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THE INFLUENCE OF FEEDING ON THE CHEMICAL COMPOSITION OF CARCASSES AND ON PELT QUALITY IN THE CASTOR REX RABBIT

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ABSTRACT : The influence of feeding intensity on the chemical composition of skinned whole carcasses and on fur quality was examined in 2 groups of Castor Rex rabbits, fed *ad libitum* (n = 8 ♂ and 8 ♀) and 75 % of *ad libitum* (n = 8 ♂ and 8 ♀), respectively. The rabbits were born in June and pelted in December at 179 days of age. Feeding intensity strongly affected body weight at pelting (P<0.001), fat content (P<0.001), protein content (P<0.01), and water content (P<0.001) of the carcass, but did not affect the content of ash and residues. The restricted group had an 11 % lower body weight and the carcasses contained 4.1 % more water, 0.7 % more protein, and 4.9 % less fat than the group fed *ad libitum*. The females were significantly (P<0.05) fatter than the males (fat content 14.6 against 11.5 %). The restricted group had significantly (P<0.05) longer hair (point 3.8 against 2.9) and significantly (P<0.05) shorter/smaller (5 %) skin length/skin size, whereas no significant differences were found in hair density, colour, quality and skin weight. The group fed *ad libitum* tended, however, to have the darkest skins and the restricted group the best hair density and quality and the lightest pelts (= dried skins).

RÉSUMÉ : Influence de l'alimentation sur la composition chimique des carcasses et la qualité de la peau du lapin Castor Rex.
L'influence du niveau d'alimentation sur la composition chimique des carcasses entières dépouillées et sur la qualité de la fourrure a été évalué sur deux groupes de lapins Castor Rex, nourris ad libitum *(n = 8 ♂ et 8 ♀) et à 75 % d'*ad libitum *(n = 8 ♂ et 8 ♀) respectivement. Les lapins nés en Juin ont été abattus en Décembre à l'âge de 179 jours. Le niveau d'alimentation affecte fortement le poids vif à l'abattage (P<0.001), les contenus en gras (P<0.001) protéines (P<0.01) et eau (P<0.001), mais n'affecte pas le contenu en cendres et résidus de la carcasse. Le groupe restreint présente à 179 jours un poids vif inférieur de 11 % ; les carcasses contiennent 4,1 % d'eau et 0,7 % de protéines en plus, mais 4,9 % de gras en moins, comparé au groupe* ad libitum. *Les femelles sont significativement (P<0,05) plus grasses que les mâles (14,6 contre 11,5 % de gras). Dans le groupe restreint, la longueur du poil est significativement (P<0,05) supérieur (3,8 points contre 2,9) et les peaux sont significativement (P<0,05) moins longue et d'une surface moindre (5 %), mais il n'a pas été décelé de différences significatives dans la densité de la fourrure, la couleur, la qualité ou le poids de la peau. Cependant, le groupe nourri* ad libitum, *tend à avoir des peaux plus foncées et pour le groupe restreint, à avoir les meilleures densité et qualité de fourrure et des peaux plus légères (peaux sèches).*

INTRODUCTION

The aim of fur animal production is to produce pelts, and the most important property in this respect is the fur quality. The body of most fur animal species is normally regarded as waste. In the Castor Rex rabbit, however, the meat can be used for consumption, and the composition of the carcass is therefore also of importance in this fur animal species.

The results presented here, dealing with the influence of feeding intensity on the chemical composition of Castor Rex carcasses and on the fur quality and size of dried pelts, are part of a larger experiment with Castor Rex rabbits carried out at the Danish Institute of Animal Science in 1989. The results of this experiment regarding effect of age on different pelt and fur properties were previously published by PETERSEN and RASMUSSEN (1991).

MATERIALS AND METHODS

The investigation included 32 Castor Rex rabbits divided into two groups with 16 animals each. The young rabbits were weaned at the age of 40 days. From weaning until they were, at the age of 3 months, included in the experiment, they were fed *ad libitum*. At the start of the experiment, sexes and litters were distributed equally into two groups, where group 1 was fed *ad libitum* and group 2 was given 75 % of the feed quantity consumed on average per animal per day in the group fed *ad libitum*. From weaning and during the experimental period the same feed mixture shown in

Table 1 : Composition of feed mixture

Ingredients	%
Barley	15.0
Oats	30.0
Grass meal	30.0
Wheat bran	9.6
Soya bean meal	4.0
Sunflower seeds, partly decorticated	8.0
Molasses	1.5
Mineral/vitamin mixture	1.5
Methionine, 40%-mixture	0.4
Analysed content:	
Digestible energy, kcal/kg	2545
Crude protein, % of feed mixture	16.4
Methionine and cystine, % of feed mixture	0.7

Table 1 was used. Furthermore, the rabbits had free access to straw.

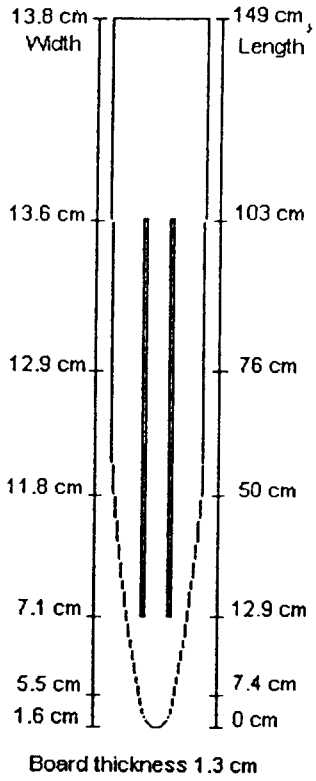
The experimental house was equipped with windows, and no extra electric light was used. The rabbits thus followed the natural day length during the entire growth and experimental period. On average, the day length was thus decreasing about 10 hours during the research period. At the end of the experiment in December, the day length was a little over 7 hours. As no heat was supplied, the temperature in the house reflected that of the ambient environment.

The rabbits were placed in wire mesh cages with only one animal each. Cage measurements: length 91 cm, depth 51 cm, height 38 cm. At the start of the experiment the rabbits were 93 days old, and the experiment ended when they had reached the age of 179 days.

The rabbits were slaughtered without prior fasting, and the skin was removed and cleaned of fat and muscle remains. The chemical analysis was performed on the entire carcass including the cleaned off fat and muscle remains, but excluding the cleaned skin with fur. Dry matter, ash, protein and fat contents were determined. The fat analyses were made by the STOLDT method and determination of protein by the KJELDAHL method.

The skins were stretched and dried on a wooden board especially developed for the drying of rabbit pelts (fig. 1).

Figure 1 : Board for shaping and stretching the skins for drying.



Subjective evaluation of hair length, hair density, and colour was made on live animals the day before killing, whereas skin length was measured and fur quality evaluated subjectively after the pelts had been dried. The grading scale is shown in table 2.

The statistical analysis was carried out with the below model, and the effect of feeding intensity was tested by means of a t-test for least-square-means. As no significant interaction was found between group and sex, the interaction was omitted from the calculations.

Table 2 : Grading scale

	Points	Grading		
Hair length	1 - 5	1 = shortest hairs		5 = longest hairs
Hair density	1 - 5	1 = poorest density		5 = best density
Colour	1 - 3	1 = dark	2 = medium	3 = pale
Pelt quality	1 - 10	1 = poorest quality		10 = best quality

Table 3 : Chemical composition of Castor Rex carcasses and body weight at pelting ($\bar{x}$ ± SD)

	Ad libitum group	75 % of *ad libitum* group	P
Number of animals	*16*	*16*	
Body weight at pelting	3421 ± 298	3056 ± 227	0.0005
Water %	61.8 ± 3.1	65.9 ± 3.6	0.0002
Ash %	3.4 ± 0.3	3.6 ± 0.5	0.0963
Protein %	16.6 ± 0.7	17.3 ± 0.7	0.0048
Fat %	15.5 ± 3.7	10.6 ± 3.3	0.0001
Residue %	2.7 ± 0.4	2.6 ± 0.6	0.5325
% of dry matter :			
Ash	8.9 ± 1.2	10.6 ± 1.8	
Protein	43.8 ± 5.1	51.1 ± 5.5	
Fat	40.1 ± 6.4	30.5 ± 7.3	
Residue	7.2 ± 1.0	7.8 ± 1.9	

$$Y_{ijk} = \mu + F_i + K_j + e_{ijk}$$

where
Y_{ijk} = observed parameter
μ = overall mean
F_i = effect of feeding method (1-2)
K_j = effect of sex (1-2)
e_{ijk} = random error

As the data for the traits hair length, hair density, colour, and fur quality are not normally distributed, the Wilcoxon nonparametric test was used for comparing the groups in regard to these traits.

RESULTS AND DISCUSSION

Chemical composition of the carcass

As both groups consisted of an equal number of males and females, the results are presented totally per group.

The method of feeding resulted in a significant difference between groups in body weight at pelting and water, protein, and fat contents of the carcass, whereas no difference was found in content of ash and residues, which mainly consist of unspecified carbohydrates (Table 3). Group 2 (restricted feeding) had the lowest body weight and the lowest fat content but the highest content of protein and water.

The females were significantly (P = 0.0108) fatter than the males. The females in group 1 had a fat content of 16.7 % and the males a fat content of 14.3 %. For group 2 the same figures were: 12.5 % and 8.8 %. This also resulted in a significant (P = 0.0106) difference in water content, with an average water content of 65.1 % in males and 62.5 % in females. No sex differences were found in contents of ash, protein and residues.

THORBEK and CHWALIBOG (1981) found approximately the same distribution of the chemical composition of 113 day old Danish White rabbits weighing 2503 g as compared to Castor Rex rabbits (Table 3), which in 6 months reached the average weight of 3431 and 3056 g for the 2 feeding groups, respectively.

The investigation thus showed that the fat content decreased and the protein content increased by restricted feeding of Castor Rex fur rabbits. This means that the meat has a nutritionally better composition, but also that feed can be saved when producing fur rabbits. From the start of the experiment and until the end, the rabbits fed *ad libitum* consumed an average of 13.1 kg feed, whereas the rabbits fed restrictively only received 9.7 kg. In other words, a saving of 3.4 kg feed for the production of one fur rabbit. Besides the saving on feed, the feed restriction also, as shown in Table 3, results in more lean rabbits and thus facilitates the pelting work (TAYLOR and JOHNSTON, 1984).

Fur quality and pelt size

Table 4 shows the effect of feeding intensity on hair length, hair density, and colour evaluated on live animals as well as quality and length of dried pelts.

There was a significant effect of feeding intensity on the hair length, whereas the other traits were not affected significantly. The hair length was longer in the restricted group. The values of the other traits also tended to be a little higher in this group, apart from fur colour, where the group fed ad libitum had a somewhat darker fur colour. This is desirable, as the buyers of Castor Rex pelts at the Danish Fur Sales

Table 4 : Effect of feeding intensity on hair length, hair density and fur colour evaluated on live animals as well as fur quality and length of dried pelts ($\bar{x}$ ± SD).

	Ad libitum Group	75 % ad libitum group	P
Subjective evaluations :			
Live animals :			
Hair length	2.9 ± 1.1	3.8 ± 1.0	0.0306
Hair density	3.4 ± 0.9	3.6 ± 1.3	0.4205
Colour	1.6 ± 0.7	1.9 ± 0.6	0.2527
Pelts :			
Fur quality	6.7 ± 2.2	7.0 ± 1.4	0.7309
Measures :			
Skin length (cm)	70.5 ± 5.8	67.5 ± 2.8	0.0460
Weight of dried pelts (g)	325.7 ± 51.9	303.0 ± 64.5	0.1133

in Glostrup, Denmark, prefer a dark, warm chestnut colour.

No sex differences were found in hair length, hair density, and colour of live animals or fur quality and size of the pelts. The proportion of prime areas on dorsal skin, measured on the leather side of the pelts, was on average 85 % ± 14 % (SD).

In fur production, fur quality and size are the economically most important properties of the pelt (= dried skin). In mink production, the size is normally defined as the length of the dried skin (LOHI *et al.*, 1989). Correlation between skin length and skin area is not calculated in this investigation, but as the skins are dried on a standard size stretching board, the length is representative for comparison of size. JØRGENSEN (1991) found a positive correlation ($r = 0.86^{***}$) between the length of dried skins and the area of dressed pelts. She recommends the length of dried skins to be used as a measure of size also in the production of Castor Rex pelts. In this case, feeding intensity affected the size significantly ($P = 0.0460$), and the longest pelts were achieved from the animals fed *ad libitum.*

A significant ($P = 0.0145$) difference in pelt length was found between sexes with the females producing the longer pelts, 70.9 cm against 67.1 cm in the males. This may be because the females were in general fatter than the males, but may also be ascribed to certain conditions in connection with the stretching of the pelts. TAO (1994) found in his investigation that the leather of the females was thinner than that of the males. The leather thickness was not measured in this investigation, but the sex difference found in the weight of dry, undressed pelts indicates that this is the case. In both feeding groups, the females had significantly ($P = 0.0001$) lower pelt weight : in group one 291 ± 35 g against 360 ± 43 g in males, and in group two 252 ± 37 g against 354 ± 42 g. The weight differences cannot be ascribed to a larger hair mass in the males, as no difference was found in hair density.

The reason why the dried female skins are longer than the dried male skins can be that, the same force being used at stretching, the female skins with the thinner leather will stretch more than the male skins.

It is interesting that no quality differences were found between male and female skins. It therefore seems possible to produce lighter garments from female skins without reducing the quality of the final product. Further investigations are, however, necessary to confirm this result.

Feed restriction had no negative influence on the quality traits but caused a significant reduction of skin length/skin size of 5 %. This is in agreement with TAYLOR and JOHNSTON (1984) who found that the skin area was reduced by 5 % when the same feeding method was used and animals were about the same age as in this investigation. RAHARJO and SARTIKA (1992) observed, however, that by limiting the feed to 80 % of ad libitum for 6 month old Rex rabbits, the skin area was reduced by 8 %. None of these results were, however, significant.

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REFERENCES

JØRGENSEN, B.C. 1991. Produktion af skind med Castor Rex kaniner. *M.Sc. thesis. Institute of Animal Science and Animal Health, Royal Veterinary and Agricultural University, Copenhagen, Denmark.*

LOHI O., JOHANNESSEN K.R., BØRSTING E., EINARSSON E.J., JOUTSENLAHTI U., LAGERKVIST G., JONSSON M., 1989. Analyses of pelt prices as an aid in breeding programmes. *NJF report No 54, 1-25.*

PETERSEN A., RASMUSSEN P.V. 1991. Examination of fur quality and priming of the rabbit Castor Rex in relation to age and feeding intensity. *Report N° 690 from The National Institute of Animal Science, P.O.Box 39, DK-8830 Tjele, Denmark. 32 pp.*

RAHARJO Y.C., SARTIKA J. 1992. Effects of environmental temperatures and restricted feeding on the performance, carcass percentage and fur quality of the rex rabbits. In: *Proc. of the World Rabbit Science Association's fifth congress. Oregon State University, Corvallis, Oregon, USA. Vol. 6, 1590-1598.*

TAO Y.R. 1994. Studies on the quality of rex rabbit fur. *World Rabbit Science, Vol. 2, 21-24.*

TAYLOR T.W., JOHNSTON N.P. 1984. The effect of feed restriction on pelt size and degree of prime in rex rabbits. *J. Applied Rabbit Research, Vol. 7, 62-67.*

THORBEK G., CHWALIBOG A. 1981. Growth, digestibility, nitrogen and energy metabolism in growing rabbits fed different feed compounds. *Report No. 510 from The National Institute of Animal Science, P.O.Box 39, DK-8830 Tjele, Denmark.*