

## **EFFECT OF A FEED RESTRICTION AND GENDER ON THE PERFORMANCE AND CHARACTERISTICS OF THE RABBIT CARCASS IN THE FATTENING PERIOD**

**Ribeiro J., Andrade E., Monteiro D., Pinheiro V.**

Veterinary and Animal Research Centre (CECAV), University of Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801, Vila Real, Portugal.

Corresponding author: [jessica\\_paie@hotmail.com](mailto:jessica_paie@hotmail.com)

### **ABSTRACT**

The aim of the present study is to evaluate the effect of gender and a moderate feed restriction on carcass characteristics and development of the viscera in rabbits of both genders, during the fattening period. The study was conducted in the rabbit sector of the University of Trás-os-Montes e Alto Douro, Vila Real, Portugal. In the experiment 24 rabbits (12 male and 12 female) of the New Zealand X Californian breed were used, which were controlled between 62 and 86 days of age. The rabbits were individually housed and randomly distributed between the two treatments, one with feeding at will (*ad libitum* group) and the other feeding with 20% restriction (restricted group). During the trial, commercial pelletized feed was provided to the animals. At the end of the experiment, ten animals of each treatment were slaughtered to evaluate the development of the digestive tract and carcass characteristics. The feed restriction significantly increased ( $P<0.05$ ) the percentage weight of the liver (+ 14 %) and the dry matter content of the caecum (+17%) and decreased the proportion of total fat in the carcass (reduction from 29%, from 1.87 to 1.33 g/kg LW). The gender of the animal also significantly influenced some parameters ( $P<0.05$ ). In males, there was an increase in the slaughter weight (+ 167g) and the muscle weight of the hind leg (+13.2 g; + 7%) and a decrease of the fore part of the carcass (22.7 vs. 24.6%) and the colon length (-12 cm). According to the results obtained, we can point out that under the conditions in which the test was performed, the dietary restriction increases the liver weight and decreases the content of fat in the carcass.

Keywords: rabbits, carcass, feed restriction.

### **INTRODUCTION**

The use of heavier carcasses can be advantageous when you want to use resulting meat for manufacturing processed products such as sausages or hamburgers. The feed restriction at the end of fattening period may lead to carcasses with fewer fat deposits and improve feed efficiency. The feed restriction during post weaning period is also applied to reduce digestive disorders, occurrence of epizootic rabbit enteropathy (ERE) and to improve feed efficiency (Gidenne et al., 2012) without impairing slaughter results and carcass traits (Birolo et al., 2019). There was small effects of gender on carcass chemical composition (Szendro et al., 1998), but other characteristics may show differences (Hussein and El-Fattah, 2020). Limited feed intake has a positive effect on feed efficiency (Gidenne et al. 2012) and reduces carcass fat. Therefore, the present work aimed to analyse the effects of a rabbit gender and feed restriction on the characteristics of the carcass at the end of fattening period.

## MATERIALS AND METHODS

### Animals and experimental design

This essay was performed at the UTAD rabbit production unit in Vila Real, Portugal. During the work, the animals were housed in galvanized wire cages with dimensions of 40 cm deep, 25 cm wide and 30 cm of high, with individual drinkers and feeders. The cages were installed in a closed pavilion, with temperature control (18 to 23°C) and photoperiod (7h00 to 19h00), complying with the welfare legislation applied to these animals (Port. n° 1005- 1092). 24 animals with 62 days of age were used, being 12 females and 12 males, from the white NZ x Californian breed, which were randomly distributed between the two treatments (feed *ad libitum* group and group restricted to 80% of the feed consumed by the ingestion of the control group in the previous week). During the work a balanced commercial feed was used according to the (De Blas and Mateos, 2010), without medical substances. The animals underwent a 4 days period of adaptation to the environment and diet and the experiment lasted about three weeks. The animals were weighed before the experiment started and weekly during the whole period. Feed intake was also recorded weekly. During the adaptation period, the animals were given water and commercial pelletized feed at will.

### Measurements

At 86 days of age, 10 fasting rabbits of each treatment were slaughtered between 11:30 and 12:30h, by sudden cervical dislocation. The carcasses were prepared removing the skin, feet, legs, genital organs, bladder and digestive tract, as recommended by Blasco et al., 1993. The carcass, liver, kidneys, heart, lungs and complete gastrointestinal tract were weighed, and their weights were expressed as a percentage of the chilled carcass weight. The length of digestive organs was also measured. The carcass was refrigerated for 24 hours and the leg meat colour and pH of *biceps femuris* muscle were assessed. After the measurements, carcass was divided in the different parts, according to what was proposed by Blasco et al. (1993). From each slaughtered animal, the left leg was dissected and its different tissues (muscle, bones, tendons and fat) were separated and individual weighed.

### Statistical Analysis

Statistical analysis was performed with JMP program, version 14 (SAS Institute, Cary, NC, USA). Data were one-way analysis of variance (ANOVA) with the feeding, gender and gender x feeding as the factors tested, using the General Linear Model procedure. Statistical significance was accepted at  $P < 0.05$ .

## RESULTS AND DISCUSSION

The results show that the slaughter live weight at 86 days are similar to those reported by Szedro et al. (2016). The application of the feed restriction significantly increased ( $P < 0.05$ ) the liver weight (+ 14%) and decreased the proportion of total fat in the carcass (reduction of 29%, from 1.87 to 1.33 g/kg PV) (Table 1) The feed restriction did not affect the proportion of carcass parts, as observed by Chodóva et al. (2019). The dressing out percentage and the proportion of the different tissues in the hind leg, also observed by Birolo et al. (2017). These authors did not observe the effect of feed restriction on dissectable fat weight, which is not in accordance with our work, what can it be justified by the level of restriction and age of slaughter. The gender of the animal significantly influenced some parameters ( $P < 0.05$ ). In males, the slaughter weight (+ 167g; 6.7%) and the muscle weight in the hind leg (+13.2 g; 7%) is higher and the weight of the fore-part of the carcass (from 22.7 vs. 24.6%) is lower. Hussein and El-Fattah (2020) observed differences in the proportion of the viscera, but feed management and slaughter weights are different. The differences in live weight between genders, was also higher than that of the rabbits in this work.

**Table 1:** Effect of feed restriction and gender on carcass characteristics.

	Feeding (F)		Gender (G)		SEM	P value		
	Ad libitum	Restrained	Female	Male		F	G	F * G
Slaughter LW (g)	2632	2553	2509	2676	35.7	ns	0.016	ns
Hot carcass (g)	1526	1473	1453	1546	24.5	ns	0.059	ns
Chilled carcass - CC (g)	1426	1377	1358	1445	22.94	ns	0.062	ns
Dressing out percentage	51.7	51.0	51.3	51.4	0.39	ns	ns	ns
Hind Leg (pH and colour)								
pH	6.52	6.52	6.62	6.42	0.056	ns	0.060	ns
L	45.2	47.0	47.5	44.7	1.20	ns	ns	ns
a	3.15	5.01	4.59	3.57	0.676	ns	ns	ns
b	8.68	8.98	8.9	8.76	0.338	ns	ns	ns
<i>Weight (% in CC)</i>								
Head	9.69	10.43	10.62	9.49	0.243	0.084	0.012	ns
Liver	4.92	5.64	5.56	5.00	0.156	0.012	0.040	ns
Kidneys	1.16	1.22	1.24	1.14	0.029	ns	0.062	ns
Thymus and heart	2.03	2.07	2.07	2.02	0.086	ns	ns	ns
Total fat	1.87	1.33	1.65	1.55	0.134	0.038	ns	ns
Hind Legs	38.4	38.7	38.8	38.3	0.25	ns	ns	ns
Fore-part	23.6	23.7	22.7	24.6	0.44	ns	0.029	ns
Loin	23.3	22.5	22.9	22.9	0.25	ns	ns	ns
<i>Hind Leg</i>								
Muscle (g)	188.9	183.9	179.8	193.0	3.18	ns	0.035	ns
Bone (g)	2.96	2.63	2.99	2.61	0.418	ns	ns	ns
Fat (g)	29.9	29.4	29.2	29.9	0.245	ns	ns	ns
Cartilage (g)	8.55	9.02	8.91	8.66	0.690	ns	ns	ns
Muscle/bone	6.31	6.26	6.15	6.42	0.084	ns	0.09	ns

ns = not significant

**Table 2:** Effect of feed restriction and gender on digestive development.

	Feeding (F)		Gender (G)		SEM	P value		
	Ad libitum	Restrained	Female	Male		F	G	F * G
<i>Full Gastrointestinal Tract Weight (% LW)</i>								
Stomach	4.27	4.32	4.38	4.21	0.238	ns	ns	ns
Small intestine	3.19	3.54	3.29	3.45	0.098	0.087	ns	ns
Caecum	6.41	7.12	6.65	6.88	0.284	ns	ns	ns
Colon	2.74	2.61	2.59	2.76	0.114	ns	ns	ns
<i>Length (cm)</i>								
Small intestine	335.5	341.7	341.6	335.6	5.43	ns	ns	ns
Caeco	53.3	52.3	53.5	52.1	1.11	ns	ns	ns
Colon	128.9	123.3	132.1	120.1	2.10	0.09	0.016	ns
Total digestive tract	517.7	517.3	527.2	507.8	6.10	ns	ns	ns
<i>Caecum</i>								
pH	6.08	6.15	6.05	6.18	0.067	ns	ns	ns
Fresh Content (g)	125.4	136.7	132.1	130.0	6.30	ns	ns	ns
Dry Content (g)	25.6	32.7	28.4	29.9	1.85	0.062	ns	ns
DM (%)	20.3	23.9	21.3	22.9	0.664	0.003	ns	ns

ns = not significant

The results of feed restriction and gender on digestive tract characteristics are shown in Table 2. The feed restriction significantly affected ( $P < 0.05$ ) the dry matter content of the cecum (+17%; in the restricted group). As noted by Birolo et al. (2017), the feed restriction did not affect the weight of digestive viscera. According to the results of Table 2, the gender of the rabbits influence ( $P < 0.05$ ) the length of the colon, that is higher in females (+ 12 cm).

## CONCLUSION

The feed restriction had a positive influence on the reduction of the dissectable fat content of the carcass but did not influence other parameters. Regarding gender, we observed that females had a lower live weight, but the weight of the hind leg muscle was higher which could improve the yield for transformation. It would be interesting to extend the duration of the trial to confirm the results obtained.

## ACKNOWLEDGEMENTS

For the authors integrated into the research unit CECAV, the research was financed by the National Funds from FCT, the Portuguese Foundation for Science and Technology, project number UID/CVT/0772/2016.

## REFERENCES

- Birolò, M., Trocino, A., Tazzoli M., Xiccato, G. 2017. Effect of feed restriction and feeding plans on performance, slaughter traits and body composition of growing rabbits. *World Rabbit Sci.*, 25: 113-122.
- Chodova, D.; Tumova, E., Volek, Z. 2019. The effect of limited feed intake on carcass yield and meat quality in early weaned rabbits. *Italian Journal of Animal Science*, 18, 381–388
- De Blas, C., Mateos, G.G., 2010. Feed formulation. In: De Blas J.C., Wiseman, J. (Eds.), *The Nutrition of the rabbit*, 2nd edition. Oxfordshire, UK: CAB International, S222–S232
- Gidenne, T., Combes, S., Fortun-Lamothe, L. 2012. Feed intake limitation strategies for the growing rabbit: effect on feeding behaviour, welfare, performance, digestive physiology and health: a review. *Animal*, 6: 1407-1419.
- Szendrő, Zs., Kenessey, Á., Jensen, J. F., Jensen, N. E., Csapó, J., Romvári, R., Milisits, G., 1998. Effect of genotype, age, body weight and sex on the body composition of growing rabbits. *World Rabbit Science*, 6: 3-4.
- Hussein, A. And El-Fattah, A. 2020. Effect of sex and feed frequency on growing california rabbits, carcass characteristics and meat quality. *Egypt. Poultry Sci.* , 40: 405-419
- SAS Institute Inc., 2018. JMP® 14. Cary, NC: SAS Institute Inc
- Szendrő, Zs., Matics, Zs., Szabó, R., Kustos, K., Mikó, A., Odermatt M., Gerencsér Zs., 2016. Aggressivity and its effect on lifespan of group-housed rabbit does. Preliminary results. *Proceedings 11th World Rabbit Congress - June 15-18, 2016 - Qingdao - China*, 719-722.