ZOOTECNIA BRASIL
Centro de Convenções da PUC-GO | Goiânia-GO
27 a 30 de agosto de 2018

55ª REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA

ZOOTEC 28º CONGRESSO BRASILEIRO DE ZOOTECNIA

VI ARC 6th AMERICAN RABBIT CONGRESS

CONSTRUINDO SABERES, FORMANDO PESSOAS E TRANSFORMANDO A PRODUÇÃO ANIMAL

DIFFERENT LEVELS OF SOLUBLE FIBER IN THE PERFORMANCE OF GROWING RABBITS

Ferreira, W. M. [1*]; Inácio, D. F. S[1]; Ferreira, F. N. A. [1]; Mota, K. C. N. [1]; Costa Junior, M. B. [1]; Silva Neta, C. S. [1]; Rocha, L. F. [1]; Ferreira, M. [1]

*corresponding author: waltermf@ufmg.br
[1]Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brasil

Abstract: O objetivo deste trabalho foi avaliar o desempenho produtivo de coelhos em crescimento alimentados com diferentes níveis de fibra solúvel (75; 95; 115; 135; 155 g/kg). 140 coelhos jovens foram utilizados em um delineamento totalmente casualizado, com cinco tratamentos, 28 animais cada. O ganho médio diário (GMD), consumo médio de ração (CMD) e conversão alimentar (CA) foram avaliados. Efeitos linear e quadrático da inclusão de fibra solúvel foram estudados. Os níveis de fibra solúvel utilizados resultaram em uma redução linear do peso vivo aos 51 dias (1513 a 1303g, $p < 0.001$) e o efeito foi mantido aos 72 dias de idade (2205 a 1963g, $p < 0.001$). No primeiro período foi observado que ao se elevar os níveis de fibra solúvel, houve redução linear para CMD (39.4 a 29.4 g/d, $p < 0.001$) e aumento linear para CA (2.39 a 3.73 g/g, $p = 0.001$). Para o período total, houve uma redução linear CMD (36.2 a 30.4 g/d, $p < 0.001$) e aumento linear para CA (2.83 a 3.61 g/g, $p = 0.017$). Com isso, observa-se que ao elevar a fibra solúvel ocorre uma redução do ganho de peso diário e piora a conversão alimentar.

Keywords: fiber levels, daily gain, feed conversion, live weight

Introduction

The rabbit is a non-ruminant herbivorous animal, which has an adaptation of its digestive physiology to a high intake of dietary fibers, which are fermented in the large intestine, besides being adapted to a concentrated diet. Rabbits possess in their biological characteristics rapidity of the cycle of production, prolificacy, power of transformation and great quality of the meat, which makes them extremely important for the improvement of the diet of the population. The fiber can be fractionated in total dietary fiber which is the major fraction of commercial diets for rabbits (35-50% as-fed). Insoluble fiber is said to be recognized as the most important fiber fraction and used to express fiber requirements (Gidenne et al., 2010). In contrast, soluble fiber comprises non-starch and NonNDF polysaccharides (Hall, 2003) and is a minor and heterogeneous fraction of the total dietary fiber. This work aims to assess characteristics of the production performance of growing rabbits fed with different levels of soluble fiber (75, 95, 115, 135, 155 g/kg).

Material and methods

The study was carried out in the rabbit sector of the Experimental Farm Professor Hélio Barbosa of the Federal University of Minas Gerais (UFMG) situated in the city of Igarapé, state of Minas Gerais, Brazil. The animals were kept in a semi-enclosed shed with natural ventilation and photoperiod during the months of October and November 2017. A total of 140 New Zealand White rabbits of both sexes weaned at 30 d and with a 684.9 ± 138.5 g initial weight were housed in pairs in an individual cage (60 x 60 x 40 cm). The rabbits were randomly divided into five groups of 28 animals each and assigned to five dietary treatments, based on five experimental diets, containing different levels of soluble fiber (75, 95, 115, 135, 155 g/kg). The treatments diets were formulated accordingly to maintain the needs of growing rabbits according with the recommendations of De Blas and Matheus (2010). The

rabbits had *ad libitum* access to feed and water throughout the experimental period. The average daily feed intake, average daily gain and feed conversion ratio among the treatments was controlled weekly until the animals reach the slaughter weight or complete 72 days. The parameters evaluated in the experiment were subjected to analysis of variance and regression through the Software R (R Core Team 2017), and for the relevant media compared the Tuckey test at a level of 5% probability.

Results and discussion

The table 1 It shows the effects of increasing levels of soluble fiber on live weight, average daily feed intake, average daily gain, and feed conversion ratio. The different levels of soluble fiber used resulted in a linear reduction to live weight at 51 days (1513 to 1303g, $p < 0.001$) and the effect was maintained until 72 days (2205 to 1963g, $p < 0.001$). In the first period evaluated (30 to 51 days) it was observed that different levels of soluble fiber reduced linearly the average daily gain (39.4 to 29.4 g/D, $p < 0.001$) and for feed conversion ratio was observed a linear increase (2.39 to 3.73 g/g, $p = 0.001$). In the second period evaluated (51 to 72 days) no significant difference was observed for the same variables evaluated ($P < 0.05$). Evaluating the total trial period (30 to 72 days), a linear reduction was observed for the average daily gain (36.2 to 30.4 g/D, $p < 0.001$) and a linear increase for food conversion (2.83 to 3.61 g/g, $p = 0.017$), however, no difference was observed significant for daily average consumption which resulted in an average consumption of 102.7 g/d ($P < 0.05$).

Table 1.
Live weight, average daily feed intake (ADFI, g/d), average daily gain (ADG, g/d) and feed conversion rate of growing rabbits fed diets containing different levels of soluble fiber

	Dietary treatments†					SEM*	Contrasts	
	75SF	95SF	115SF	135SF	155SF		Linear	Quadratic
Live weight								
30 d [g]	684.3	684.8	685.0	685.3	685.0	15.82	0.988	0.992
51 d [g]	1474	1513	1478	1315	1303	29.94	<0.001	0.101
72 d [g]	2145	2205	2168	1987	1963	33.49	<0.001	0.091
First period (30 to 51 d)								
ADG [g/d]	37.6	39.4	37.8	30.0	29.4	0.93	<0.001	0.118
ADFI [g/d]	89.6	95.2	95.0	94.2	97.3	2.47	0.417	0.788
FCR [g/g]	2.39	2.43	2.52	3.50	3.73	0.17	0.001	0.337
Second period (51 to 72 d)								
ADG [g/d]	31.9	33.0	32.9	32.0	31.4	0.52	0.577	0.363
ADFI [g/d]	115.9	114.0	110.2	114.8	113.9	3.40	0.900	0.721
FCR [g/g]	3.63	3.46	3.37	3.59	3.84	0.12	0.519	0.253
Whole period (30 to 72 d)								
ADG [g/d]	34.8	36.2	35.3	31.0	30.4	0.59	<0.001	0.101
ADFI [g/d]	102.7	104.6	99.6	103.0	103.6	2.62	0.994	0.786
FCR [g/g]	2.95	2.89	2.83	3.35	3.61	0.11	0.017	0.156

†SF: soluble fiber, %SW: Proportioned to slaughter weight; *SEM: Standard error mean.

The effects of diets with high levels of soluble fiber (> 12%), has not yet been much investigated, accordingly to the literature is possible that it corresponds to an increase in the caecal content (PEETERS et al., 1995; GOMEZ-CONDE et al., 2009; MARTINEZ-VALLESPIN et al., 2013). In this present study, was possible to observe when measuring performance characteristics, how animals respond to diets with soluble fiber levels above and below the recommended (12%), it is possible to observe that the animals presented results of ADG (34 g/d) and ADFI (99.6 to 105

g/d) when assessing the total period (30 to 72d). These values are lower than the observed by Trocino et al. (2011), when using diets with high and low levels of inclusion of soluble fiber and starch, with average 45 g/d for ADG and a ADFI of 149 g/d, it was demonstrated that increasing the soluble fiber level combined with starch, rabbits linearly increased the live weight, and despite higher values there was a linear reduction of the ADFI when the levels of fiber soluble in the diet (144 to 133 g/d) increased, corroborating with the observed in this study.

Trocino et al. (2010), observed that by raising the level of diet-soluble fiber to 9%, rabbits expressed their growth potential with a ADG of 50 g/d, but similar to this work as it elevates the level of soluble fiber, the average daily feed intake of animals decreases linearly , allowing a significant improvement of the food conversion as is observed in this work for the levels of 7.5 to 11.5% of soluble fiber.

It is possible to find data in the literature that shows that the consumption of feed reduces when the animals consume diets with high fiber digestible of the beet pulp and low levels of insoluble fiber of alfalfa hay (Carabaño et al. 1997), moreover Falcão-e-Cunha et al., (2004), noted that reduction in the growth rate and live weight of animals occurs in diets with high concentration of beet pulp (< 30%). This fact was also observed by Garcia et al., (1993), using a diet that the inclusion of beet pulp exceeded 35%, causing substitution of starch fractions by highly digestible fiber which caused increased consumption of the diets, however it caused a reduction in growth. In addition, for young animals up to 38 days of age, diets with high levels of beet pulp have adversely affected the consumption of feed and growth (Gidenne et al. 2004).

Conclusion

Therefore, it is possible to conclude that increasing the level of soluble fiber in the diet, growing rabbits adequately respond to the diets with better daily average gain

and feed conversion ratio. Yet high levels of soluble fiber can impair another biological characteristic that can negatively influence rabbit's development.

Acknowledgments (Optional)

This work was supported by the National Counsel of Technological and Scientific Development (CNPq; grant numbers 443305/2014-5 and 140335/2015-3) and the Foundation for Research Support of Minas Gerais (FAPEMIG; grant number CVZ-PPM-00247-16). Special thanks to Coordination for the Improvement of Higher Education Personnel (CAPES) for the support in the development of this research.

References

DE BLAS, J. C., MATEOS, G. G. Feed formulation. In: De Blas, C., Wiseman, J. (Eds.), The Nutrition of the Rabbit. 2nd ed. CABI Publishing, CAB International, Wallingford Oxon, UK, p. 222–232, 2010.

CARABAÑO, R., MOTTA-FERREIRA, W., De BLAS, J. C., FRAGA, J. Substitution of sugarbeet pulp for alfafa hay in diets for growing rabbits. Anim. Feed. Sci. Tech. v.65, n. 1-4, p. 249-256, 1997.

FALCÃO-E-CUNHA L., PERES H., FREIRE J. P. B., CASTRO-SOLLA L. Effects of alfalfa, wheat bran or beet pulp, with or without sunflower oil, on caecal fermentation and on digestibility in the rabbit. Anim. Feed Sci. Tech., v. 117, p. 131-149, 2004.

GARCIA, G., GALVEZ, J. F., De BLAS, J. C. Effect of substitution of sugarbeet pulp for barley in diets for finishing rabbits on growth performance and on energy and nitrogen efficiency, *Journal of Animal Science*, Volume 71, Issue 7, 1 July 1993, Pages 1823–1830.

GIDENNE, T., GARCIA, J., LEBAS, F., LICOIS, D. Nutrition and feeding strategy: Interactions with pathology. In: De Blas, C., Wiseman, J. (Eds.), The Nutrition of the Rabbit. 2nd ed. CABI Publishing, CAB International, Wallingford Oxon, UK, p. 179–207, 2010.

GIDENNE, T., MIRABITO, L., JEHL, N., PEREZ, J.M., ARVEUX, P., BOURDILLON, A., BRIENS, C., DUPERRAY, J., CORRENT, E. Impact of replacing starch by

digestible fibre, at two levels of lignocellulose on digestion, growth and digestive health of the rabbit. Anim. Sci., v. 78, p. 389-398, 2004.

GÓMEZ-CONDE, M. S., DE ROZAS, A. P., BADIOLA, I, PÉREZ-ALBA, L, DE BLAS, C, CARABAÑO, R, et al. Effect of neutral detergent soluble fibre on digestion, intestinal microbiota and performance in twenty five day old weaned rabbits. Livest. Sci. V. 8, p.125-192, 2009.

HALL, M. B. Challenges with nonfiber carbohydrate methods. J. Anim. Sci. V.1.p.3226–3232, 2003.

MARTÍNEZ-VALLESPIN, B., MARTÍNEZ-PAREDES, E., RÓDENAS, L., MOYA, V. J., CERVERA, C., PASCUAL, J. J., BLAS, E. Partial replacement of starch with acid detergent fiber and/or neutral detergent soluble fiber at two protein levels: effects on ileal apparent digestibility and caecal enviroment of growing rabbits. Livest. Sci. V. 154, p. 123-130, 2013.

PEETERS J. E., MAERTENS L., ORSENIGO R., COLIN M. Influence of dietary beet pulp on caecal VFA, experimental colibacillosis and iota-enterotoxaemia in rabbits. Anim. Feed Sci. Tech., v. 51, p. 123-139, 1995.

R Core Team. 2017. R: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna. Austria, 2017.

TROCINO, A., FRAGKIADAKIS, M., MAJOLINI, D., CARABANO, R., XICCATO, G. Effect of the increase of dietary starch and soluble fiber on digestive efficiency and growth performance of meat rabbits. Anim. Feed Sci. Tech.v.165, p.265–277, 2011.

TROCINO, A., FRAGKIADAKIS, M., RADAELLI, G. XICCATO, G. Effect of dietary soluble fibre level and protein source on growth, digestion, caecal activity and health of fattening rabbits. World Rabbit Science, [S.l.], v. 18, n. 4, p. 199-210, dec. 2010. ISSN 1989-8886.