

EFFECTS OF PROTEIN LEVEL FROM FORAGES ON THE RABBIT CARCASS QUALITY

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Abstract

The experiment was conducted on three groups (a control group and two experimental groups, A and B) of domestic rabbits, 11 weeks old, raised in household system. The rabbits were fed for 20 days with feed enriched in vegetable protein by addition of soya bean. Diets of experimental groups presented an energetic / protein ratio of 2,593 kcal / 15.2 g in group A and 2,586 l/17.0 in group B. The diet of control group presented an energetic/protein ratio of 2,548 kcal/12.3 g. After depletion of the experimental feeding period, the animals were slaughtered. To characterize the quality of carcass, there were determined as follows: dressing percentage, dissected fat and meat / bone ratio. Dressing percentage of the control group amounted to a value of 55.5% while in the experimental group dressing percentage amounted to 60.4% and, 62.0%, respectively, showing a stimulatory effect of protein supplementation on muscle growth. Dissectible fat values amounted to 3.71% in the control while in the experimental groups dissectible fat showed lower values: 3.31% and, respectively, 3.00%. This decrease is due to the increasing proportion of muscle and not by lowering the amount of fat. Meat / bone ratio in the control group amounted to 5.54, while in the experimental groups it had values amounting to 6.08 and 5.96, respectively. The experimental groups showed an increase in the ratio of meat / bone compared with controls. This was based on the increase in mass of skeletal muscle tissue, since bone weight remained relatively constant.

Key words: protein enriched forage, carcass quality, rabbit.

INTRODUCTION

Diet structure and composition specifically influences the quality of carcass but the exact effects are not exactly known. There were described influences according to animal species, the levels of protein, fat or starch. The composition of the critical amino acid of the protein in the diet can also affect the composition of the meat, the rate of growth and, consequently, the yield to slaughter. According to the literature data, the changes in growth rates are, however, generally more than 10% compared to control groups. Meat / bone ratio and fat dissectible fat of a carcass are not significantly altered (Ouhayoun, 1998). Accordingly, the present work aimed to find the effects of different levels of protein (soy bean) enriched forage on the main carcass features in rabbits.

MATERIALS AND METHODS

The experiment was conducted on three groups of domestic rabbits (a control group and two experimental groups, noted as A and B (5

rabbits for each group). All the three groups were 11 weeks old, and were raised in household system. The rabbits were fed for 20 days with feed rich in vegetable protein by addition of soya bean in the standard diets. Diets of experimental groups presented an energy / protein ratio of 2,593 kcal / 15.2 g in group A and 2,586 l/17.0 in group B. The diet of control group presented an energy/protein ratio of 2,548 kcal/12.3 g. After depletion of the experimental feeding period, the animals were slaughtered. To characterize the effect of the protein enriched forages on the quality of carcass, they were determined as follows: dressing percentage, dissected fat and meat / bone ratio.

The dressing percentage was calculated as a ratio between the weight of the rabbits before slaughter and hot carcass weight x 100. Rabbit carcass was obtained after skinning, removing of gastrointestinal tract, uro-genital tract, tail and limbs. In countries with traditionally high consumption of rabbit meat, usually they remain at the carcass the head, lungs, trachea, esophagus, heart, liver and kidney (Pla and Dalle Zotte, 1996). There are differences in the

countries, traditionally in main, regarding the keeping of the head to the carcass. Keeping the head explains the relatively high dressing percentage values reported in this paper.

Dissected fat was determined by dissection, collecting and weighing the fat deposits in areas of shoulder and kidney (between 7th thoracic vertebrae and 5th lumbar). If is performed the dissection of other fat depots (abdominal wall and the inguinal region), this must be specified.

Bone / meat ratio is a parameter for assessing the quality of the carcass in small animals such as rabbits. According to Varewikcy and Bouquet (1982), meat / bone ratio determined on hind is a good indicator of the prediction of this parameter in the entire skeleton. In the case of the dissection of the right hind limb, the prediction is $R^2 = 0.69$ (Hernandez *et al.*,

2007). The meat from the hind leg dissected tissues includes muscle and adipose tissue, being representative for extrapolation to the whole skeleton.

The results were statistically analyzed by ANOVA test. The differences between analyzed groups were considered significant from statistic point of view when $P < 0.05$.

RESULTS AND DISCUSSIONS

Dressing percentage of the control group amounted to a value of 55.5%, and the experimental groups the values were 60.4% and 62.0%, respectively, with a statistic significant difference ($P=0.0386$), revealing the stimulator effect of feed proteins upon the muscle growth (Table 1).

Table 1. Effect of vegetable protein (soya bean) enriched forage on the dressing percentage in rabbits

No.	Item		Carcasses from control (15% veg. Protein)	Carcasses from group A (15% suppl.)	Carcasses from group B (17% suppl.)	P value
1	Living weight before slaughter (in grams)	Minimal value	1,944	2,134	2,292	
		Maximal value	2,075	2,176	2,320	
		($\bar{X} \pm S_x$)	1,961.9 $\pm$ 54.1	2,150.0 $\pm$ 87.0	2,290.1 $\pm$ 90.7	0.0459
2	Carcass weight (in grams)	Minimal value	1,049	1,270	1,380	
		Maximal value	1,163	1,317	1,446	
		($\bar{X} \pm s_x$)	1,088.8 $\pm$ 21.9	1298.6 $\pm$ 16.5	1,419.8 $\pm$ 29.0	0.0153
3	Dressing percentage		55.5 $\pm$ 4.4	60.4 $\pm$ 9.6	62.0 $\pm$ 10.5	0.0386

Significant effects on dressing percentage have the feeding type: restricted or *ad libitum*. According to Ouhayoun *et al.* (1996), carcasses of fed restricted rabbits have a lower fat content, a meat / bone ratio smaller and lower dressing percentage.

Dissectible fat values were 3.71% in the control group, 3.31% in group A and 3.00% in group B (Table 2). The analysis of kidney fat percentage evolution based on the percentage of protein in the diet show increased total amount of carcass fat but this increase is not proportional to the carcass increase. Statistical analysis revealed a

significant difference ($P = 0.0477$). Thus, the perirenal fat values fell in this sequence: control group ^ group A ^ group B.

This evolution is driven not by decreasing fat deposits, but by increasing the proportion of other tissues in the meat structure, likely skeletal muscle tissue. It can be concluded that the extra protein in the feed was converted to some extent in fat, but the most was converted in muscle protein, improving this feature of the carcass.

Table 2. Effect of protein enriched forages on the scapular and perirenal dissectible fat of the carcass in rabbit
(% from the carcass weight)

No.	Item		Control (12% protein)	Group A (15% suppl.)	Group B (17% suppl.)	P value
1	Individual value obtained by dissections (g of fat)	Minimal value	39.0	41.9	41.9	
		Maximal value	42.5	44.3	44.0	
2		$\bar{X} \pm s_x$	40.4 $\pm$ 1.8	43.1 $\pm$ 1.0	42.6 $\pm$ 2.2	P = 0,0329
3	Mean of the carcass weight (grams)		1,088.8	1,298.6	1,419.8	
4	% dissectible fat		3.71 $\pm$ 0.55	3.31 $\pm$ 1.01	3.00 $\pm$ 0.43	P = 0.0477

The amount of fat in the rabbit kidney is affected depending on a number of factors, such as forage composition, but sex, age and maintenance system also, with reference to significant variations based on the mentioned factors (Cavani *et al.*, 2004).

According to Lebas (1991), if the digestible protein / digestible energy (DP / DE) ratio is greater than the optimal value of 10.5-11 g, then muscle protein synthesis achieves the maximum possible, and the excess is used as an energy source. In this case, the composition of weight gain may remain constant and fat deposits may suffer a slight reduction

((Xiccato, 1999, Maertens *et al.*, 1988). If the DP / DE is very high (over 14 g MJ⁻¹), daily gain and feed conversion are damaged, kidney fat is reduced and mortality may increase (Kjaer and Jensen, 1997, cited by Maertens *et al.*, 1998).

Meat / bone ratio in the control group amounted to 5.54, while in the experimental groups it had values amounting to 6.08 and 5.96, respectively (Table 3). The experimental groups showed an increase in the meat / bone ratio compared with controls. This was based on the increase in mass of muscle tissue, since bone weight remained relatively constant.

Table 3. Effect of vegetal protein (soya bean) enriched forage on the meat / bone ratio in rabbits
(calculated based on meat to bone ration of the hind leg, immediately after slaughtering)

Calculated based on meat to bone ratio of the hind leg immediately after slaughtering							
No.	Item			Control (12% protein)	Group A (15% suppl.)	Group B (17% suppl.)	P value
1	Bones (grams)	Individual values obtained by deboning and weighting	Minimal value	26.8	26.9	26.3	P = 0.0499
			Maximal value	30.5	35.4	35.5	
			X_± s_x	28.1±1.1	30.0±1.6	30.9±2.0	
2	Meat (grams)	Individual values obtained by deboning and weighting	Minimal value	145	170	176	P = 0.0181
			Maximal value	161	191	192	
			X_± s_x	155.6±5.4	181.1±24.1	184.1±4.4	
3	Meat/bone ratio (X_± s_x)			5.54±0.43	6.08±0.69	5.96±0.53	P=0.00858

According to the data from the literature, it is to be mentioned the work of Bovera *et al.* (2008, cited by Pla *et al.*, 2009), authors who fed a lot of rabbits restricted by 20 % in the period

between 35 and 60 days of age compared with a control fed *ad libitum*. The authors found differences in meat / bone ratio : 5.15 in rabbits fed *ad libitum* to fed-restricted rabbits: 4.71.

No significant differences were found regarding the water content of the meat and the water retention capacity of the meat.

Also, Trocino *et al.* (2004) investigated the effect of feeding with the vegetable protein containing various levels of protein on the growth, carcass and meat quality and the excretion of nitrogen in 120 rabbits. Despite the wide limits of variation of the proteins tested, there were not observed significant influence on growth performance and meat / bone ratio. However, a decrease in muscle growth was observed in the group fed the diet contains lower levels of protein.

CONCLUSIONS

Dietary supplementation with protein of rabbit diets improve the carcass quality by increasing muscular mass and decrease body fat and bone weight, which can be exploited when it is desired to obtain larger mass of carcass meat.

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