THE EFFECT OF NATURAL PHYTOADDITIVE *SILYBUM MARIANUM* ON PERFORMANCE OF BROILER RABBITS*

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The effect of different label and processing methods of milk thistle on growth performance in broiler rabbits (HYLA, n = 255) fed with different concentration of milk thistle (Silybum marianum) was studied. Four experiments were conducted. Rabbits were fed with different concentrations of 1% non-fermented milk thistle (experimental group E1) and 0.5% fermented milk thistle (experimental group E2), and the results were compared with a control group C (standard feed ration without any supplementation). Each experiment started at 42 days of rabbits' age and finished at 85 days of age. Observed parameters were: average daily gain, average daily feed consumption, total feed consumption, slaughter live weight, and carcass weight. The best results were showed in experimental group E2 (supplement of 0.5% fermented milk thistle). Significant differences ($P<0.05$) were recorded in average daily feed consumption, total feed consumption, slaughter live weight, and carcass weight. The results show that 0.5% fermented milk thistle extract supplemented in the feed ration for broiler rabbits has a positive effect on fattening performance.

milk thistle, rabbit, fattening, growth performance

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INTRODUCTION

Milk thistle (*Silybum marianum*) is an annual plant belonging to the Asteraceae family, and the plants are widespread in the arid and semi-dry areas of the Mediterranean regions (Tagliapietra et al., 2014). It is a medicinal herb (Kren, Walterova, 2005; Ibrahim et al., 2007) used also in animals, to increase productive and reproductive performance and improve health status (Schulz et al., 1998), and also in healing some animal diseases. For example, milk thistle enhances the immune function against aflatoxin and improves carcass performance and growth (Chand et al., 2011).

In addition, milk thistle seeds might have a potential as a source of edible oil as the mature seeds contain 25–30% high-quality oil, e.g. 42% linoleic acid and 36% oleic acid (Khan et al., 2009). The milk thistle. extract contains several phytochemicals and contains 65% to 80% silymarin (a complex of at least seven flavonolignans and one flavonoid) and 20% to 35% fatty acids, such as linoleic acid (Kroll et al., 2007).

Rabbits are herbivores which, due to morphological and functional parameters of the digestive tract, are capable of processing fibrous feeds (Makovicky et al., 2014). Rabbit broilers are well known for their high-quality meat rich in highly unsaturated fats and low fat and cholesterol content (Dalle Zotte, 2014).

Rabbit experiments on the health status and production of broiler rabbit fattening have been well documented. At present, however, not enough information is at disposal regarding the preparation of compound

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feed and technological processing with different types of medicinal plants for rabbits for fattening. The aim of this study was to investigate the effect of different milk thistle technology and the influence on growth parameters of broiler rabbits fed different concentrations of supplemented milk thistle (0.5% fermented milk thistle and 1% non-fermented milk thistle). Fermented feed was processed using some basic technologies, e.g. silage methods, in our experiments with Probiostan E10®. Non-fermented feed was dried and used, with an additional benefit for the farmers – it was easy and simple to use for feeding the rabbit.

MATERIAL AND METHODS

Animals

Rabbits of HYLA broilers (n = 255; males and females, aged 42 days) were obtained from the genetic centre HYLA (Ratibořice, Czech Republic). This experiment was conducted in accordance with Good Agricultural Practices (GAP), published by the Food and Agriculture Organization of the United Nations (FAO, 2004) and is not classified as an experiment in accordance with Act No 246/1992 Coll., on the protection of animals against cruelty.

Animal husbandry

Animals were housed in all-metal fattening cages by Velaz Inc. (Prague, Czech Republic) in the automatic air-conditioned hall of demonstration and experimental barns at the Czech University of Life Sciences Prague (CULS), Czech Republic. Feed and water were available *ad libitum*. Health status was monitored throughout the trial and was regularly evaluated.

Experimental design

Four trials were conducted from 2013 until 2015. Rabbits, males and females, were randomly allocated to three groups: experimental group E1 (supplement of 1% non-fermented milk thistle), experimental group E2 (supplement of 0.5% fermented milk thistle) and control group C (standard feed ratio, without any supplementation). In each trial 85 animals were included in each group. Experiments started after 42 days of rabbits' age (after seven days of adaptation) and ended at 85 days of age. During these experiments, the following parameters were recorded: average daily gain, average daily feed consumption, total feed consumption, slaughter live weight, and carcass weight.

Feed mixture

The feed mixtures content is listed in Table 1. The producer, Biocron Inc. (Blučina, Czech Republic), prepared the complete original mixtures for rabbits fattening (KBO) with 10% Probiostan E10® (producer Biokron Inc.), supplemented with milk thistle (supplier Irel Inc., Brno, Czech Republic) and 0.25% Emanox PMX® (supplier Manghebati Inc., Châteaubourg, France) with anticoccidial effect. The seeds of milk thistle were mechanically processed and also fermented and dried at Biocron Inc. Finally, the feed mixtures for broiler rabbits were prepared ready for individual experimental groups with milk thistle (E1 and E2) and without milk thistle (control group, C) supplementation.

Table 1. Composition of the control diet and diets containing non-fermented milk thistle (1%), and fermented milk thistle (0.5%)

Nutrients	Content
Crude protein	16.5%
Crude fat	2.5%
Crude ash	8.0%
Crude fibre	14.5%
Calcium	1.10%
Natrium	0.35%
Phosphorus	0.6%
Vitamin A	11 000 IU kg^{-1}
Vitamin D_3	1200 IU kg^{-1}
$FeSO_4.7\ H_2O$	55 mg kg^{-1}
KI	1.1 mg kg^{-1}
$CuSO_4.5H_2O$	12.1 mg kg^{-1}
MnO	33 mg kg^{-1}
ZnO	33 mg kg^{-1}
Na_2SeO_3	0.05 mg kg^{-1}
Emanox PMX	0.25 g kg^{-1}
Probiostan E10 (probiotic)	2.5 g kg^{-1}

Data analysis

The results were statistically evaluated and graphs were generated using STATISTICA CZ v. 9 (StatSoft, USA). Data was expressed as mean ± SD (standard deviation). One- and two-way analysis of ANOVA and subsequently selected post hoc (Tukey's HSD) test were used. A 95% confidence interval was selected.

RESULTS

Average daily gain was 41.4 ± 5.8 g in group E1, 41.3 ± 5.6 g in group E2, and 41.4 ± 5.9 g in group C. No significant differences between experimental groups E1 and E2 and control group C were found ($P > 0.05$). The results are documented in Fig. 1.

On the other hand, differences concerning average daily feed consumption were significant. Experimental

group E2 showed higher value (162.1 ± 10.2 g) in this parameter than group C (155.7 ± 10.4 g) (P = 0.0023) and group E1 (154.7 ± 12.6 g) (P = 0.0006). Average daily feed consumption did not differ significantly between group C and group E1 (Fig. 2). However, average feed conversion ratio was nonsignificant amongst the groups: C (3.8 ± 0.59 g), E1 (3.78 ± 0.45 g), and E2 (3.98 ± 0.55 g).

The difference in average total feed consumption was significant between groups E2 and E1 (P = 0.02276), however between groups C and E1, as well as groups C and E2, there were no significant differences (P > 0.05) (Fig. 3). Average total feed consumption attained to 5201.5 ± 876.7 g in group E1, 5618.2 ± 915.6 g in group E2, and 5279.6 ± 923.6 g in group C.

The highest average slaughter live weight was recorded in group E2 (2758.6 ± 113.7 g), in compare to group E1 (2706.9 ± 98.8 g) and group C (2715.4 ± 99.5 g). The differences in average slaughter live weight were significant between groups E2 and E1 (P = 0.0130) and E2 and C (P = 0.0347). Nonsignificant difference (P > 0.05) was between groups E1 and C. These results are presented in Fig. 4.

Fig. 5 shows results in the average carcass weight of broiler rabbits. This observed parameter was 1574.9 ± 99.3 g in group E1, 1608.6 ± 83.9 g in group E2, and 1561.7 ± 77.8 g in group C. In group E2, the highest average carcass weight was achieved if compared to other groups, but a significant difference was only found between groups E2 and C (P = 0.0043). The other differences were insignificant (P > 0.05).

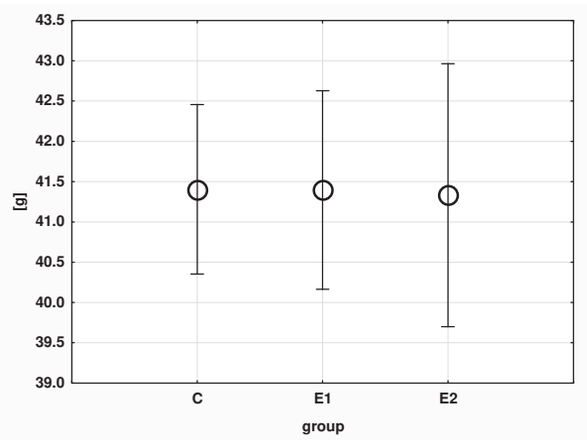

Fig. 1. Average values of daily gain of rabbits in groups C = control group (no milk thistle supplementation), E1 = experimental rabbit groups 1% non-fermented milk thistle, E2 = experimental rabbit groups 0.5% fermented milk thistle

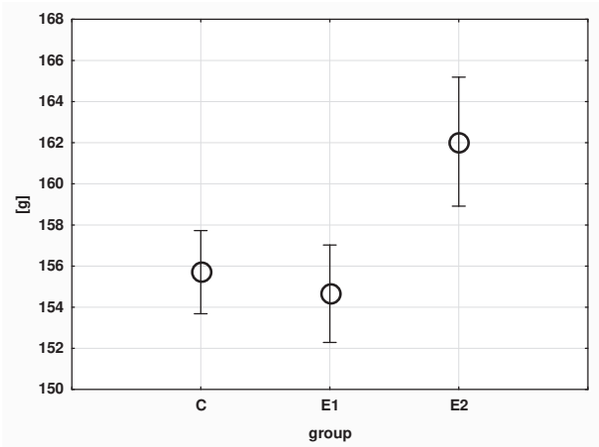

Fig. 2. Average values of daily feed consumption of rabbits in groups C = control group (no milk thistle supplementation), E1 = experimental rabbit groups 1% non-fermented milk thistle, E2 = experimental rabbit groups 0.5% fermented milk thistle

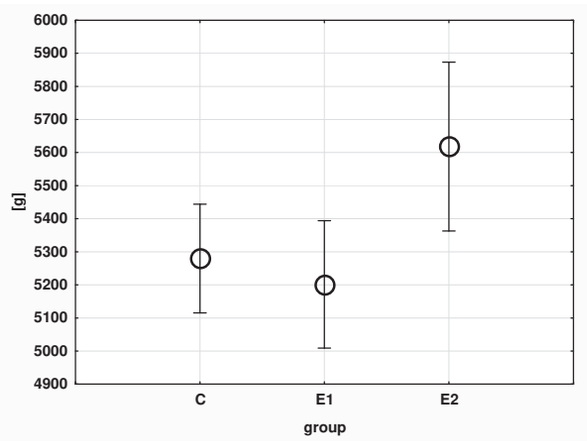

Fig. 3. Average values of total feed consumption of rabbits in groups C = control group (no milk thistle supplementation), E1 = experimental rabbit groups 1% non-fermented milk thistle, E2 = experimental rabbit groups 0.5% fermented milk thistle

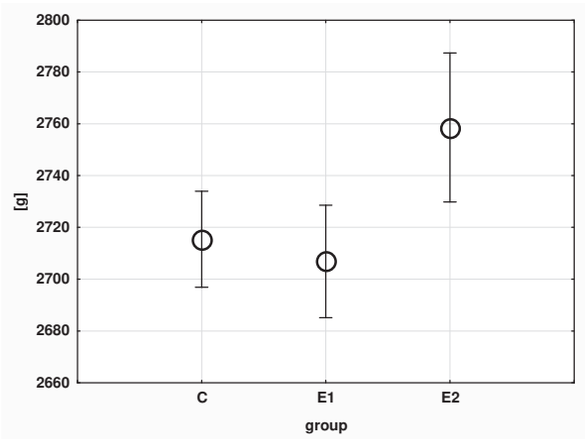

Fig. 4. Average values of slaughter live weight of rabbits in groups C = control group (no milk thistle supplementation), E1 = experimental rabbit groups 1% non-fermented milk thistle, E2 = experimental rabbit groups 0.5% fermented milk thistle

DISCUSSION

At present, there is not much informations about the use and effect of milk thistle on the performance of broiler rabbits**.** C u l l e r e et al. (2016) investigated the effect of *Silybum marianum* plants on the productive performance, carcass weight, and meat quality of growing rabbits. In their study, dietary supplementation with *Silybum marianum* did not affect the characteristics of carcass weight and the rabbit mortality was significantly reduced.

S i l b e r o v a et al. (2014) did not find statistically significant differences between the control group and the experimental group (1% black thistle extract supplemented in the diet) in the growth performance and carcass yield. K o s i n a et al. (2017) recorded a modest effect on rabbit growth performance, especially carcass weight and carcass yield, in the group fed 1% of mechanically processed milk thistle plant.

In our study, a positive effect was documented in the group supplemented with 0.5% fermented milk thistle in diet. Significant differences ($P < 0.05$) were recorded in the average daily feed consumption, total feed consumption, slaughter live weight and carcass weight, so these results are important for rabbit breeders. Also, no significant changes in the health status of rabbits and mortality were observed during experiments, and rabbits performed well until slaughter.

Rabbits evolved to consume natural grass and other vegetation that is high in fibre and has low nutritional quality and a high fibre diet is very important for maintaining digestive health. On commercial farms, rabbits are mostly exclusively fed with pellet foods. Farmers can rarely use additional fibre material such as hay. In addition to nutritional benefits, the feed is also suitable for their well-being, preventing stereotypical behaviour related to boredom and aggression (B e r t h e l s e n , H a n s e n , 1999). Inability to provide good food (fibre diet, quality pellets) is the basis of many gastrointestinal problems that rabbits suffer from (G i d e n n e , 2015).

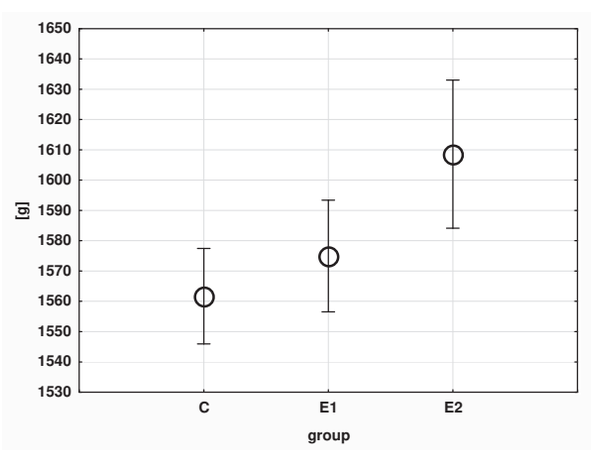

Fig. 5. Average values of carcass weight of rabbits in groups C = control group (no milk thistle supplementation), E1 = experimental rabbit groups 1% non-fermented milk thistle, E2 = experimental rabbit groups 0.5% fermented milk thistle

At present, the most scientific experiments have focused on the use of milk thistle in broiler chickens for fattening. But literary sources provide contradictory results in terms of diet with milk thistle. C h a k a r v e r t y , P a r s a d (1991) recorded a higher weight gain in the complementary diet with milk thistle. Similarly, other studies confirmed that thistle has improved body weight, feed intake, and other production parameters (T e d e s c o et al., 2004; K a l o r e y et al., 2005; K a l a n t a r et al., 2014; K r a l i k et al., 2015; Z a r e i et al., 2016).

The scientific team of G a w e l et al. (2003) recorded an increase in slaughter poultry weight when thistle was administered. On the contrary, S u c h y et al. (2008) indicated that the addition of milk thistle caused an insignificant decrease in live weight and feed conversion in chickens compared to the control group.

Also S c h i a v o n e et al. (2007) showed that the milk thistle in rabbit feed did not affect growth, but slightly negatively affected slaughtering yield loss while other studies showed that such dietary supplementation reduced feed consumption and nutrient conversion, but did not affect the gain of weight (Blevins et al., 2010; M o j a h e d t a l a b et al., 2013). It is therefore clear that the results obtained were contraindicated. These findings suggest that milk thistle may be used in the feed, but further studies are also necessary in poultry farming.

CONCLUSION

The results of this study showed that 0.5% fermented milk thistle extract supplemented in the feed ration for broiler rabbits had a positive effect on fattening performance. Rabbits fed with this supplement had significantly higher average daily feed consumption, total feed consumption, slaughter live weight, and carcass weight. To optimise the effect, a higher proportion of fermented milk thistle in a diet might be recommended. The present results should be implemented in further studies considering digestibility of nutrients, as well as the effect of this herb on intestinal microbiota.

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