influence of the male rabbit castration on the quality of meat was, to our knowledge, the object of no previous study, but ours. The main object of this work was to test this technique as way of improvement of the meat quality and as one of the solutions to be envisaged for the group rearing of animals until an advanced age. This paper deals with fattening period performances and carcass quality. The meat sensory and physico-chemical qualities are presented in an second communication (LEBAS *et al.*, 2000).

MATERIAL AND METHODS

Animals

The experimentation was realised with a group of 450 commercial hybrid rabbits (Hyplus commercialised by *Grimaud Frères* France) composed of 150 entire males, 150 castrated males and 150 females born on the same day. Castration was made by abdominal incision under general anaesthesia at 1 week of age (JEHL *et al*., 1999).

Fattening period performances

From weaning (36 days) to slaughter age, animals are grouped by sex and placed in collective wire mesh cages (5 per cage). They received *ad libitum* a commercial pelleted feed, and fresh

water was always available. The individual weight and the collective feed intake were controlled at 36, 47, 75, 99, 120 and 141 days of age.

Slaughtering

Fifty rabbits of each sex were slaughtered at three different ages : 14 weeks (99 days), 17 (120 days) and 20 weeks (141 days). Chilled carcasses were weighed and separated in two pieces in the length sense and preserved under vacuum at -20°C for ulterior analyses. The right half-carcasses was used for the estimation of carcasses and meat physical characteristics while the left one was employed for sensory analysis by a trained panel of tasters.

Carcasses characteristics

From the right ½ carcass, back (½ loin), thigh (right hindleg), kidney and kidney fat were weighed separately. Weight of each of these parts, multiplied by two when pertinent, were calculated in proportion of the whole carcass. This multiplication was made to make easier references to published literature based on carcass cuts. The noble part corresponds to the proportion of weights of loin + thighs / carcass weight. The bad section of the end of too many tibias in the slaughter house made unsuitable the classical estimation of the muscle to bone ratio. For this reason meatiness of the thigh was estimated as the bone to muscle proportion which was calculate on the hind leg as weight of femur + coxal bones / total thigh soft parts.

Statistical analyses

Results were treated by variance analysis with the SAS-GLM procedure according to a 3 ages x 3 sexes factorial design with interaction.

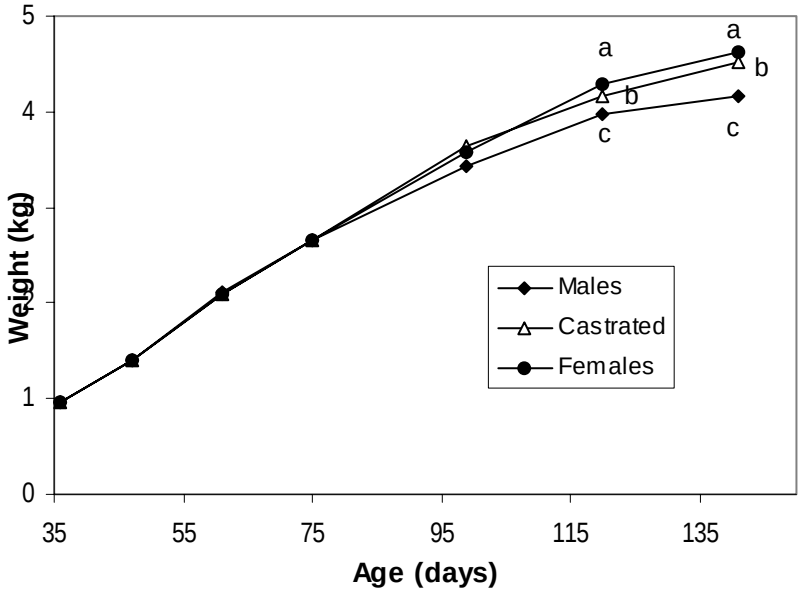
RESULTS AND DISCUSSION

Fattening period performances

Growth performances

No significant effect of sex on rabbit's live weight was detected before 14 weeks. The males weight tended to be lower than that of females at 14 weeks (P=0,11) and the difference were significant after. Weight of castrated males was similar to that of females until 14 weeks and then slightly inferior at 17 and 20 weeks (figure 1).

Figure 1 *: Evolution of the rabbits live weight from weaning to slaughter age*



These tendencies were already previously observed by JEHL *et al.* (1999) with animals castrated at different ages and slaughtered at 14 weeks of age. The superiority of females weight could be explained by the sexual dimorphism of adult weight in the Rabbit, females being heavier than males.

Feed intake

The average feed intake was not significantly different according to the sex of rabbits (P=0,32). Nevertheless, this result needs to be confirmed by complementary measures since, on the one hand, these values corresponded to the average feed intake of the group reared in the cage (5 rabbits/cage) and then to few data by statistical basic cell, on the other hand, it was difficult to take in account the waste of pellets that can sometimes be important.

Since the feed intake was similar while the daily weight gain was superior for females compared to males at the end of the fattening period, a better feed conversion ratio was logically observed for females compared to males during this period, with intermediate values for castrated animals (table 1).

Table 1 : *Effect of males castration on the feed conversion ratio during the fattening period.*

	Periods (days)					
sex	**36-47**	**47-61**	**61-75**	**75-99**	**99-120**	**120-141**
males	2.35	2.85	3.69	5.24	9.31[a]	15.28[a]
castrated males	2.41	2.98	3.78	5.20	8.27[b]	11.39[b]
females	2.41	2.96	3.76	4.99	7.33[c]	9.48[c]
Statistical Signif.	*NS*	*NS*	*NS*	*0.07*	*P<0.001*	*P<0.001*

(a), (b), (c), means having a common letter did not differ at the level P=0.05

In the other species, most of authors observed a lower feed efficiency for castrated males in comparison with entire males. For pigs (DESMOULIN *et al*, 1990) or steers (MORGAN *et al.*, 1993), the feed efficiency of entire males was, on the average, 13% better than that of the castrated ones. However for these species, the castrated males growth rate was also inferior to that of non castrated ones.

For sheep, a lower feed efficiency of castrated males has been taken in relation with a significantly lighter digestive tract for the sheep compared to the ram (LIRETTE *et al*, 1984). According to WILLIAMS (1976), it seems that this phenomenon is sexual hormone dependent and especially of the testosterone level, one of the regulators of the digestive system development.

Carcasses characteristics

The carcasses characteristics are presented in the table 2. For each criterion, are mentioned the effect of the age and / or of the sexual type.

Dressing percentage (chilled carcass weight / living animal weight) increased regularly with the age; it was 58.3 % at 14 weeks and reached 61.4 % at 20 weeks of age. On the other hand, the sexual type does not seemed to have any significant influence on the dressing percentage.

Concerning the carcass "noble parts" proportion (% of [hind legs + degreased loin] in the carcass) no significant differences were observed between the ages or the sexual types (stabilisation to approximately 46 %). Nevertheless, proportion of hindlegs in the carcass

decreased with age mainly at 20 weeks (24.2% *vs* 25.2 - 25.0 %) but was the highest of all for 20 weeks old entire males (26.4%, *vs* 23.2% for the 2 others sexes at this age)

The percentage of kidney fat in the carcass was strongly influenced by the age and by the sexual type with a significant interaction between age and sexual type. Castrated males and females had a higher carcass adiposity than males. At 20 weeks of age, castrated males were significantly fatter than females, but this was not observed at 17 weeks. These results, revealed the need to commercialise castrated rabbits in carved pieces or in cooked meat preparations, because this accumulation of visible fat on the carcass would repel consumers.

Finally, the bone/muscle ratio of the hindleg decreased between 14 and 17 weeks and then stabilises to approximately 12.4 . The diminution of this ratio was mainly due to the muscular growth since the bone growth is then quite achieved (GILSANZ *et al*., 1988).

CONCLUSION

From the viewpoint of fattening period performance, the male rabbit castration had caused a late increase of the growth speed after 14 weeks compared to the entire male with practically similar performances to those of females. For rabbits slaughtered at 20 weeks of age, the difference in live weight was about 300g.
The castration of male rabbits, as for others species of mammals, had not leaded to a best dressing percentage. The over-development of external fat as a consequence of the castration would impose to remove the fat of carcasses before commercialisation. This operation is easy for the kidney fat that is easily accessible but needs more manipulations for the other locations and would impose to commercialised rabbits in more or less degreased pieces.

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Table 2 : Carcass characteristics of females, castrated males and entire males slaughtered at different ages.

	Mean of each sexual type of rabbit at different ages									Statistical significance		
	14 weeks			**17 weeks**			**20 weeks**			Factor		
	females	castrated males	males	females	castrated males	males	females	castrated males	males	Sexual type	Age	Sexe *Age
Live weight (g)	3587	3649	3436	4282	4171	3985	4631	4522	4173	***	***	*
		3557 a			**4146 b**			**4455 c**				
Carcass weight (g)	2065	2122	2029	2592	2531	2366	2857	2802	2544	***	***	***
		2072 a			**2497 b**			**2735 c**				
Dressing percentage %	57.7	58.0	59.1	60.5	60.8	59.4	61.7	61.4	61.0	ns	***	ns
		58.3 a			**60.3 b**			**61.4 c**				
% noble parts / carcass	46.54	45.06	45.84	45.9	45.70	46.46	47.06	45.42	44.22	ns	ns	ns
		45.80			**46.02**			**45.56**				
% hind legs / carcass	25.40	24.96	25.30	24.96	24.60	25.42	23.16	23.18	26.38	**	***	*
		25.22 a			**25.00 a**			**24.24 b**				
% kidney fat / carcass	3.58	4.00	3.26	5.14	4.94	4.56	5.84	6.78	4.88	***	***	*
		3.62 a			**4.88 b**			**5.84 c**				
% kidneys / carcass	0.92	0.92	0.92	0.74	0.80	0.86	0.72	0.72	0.76	***	**	ns
		0.92 a			**0.80 b**			**0.74 c**				
% bone/muscle in right hind leg	13.65	13.21	13.25	11.95	12.5	12.74	12.23	12.72	12.44	ns	***	ns
		13.37 a			**12.40 b**			**12.46 b**				

ns=non significant ; * P<0.05; ** P<0.01; ***P<0.001

a, b, c : on the same line, means having a common letter did not differ at the level P=0.05