

## A COMPARATIVE STUDY OF THE GROWTH PROMOTER EFFECTIVENES FOR DIFFERENT DRUG FORMULATIONS, CONTAINING OREGANO OIL FOR BROILER CHICKENS

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### ABSTRACT

A comparative study for broiler chickens using different drug formulations, containing oregano essential oil was added daily: Ecodiar® liquid 5% to the drinking water; Ecodiar® powder 5 % and oregano oil 1 % to the complete feed from the 1 to the last day of the finishing period (day 41). The experiment included 80 clinically healthy broiler chickens of the both sexes, 1-day old, hybrid Cobb-500, bred to the last day of the starter (n = 40) and bred to the last day of the finishing period (n = 40). In the dynamics (during the starter and finishing period), the indicators were determined: body weight, average daily gain, feed intake per capita/per day, energy and protein intake, feed efficiency, energy efficiency and crude protein efficiency per 1 kg gain, weight of the carcass, liver, heart, gizzard, spleen and bursa of Fabricius. The our results showed that in body weight gain and carcass, liver, spleen and heart weights of the broilers without statistically significant differences were observed compared to the control group during the starter and the finishing periods

In the gizzard weight of broilers that received Ecodiar® liquid 5 % and Ecodiar® powder 5 % with statistically significant differences were observed during the starter period, compared to the control group ( $p < 0,05$ ). In weights of the bursa Fabricius in broilers that received Ecodiar® liquid 5 % and 1 % of oregano oil ( $p < 0,05$ ) with statistically significant difference was observed during the grower-finisher period.

**Keywords:** chickens, drug formulations, containing oregano oil, growth.

### INTRODUCTION

The uncontrolled and inappropriate (incorrectly) use of antibiotics has resulted in the occurrence of large number of resistant bacteria. The uncontrolled and inappropriate (incorrectly) use of antibiotics has resulted of large number of resistant bacteria were found.

This led to withdraw approval for antibiotics as growth promoters in the European Union since January 1, 2006. The such substances were deleted from the European Register of the additives authorized for use in poultry feed.

In veterinary medicine, more essential medicinal herbs are used as feed additives for pigs and poultry. This herbs replace the nutritional antibiotics as growth promoters leading to increased in animal biomass. A major advantage of the essential oils is the fact that bacterial antibiotic resistance is not developed to their components. Unlike chemotherapeutics they do not required compliance with a withdrawal period. This guarantee the safety of the animal production obtained from them.

### MATERIALS AND METHODS

The trial was performed with 80 clinically healthy broiler chickens, hybrid Cobb-500, 1-day old, of the both sexes, with a body weight on the first day of 38-43 g. The chickens were divided by

20 chickens in 4 groups. Each group was divided by 10 chickens in 2 subgroups (A and B) as follows:

- the I group birds (n = 20) was treated ad libitum with 5 % Ecodiar® liquid which was added to the drinking water in dosage 0,5 ml/1 L from the 1 to the last day of the finishing period (day 41) of the experiment. The group was divided into 2 subgroups (IA and IB):

- the IA subgroup chickens (n = 10) was bred from the 1 to the last day of the starter period (day 21). The broilers were fed complete starter feed;

- the IB subgroup broilers (n = 10) was bred from the 1 to the last day of the finishing period (day 41). The broilers were fed complete starter, grower and finisher feeds;

- the II group birds (n = 20) was treated with Ecodiar® powder 5 % which was added to the complete feed in dosage 0,5g/1kg ad libitum, from the 1 to the last day of the finishing period (day 41) of the experiment. The group was divided into 2 subgroups (IIA and IIB):

- the IIA subgroup chickens (n = 10) was bred from the 1 to the last day of the starter period (day 21). The broilers were fed complete starter feed;

- the IIB subgroup broilers (n = 10) was bred from the 1 to the last day of the finishing period (day 41). The broilers were fed complete starter, grower and finisher feeds;

- the III group broilers (n = 20) (positive control), was treated with 1 % oregano oil (prepared by mixing 1 ml of 100 % oregano oil with sunflower oil until reaching the volume of 100 ml) which was added to the complete feed in dosage 0,5ml/1kg ad libitum, from the 1 to the last day of the finishing period (day 41) of the experiment. The group was divided into 2 subgroups (IIIA and IIIB):

- the IIIA subgroup chickens (n = 10) was bred from the 1 to the last day of the starter period (day 21). The broilers were fed complete starter feed;

- the IIIB subgroup broilers (n = 10) was bred from the 1 to the last day of the finishing period (day 41). The broilers were fed complete starter, grower and finisher feeds;

- the IV group broilers was negative control. The broilers were fed complete feed without any drugs of oregano oil. This group was also divided into 2 subgroups (IVA and IVB):

- IVA subgroup chickens (n = 10) was bred from the 1 to the last day of the starter period (day 21). The broilers were fed complete starter feed;

- IVB subgroup broilers (n = 10) was bred from the 1 to the last day of the finishing period (day 41). The broilers were fed complete starter, grower and finisher feeds.

In II and III groups we was added ex tempore drug formulations, containing oregano oil. We daily feed intake were measured from each group of birds. We weighed the amount of non-consumed feed of the chickens in each group. We daily calculated feed intake of the birds from each group

We daily monitored the clinical status of the animals in the experimental groups for 41 days.

On the day 21 the I, II, III and IV A subgroups broilers and on the day 41 the I, II, III and IV B subgroups broilers fasted for 12 h before weighing. The birds were euthanised by exsanguination by puncture of v. jugularis dexter follow by cervical dislocation. The carcasse weight of the broiler chickens were weighed individually. The liver, heart, gizzard, spleen and bursa of Fabricius from each bird were obtained and weighed.

For statistical analysis and determination of significant differences was used a computer program Statistica 6.0. by the nonparametric Mann Withney U-test and by the one-way ANOVA method.

## RESULTS

Figure 1 presents the body weight in dynamics (from day 1 to 41) of the broilers which treated with drug formulations, containing oregano oil.

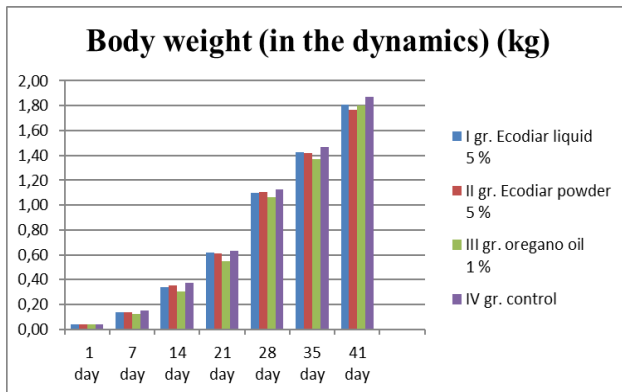
The broiler chickens which received 1 % oregano oil ( $59,500 \pm 3,900$  g) had the most effective average daily gain during the grower + finisher period. Compared to the control group (IVB) the value of indicator is 400 g more (figure 2).

The broilers which received Ecodiar® liquid 5 % (0,130 kg) had the most effective feed intake per capita/per day during the grower + finisher period. Compared to the control group (IVB) the value of indicator is 2 g less. The broiler chickens which received 1 % oregano oil (0,123 kg) had the lowest feed consumption (feed intake).

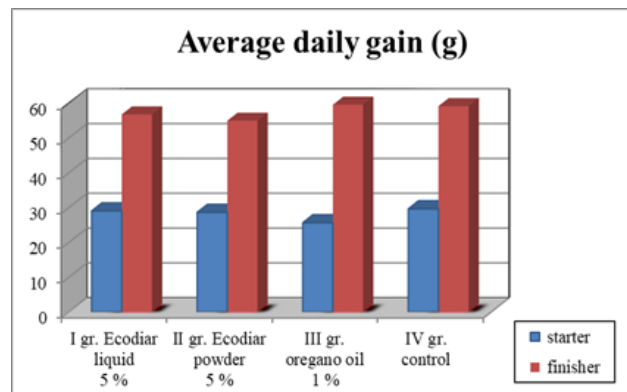
**Table 1.** Feed intake per capita/per day and nutrients (energy intake and crude protein intake) of the broiler chickens which treated with drug formulations, containing oregano oil. Feed efficiency, energy efficiency and crude protein efficiency of the broiler chickens, which treated with drug formulations, containing oregano oil ( $\bar{x}$ )

Groups	Feed intake of per capita/per day, (kg)	Energy intake per capita/per day (kcal/kg)	Crude protein intake, per capita/per day (g/kg)	Feed efficiency (g/1kg gain)	Energy efficiency (kcal/kg gain)	Crude protein efficiency (g/kg gain)
<b>I group</b>						
- starter (IA)	0,047	127,899	9,619	1,621	4410,310	331,690
- grower + finisher (IB)	0,130	365,922	23,823	2,293	6453,651	420,159
<b>II group</b>						
- starter (IIA)	0,044	119,735	9,005	1,538	4186,538	314,860
- grower + finisher (IIB)	0,127	357,478	23,273	2,313	6511,439	423,916
<b>III group</b>						
- starter (IIIA)	0,040	108,850	8,186	1,563	4251,953	319,766
- grower + finisher (IIIB)	0,123	346,219	22,540	2,067	5818,807	378,820
<b>IV group</b>						
- starter (IVA)	0,044	119,735	9,005	1,486	4045,101	378,824
- grower + finisher (IVB)	0,132	371,552	24,189	2,234	6286,836	409,290

I group – Ecodiar® liquid 5 %; II group – Ecodiar® powder 5 %; III group – 1 % oregano oil; IV group – control;



**Figure 1.** Body weight (in the dynamics, from day 1 to 41) for broiler chickens, treated with drug formulations, containing oregano oil



**Figure 2.** Average daily gain (in the dynamics) for broiler chickens, treated with drug formulations, containing oregano oil

The chickens which received Ecodiar<sup>®</sup> liquid 5 % (365,922 kcal) had the most effective energy intake (kcal) during the grower + finisher period. Compared to the control group the value of indicator is 5,630 kcal less. The broilers which treated with 1 % oregano oil (346,219 kcal) had the lowest energy intake.

The birds which received Ecodiar<sup>®</sup> liquid 5 % (23,823 g) had the most effective crude protein intake during the grower + finisher period. Compared to the control group the value of indicator is 0,366 g less. The broilers that received 1 % oregano oil (22,540 g) had the lowest crude protein intake. The broilers which treated with a 1 % oregano oil (2,067 kg) had the most effective feed efficiency (per kg gain) during the grower + finisher period. Compared to the control group (IVB) the value of indicator is 167 g more. The birds that received 1 % oregano oil (5818,807 kcal) had the most effective energy efficiency during the grower + finisher period. Compared to the control group (IVB) the value of indicator is 30,470 kcal less. The chickens that received 1 % oregano oil (378,820 g) had the most effective crude protein efficiency during the grower + finisher period. Compared to the control group (IVB) the value of indicator is 30,470 g more. The broilers that received Ecodiar<sup>®</sup> powder 5 % had the most effective energy and crude protein (per 1kg gain) conversion ratio (per 1 kg gain).

**Table 2.** Slaughter indicators for broiler chickens, treated with drug formulation containing oregano oil at the end of the finishing period (day 41) ( $\bar{x} \pm S\bar{x}$ )

Group №	body weight (kg)	weight of the carcass (kg)	weight of the liver (g)	weight of the heart (g)	weight of the gizzard (g)	weight of the spleen (g)	weight of the bursa of Fabricius (g)
I Б	1,807 ± 0,119	1,351 ± 0,096	32,893 ± 1,954	8,516 ± 0,489	23,697 ± 1,125	1,682 ± 0,245	2,703 ± 0,183 ( $u_1; a_1$ )
II Б	1,764 ± 0,070	1,278 ± 0,057	33,611 ± 1,185	9,529 ± 0,397	25,478 ± 0,991	1,547 ± 0,163	2,994 ± 0,343
III Б	1,799 ± 0,107	1,328 ± 0,086	35,158 ± 2,576	9,372 ± 0,433	25,501 ± 0,910	1,702 ± 0,147	3,520 ± 0,266 ( $u_1; a_1$ )
IVБ	1,870 ± 0,058	1,371 ± 0,046	32,204 ± 1,809	9,683 ± 0,428	24,430 ± 1,287	1,808 ± 0,119	3,041 ± 0,170

Statistically significant difference:

1. Mann Whitney U-test:  $u_1$  – at  $p < 0,05$ ;  $u_2$  – at  $p < 0,01$ ;

2. One-way ANOVA:  $a_1$  – at  $p < 0,05$ ;  $a_2$  – at  $p < 0,01$ ;  $a_3$  – at  $p < 0,001$ .

I group – Ecodiar® liquid 5 %; II group – Ecodiar® powder 5 %; III group – 1 % oleum origani; IV group – control;

The body weight of the birds which received Ecodiar® liquid 5 % ( $1,807 \pm 0,119$  kg) was the highest to the last day of the finishing period. Compared to the control group (IVB) the value of indicator is 63 g less (table 2). The carcass weight of the broilers that received Ecodiar® liquid 5 % ( $1,351 \pm 0,096$  kg) was the highest to the last day of the finishing period. Compared to the control group (IVB) the value of indicator is 20 g less, without statistically significant difference (table 2). The liver weight of the broiler chickens which received 1 % oregano oil ( $35,158 \pm 2,576$  g) was the highest to the last day of the finishing period (day 41). Compared to the control group (IVB) the value of indicator is increased by 2,954 g, without statistically significant difference (table 2). The heart weight of the birds that received Ecodiar® powder 5 % ( $9,529 \pm 0,397$  g) was the highest to the last day of the finishing period. Compared to the control group (IVB) the value of indicator is 0,154 g less, without statistically significant difference (table 2). The weight of the bursa of Fabricius of the broiler chickens which received 1 % oregano oil ( $3,520 \pm 0,266$  g) was the highest to the last day of the finishing period. Compared to the control group (IVB) the value of indicator is increased by 0,479 g with statistically significant difference (table 2). The gizzard weight of the birds that received 1 % oregano oil ( $25,501 \pm 0,910$  g) was the highest. Compared to the control group (IVB) the value of indicator is increased by 1,071 g without statistically significant difference (table 2).

## DISCUSSION

According to Jang *et al.* (2007) the oregano oil application as a feed additive for broilers, improves the growth and feed conversion ratio (kg feed/kg gain). Similar results are obtained by Fotea *et al.* (2011). They found that broiler chickens which received 1 % oleum origani which was added to the feed had the most effective average daily gain and lowest feed consumption (feed intake) compared to the control group of birds. Similar results reported by Basmacioğlu *et al.*, (2010), Roofchae *et al.* (2011) and Giannenas *et al.*, (2005). We received similar results, but only for the grower + finisher period, compared to the control group, without statistically significant difference. Alp *et al.* (2012) reported that broiler chickens which received feed, containing oregano oil consumed significantly less food compared to the control group. In our studies, we found the broilers that received 1 % oregano oil had the most effective feed conversion ratio (per kg gain) from the 1<sup>st</sup> to 35<sup>th</sup> day (except for the period from 35 to 41 day of age).

In experiment El-khalek *et al.* (2016) also found that the birds were fed food with addition of oregano oil in dosage 1 ml/1kg to the feed, had the most effective body weight and gain, compared to other experimental groups, with statistically significant difference. According to the authors, these results can be attributed to the components of plant substances that stimulated the digestive system, which control the intestinal pH and control the digestive enzymes activity (protease and lipase). In the digestive tract they reduce the pathogenic microorganisms (the total number of the aerobic and anaerobic microorganisms in the intestine, total number of coliforms) which improves broiler chickens performances.



The our results showed that in the body weight of the broiler chickens in the trial groups during the study periods (starter and grower + finisher) without statistically significant difference was observed. The birds which treated 1 % oregano oil had the most effective average daily gain during the grower + finisher period, without statistical significance. The broilers which treated with a 1 % oregano oil had the most effective feed efficiency (per kg gain), energy efficiency and crude protein efficiency compared to the others experimental groups of chickens during the grower + finisher period. The high values are supposedly due to the fact that these medicinal plants also have antibacterial, antiprotozoal, antifungal and antioxidant properties.

## CONCLUSION

The results obtained by Jang et al. (2007), Fotea et al. (2011), Alp et al. (2012) and our results (for the use of different drug formulations, containing oregano oil for broiler chickens) we suggest that 1 % oregano oil and Ecodiar<sup>®</sup> liquid 5% may be considered as potential natural growth promoters in poultry.

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