STUDY OF THE EFFECT OF ROSEMARY (*ROSMARINUS OFFICINALIS*) AND GARLIC (*ALLIUM SATIVUM*) ESSENTIAL OILS ON THE PERFORMANCE OF RABBIT

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ABSTRACT

This study aimed to evaluate the efficiency of rosemary or garlic essential oils or their combination on the daily weight gain, feed intake and feed conversion ratio of young grower rabbits weaned at 23 days of age. Two hundred Pannon White rabbits were used and divided into 4 groups: 1 control and 3 treated groups. Control rabbits were fed standard medication-free growers diet supplemented with 1% sunflower oil containing or not the essential oils. Feeds of treatment groups were supplied with 0.025% garlic essential oil (group 2), with 0.15% rosemary essential oil (group 3), and combination of 0.025% garlic essential oil+0.15% rosemary essential oil (group 4), respectively. Essential oils were blended in 1% sunflower oil to ensure their homogeneity in feed. Mortality was recorded all over the experimental period. Average body weight and feed intake were measured at 3, 5, 7, 9, 11 weeks of age and used to calculate daily weight gain and feed conversion ratio. Mortality was very high between the 5th and 7th weeks of age in all groups (Group 1: 32%, Group 2: 30%, Group 3: 24%, Group 4: 38%). Rosemary oil supplementation showed some beneficial, but not statically significant, effects, as death rate was the lowest in Group 3. Combined essential oils supplementation had aggravating effect on digestive disorders as compared to the 2 single essential oils supplementation. Feed intake was only slightly and not significantly modified by essential oils. Average body weight and daily weight gain were also similar among groups. The lowest daily weight gain was found in the control group (35.9 g/day), while group 2, 3 and 4 showed somewhat higher gain (36.1, 37.8 and 37,1 g/day, respectively), but differences were not significant. Feed conversion ratio (FCR) was modified in the first four weeks of the growing period. Each treatment group (3.95, 3.93, 3.65 kg/kg, respectively) showed reduced FCR compared to the control (4.10 kg/kg). The effect was significant only in the combined treatment and between 5 and 7 weeks of age, which coincided with digestive problems. Altogether, no beneficial effect on the studied performance traits was found due to the essential oils supplementation. Digestive disorders of early weaned rabbits were not prevented by the garlic and rosemary essential oils, moreover severity of diarrhoea was increased when these essential oils were combined.

Key words: phytobiotics, garlic oil, rosemary oil, performance, growth promotion

INTRODUCTION

Early weaning of rabbit at 21-23 days of age might imply economical benefit as reducing the contact of litter and doe would reduce the possibility of transmission of pathogens (Schlolaut, 1988), and also shorter lactation might reduce energy deficit of does (Xiccato, 1996). However young rabbits are more susceptible to pathogens and digestive problems are more frequent (Maertens, 1992) in this period. To prevent digestive disorders of early weaned rabbits antibiotic growth promoters (AGP) have been generally used in the specific diet of these animals.

As effect of endemics in the last decade and changes of the consumers needs, use of AGPs declined and has become strictly regulated until 2006, when AGPs were banned in the European Union. After AGP era, searching for new AGP alternatives is a must to maintain the production conditions.

One successful choice might be an improved management technique. This was found to be partially effective in poultry and swine production. Although efforts has been done in rabbit production as well, due to the aetiology of enteropathies the situation seems to be more complicated.

Besides improved management techniques, alternatives to antibiotics are increasingly searched with a view to disease control. Among others (probiotics, prebiotics, symbiotics, organic acids, immuno modulators, enzymes), phytobiotics might be considered as potential alternatives to AGPs (Maertens *et al.*, 2006). Phytobiotics are all the forms and parts of medicinal plants and spices appropriate for feeding, *i.e*. leaves, whole plant, stem, root, flower, seed, etc., as well as plant extract or essential oils. Effect of phytobiotics depends on their bioactive compounds. The most commonly used spices, oregano, savoury and thyme are known to have antibacterial effect, due to their main active compounds, like thymol, carvacrol, p-cymene and γ-terpinene (Nevas *et al.*, 2004). But the number of potential phytobiotics is almost endless.

Data on phytobiotics in rabbit production are relatively poor, while in poultry or swine production they are used commonly in practice. In the presented experiment essential oils of two plants found to be beneficial to the performance of broiler chicken (Carrijo *et al*., 2005; Govaris *et al*., 2007) were used. Effects of rosemary and garlic essential oils and their combination on performance of growing rabbits after early weaning were studied.

MATERIALS AND METHODS

Contemporaneous Pannon White kits (n=200) born from one series of insemination were divided into 4 groups (n=50 animals/group) at 23 days of age. Rabbits were housed in double-floor wire cages (2 rabbits/cage, 16 rabbits/m²) in a building with permanent 15°C temperature. The length of daily illumination was 16 hours. Animals were fed *ad libitum*. Feed of the 4 groups was based on a commercially available grower diet (Digestible energy – 9.14 MJ/kg DM, crude protein – 17.32%, crude fat – 3.3% crude fibre – 17.2% and crude ash 10%), free of any antibiotics and added antioxidants. This feed was supplemented with certain concentration of rosemary (*Rosmarinus officinalis*) or garlic (*Allium sativum*) essential oil or both (Table 1). To ensure homogeneity, the essential oils were dissolved in extruded sunflower oil free of added antioxidants. The experiment ended at 11 weeks of age.

Table 1. Scheme of treatments

	Group C	Group GO	Group RO	Group GO+RO
Treatment	Control	Garlic essential oil (GO)	Rosemary essential oil (RO)	Combined essential oils supplementation
Vehicle	1% sunflower oil	1% sunflower oil	1% sunflower oil	1% sunflower oil
Essential oil	0	0.025% GO	0.15% RO	0.025% GO +0.15% RO

During the experiment, weight and feed consumption were measured at 3rd, 5th, 7th, 9th and 11th weeks of age. Also average daily weight gain and feed conversion ratio were calculated. Mortality was recorded in each group. Mean and standard deviation values were calculated for each group and each parameter. One-way ANOVA test was applied for statistical analysis of the results.

RESULTS AND DISCUSSION

Performance data collected are summarised in Table 2. None of the differences between treatments were significant.

Although antibacterial effect of rosemary, but even more of garlic is common knowledge, this property has not shown in the experiment considering mortality data (Table 3). High mortality rate between 35-49 days of age period was due to sever diarrhoea, which is the most frequent digestive disorder in early weaned rabbits.

Table 2: Performance data for the total experimental period (23-77 days)

Performance	Group C		Group GO		Group RO		Group GO+RO	
	Average	SD	Average	SD	Average	SD	Average	SD
Initial weight (g)	437	56	437	56	437	56	436	56
Final weight (g)	2433	217	2378	302	2473	218	2439	224
Final number of rabbits	34	-	35	-	38	-	30	-
Daily gain 23-77 days (g/day)	35.9	7.8	36.1	5.2	37.8	3.7	37.1	3.9
Daily feed intake (g/day)	147	18	143	24	149	33	136	25
Feed conversion ratio (kg/kg)	4.10	-	3.95	-	3.92	-	3.67	-

Table 3: Mortality during the experiment (%)

Period	Group C	Group GO	Group RO	Group GO+RO
23-35 days	0	2	0	0
35-49 days	32	30	24	38
49-63 days	0	0	0	2
63-77 days	0	0	0	0

However, combined essential oils supplementation seems to even aggravate the digestive disorders when compared to the single essential oils use (Group GO+Group RO vs. Group GO+RO, P=0.098) specifically in the comparison with sole rosemary essential oil utilisation (Group GO+RO vs. Group RO, P=0.066).

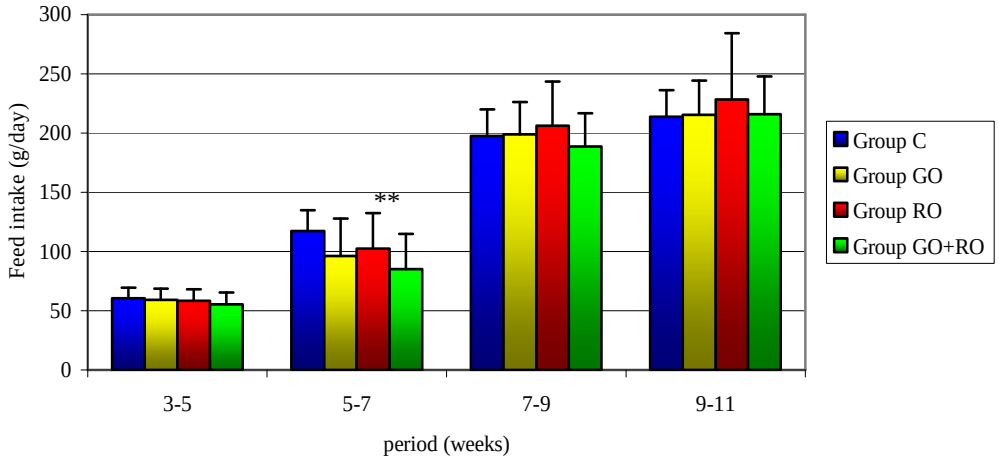

Figure 1: Average feed intake (g/day/ individual) ** - P<0.01

According to feed measurements, average feed intake was similar in each group at each measuring period (Figure 1). Significant (P<0.01), difference was found only in the combined treatment and only between 5-7 weeks as compared to the value of the control group.

Average body weight was similar in each group at each measurement (Figure 2). Starting with same weight in each group, the control values were the highest until 7th weeks of age. From 9th weeks of age average body weight of rosemary oil supplemented group has exceeded the values of the other groups, and at the end of the experiment (77 days of age) even the average weight of the combined treatment was slightly higher, than that of the control group. However, these differences were not significant.

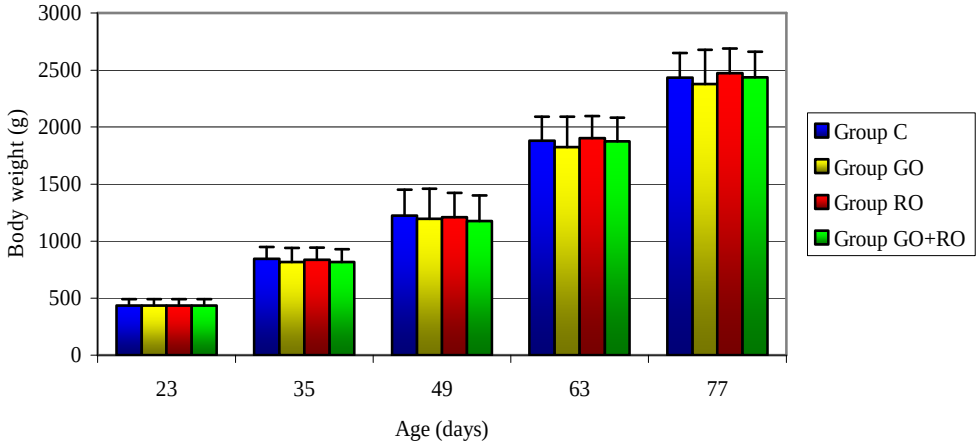

Figure 2: Average body weight (g) at 23, 35, 49, 63 and 77 days of age

Consistent to body weight data, average daily weight gain was calculated (Figure 3). The same slight differences were found as in body weight. When average weight gain for the whole grower period (from 23rd to 77th days of age) was calculated, almost no differences occurred, however, each oil-supplemented group showed slightly better weight gain, than the control (Table 2).

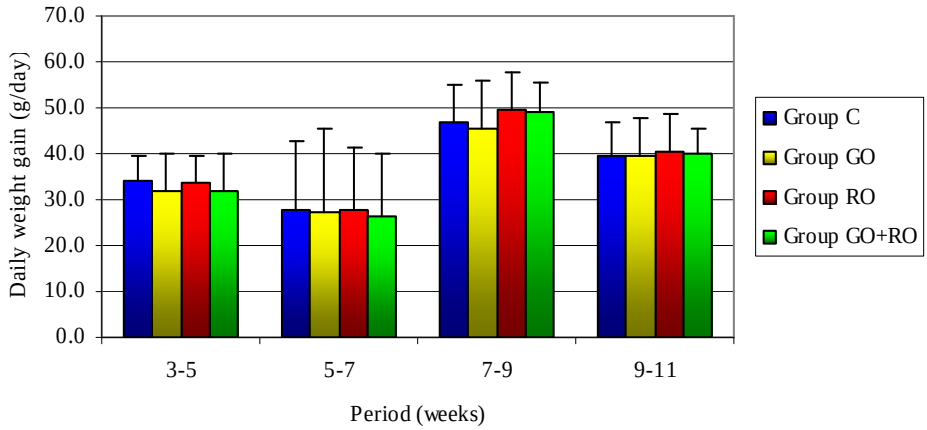

Figure 3: Average daily weight gain (g/day)

Based on the data of feed consumption and average daily weight gain, feed conversion ratio was calculated. Remarkable differences were found only in the 5th to 7th weeks of age period, when each essential oils supplemented group showed better FCR than the control, but it was significant only in the combined treatment group (Figure 4). Feed conversion ratio for the total growth period was also numerically better in each treatment group as compared to the control, but the effect was not statistically significant.

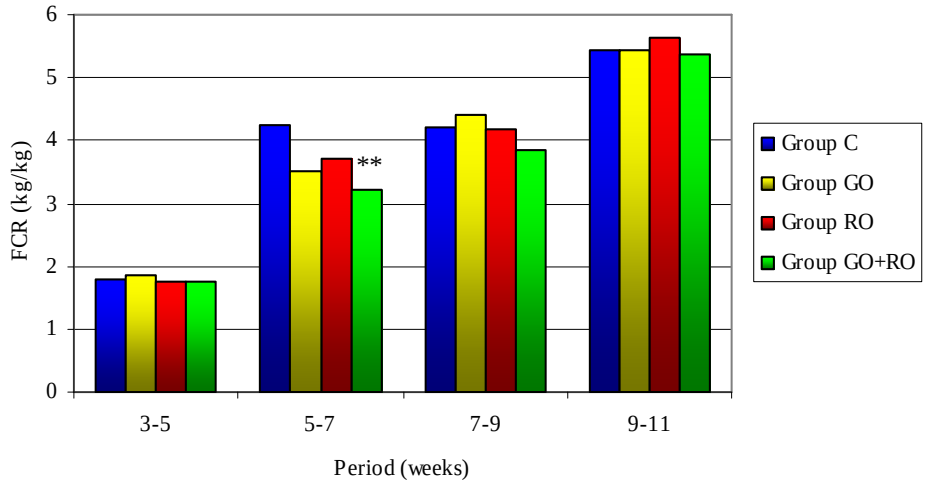

Figure 4: Average feed conversion ratio (kg/kg) (**P<0.01)

CONCLUSIONS

The studied essential oils were not capable to prevent diarrhoea after weaning, moreover an aggravation of digestive disorders was observed, when garlic and rosemary essential oils were supplemented in combination. Considering performance traits no effect was found on growth rate, though some reduction has occurred on FCR in each treated group, which is more likely due to the digestive disorders than to increased digestive efficiency. Altogether, the studied essential oils are no alternatives to medication or AGPs in early weaned rabbits.

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