

THE EFFECT OF DIETS SUPPLEMENTED WITH PHYTOADDITIVES ON SELECTED GROWTH PERFORMANCE TRAITS IN FATTENED RABBITS

Klára Poláková, Vlastimil Šimek, Radka Dobšíková

*Department of Animal Breeding, Animal Nutrition and Biochemistry,
Faculty of Veterinary Hygiene and Ecology, University of Veterinary Sciences
Brno, Palackého třída 1946/1, 612 00 Brno, Czech Republic*

Corresponding email address: polakovak@vfu.cz

ABSTRACT

This study assessed the effect of complete diets supplemented with selected phytogetic additives on chosen growth performance traits in fattened rabbits. A total of forty-eight 42-day old weaned HYLA rabbits were randomly assigned to four dietary groups. housed in loose group pens. The feeding trial lasted until 97 days of age. Four complete diets without coccidiostats were formulated: a control diet (C) without additives, and three experimental diets supplemented with 2.0% *Artemisia abrotanum* (E1), a combination of 1.5% *Arthrospira platensis* and 0.5% Sencha green tea (E2), and a combination of 1.5% *Chlorella vulgaris* and 0.5% Matcha green tea (E3). Live weights and feed intake were recorded throughout the experimental period, thereafter feed conversion ratio (FCR) and average daily gain (ADG) were calculated. No statistically significant differences in the monitored growth performance traits were found. The results indicate that the inclusion of *Artemisia abrotanum*, microalgae, and green tea combinations at the tested levels does not negatively affect growth performance, feed palatability, or feed efficiency in growing rabbits. These findings can be used for further updating and optimizing of rabbit diets enriched with bioactive compounds with regard to metabolism and health evaluation of the rabbits.

Keywords: *Oryctolagus cuniculus*; *Artemisia abrotanum*; microalgae; green tea; feed conversion ratio

INTRODUCTION

In recent years, rabbit production has experienced a notable transformation. Beyond traditional meat production, rabbits are increasingly kept as companion animals, making breeders focus more on long-term health and longevity of their animals. Nutrition plays a key role in maintaining overall vitality, supporting



a healthy gut microbiome, and preventing gastrointestinal disorders. As a result, functional feed additives are becoming popular because they effectively support general health and gut function (El-Sabrout et al., 2023; Plachá et al., 2022). Phytogetic feed additives, such as plant extracts, microalgae, and herbal plants, provide a wide range of bioactive substances (polyphenols, essential oils, and polysaccharides) with reported antimicrobial, antioxidant, and immunomodulatory properties (Dalle Zotte et al., 2016; El-Sabrout et al., 2023; Plachá et al., 2022). Among plant additives, *Artemisia* species contain essential oils and flavonoids capable of enhancing nutrient digestion, improving gut health, and preventing coccidial infections (Popović et al., 2017). Microalgae such as *Arthrospira platensis* and *Chlorella vulgaris* are rich sources of high-quality protein, essential fatty acids, and immunomodulatory pigments that enhance gut immunity and support growth performance (Abdelnour et al., 2019; El Basuini et al., 2023; Saleh et al., 2026). Furthermore, green teas (*Camellia sinensis*), particularly Sencha and Matcha, are rich sources of catechins (e.g., epigallocatechin gallate), which act as strong antioxidants and support healthy gut bacteria (Mohamed et al., 2025). Recent research demonstrates that combinations of Spirulina and Matcha tea can effectively protect against hepatic coccidiosis, support growth performance, and restore digestive integrity in rabbits (Saleh et al., 2026). Although these natural additives mainly aim to promote long-term health and longevity, key growth traits, such as feed intake and feed conversion ratio (FCR), remain essential indicators of feed palatability, nutrient absorption, and overall gut function. Therefore, the aim of this study was to evaluate the effects of diets supplemented with chosen phytogetic additives of principal growth performance traits in fattened young broiler rabbits.

MATERIAL AND METHODS

A total of 48 young, weaned HYLA rabbits aged 42 days were selected for the feeding trial. The experiment commenced immediately after weaning and lasted until the rabbits reached 97 days of age. The rabbits were housed in the experimental facility of the Department of Animal Breeding, Animal Nutrition and Biochemistry, Faculty of Veterinary Hygiene and Ecology, University of Veterinary Sciences Brno. At 55 days of age, all rabbits were vaccinated against rabbit haemorrhagic disease and myxomatosis (BioRabbit RHDV 1,2, Bioveta, Czech Republic; MXT, Dyntec, Czech Republic). The rabbits were housed loose in groups of six per pen, resulting in a total of 12 rabbits per monitored dietary group. Both sexes were represented in all experimental groups. To provide environmental enrichment, individual pens were equipped with tunnels and mirrors. Wood shavings were used as bedding, and plastic rabbit litter boxes were placed within each pen. Ambient temperature and relative humidity were recorded continuously throughout the feeding trial. Throughout the experiment, the overall health status of all rabbits was checked daily. The rabbits were weighed at regular, predetermined weekly intervals to monitor growth rates. Feed intake was recorded too with aim to calculate ADG and FCR.

For the purpose of the experimental trial, four original formulations of complete diets were designed and manufactured by Biokron, s. r. o. (Blučina, Czech Republic). The feed mixtures were formulated without coccidiostats. The rabbits were randomly assigned to four dietary groups: **control group (C)**: basal complete compound feed without added phytoadditives; **experimental group 1 (E1)**: basal complete compound feed supplemented with 2.0% dried Southernwood herb (*Artemisia abrotanum*); **experimental group 2 (E2)**: basal complete compound feed supplemented with 1.5% spirulina algae (*Arthrospira platensis*) and 0.5% Sencha green tea (*Camellia sinensis*); **experimental group 3 (E3)**: basal complete compound feed supplemented with 1.5% chlorella algae (*Chlorella vulgaris*) and 0.5% Matcha green tea (*Camellia sinensis*).

Given the normal distribution of the data, a two-way analysis of variance (ANOVA) was subsequently applied to assess the effects of sex, experimental diet type, and their mutual interaction on rabbit growth.

RESULTS AND DISCUSSION

The effects of complete diets supplemented with selected phytogetic additives (*Artemisia abrotanum*, *Arthrospira platensis*, *Chlorella vulgaris*, and *Camellia sinensis*) on growth performance, weekly body weights, daily feed intake, and feed conversion ratio (FCR) of fattened rabbits are summarized in Table 1 and Table 2. Overall, no significant differences ($P > 0.05$) were observed among the dietary groups or between sexes for any of the evaluated growth parameters, and no diet-sex interactions were recorded.

Throughout the 55-day trial period (D42–D97), initial (960.17–975.58 g) and final live weights (2721.6–2786.3 g) showed no statistically significant differences among experimental groups. ADG followed common patterns ($P > 0.05$), with the highest rates recorded during D63–D69 at 44.25–48.83 g/d. These results confirm that supplementation with 2.0% *Artemisia abrotanum* (E1), 1.5% *Arthrospira platensis* + 0.5% Sencha tea (E2), or 1.5% *Chlorella vulgaris* + 0.5% Matcha tea (E3) does not impair growth. These findings are consistent with previous studies evaluating similar natural feed additives in rabbit nutrition. Specifically, Liu et al. (2019) and Ding et al. (2019) found that dietary inclusion of *Artemisia* spp. supported rabbit intestinal health without compromising LW, or ADG. Similarly, Yin et al. (2024) reported that supplementing post-weaning rabbit diets with green tea polyphenols showed no adverse effects on growth performance parameters. Similarly in dwarf rabbit breed, receiving *Artemisia vulgaris* enriched diets did not affected growth dynamics within young kits raising (Kudělková et al., 2022).

Total FCR (D42–D97) remained uniform across experimental groups (4.35–4.50 g/g), displaying typical age-dependent increases toward the end of the fattening period (Table 2). Although the diets were formulated for pet rabbits - characterized by high fiber and lower protein content compared to commercial fattening diets - the rabbits maintained consistent growth and optimal feed

efficiency. Furthermore, plant secondary metabolites (such as essential oils, tannins, and polyphenols in *Artemisia* and green teas) can occasionally reduce feed intake due to bitterness or altered palatability. However, daily feed intake and FCR in this study were unaffected by any additive combination, confirming that inclusion rates up to 2.0 % preserved feed palatability. This is consistent with findings by Yin et al. (2024), who reported that green tea polyphenols do not impair palatability or feed efficiency in growing rabbits. Similarly, incorporating low levels of microalgae maintained feed intake and digestibility without disrupting overall feed conversion (Abu Hafsa et al., 2021). Overall health status remained excellent, with exceptionally low mortality (only one rabbit died in E2; 2.08 %). This is consistent with findings by Liu et al. (2019), who similarly reported that dietary supplementation with *Artemisia* species in post-weaning rabbits significantly reduced the incidence of diarrhea and strengthened gut barrier integrity without requiring synthetic coccidiostats. The bioactive compounds in *Artemisia*, green tea, and microalgae protect the digestive system by maintaining a healthy gut microbiome (Liu et al., 2019; Gadzama et al., 2025).

Tab. 1: Live weight and average daily gain of fattened rabbits depending on dietary group.

Traits	Units	Diet (x ± SEM)				P
		C	E1	E2	E3	
LW D42	g	960,2 ± 24,41	968,4 ± 16,80	975,6 ± 17,45	970,4 ± 20,31	n.s.
LW D49	g	1103,8 ± 26,82	1124,3 ± 30,39	1114,8 ± 22,43	1110,6 ± 25,19	n.s.
ADG D43-D49	g/d	20,5 ± 1,10	22,3 ± 2,41	19,9 ± 1,36	20,0 ± 2,15	n.s.
LW D55	g	1271,4 ± 30,39	1279,5 ± 38,06	1292,7 ± 27,02	1277,7 ± 25,73	n.s.
ADG D50-D55	g/d	24,0 ± 1,13	22,2 ± 1,55	25,4 ± 1,42	23,9 ± 1,16	n.s.
LW D62	g	1488,8 ± 41,52	1475,8 ± 44,18	1507,7 ± 31,67	1509,4 ± 27,83	n.s.
ADG D56-D62	g/d	31,1 ± 2,13	28,0 ± 1,87	30,7 ± 1,43	33,1 ± 1,21	n.s.
LW D69	g	1798,6 ± 52,98	1787,2 ± 56,64	1828,9 ± 34,51	1851,3 ± 28,58	n.s.
ADG D63-D69	g/d	44,2 ± 2,38	44,5 ± 2,08	45,9 ± 1,47	48,8 ± 1,56	n.s.
LW D76	g	2005,7 ± 63,00	1975,7 ± 67,10	2017,8 ± 42,82	2054,9 ± 37,98	n.s.
ADG D70-D76	g/d	29,6 ± 2,23	26,9 ± 2,01	27,0 ± 2,74	29,1 ± 2,46	n.s.
LW D83	g	2244,9 ± 70,38	2234,1 ± 75,97	2274,0 ± 39,07	2327,8 ± 37,05	n.s.
ADG D77-D83	g/d	34,2 ± 2,04	36,9 ± 1,87	32,8 ± 1,99	39,0 ± 1,92	n.s.
LW D90	g	2497,7 ± 79,06	2483,6 ± 78,58	2577,5 ± 54,93	2562,8 ± 39,71	n.s.
ADG D84-D90	g/d	36,1 ± 2,85	35,6 ± 0,84	43,4 ± 3,69	33,6 ± 1,56	n.s.
LW D97	g	2747,8 ± 85,27	2721,6 ± 89,50	2784,9 ± 72,20	2786,3 ± 49,87	n.s.
ADG D91-D97	g/d	35,7 ± 1,54	34,0 ± 1,95	29,6 ± 2,84	31,9 ± 2,92	n.s.

C, control group; E1, experimental group fed basic diet with 2 % supplementation of *Artemisia abrotanum*; E2, experimental group fed basic diet with 1.5% supplementation of *Spirulina platensis* and 0.5 % *Sencha* green tea; E3, experimental group fed basic diet with 1.5 % supplementation of *Chlorella vulgaris* and 0.5 % *Matcha* tea; LW, live weight; ADG, average daily gain; D, day; FCR, feed conversion ratio; n.s., not significant

Tab. 2: Feed conversion ratio (FCR) across different periods and mortality rate of rabbits according to dietary groups.

FCR (g/g)	Diet			
	C	E1	E2	E3
D43-D49	3,51	3,20	3,58	3,56
D50-D55	3.20	3.46	2.97	3.07
D56-D62	3.44	3.81	3.48	3.13
D63-D69	3.27	3.43	3.21	3.16
D70-D76	5.07	5.62	5.64	5.29
D77-D83	4,99	4,77	5,52	4,81
D84-D90	5.19	5.44	4.36	5.79
D91-D97	5.65	5.85	6.70	6.45
D42-D97	4.35	4.50	4.38	4.41
Mortality (indiv.)	0	0	1	0

C, control group; E1, experimental group fed basic diet with 2 % supplementation of *Artemisia abrotanum*; E2, experimental group fed basic diet with 1.5 % supplementation of *Spirulina platensis* and 0.5 % *Sencha green tea*; E3, experimental group fed basic diet with 1.5 % supplementation of *Chlorella vulgaris* and 0.5 % *Matcha tea*; FCR, feed conversion ratio.

CONCLUSION

The dietary inclusion of selected herbs and microalgae in coccidiostat-free diets did not alter growth performance or feed efficiency in young growing rabbits. Consequently, these functional natural ingredients can be safely incorporated into rabbit diets as health-supportive alternatives without compromising growth or feed utilization. Further studies are needed with aim to deepen knowledges and understand mechanisms of action of these bioactive compounds in rabbit diets.

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