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The Effect of Dietary Crude Fibre Content on Eimeria Oocyst Excretion and the Production of Fattening Rabbits

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ABSTRACT

The aim was to investigate the effect of dietary crude fibre (CF) content on Eimeria excretion and production in fattening rabbits. Weaned rabbits were divided into two groups: The control group (C) was fed a commercial pelleted diet (CF = 17%); the high-fibre group (HF) was fed a diet with a higher fibre content (CF = 24%). In Experiment 1, the production of 90 rabbits per group was compared and mortality data and faecal samples from 800 rabbits per group were analysed. In Experiment 2, the production of 90 growing rabbits and the faecal samples and mortality of 1050 animals per group were studied. Although feed consumption did not differ between groups, the HF group had lower weight gain than the C group ($P < 0.001$). The body weight of the HF group was lower at the end of fattening ($P < 0.001$). The HF group had a very unfavourable feed conversion ratio (4.07). Mortality was not different between the groups. In both groups, Eimeria oocysts were detected in faecal samples from 44-45 days of age until the end of fattening. A higher proportion of moderately pathogenic Eimeria species was detected in the C group compared to the HF group, and highly pathogenic oocysts were observed only in the C group.

Keywords: Oryctolagus cuniculus, fibrous diet, growth performance, oocysts, Eimeria

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1. INTRODUCTION

Rabbit farmers face many challenges these days. Rising feed prices are putting farms in an increasingly difficult economic position. In addition, gastro-intestinal diseases in rabbits and the resulting mortality further aggravate the situation. The price of rabbit feed can be reduced somewhat by using by-products from the milling industry. Due to their high fibre content, they can have a beneficial effect on the digestive system of rabbits. While the impact of high dietary fibre on rabbit production has been studied, to our knowledge, no literature exists on the effect of high dietary fibre on Eimeria species, which parasitise the digestive tract of rabbits and cause coccidiosis.

2. LITERATURE REVIEW

Nowadays, several social, economic and geopolitical problems have significantly reduced the demand for rabbit meat and the profitability of rabbit meat production. The situation has been exacerbated by a trend towards increased demand from other livestock sectors for by-products that were previously used primarily as rabbit feed. As with most livestock species, the highest cost item in rabbit production is rabbit feed, which represents almost 45 % of the total cost of rabbit production in Spain, 55-60 % in France and 73-78 % in Hungary (Cartuche et al., 2014; Coutelet, 2015; Juráskó, 2017). Feeding of suckling rabbits accounts for about one third (31.3 %) of the total feed costs (Cartuche et al., 2014), while the remaining high proportion of feed costs occurs mainly in the last two thirds of the fattening period, due to deteriorating feed utilisation of the animals and frequent animal health problems.

In addition to the problems affecting the rabbit industry, overcoming intestinal problems in rabbits is a daily challenge, and reducing these problems is essential for economic production. In rabbit production, gastrointestinal diseases are most common in the post-weaning period (Carabaño et al., 2008; Gidenne, 2015). Post-weaning diarrhoea can affect the entire flock and, without proper treatment, mortality can reach 30-80 %. The rabbit is an herbivore, and its digestive physiology is well adapted to the high intake of plant cell walls. The rabbit's fibre requirement is particularly high in the post-weaning period (Lebas et al., 1998). Increasing the fibre content of the diet while reducing the starch content may help to prevent digestive problems (Gidenne et al., 2004; Martínez Vallespin et al., 2011). However, some studies contradict these findings (Gutierrez et al., 2002).

According to Gidenne (2015), a minimum of 55 g lignin, 130 g cellulose and 120 g hemicellulose per kg feed is recommended for rabbits in the 2-3 weeks after weaning. The lignin/cellulose (> 0.40) and digestible fibre/acid detergent fibre (DgF/ADF; ≤ 1.3) ratios are also important.

In rabbit farms, epizootic rabbit enteric disease (ERE) causes the greatest losses worldwide, including Hungary. According to several researchers, there is an obvious synergy between ERE and coccidiosis (Licois & Coudert, 2001). Although the digestive system of poultry is different from that of rabbits, several studies have shown that a diet rich in fibre can reduce the risk of digestive disorders in broilers. Sadeghi et al. (2020) reported that supplementing the basal diet with rice hulls (40 g/kg) and soybean hulls (40 g/kg) could reduce the adverse effects of coccidiosis on duodenal villus height. Similarly, Shang et al. (2020) found that dietary supplementation with wheat bran (30 g/kg) increased villus height and the ratio of villus height to crypt depth.

Based on the above, the aim of this study was to investigate whether an extra high crude fibre diet (24 % crude fibre compared to 17 % crude fibre) affects Eimeria oocyst shedding, production performance and mortality in young rabbits. The study focused on the number of Eimeria oocysts

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detected in faecal samples, as the relationship between oocyst numbers and dietary fibre content has not been previously studied.

3. MATERIALS AND METHODS

Rabbits were treated according to the principles of the European Directive 2010/63/EU and the Hungarian legislation (32/1999. /III. 31./ and 178/2009. /XII. 29./). The study was approved by the Institutional Animal Welfare Committee of the Hungarian University of Agricultural and Life Sciences, Kaposvár Campus, Hungary (MATE KC-MÁB/2024/9/2).

3.1 Animals, housing

Two experiments were conducted in two rabbit farms of Tetrabbit Ltd. in Hungary (Experiment 1: Vaskút; Experiment 2: Dabas) with Hycole weaned rabbits (*Figure 1*), originating from the same breeding farm of Tetrabbit integration in Fülöpháza (Vaskút is 118 km and Dabas is 46 km from the breeding farm Fülöpháza).
At both sites, the ambient temperature was 18-22 °C and the light schedule was 8L:16D. In Experiment 1 (Vaskút), individual body weights of 90 rabbits per group were measured and weight gain was assessed, and mortality data and faecal samples of 1600 rabbits (800 individuals per group) kept under the same conditions (in the same building and housing technology) were analysed. In the first study, the automatic feed dispenser system used at the farm did not allow accurate measurement of feed intake and evaluation of feed consumption and feed conversion. In Experiment 2, production data of 90 animals per group (individual body weight and weight gain, feed consumption per cage and feed conversion) and mortality and faecal samples of 1050 animals per group (kept under the same conditions) were analysed.
Experiment 1 was conducted between 37 and 72 days of age and Experiment 2 between 38 and 66 days of age.

Figure 1: Hycole growing rabbits

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The rabbits were kept in wire mesh cages in both farms (*Figure 2*). Meneghin Pratica Rimonta cages were used at the Dabas farm and Pratica single tier cages at the Vaskút farm. During the growing period, 5-5 individuals were housed in each cage (cage size: 0.38 m x 0.87 m x 0.32 m; stocking density: 15 rabbits/m2). Within the buildings, the rabbits of each group were placed in equal proportions in each part of the building and in each row of cages.

Figure 2: Housing system

3.2 Feed and water

Weaned rabbits were divided into 2 groups based on the rabbit feed used in the study: rabbits in the control (C) group were fed a commercially available pelleted complete diet, whereas rabbits in the experimental group were fed a special high-fibre (also lower in energy and crude protein) commercial diet (high-fibre group; HF).
The composition and nutrient content of the diets are shown in *Table 1.*

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Table 1: Ingredients and chemical composition of the diets

Items	Diet	
	Control	High Fibre
Ingredients, %		
Alfalfa, CP 16-18 %	33.0	36.0
Soy hulls, CF 32-36 %	1.00	12.0
Wheat bran	30.0	20.0
Sugar beet pulp, SUG < 10 %	3.00	2.00
Barley	5.00	6.10
Sunflower meal, CF 16-20 %	15.0	10.0
Oat	5.00	3.00
Molasses	3.00	2.00
Sunflower hulls	2.00	5.00
Arbocel	0.500	2.00
Sunflower oil	1.00	1.00
Calcium Carbonate	0.900	0.200
Salt	0.200	0.200
Rabbit Premix 0.3 %	0.300	0.300
L-Lysine HCL	0.050	0.100
DL-Methionine	0.020	0.020
Nutrient content		
DE rabbit, MJ	9.00	8.40
Crude protein, %	16.0	14.3
Crude fat, %	2.90	2.70
Crude fibre, %	17.5	24.0
NDF, %	38.0	43.6
ADF, %	22.0	28.3
ADL, %	5.70	6.40
Cellulose, %	17.2	22.3
Hemicellulose, %	15.3	15.1
Digestible fibre/ADF	1.03	0.80

The diets contained antibiotics and coccidiostats (Robenidine 66 ppm and Valnemulin 30 ppm).

Rabbits on both farms were allowed to drink ad libitum from nipple drinkers. The quality of the drinking water was tested for pH, total microbial count and enterobacteria using ATP (Ensure Touch) and DIP slide (Liofilchem Contact sile II). The parameters tested met the quality criteria for large livestock farms (*Table 2*).

Table 2: Water quality parameters at the two farms

Groups	pH	Total plate count, cfu/ml	Enterobacteria, cfu/ml	ATP
Experiment 1	7.4	10^1-10^2	0	28
Experiment 2	6.8	10^1	0	11

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3.3 Production data

In both studies, the individual body weights of the rabbits were measured weekly (n = 90 rabbits/group), from which the average daily weight gain was calculated. In the second study, the amount of feed consumed per cage was also recorded (n = 18 cages/group), from which the feed conversion ratio was calculated. Mortality was recorded daily in both studies.

3.4 Parasitological investigations: faecal sampling and analysis

In all cases, pooled samples were collected from the droppings channel under the rabbit cages. Sampling was performed after daily manure removal. A minimum of 2-5 g of samples per row of cages was collected from the first, middle and last third of the row and pooled, i.e. the samples were not individual samples from each animal, but a pooled sample consisting of the same age group of rabbits in the barn (n = 3 samples per group per week). Flotation tests were carried out at the S&K-Lap Ltd. laboratory within 48 hours of collection. The solution used for surface enrichment was a mixture of 400 g magnesium sulphate (MgSO4) and 1 litre of distilled water. Faecal samples were processed according to the McMaster method as recommended by the Royal Veterinary College and the FAO (RVC/FAO Guide to Veterinary Diagnostic Parasitology, n.d.). During the tests, the number of Eimeria oocysts was counted and expressed as OPG (oocysts per gram) based on Demeter et al. (2023).
Later, the samples from Experiment 2 were separated for further sporulation procedures to identify the Eimeria species. The same magnesium sulphate solution was used for sporulation of oocysts and the filtered liquid was stored in a plastic cup at room temperature (20-24 °C). After 4 days, the first 20 oocysts (maximum) were randomly identified from the positive samples tested. Eimeria species were identified using a size and morphological identification key (Eckert et al., 1995; Taylor et al., 2016) with a Nikon Optiphot-2 microscope and special software (Aenscope) that digitally displays the microscope image and allows digital measurement of width and length with a valid ruler. Magnifications of 100x and 200x were used during the tests.

3.5 Statistical analysis

The normal distribution of the data was checked using the Shapiro-Wilk method. The production traits studied showed a normal distribution. Production traits (body weight, weight gain, feed consumption and feed conversion ratio) were compared by independent samples t-test using R software (R Core Team, 2021). The chi-squared test was used to evaluate mortality (alpha value: 0.05).

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4. RESULTS

In this chapter, the results of the two performed tests are discussed separately.

4.1 Experiment 1

4.1.1 Body weight and weight gain

Body weight of rabbits randomly divided into the two dietary groups did not differ at weaning *(Table 3)*.

Table 3: Body weight and weight gain of rabbits depending on the diet in Experiment 1

Age, day	Diet		P-value
	Control	High Fibre	
Body Weight, g			
37	1108	1125	0.556
44	1308	1219	0.038
51	1592	1424	< 0.001
58	1691	1463	< 0.001
65	2112	1782	< 0.001
72	2383	2009	< 0.001
Weight gain, g/day			
37-44	28.7	13.1	0.027
44-51	40.4	29.2	0.124
51-58	14.1	5.52	0.199
58-65	60.2	45.6	0.109
65-72	38.8	32.4	0.443
37-72	36.4	25.3	< 0.001

During the first week of fattening, the weight gain of the rabbits on the high fibre diet was drastically lower than that of the rabbits on the control diet (-54.4 %; $P < 0.05$; *Table 3*), resulting in the body weight of the high-fibre group being lower than that of the control group at 44 days of age (-6.8 %; $P < 0.05$; Table 3). Although there was no difference in the weight gain of the two groups during the later weeks of fattening, the difference in body weight between the two diets remained significant throughout the growing period and even increased (-10.6 %, -13.5 % and -15.6 % at 51, 58 and 65 days of age, respectively; $P < 0.001$). At the end of the finishing period, the rabbits in the high-fibre group were 15.7 % smaller than those in the control group ($P < 0.001$). At 51-58 days of age, there was a significant decrease in weight gain in both groups, regardless of diet. Daily weight gain calculated for the entire fattening period (37-72 days of age) was 30.5 % lower in the high-fibre group than in the control group ($P < 0.001$; *Table 3*).

4.1.2 Mortality

Based on the data collected from the larger number of animals (800 rabbits/group), there was no difference in group mortality calculated over the entire fattening period (5.50 % vs. 5.75 % in the control and high-fibre groups, respectively; $P = 0.828$). The dead rabbits showed symptoms of ERE (Epizootic Rabbit Enteropathy).

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In several cases, the mortality of both groups exceeded the daily mortality rate of 0.2 % considered critical in industrial practice (control group: 14 times; high-fibre group: 10 times; Figure 3). Mortality curves peaked between 53 and 60 days of age in both the control and high-fibre groups. In the High-fibre group, extremely high mortality was observed at 58 days of age, but no mortality was observed after 60 days of age, while in the control group, mortality was also observed in the last 2 weeks of fattening.

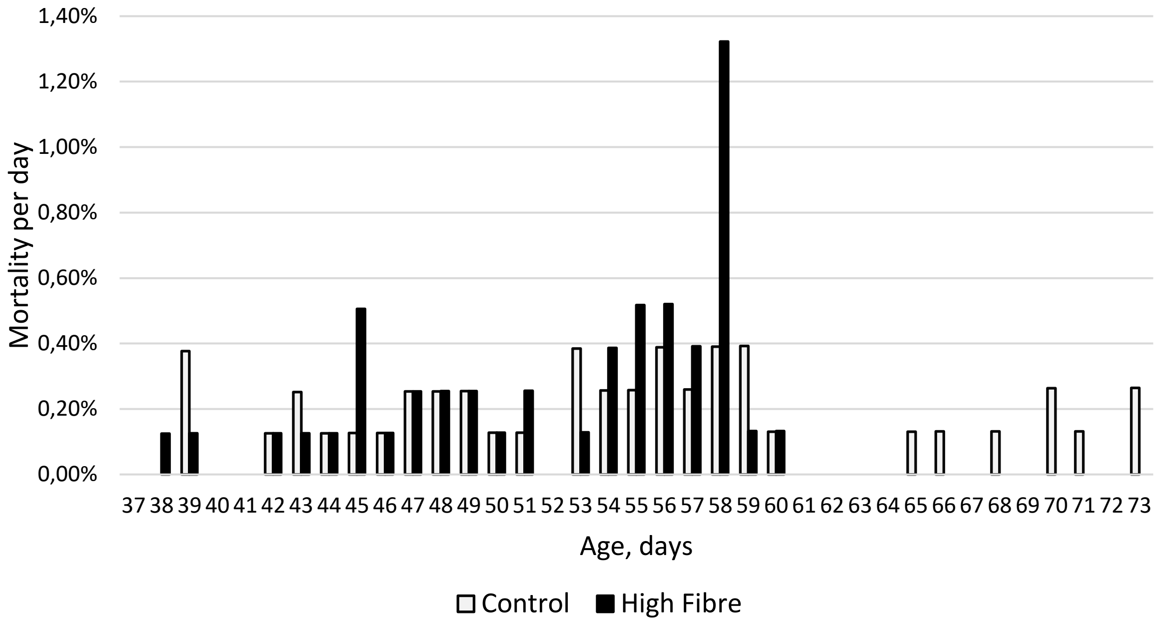

Figure 3: Daily mortality of the Control and High-fibre groups during the fattening period in Experiment 1

4.1.3 Parasitology

The parasitological results of the weekly samples show that the occurrence of oocysts was independent of the diet, but the number of oocysts per gram of faecal sample indicated partly different trends (*Figure 4*). At 56 and 64 days of age, the number of oocysts per gram of faecal sample appeared to be lower in the high-fibre group than in the control group.

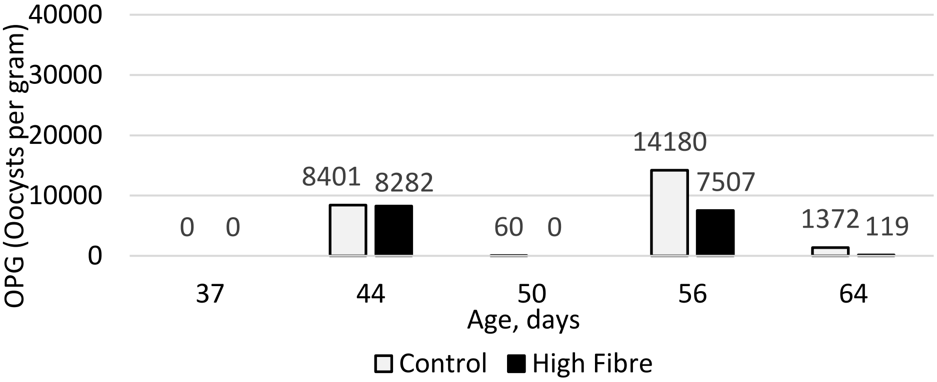

Figure 4: OPG (oocysts per gram) values in faecal samples of groups at different ages in Experiment 1

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4.2 Experiment 2

4.2.1 Body weight and weight gain

At the beginning of fattening, the groups did not differ in body weight (*Table 4*). At 38-45, 52-59 and 59-66 days of age, the high-fibre group had 21.6 %, 44.7 % and 17.3 % lower body weights than the control group (*Table 4*). A significant difference was found between the weight gains of the groups when calculated for the entire fattening period (38-66 days of age; -22.1 %; P < 0.001). As a result of the above data, the body weight of the high-fibre group was lower than that of the control group throughout the fattening period and the difference increased with age (at 45 day: -4.43 %, P < 0.01; at 52 day: -5.24 %, P < 0.05; at 59 day: -11.05 %, P < 0.001; at 66 day: -11.95 %, P < 0.001).

Table 4: Body weight and weight gain of the rabbits depending on the diet in Experiment 2

Age, day	Diet		P-value
	Control	High Fibre	
Body Weight, g			
38	1156	1166	0.314
45	1513	1446	0.009
52	1735	1644	0.014
59	2073	1844	< 0.001
66	2377	2093	< 0.001
Weight gain, g/day			
38-45	51.0	40.0	0.002
45-52	31.5	27.2	0.293
52-59	49.2	27.2	< 0.001
59-66	43.4	35.9	0.002
38-66	43.6	34.0	< 0.001

4.2.2 Feed consumption and feed conversion ratio

The feed consumption of the groups differed significantly only in the first week of fattening, the high-fibre group consumed less feed (days 38-45: -9.75 %; P < 0.05; *Table 5*).

Although there were no differences in feed consumption between the groups during the later weeks of life and throughout the entire fattening period, due to the differences in weight gain, the feed conversion ratio of the high-fibre group was significantly worse than the feed conversion ratio of the control group (days 38-45: +16.4 %, P < 0.05; 52-59 days: +82.2 %, P < 0.001; 59-66 days: +20.0 %, P < 0.05; *Table 5*). During the fattening period, the feed conversion ratio of the high-fibre group was 28.8 % lower than that of the control group (P < 0.001).

4.2.3 Mortality

Over the entire fattening period, the difference in mortality between the two large groups studied (1050 rabbits/group) was not statistically significant (control group: 13.1 %, high-fibre group: 10.6 %; P = 0.068).

Mortality in both groups frequently exceeded the 0.2 % daily mortality rate considered critical in large-scale farming (23 times in the control group, 24 times in the high-fibre group*; Figure 5*), and the groups showed slightly different trends. The daily mortality rate of rabbits on the control diet was more than 0.4 % between 48 and 62 days of age.

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In the high-fibre group, mortality exceeded this level in a shorter period, between 44 and 54 days of age and at 63 days of age.

Table 5: Feed consumption and feed conversion ratio of the rabbits depending on the diet in Experiment 2

Age, day	Diet		P-value
	Control	High Fibre	
Feed intake, g/day			
38-45	96.4	87.0	0.012
45-52	108	114	0.379
52-59	147	144	0.588
59-66	196	187	0.291
38-66	137	133	0.285
Feed conversion ratio			
38-45	1.95	2.27	0.025
45-52	2.91	4.67	0.058
52-59	3.20	5.83	< 0.001
59-66	4.50	5.40	0.024
38-66	3.16	4.07	< 0.001

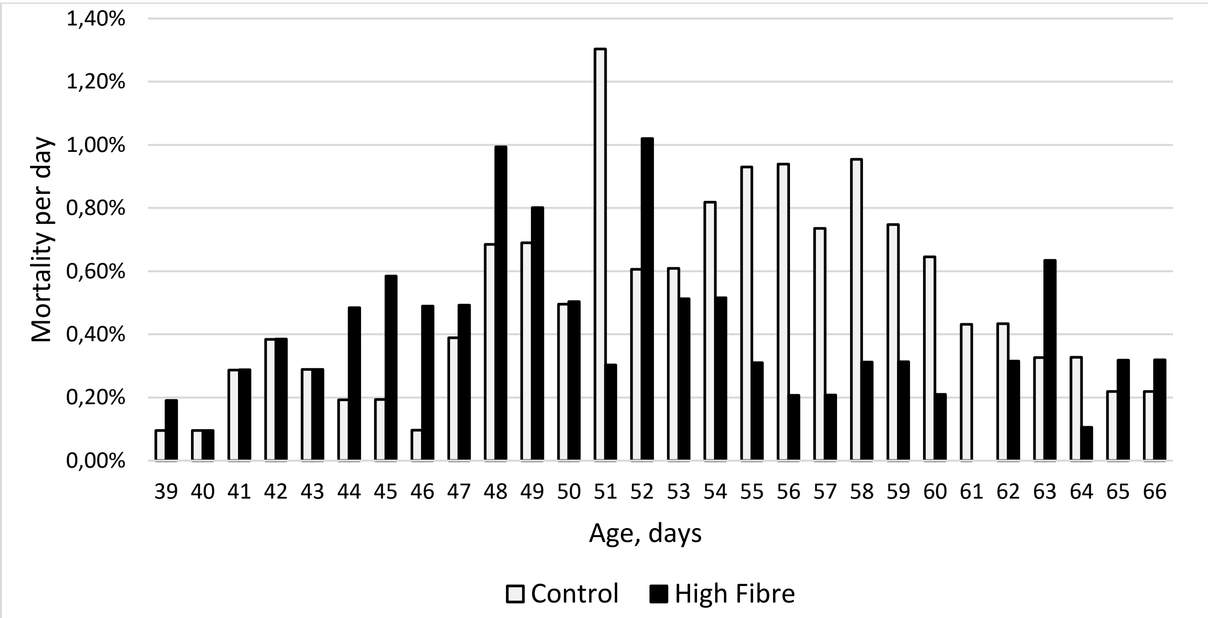

Figure 5: Daily mortality of the control and high-fibre groups during the fattening period in Experiment 2

4.2.4 Parasitology

Figure 6 shows the number of Eimeria oocysts detected in faecal samples collected weekly. Both groups gave negative results at 40 days of age, i.e. no oocysts were detected in the faecal samples of the rabbits.

Thereafter, the number of oocysts in the control group increased from 45 days to 59 days of age. In the high-fibre group, there was a sharp increase at 45 and 52 days of age, but later the number of oocysts detected in the samples decreased rapidly.

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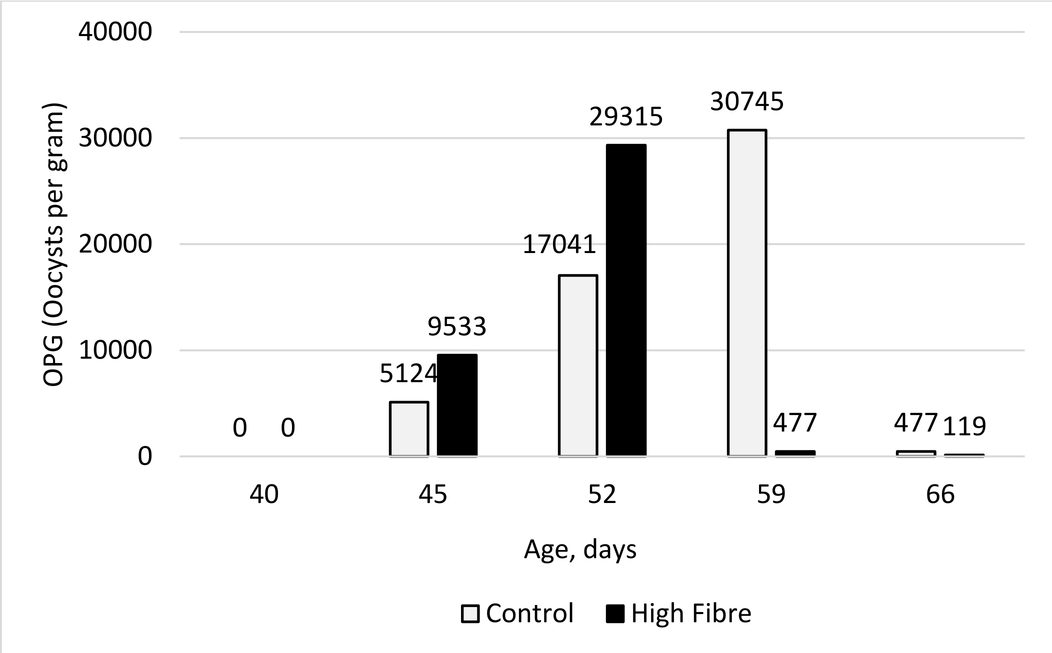

Figure 6: OPG (oocysts per gram) values in faecal samples of dietary groups at different ages in Experiment 2

The identification of Eimeria species found in the faecal samples collected in the second study at the ages of 52 and 59 days is shown in *Table 7*.

Table 7: Distribution of Eimeria species from faecal samples collected at 52 and 59 days of age (%)

Eimeria species	Localization in the digestive system	Pathogenicity	Control		High Fibre	
			52 days of age	59 days of age	52 days of age	59 days of age
E. media	small intestine	slightly pathogenic	15	0	53	0
E. perforans	small intestine	slightly pathogenic	0	0	13	50
E. coecicola	caecum	slightly pathogenic	31	32	13	50
E. magna	jejunum, ileum	moderately pathogenic	38	47	20	0
E. irresidua	small intestine	moderately pathogenic	8	11	0	0
E. piriformis	colon	moderately pathogenic	0	0	0	0
E. flavescens	caecum	highly pathogenic	8	11	0	0
E. intestinalis	ileum	highly pathogenic	0	0	0	0
E. stiedai	bile	variable pathogenic	0	0	0	0

Six Eimeria species were identified from the faecal samples (*E. media*, *E perforans*, *E. coecicola*, *E. magna*, *E. irresidua*, *E flavescens*), *E. piriformis*, *E. intestinalis* and *E. stiedai* oocysts were not detected.

The distribution of Eimeria species according to pathogenicity in the groups shows an interesting picture. In the control group, on the day 52, 46-46 % of the oocysts belonged to the slightly and moderately pathogenic classification, and the highly pathogenic *E. flavescens* appeared in 8 %. At the age of 59 days, some changes were observed in case of control group, as the proportion of slightly pathogenic Eimeria oocysts decreased to 11 %, and the proportion of moderately pathogenic and very pathogenic oocysts increased to 58 % and 11 %, respectively.

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On the other hand, no highly pathogenic Eimeria species were detected in the high-fibre group. At 52 days, 80 % of the oocysts were classified as low pathogenic and 20 % as moderate pathogenic, and all oocysts identified at 59 days were from low pathogenic Eimeria species.

5. DISCUSSION

According to the scientific literature, rabbits consume more from a diet with higher crude fibre, NDF and ADF content (Wu et al., 2019). In our study, the rabbits' feed consumption did not differ when different diets were compared.

The different nutrient content of the diets affected the growth of the rabbits. In the first study, in the week after weaning, and in the second study, in three of the four weeks of the study, the weight gain of the rabbits consuming the high-fibre diet was lower than that of the control group, certainly as a consequence of the lower energy and crude protein content of the diet. Throughout the fattening period, the higher fibre and lower protein and energy content caused a drastic deterioration in weight gain. Hoover and Heitmann (1972) and Wu et al. (2019) also reported the negative effect of higher fibre content on weight gain, similar to our results.

In both experiments, the lower weight gain was also reflected in the weight of the finishing rabbits, as the body weight of the rabbits in the high-fibre group was lower one week after weaning and their deficiency continued to increase until the end of the finishing period. From a practical point of view, a not insignificant difference of about 0.3 kg was observed between the groups up to 65-66 days of age.

In industrial rabbit farming, diarrhoeal symptoms often appear in fattening rabbits in the weeks after weaning (Savietto & Gelain, 2017). Although diarrhoea was not evaluated in this study, an interesting trend can be observed in the weight gain of the rabbits in both experiments. Regardless of the diet, a significant decrease in weight gain was observed between 51-58 days of age in the first study and 45-52 days of age in the second experiment.

Despite almost identical feed consumption, the lower growth rate resulted in very unfavourable feed conversion ratios for the high-fibre group. These results are consistent with literature data (Wu et al., 2019), as feed utilisation was less favourable when rabbits were fed diets with higher fibre content.

In the second study, slightly higher mortality rates were observed in both groups than in the first study, but in both cases the differences between the groups could not be statistically proven. We observed peaks in mortality in both groups at almost the same time as the aforementioned deterioration in weight gain. Our results do not agree with those of Maître et al. (1990), who found a linear decrease in mortality from 14 % to 7 % for diets with ADF contents ranging from 15 % to 21 %. Gidenne et al. (2020) also concluded, based on data from 12 studies, that post-weaning mortality in rabbits decreased with increasing ADF concentration.

Irrespective of the diet, it was observed in both studies that Eimeria oocysts were not detectable in the samples in the days after weaning. Oocysts appeared in faecal samples from 44-45 days of age in both diet groups and their presence could be detected until the end of the finishing period. In Experiment 2, oocyst infection was higher in the high-fibre group on days 45 and 52, but OPG levels in the control group continued to rise until 59 days of age. In addition, six Eimeria species were identified in the samples taken at 52 and 59 days of age and there were differences in pathogenicity between the groups.

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In the control group, the proportion of low and medium pathogenic Eimeria species was high at 52 days of age, and one week later the proportion of low pathogenic species decreased and that of medium pathogenic species increased. Unfortunately, oocysts of the highly pathogenic E. flavescens were also present in the faecal samples of the control group at both time points.
A more favourable picture was obtained in the rabbits fed the high-fibre diet, with a higher proportion of low pathogenic species and a lower proportion of medium pathogenic species identified at 52 days of age, whereas only low pathogenic species were detected in the samples at 59 days of age. Regarding the oocyst infection at each life stage and the species detected, our results only partially agree with the results of our previous parasitological survey on large-scale rabbit farms (Demeter et al., 2002).
There was no similar trend in mortality, i.e. a correlation between the pathogenicity of the Eimeria species and the mortality of the groups could not be demonstrated.

6. CONCLUSION

Consistent with literature data, feeding diets with higher crude fibre content and lower energy and crude protein content resulted in lower production levels.
The diets did not affect mortality but caused a slightly different trend in the number and type of oocysts. A higher proportion of moderately pathogenic Eimeria species and highly pathogenic E. flavescens oocysts were detected in the control group. In the high fibre diet, the presence of low pathogenic species was typical and high pathogenic species were not detected.
The correlation between diet composition and the presence of Eimeria species with different pathogenicity should be investigated in further studies.

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A takarmány rosttartalmának hatása a hízónyulak parazitológiai terheltségére és termelésére

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ÖSSZEFOGLALÁS

A kísérlet célja a takarmány nyersrost (CF) tartalmának a hízónyulak Eimeria oociszta fertőzöttségére és termelésére gyakorolt hatásának vizsgálata volt. A választott nyulakat két csoportra osztottuk: a Kontrol csoport (C) kereskedelmi forgalomban kapható, granulált takarmányt kapott (CF = 17 %); a Magas Rost csoport (HF) megemelt rosttartalmú takarmányt ehetett (CF = 24 %). Az 1. vizsgálatban 90 nyúl termelési eredményeit és 800 nyúl elhullását és bélsármintáit vizsgáltuk csoportonként. A 2. vizsgálatban csoportonként 90 nyúl termelését és 1050 nyúl elhullását és bélsár mintáit értékeltük. Habár a csoportok takarmányfogyasztása nem különbözött, a HF nyulak súlygyarapodása elmaradt a Kontrol csoporttól (P < 0,001) és a hízlalás végi testsúlyuk is kisebb volt (P < 0,001). A HF nyulaknál nagyon kedvezőtlen takarmányértékesítést tapasztaltunk (4,07). A csoportok elhullása nem különbözött. Mindkét csoport bélsármintáiban megfigyelhetők voltak Eimeria oociszták 44-45 napos kortól egészen a hízlalás végéig. A C csoportban nagyobb arányban mutattunk ki mérsékelten patogén Eimeria fajokat, mint a Kontrol csoportban, továbbá erősen patogén faj oocisztái csak a Kontrol csoport bélsármintáiban fordultak elő.

Kulcsszavak: Oryctolagus cuniculus, rostkiegészítés, hizlalás, oociszta, Eimeria

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